Annex F

FAO/UNECE/ILO
Seminar on Forest, Fire, and Global Change
Shushenskoe (Russian Federation), 4-9 August 1996

The seminar on Forest, fire, and global change was held in Shushenskoe, at the invitation of the government of the Russian Federation from 4 to 9 August 1996, jointly organized with the UN-FAO/ECE/ILO Team of Specialists on Forest Fire. The following non-governmental organizations were represented: International Union of Forestry Research Organizations (IUFRO); the International Boreal Forest Research Association (IBFRA). Stand Replacement Working Group; and the International Global Atmospheric Chemistry (IGAC) Project, of the International Geosphere-Biosphere Programme (IGBP). The seminar addressed:

- Assessments on the extent of land areas affected by fire (forest and other land)
- Assessment of damages caused by wildfires
- Clarification of the role of forest fires in

  (a) land-use and land cover changes
  (b) ecosystems and in maintaining biodiversity
  (c) global carbon nutritient and water cycles
  (d) forests affected by industrial and radionuclide pollution
  (e) ecosystems affected by climate change

- Forest fire management, fire intelligence and equipment
- New spaceborne fire sensors

Based on these contributions the seminar formed working groups which prepared a general statement, conclusions, and recommendations which were adopted by the seminar participants (source: UNECE TIM/EFC/WP.1/SEM.44/2 dated 16 August 1996, also published in International Forest Fire News No.15, p. 40-47).

Conclusions and recommendations

1. General statement: The Role of Fire in the Global Environment

1.1 Both anthropogenic and natural fires are an important phenomenon in all vegetation zones of the globe. Their impacts, however, are not uniform. Fires may lead to the temporary damage of forest ecosystems, to long-term site degradation and to alteration of hydrological regimes which may have detrimental impacts on economies, human health and safety.

1.2 As a consequence of global population growth and land-use changes, the cumulative effects of anthropogenic disturbances, and the over-use of vegetation resources, many forest types, which over evolutionary time periods became adapted to fire, are now becoming more vulnerable to fire.

1.3 On the other hand, in many vegetation types, of the temperate, boreal and tropical ecosystems, fire plays a central role in maintaining the natural dynamics, biodiversity, carrying capacity and productivity of these ecosystems. In many parts of the world sustainable forestry and agricultural practices as well as pastoralism depend on the use of fire.

1.4 Vegetation fires produce gaseous and particle emissions that have significant impacts on the composition and functioning of the global atmosphere. These emissions interact with those from fossil fuel burning and other technological sources which are the major cause for anthropogenic climate forcing.

1.5 Global climate change is expected to affect fire regimes and lead to an increase of occurrence and destructiveness of wildfires, particularly in the boreal regions of continental North America and Eurasia.

1.6 Fire control has been the traditional fire policy in many parts of the world. An increasing number of countries have adopted fire management policies instead, in order to maintain the function of fire in removing the accumulation of fuel loads that would otherwise lead to damaging wildfires, and in order to arrest succession at stages that are more productive to humans than are forests and brushlands that would predominate in the absence of fire.

1.7 In many countries, however, inappropriate choices are made - often because the responsible authorities and managers are not provided adequately with basic fire information, training, technologies and infrastructures. Large-scale wildfire disasters which occurred in the past years, especially in the less developed countries, may have been less severe and extended if national fire management capabilities had been developed and assistance through the international community provided.

1.8 Although the global fire science community has made considerable progress to investigate global impacts of fire, using available and developing new technologies, no international mechanisms exist for systematically collecting, evaluating and sharing global fire information. There are also no established mechanisms at the international level to provide fire disaster management, support and relief

1.9 Therefore the participants of the FAO/ECE/ILO Seminar on "Forest, Fire and Global Change" adopted the following conclusions and recommendations:

2. Conclusions

2.1 The economic and ecological impact of wildland fire at local to global levels has been demonstrated at this seminar. The possibility of major world disasters, such as the transfer of radioactive materials in wildland fire smoke, and the substantial loss of

human life in recent fires, has been scientifically documented. The lack of, and need for, a global statistical fire database, by which the economic and ecological impact of fires could be spatially and temporally quantified, was identified. Such a reliable database is essential, under current global change conditions, to serve sustainable development and the urgent needs of fire management agencies, policy makers, international initiatives, and the global modelling community.

2.2 Similarities in wildfire problems throughout the world are evident, particularly increasing fire incidence and impact coupled with declining financial resources for fire management, underlying the urgent need to coordinate resources at the international/global level in order to deal effectively with impending major wildland fire disasters.

2.3 As climate change is a virtual reality, with predicted significant impacts at northern latitudes, seminar participants recognize that boreal and temperate zone fire activity will increase significantly in the future, with resulting impacts on biodiversity, forest age-class distribution, forest migration, sustainability, and the terrestrial carbon budget. It is essential that future fire regimes in these regions be accurately predicted, so informed fire management decisions can be made.

3. Recommendations

The seminar participants draw the attention of the Joint Committee to this serious situation and to expeditiously consider the following recommendations:

3.1 Quantifiable information on the spatial and temporal distribution of global vegetation fires is urgently needed relative to both global change and disaster management issues. Considering the recent various initiatives of the UN system in favour of global environmental protection and sustainable development, the ECE/FAO/ILO Seminar on Forest, Fire and Global Change strongly urges the formation of a dedicated United Nations unit specifically designed to use the most modern means available to develop a global fire inventory, producing a first-order product in the very near future, and subsequently improving this product over the next decade. This fire inventory data will provide the basic inputs into the development of a Global Vegetation Fire Information System

The FAO should take the initiative and coordinate a forum with other UN and non-UN organizations working in this field, e.g. various scientific activities of the International Geosphere-Biosphere Programme (IGBP), to ensure the realization of this recommendation.

The information given in the Annexes I to III (Draft Proposals for the Development of a Standardized Fire Inventory System) to these recommendations describe the information requirements (classes of information, information use), the establishment of mechanisms to collect and distribute fire inventory data on a global scale.

3.2 The development of a satellite dedicated to quantifying the geographical extent and environmental impact of vegetation fires is strongly supported. Such an initiative is currently being evaluated by NASA, and this seminar strongly recommends that this and similar initiatives (e.g., NOMOS sensor on MIR space station) be encouraged and supported.

3.3 A timely process to gather and share information on ongoing wildfire situations across the globe is required. The creation of a WWW Home Page to handle this information flow is recommended. This could be coordinated with an ongoing G7 initiative, the Global Emergency Management Information Network Initiative (GEMINI), which includes a proposal to develop a Global Fire Information Network using the World Wide Web.

3.4 Mechanisms should be established that promote community self reliance for mitigating wildfire damages and would also permit rapid and effective resource-sharing between countries as wildfire disasters develop. Since the United Nations Disaster Relief Organization (UNDRO) is an organization recognized and established to coordinate and respond to emergency situations, including wildfires, it is recommended to entrust this organization, in collaboration with the United Nations Educational, Scientific and Cultural Organization (UNESCO), to prepare the necessary steps. The measures taken should follow the objectives and principles of the International Decade for Natural Disaster Reduction (IDNDR).[1]

3 5 The unprecedented threat of consequences of fires burning in radioactively contaminated vegetation and the lack of experience and technologies of radioactive fire management requires a special, internationally concerted research, prevention and control programme. Such programme should be implemented under the auspices of the FAO/ECE/ILO.

3.6 The Wildland Fire 97 International Conference in Canada should be used as a forum to further promote the recommendations of this seminar. This can be realized through co-sponsorship of this conference by the FAO, UNDRO, UNESCO, IDNDR and the ECE/FAO/ILO Team of Specialists on Forest Fire.

[1] The participants of the Shushenkoe conference were not informed that UNDRO is not longer operational. At time of writing this report IDNDR is part of the UN Department of Humanitarian Affairs (DHA)

Appendix I: Draft Proposals for the Development of a Standardized Fire Inventory System

A Vegetation Fire Inventory System at both national and international levels serve a large number of practical needs:

1 Regional - national fire management
- a budget - resource requirements
- b daily to annual tracking of activity compared to normal
- c long-term trends
- d interagency - intergovernmental assistance
- e changes in long term trends

2 Regional - national non-fire
- a integrated assessments - monitoring of fire impacts on other resources
- b policies and regulations on
  - i air quality
  - ii global change
  - iii biodiversity
  - iv other

3 International use of fire inventory
- a updated forest inventory; availability of timber; fire integrated in resource availability salvage
- b market strategies
- c import- export policies - strategies
- d food and fibre availability rangelands
- e interagency - intergovernmental assistance agreements
- f national security
- g food and fibre assessment grass and fodder
  - i
  - ii water supply and quality
- h research
  - i global change
  - ii integrated assessments monitoring
- i international treaties agreements
  - i UNCED
    - climate convention
    - biodiversity
  - ii CSD, IPF
  - iii Montreal protocol on ozone
  - iv IDNDR, others

4 Economic data utility national, but not international compatibility of assumptions

Appendix II: Information Requirements

A. Classes of information

alpha type
- fire start and end dates
- fire location (lat, long; resolution?)
- fire size
- cause of fire

beta type
- fuels - biome classification
- fuel loading forest inventory, age class, size class

gamma type
- fire characterization (crown, surface, etc.)
- fuel consumption
- structural involvement (wildland urban interface)

delta type (current ECE/FAO)
- number of fires
- area burned (by forest type)
- cause of fires (number)

epsilon type
- gas and aerosol emission data

eta type
- total expenditure of fire programme
- total fire suppession costs
- total direct losses of merchantable timber, structural losses

B. Decision Space Table

	Information use	Information type					Frequency
		alpha	beta	gamma	delta	eta	of info
Regional/National (fire)							
1	Budget resource requirements	x	x			x	A
2	Daily to annual fire activity	x	x	x		x	DWMA
3	Long term trends	x	x	x		x	A
4	Interagency agreements	x				x	DWMA
5	Resource allocation	x	x	x		x	DWM
Regional/National (non fire)							
6	Assessment monitoring	x	x				A
7	Air quality policy regulations	x	x		x		A
8	Global change policy regulations	x	x	x			A
9	Habitat change	x	x	x			A
International (fire)							
10	Intergovernmental assistance	x	x	x		x	DWMA

Information use	Information type					Frequency
	alpha	beta	gamma	delta	eta	of info
International (non-fire)						
11 Treaties and agreements	x	x	x	x		A
12 National security	x	x	x			DWM
13 Research		x	x	x	x	A
14 Market import/export forecasting	x	x		x	x	A

D = daily; W = weekly; M = monthly; A = annual

C. Parsimonious Fire Inventory

Intergovernmental assistance at bilateral or regional level does not require a global database. These agreements are regional and may differ in requirements from one region to another. If we exclude national security, we need only annual data for a global database. The gamma data type is assembled from the alpha data so there is no need to report this separately. The beta data on fuels can be obtained from other inventories, but must be standardized. The gamma data type will also require development of international standards before it can be considered. All vegetation fires must be included in this database.

Appendix III: Establishment of Mechanisms to Collect and Distribute Fire Inventory Data on a Global Scale

A. Current State of Fire Inventory

A Data consisting of individual fire reports are developed by many nations, but many regions of the world are not covered.

B Only ECE and EU nations have established mechanisms to share data.

C Current shared data consists of statistics aggregated from individual fire reports.

D Data from remote sensing is rapidly becoming available, but only for fires that can be defined by either heat signature or by fire scars on the landscape.

B. Issues

A A large number of uses of an international fire inventory have been identified in fire management, environmental policy and agreements, and in economic growth of nations.

B A parsimonious inventory has been identified which can be utilized by all nations (see statement on standardized fire inventory).

C There needs to be international agreement to provide fire inventory (similar to the FAO global forest inventory).

C. Implementation

A Fire inventory at the global scale should consist of individual fire data of date of fire start and end, location of fire, size of fire, and cause of fire. Fire location from individual fire reports normally report origin of fire. Remote sensed data are more likely to report centre of burned area. Should fire reports contain centre rather than origin, in addition to origin?

B Two additional forms of data will be needed in the future, biome classification and fire characterization. Standard for these additional information will need to be developed

C Rapid electronic communication is available for nearly all parts of the globe. Fire inventory data can be made available through World Wide Web. FAO is an appropriate centre to compile and distribute these data.

D Remote sensed data will need to be placed in the same format as individual fire reports and be made available on World Wide Web. Images can also be made available through WWW. Appropriate potential centres for compilation and distribution of these data are ISPRA (EU) or NASA's EOS-DIS.

F Those nations which cannot provide data in electronic format, should agree upon a hard copy format which can be scanned and readily placed in electronic format.

Annex G

WMO Workshop on Regional Transboundary Smoke and Haze in Southeast Asia, Singapore, 2-5 June 1998

Executive Summary

The World Meteorological Organization (WMO) organized a regional workshop on transboundary smoke and haze in Southeast Asia as part of its continuing response to forest fire episodes which caused widespread air pollution and environmental problems throughout the region. The Workshop was held in Singapore from 2 to 5 June, hosted by the Meteorological Service of Singapore and co-sponsored by the Asian Development Bank. Representatives from the National Meteorological and Hydrological Services (NMHSs), the ASEAN Specialized Meteorological Center (ASMC), Regional Specialized Meteorological Centers (RSMCs), and other agencies and organizations that are involved with fire-related activities, as well as invited experts, were in attendance.

The meeting focused on the 1997/98 smoke and haze episodes which interfered with civil aviation operations, maritime shipping, agricultural production, and the tourist industry. They also affected the health of populations in the region. The workshop was designed to foster regional and international cooperation through the review of what has been learned during the latest fire season, and to plan and coordinate implementation activities aimed at improving the NMHS's ability to manage transboundary smoke and haze episodes. This included discussions of regional plans such as the WMO Programme to Address ASEAN Regional Transboundary Smoke (PARTS) and the Regional Haze Action Plan (RHAP).

The workshop concentrated on operational aspects with emphasis on:

- The assessment of the current measurement systems and possible improvements to enhance regional capability in support of health and environmental assessments of smoke and haze effects;

- The regional capabilities to provide meteorological support during episodes of severe smoke, including the improvement of daily smoke trajectory and dispersion forecasts from the Atmospheric Transport Models (ATMs);

- The role of remote sensing in detecting and tracking fires, plumes, and aerosols and other emitted pollutants;

- Improvements in information exchange and coordination of activities among national authorities, NMHSs and international and regional agencies concerned with smoke and haze and other transboundary pollution events.

One major lesson learned from the Southeast Asian fire episodes is that smoke and haze do not recognize national boundaries. The fires last year were exacerbated by the El Niño related drought in the region which provided favourable conditions for large scale fires. It was also evident that the Meteorological Services played a critical role in the response to the smoke and haze problems. They contributed in valuable ways through:

(i) Daily meteorological monitoring and forecasting.
(ii) Specialized activities, that included hot spot identification using satellite imageries, haze trajectory modelling, compiling monthly and seasonal climate prediction information, and enhanced air quality monitoring activities.
(iii) The prompt dissemination of haze and smoke information to governmental agencies and the general public.

The fires of 1997/98 were looked at in comparison with earlier events. Records show that there have been at least nine widespread smoke and haze episodes in the region since the 1970s, occurring most frequently during El Niño periods. It is very likely that widespread smoke and haze episodes will occur again, especially as present plans call for continued large scale land conversion. Thus there is a pressing need for developing and implementing haze-related action plans.

The role of the Meteorological Services during the fire episodes is crucial. It is therefore important to strengthen their capacities for providing the timely warnings and forecasts needed to anticipate risks of future widespread smoke and haze episodes, and assist decision makers in managing these episodes. Towards this end, the following recommendations were developed at the Workshop.

RECOMMENDATIONS

The workshop formulated recommendations on modelling (A), remote sensing (B), measurements and monitoring (C) and information exchange (D).

A. Modelling

Enhance 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), through:

(a-1). Improvement of regional climate prediction capabilities to interpret global forecasts.

(a-2). Development of flexible, situation-dependent programmes which allow for the provision of enhanced meteorological measurements (expanded frequency and spatial coverage) during periods of severe smoke and haze, and expanded use of satellite-derived meteorological products as input to models

(a-3). Installation of trajectory/dispersion modelling capabilities at local meteorological services and utilization of local area modelling (LAM) capabilities in the region.

(a-4). Improvement of model performance through case studies and by conducting dry run exercises and possible tracer experiments.

B. Remote sensing

Improve the ability to characterize fire activity and track the movement of smoke and haze by strengthening present remote sensing capabilities by:

(b-1). Improvement of the operational aspects through provisions for back-up hot spot analysis capabilities, harmonization of fire counts by use of a single detection algorithm, through real time transmission of high resolution data on fires derived from satellites, and efforts to verify fire counts and burn-area information through ground-truthing activities.

(b-2). Expanded efforts to estimate aerosol and trace gas emissions from fires by combining fire counts with burn-area, along with a better characterization of sources in the diverse eco- and land-use systems.

(b-3). Promotion of the development of the next generation of satellites. This includes the need for a new NOAA channel-3 detector optimized for fire studies, dedicated fire satellites to monitor fires more precisely, and the use of space-borne radar for burned area and vegetation dryness assessment, and of lidar systems to measure the vertical distribution of trace gases and aerosols.

C. Measurements and monitoring

Strengthen regional monitoring efforts to assess the effects of smoke and haze on human health, to evaluate ecosystem impacts, to help validate atmospheric transport models, and characterize emission sources, by:

(c-1). Enhancement of existing monitoring networks to measure smoke and haze related quantities including aerosol mass ($PM_{2.5}$, PM_{10}), visibility, optical depth, and meteorological parameters. Two levels of observing stations are envisaged, a base level comprising fewer measurement parameters but with a high level of consistency across the network, and a second level with a more comprehensive measurement suite. At selected sites, targeted chemical quantities including aldehydes and other trace pollutants (CO, O_3, NO_x, VOCs, CO_2, SO_2), aerosol composition, and UV radiation are to be measured.

(c-2). Establishment of additional, including population-based, monitoring stations at areas not presently covered by existing networks (e.g., Kalimantan).

(c-3). Promotion of the scientific exchange of the validated measurement data, and the harmonization of the regional air pollution indices (API) used in regional smoke and haze alerts.

(c-4). Formulation of uniform protocols for sampling, including temporal resolution and reporting procedures. Expanding efforts directed at improvement of QA/QC, building upon the WMO Global Atmosphere Watch (GAW) programme components (WMO, GAW Report No. 113).

D. Information exchange

Improve the management of smoke and haze (and other transboundary) pollution events through efforts directed at enhanced information exchange and coordination, including:

(d-1). Enhancement of the current system for dissemination of data products and other relevant information, through the use of the GTS for meteorological data and gridded model outputs, and the Intranet and/or Internet systems for non-standard products.

(d-2). Increase the exchange of relevant information including meteorological data (especially rainfall), air quality data (including air pollution indices), and trajectory and plume forecasts. A critical element is the harmonization of data and output products to support effective real-time decision making.

(d-3). Coordination of emergency response responsibilities and activities between national Meteorological Services in the region, with the primary responsibility for the provision of information and forecasts to reside with the ASMC, but with the option of seeking further input from other RSMCs, and with provisions for bilateral arrangements.

(d-4). Improvements in existing mechanisms to regularly review the operational coordination between the NMHSs and activities related to the Regional Haze Action Plan, and to recommend changes and/or improvements to the plans.

(d-5). Development of linkages between the Meteorological Services and other national, regional and international organizations and scientific programmes with common interests, such as (IGBP/IGAC).

It was recognized that large-scale forest fires and the associated socio-economic and health-related problems occur frequently in other parts of the world as well, notably in South and Central America and Africa. It was recommended, therefore, that the deliberations of this workshop be reviewed by the organizations concerned in those regions. It was further strongly urged to organize as soon as possible an expert-level meeting to address the current situation in South and Central America.

The Workshop concluded with a plenary session which was joined by a delegation from the *Bi-regional Workshop on Health Impacts of Haze-Related Air Pollution*, organized by the WHO Regional Office for the Western Pacific, held in Kuala Lumpur, Malaysia, during 1-4 June 1998. The objectives of that meeting were to: Review haze-related air pollution problems and research findings; Identify further research needs to support haze-related decision-making; and Develop health protection measures/strategies. That workshop concluded that the haze episodes constituted a substantial health risk to the public as evidenced by the widespread exceedances of health-related air quality standards and guidelines for particulate matter (PM_{10} and $PM_{2.5}$), increased frequency of respiratory-

related hospital visits in the most heavily impacted regions; increased frequency of attacks among asthmatic children; and reported persistent decreases in lung function among school children. The risk of long term health effects from these events is much more difficult to discern.

The representatives at the WMO Workshop recognized that the set of recommendations developed by the WHO and WMO workshops are complementary, and strongly encouraged closer cooperative activities between the meteorological and health related aspects of transboundary pollution.

Reference

WMO, GAW Report No. 131, WMO Workshop on Regional Transboundary Smoke and Haze in Southeast Asia (Singapore, 2-5 June 1998), World Meteorological Organization, Geneva

ANNEX H

WHO BI-REGIONAL WORKSHOP ON HEALTH IMPACTS OF HAZE RELATED AIR POLLUTION

KUALA LUMPUR, MALAYSIA, JUNE 1-4, 1998

EXECUTIVE SUMMARY

Objectives of the workshop

The Bi-regional Workshop on Health Impacts of Haze-related Air Pollution was conducted in Kuala Lumpur, Malaysia from 1 to 4 June 1998 by the World Health Organization Regional Offices for South-East Asia and the Western Pacific.

The objectives of the workshop were:

(1) to review and summarize research findings and other relevant information concerning the impacts of haze-related air pollution on health;

(2) to identify needs for further technical information and research to support future haze-related decision-making; and

(3) to develop draft health impact reduction measures and strategies, addressing intercountry cooperation issues, for consideration by affected countries and external support agencies.

The workshop was attended by 17 participants and five observers from seven countries of South-East Asia and Papua New Guinea, four temporary advisers; ten representatives from seven international partner agencies; and four WHO staff serving as the workshop secretariat. The proceedings comprised presentations of country reports and haze-related health effects research activities by the participants; presentations of working papers by temporary advisers and representatives of international partner agencies; and plenary and group discussions on future research needs, health impact reduction measures, and inter-country cooperation.

The workshop deliberations produced conclusions in the following four major areas:

Conclusions in relation to haze-related air pollution problems and research findings:

(1) The haze episodes in South-East Asia in 1997 and early 1998 constituted a substantial health risk to the public.

(2) The main constituent of the haze that adversely affects health is particulate matter.

(3) From the existing body of knowledge that associates a range of adverse, non-cancer health impacts with urban particulate air pollution mixtures, there is no evidence that particles from different combustion sources have different impacts on health.

(4) The risk of long-term health effects due to a single air pollution episode is difficult to detect, but repeated exposures to haze episodes merit attention.

(5) To help ensure data comparability, it is desirable that consistent protocols be followed in relation to health effects monitoring, ambient air quality monitoring, and data analysis

(6) There are a number of valuable health-related research studies currently being carried out in the region.

Conclusions in relation to further research needs:

In addressing priority environmental health research needs, underlying emphasis always needs to be placed on research and public health monitoring capacity building. The priority needs identified in the region include:

(7) Research on new mitigation approaches·

- assessment the feasibility of different arrangements for "haze shelters"
- evaluation of the most effective approaches to management of a future haze emergency in terms of arranging transport to "haze shelters" for vulnerable groups, and other mitigation methods;
- evaluation of the effectiveness of remaining indoors; and
- evaluation of the effectiveness of early health care interventions, as well as public information and awareness efforts, in reducing health impacts.

(8) Research on the impacts of the 1997 haze, primarily using data that has been routinely collected·

- evaluation of short-term health impacts, including the identification of susceptible population groups;
- a regional study of short-term health impacts using standardized methodologies and routinely-collected data;
- assessment of any long-term effects in selected groups of exposed people in areas where comprehensive mortality and morbidity data are continuously maintained and
- identification of sources of particulate air pollution exposure, especially the relative contributions of biomass and motor vehicle-related urban air pollution mixture sources.

(9) Future research requiring the development of substantial new data:

- an assessment of the real effectiveness of the use of dust masks by the general population;
- an investigation of the availability of alternatives to masks which could be effective as personal protective equipment in mitigating health impacts,

- the delineation of the health impact mechanisms associated with biomass air pollution; and
- an evaluation of the impact of specific pollutants on health (e.g., specific aspects of particulate composition, polycyclic aromatic hydrocarbons, and volatile organic compounds).

Conclusions in relation to health impact reduction measures/strategies:

Priority emphasis must be given to preventing and extinguishing fires.

(10) With regard to air quality monitoring and episode forecasting, from the health sector's perspective, information on the nature and extent of human exposure to environmental pollutants is essential to impact assessment.

(11) With regard to environmental control, for rural areas, individuals should reduce their level of physical activity and use masks when outdoors in the absence of other available measures. If possible, the infiltration of outdoor air should be reduced by closing windows, doors, etc.

(12) With regard to personal protection, properly sized and fitted respirators can provide protection for essential workers who must remain outdoors for extended periods of time during haze episodes. However, the use of masks for the general population should be the lowest priority in terms of health mitigation measures.

(13) Public health monitoring needs to be considered as a routine component of health sector operations during and after haze episodes.

Conclusions in relation to intercountry and inter-organizational cooperation and coordination:

(14) Inter-country cooperation needs to be implemented through existing regional coordination mechanisms.

(15) Areas in which regional cooperation is suggested include the following:

- the development of air pollution epidemiology guidelines to harmonize research methodologies and data collection and analysis;
- the implementation of joint studies on the health impacts of the 1997 haze, including the assessment of needs for air quality monitoring data from a public health point of view;
- the strengthening of human resources and national capacity in air pollution epidemiology and air pollution and public health monitoring;
- the establishment of a regional information clearing house on haze-related health impact research; and
- the organization of regional forums and participation in international meetings.

(16) Proposals for specific projects in the above areas of cooperation will be prepared by participants from countries with interest and expertise.

(17) International and bi-lateral partner agencies are encouraged to take up and support, in a coordinated fashion, the issues reflected in the deliberations of this meeting and summarized in these conclusions.

WHO BI-REGIONAL WORKSHOP ON HEALTH IMPACTS OF HAZE-RELATED AIR POLLUTION

Kuala Lumpur, Malaysia. June 1-4, 1998

SUMMARY OF COUNTRY REPORTS

Brunei Darussalam

Since 1982, several episodes of haze have occurred in the country. The haze episode of 22-30 September 1997, although air pollution levels were not recorded, was clearly worse than the previous episodes. From February to April 1998, during which the dry weather prevailed, the Pollution Standard Index (PSI) readings exceeded 100 and climbed as high as 250, causing the disruption of daily activities, closure of schools and changes in government working hours. Morbidity surveillance by the Ministry of Health indicated increases in hospital visits during the peak haze months.

The government action taken to respond to the haze includes.

- the establishment of a National Committee on Haze in September 1997
- the development of a National Action Plan with health guidelines.
- the fighting of local fires; distribution of respiratory masks for school children
- the installation of one fully equipped air monitoring station and eight PM_{10} monitoring stations
- the promulgation of more stringent law on open burning
- the provision of public information and education through Haze Information Center and pamphlets,
- a stock of emergency supplies, and
- cooperation with other neighbouring countries through regional coordinating mechanisms.

Indonesia

The 1997 forest fires covered 12 provinces of Indonesia in the islands of Sumatra, Kalimantan, Maluku and Irian Jaya, burning an estimated 165,000 hectares. During the peak haze period of September and October 1997, significant increases in asthma, bronchitis and ARI were observed in 8 provinces. About 1, 800,000 cases of these diseases were reported among the estimated 12,360,000 persons affected by the haze. Under the coordinating Minister of Social Welfare measures were undertaken to reduce and mitigate the impact of the fires with the cooperation of neighboring and other countries which provided technical and material support in fire fighting, air quality monitoring and personal protection measures. During the peak period of air pollution in the first week of October, total suspended particulate (TSP) levels exceeded the national standard by 3-15 times. In Jambi, North Sumatra and Central and South Kalimantan, the TSP values were 15 times the national standard during the second week of October 1997. No active PM 10 monitoring was available during the haze period.

In order to increase the awareness of the community and minimize the health impact of the haze, provincial health offices were instructed to monitor air quality, strengthen the

surveillance of haze-related diseases, distributed masks to high risk group and alerted private and government health services to provide 24-hour service. In addition, guidelines were developed for health personnel to respond to haze related emergencies and a study on the long-term health effects initiated, and an information and early warning system set up for future haze disasters. In February 1998 a joint Ministry of Health-WHO training programme on PM_{10} air quality monitoring was conducted for provincial health personnel as part of the process of establishing a PM_{10} monitoring system for early warning and disaster preparedness in event of another haze episode.

Malaysia

The 1997 haze occurred between August and October with the highest Air Pollution Index (API) of 850 observed in Kuching, Sarawak. Health Surveillance data collected in Klang Valley showed increases in cases of upper respiratory tract illness, asthma and conjunctivitis in association with API values. A haze struck Miri, Sarawak in February and March 1998 with the highest recorded API reading of 649 on 30 March. There was a definite increase in the cases of upper respiratory tract illness associated with increased API values.

The activities carried out to respond to the haze episodes include

- the setting up of the Ministry of Health operations room in September 1997;
- the implementation of health surveillance;
- the provision of health guidelines;
- the provision of public information through media;
- participation in interagency collaboration through the National Haze Committee; and
- the preparation and implementation of the Standard Operating Procedure for response to haze.

Papua New Guinea

During the later part of 1997, the haze problem affected some parts of Papua New Guinea. Because of he prevailing wind conditions at that time, it is believed that much of the pollution contributing to this problem came from forest fires in Indonesia and bush fires in Australia. In addition, the problem was made worse by some bush fires in Papua New Guinea itself. The fires in Papua New Guinea were more troublesome than would normally be expected because of the significant drought conditions that existed in the country. During the month of September, the severity of the haze problem was reflected in the cancellation of about 50 percent of the commercial airline flights.

Although no ambient air quality measurements were available, during the peak haze period visibility in the city of Port Moresby (which was considered the worst area) was about 1 kilometer. Also, although no special health impact surveillance effort was undertaken, anecdotal evidence suggests that there was an increase in the incidence of respiratory-related disease problems. Analysis of routinely collected health data, however, did not indicate a statistically significant increase in the level of these diseases.

Because of the relatively minor impact of the haze problem in Papua New Guinea, mitigation measures undertaken by the Government focused on education and information dissemination activities to minimize the traditional slash and burn practices among subsistence farmers. Overall, the concerns for the future relate more to the adverse impacts

of the El Nino Phenomenon (e.g. the severe drought conditions and associated shortages of food and safe drinking water) than to a repetition of the haze problem

Philippines

The long dry period caused by the El Nino phenomenon affecting the Asian region, particularly during the months of August and September 1997 aggravated forest fire problems in Indonesia and raised concern in the Philippines about the possibility of the significant transboundary movement of the associated air pollution. The Philippines joined other ASEAN countries in monitoring haze and related air pollution. In September, the Department of Environment and Natural Resources (DENR) created the Haze task Force, composed of representatives from various government agencies. The agencies involved are the DENR, Environmental Management Bureau, the Department of Health, the Department of Science and Technology - PAGASA, the Metropolitan Manila Development Authority, the Department of Interior and Local Government and the Department of Trade and Industry. The responsibilities of the task forces were/are:

- to monitor the movement of haze caused by forest fires in Indonesia and will serve as the official source of information on haze-related issues
- to determine the health hazards accompanying such degree of haze density and accordingly take care of announcing the same to the public, including mitigation measures through bulletins and the print media; and
- to coordinate with other government agencies as may be required

The impacts of the haze from forest fires in Indonesia were noted primarily on the southern islands of Palawan and Mindanao. While no specific ambient air quality measurements of fine particulate matter were available, the visibility in these areas was reduced to about 4-5 kilometers for several days No particular health directly related to the haze problem was noted

In January 1998, the Haze task Force formulated the national Haze Action Plan in accordance with the request of the Regional Haze Task Force for ASEAN. The Philippines has participated in the series of ministerial and Regional Task Force meetings on the haze problem in Singapore, Malaysia and Brunei. In addition, a comprehensive information campaign on haze and related air pollution, emphasizing prevention, control and protection measures, is planned.

Singapore

There are 15 air quality monitoring stations throughout the country. Of these 12 are ambient stations and three roadside stations. During the 1997 haze period, the Pollutant Standard Index (PSI) was over 100 for 12 days with the highest reading of 138. About 94 per cent of haze particles were found to be less than 2.5 μm in diameter. Health surveillance showed a 30 per cent increase in hospital attendance for haze-related illnesses. An increase in PM_{10} levels form 50 μg/m3 to 150 μg/m3 was significantly associated with a 2 per cent increase in cases of upper respiratory tract illness, 19 per cent increase in cases of asthma and 26 per cent increase in cases of rhinitis. No significant increases in hospital admissions or mortality were observed.

Health advisories were given to the public and National Haze Task Force was established. A national Haze Action Plan was prepared, which would be activated when the 24-hour PSI level exceeds 50. The action will be stepped up when the PSI level reaches 200.

Thailand

The haze from the Indonesian forest fires were observed in the Southern provinces of Thailand on 22 September 1997 with a sudden increase in daily PM_{10} concentration of 20 μg/m3 in the city of Hatyai. The first peak haze episode lasted from 22 to 29 September with a Maximum peak of 211 μg/m3 followed by a second haze peak episode during 6-8 October. Although forest fires continued in Indonesia there was no significant transboundary haze episode after these two periods.

Because of the abrupt nature of the haze and lack of experience by the authorities, the response to the haze episode occurred relatively late. In response to public demand for local air quality data, the initial emphasis of the response was on monitoring air quality rather than on prevention and mitigation measures. Ordered by the Cabinet, the Ministry of Heath set up a coordinating centre for public support and appointed its committee 3 October 1997. A total of 140,000 masks were distributed in all southern provinces in early 1997. The committee appointed a subcommittee on public information and risk communication as well as to advise on protection measures. A set of guidelines for public support during haze was produced covering such aspects as air quality monitoring, health risk communication and public advice on protection measures as well as the roles of different agencies in public support. Advice on protection measures covered suggestions for susceptible population groups and the general population. Guidelines were produced for assessing public health impacts in province.

Subsequent post-haze activities included the generation of air quality monitoring and meteorology data for haze early warning system. A multidisciplinary retrospective study to evaluate changes in meteorological conditions, air quality and health effects, and a study on the records of outpatient visits and inpatient admissions in Hatyai indicated increases in respiratory illnesses related to the haze.