# AIFM CONFERENCE ON TRANSBOUNDARY POLLUTION AND THE SUSTAINABILITY OF TROPICAL FORESTS

## TOWARDS WISE FOREST FIRE MANAGEMENT

2-4 December 1996

## PROGRAMME

ASEAN INSTITUTE OF FOREST MANAGEMENT

## AIFM Vision

**"To be a centre of excellence in enhancing sustainable management and development of tropical forests"**

## AIFM Mission

**"To be a sustainable Institute that enhances sustainable management and development of tropical forests through innovations and technology transfer, linkages and consultancy services"**

## ASPECTS AND POSSIBILITIES OF COMMUNITY BASED FOREST FIRE MANAGEMENT

*by*
**Hartmut Abberger**
Integrated Forest Fire Management (IFFM) Project
East Kalimantan, Indonesia

### ABSTRACT

Every 3-4 years major forest fires occur in East Kalimantan/Indonesia affecting large land areas and resulting in considerable damage (loss in biodiversity, loss of economical values, erosion, air and water pollution). There is evidence that nearly all of these fires are the result of human activity. Slash-and-burn activities of farmers are described as main causes for forest fires. In different surveys farmer's practice of preparing and cultivating new land was studied. Main factors were identified influencing farmer's attitude to and motivation for forest fire management. The main causes for forest fires were highlighted also from farmers' point of view. The results from this study were analyzed to support operational planning in developing a forest fire management system for East Kalimantan/Indonesia. This report reflects interim results of still ongoing surveys.

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## FIRE AS A TOOL IN TROPICAL LAND MANAGEMENT

*by*
**Ahmad Ainuddin Nuruddin, Zakariya Abdullah, Mohd Basri Hamzah** and **Norazmi Talib**
Faculty of Forestry, University Pertanian Malaysia (UPM)

### ABSTRACT

Fire plays an important tool in the management and manipulation of land-use in the tropics. Uses of fire in shifting cultivations in the tropical forest and in agriculture have been practiced for years. Preliminary study on the use of fire as silvicultural tool in the regeneration of *Acacia mangium* stand shows favourable result. Effects of fire on soil, water and air are discussed. Recommendations and guidelines on reducing the negative effects of fire are proposed.

# AIFM Conference on Transboundary Pollution and the Sustainability of Tropical Forests: Towards Wise Forest Fire Management

2-4 December 1996

***Organised by***

***ASEAN Institute of Forest Management***

## CO-SPONSORS

Canadian International Development Agency
(CIDA)

Malaysian Timber Council
(MTC)

Max Planck Institute, Fire Ecology Research Group,
Freiburg University, Germany.

GTZ Integrated
Forest Fire Management Project (IFFM)

# THE ITTO ACTIVITIES IN THE PROTECTION OF TROPICAL FOREST AGAINST FIRES

*by*
**Dr. Efransjah**
International Tropical Timber Organization (ITTO)
Japan

## ABSTRACT

Tropical rain forests can be severely affected by fire. It has become evident that in many of the burnt areas, the forest will not revert to its original state through natural succession. Vegetation composition and forest structure, depending ón the degree of degradation, may be completely changed with soil, hydrology and biodiversity becoming adversely affected. Inevitably, fire will greatly reduce the benefits offered by the tropical forests. The fire which struck East Kalimantan, Indonesia, in 1982/3 was the largest ever known in the tropics. A total of 3.2 million hectares of tropical rain forests was burnt at an estimated economic loss of US$ 9 billion [see ITTO Project PD 17/87 (F)]. ITTO has assisted the Indonesian Ministry of Forestry since early 1987 by dispatching a mission to identify means of rehabilitation. In 1991 ITTO, in collaboration with the Indonesian Agency of Forestry Research and Development, established a demonstration plot aimed at rehabilitating the degraded forests under ITTO Project PD 84/90 (F). As for the pre-fire activity, pursuant to a decision of the International Tropical Timber Council, the ITTO convened an Expert Panel Meeting in Jakarta in March 1995. The panel developed a draft of "Guidelines for Fire Management in Tropical Forests". The Guidelines are designed to provide a base for policy makers and managers at various levels to develop programmes and projects in which the specific national, socio-economic and natural problems related to fire in tropical natural and planted forests will be addressed. The scope of the guidelines is to assist the ITTO producer and consumer countries to develop programmes to prevent and to reduce damage caused by fire. In line with previously published ITTO Guidelines, the Fire Guidelines have been written in a similar format which consists of principles and recommended actions. The Guidelines covers several aspects such as policy and legislation, monitoring and research, socio-economic considerations, institutional framework, training and public education, etc.

## CARBON CONSERVATION AND SEQUESTRATION IN TROPICAL FORESTS: RESEARCH STATUS AND PERSPECTIVE

*by*

**N., Abdul Rahim** and **M.A., Abdul Razak**
Forest Research Institute Malaysia (FRIM)

### ABSTRACT

There has been a conflicting account or claim whether or not tropical forest is a net emitter or net sequester of carbon dioxide in the global changing environment. While many assessments and research projects have been carried out establish the carbon budget for different forest types or regions, the controversy still remains, in particular for tropical forests mainly because of the lack of regionous research, inadequate quantitative data and accuracy of estimates to back-up those claims. Not with standing the controversy, based on current understanding, tropical forests will potentially play a critical role in the carbon conservation (maintain carbon on the land) and carbon sequestration (increase carbon on the land). Several types of sustainable management of forests and at the same time conserve and sequester carbon. Accordingly, the need to establish required databases and relevant research projects for the above assessment is highlighted. Past and current research activities related to carbon conservation and sequestration in tropical forests are reviewed, with a special reference to the carbon off-set project undertaken in Sabah, Malaysia and carbon dioxide flux measurement in Peninsular Malaysia. Some comments on the appropriate methodologies to be used for quantifying carbon balance are discussed. Finally, the paper also identifies future research areas and needs related to carbon conservation and sequestration in tropical forest in the light of sustainable forest management.

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## TRAINING AND DEVELOPMENT IN FOREST FIRE MANAGEMENT

*by*

**Peter Fuglem**, British Columbia Forest Service, Canada; and
**Tom Niemann**, ASEAN Institute of Forest Management, Kuala Lumpur

### ABSTRACT

Wildfires are an emerging problem in many areas of the world. Each year reports of forest fire related destruction and death make the news. In an era of declining government budgets, increasing fire impacts require increased cooperation between agencies. Development and training in wildfire management is key in making this cooperation work effectively. Major areas of development and training include: ecological and economic assessment; safe use of fire; prevention and public education; planning and preparedness; detection and control; fire law and enforcement; and fireline safety. As well, training should include major areas of wildfire-related sciences, including fire behavior and danger rating. Some areas of development and training involve other agencies, including structural fire control services, weather and forecasting services, the military and civil security agencies, customs and immigration, and financial and human resources agencies. Development efforts need to include budget and management processes, regulatory frameworks, external linkages, training infrastructure, and public information. Methods of training delivery are already being adapted beyond traditional classroom and field exercises to include "bootcamps", staff exchanges, practical attachments and other innovations. Training audiences are also being expanded beyond fire fighters to include supervisors, managers and researchers. It is important to provide exposure to a wide variety of techniques and technologies in forest fire control to ensure that firefighters and decision makers are aware of the full set of tools and expertise available to them in the event of large wildfires.

## BACKGROUND

Transboundary pollution has become a great concern in South-east Asia. It poses ecological risks, economic degradation, affects human health and has permanent environmental impacts on the local, regional and international scene. Forest fires, open burning, motor vehicles and industrial emissions, hazardous wastes and ship-borne pollution, are among major causes of the transboundary pollution, and are expected to keep on rising in the future.

Forest fires in particular, have received wide attention in recent years in the ASEAN region, and blamed to have caused thick haze (*jerebu*) over the capital cities of Kuala Lumpur, Singapore and other densely populated townships. The haze may stay for weeks, jeopardising, many people believe, not only the health of nations but also survival of the tropical forests. Billions of dollars worth of flora and fauna, particularly timber, have been lost in smoke with the double irony of causing air pollution along the way. Rapid development in the environmental sphere has called for urgent ASEAN cooperation to shape international perspectives in environmental management and professionalism to address transboundary pollution. This conference could be the first of its kind organised in the ASEAN region, not because of the lack of necessity but imminent realisation of its hazardous effects on air quality and human welfare.

At the ASEAN Meeting on the Management of Transboundry Pollution, in June 1995, ASEAN Member Countries agreed to collaborate actively to develop expertise and capability to minimise the effects of transboundary pollution. The world must maintain a minimum standard of environmental healthiness conducive for sustaining the forest. Immediate attention must be taken to address the problem and maintain the clean air that we breathe. The world must enjoy the freshness of natural forest and allow it to flourish and prosper. There is a complex relationship between transboundary pollution and the sustainable management of the tropical forest, or isn't there? Indeed, whichever way we look at it, there is a real need for a multi-disciplinary and integrated resource management planning approach to tackle the issue. It is with this in mind that the Institute is organizing a conference to discuss and solicit practical solutions to address the impact of transboundary pollution on the sustainability of the tropical forest. It is hoped that the conference will recommend a pragmatic approach, techniques and procedures to help us sustain clear blue skies and safely enjoy the air that we breathe and the water that we drink.

## OBJECTIVES

This conference is being held to provide a forum with leading public and private agencies, specialists and resource persons to discuss issues, programmes and strategies surrounding transboundary pollution and sustainable development of tropical forest.

The objectives of the conference are:

- To review forest-related causes of transboundary pollution, and the effects of this pollution in South-east Asia;
- To examine the effects of all types of transboundary pollution on tropical forests in South-east Asia;
- To exchange information and experiences regarding new methods and tools for forest fire management;
- To discuss and recommend priorities for changes in policy, research, forest fire management and training; and
- To explore opportunities for international and interagency cooperation.

## PARTICIPATION

This conference is intended for foresters, resource managers, administrators, environmentalists, scientists, researchers and other related professionals involved in various disciplines such as training institutions, research agencies, universities and forest industries interested in the sustainable management of the forests and overcoming transboundary pollution.

## RESEARCH AND DEVELOPMENT NEEDS IN FOREST FIRE MANAGEMENT

by

**Dr. Kamis Awang, Ahmad Ainuddin Nuruddin** and **Mohd. Basri Hamzah**
Faculty of Forestry, Universiti Pertanian Malaysia (UPM)

### ABSTRACT

Knowledge on tropical forest fire and its effect is still scarce. With the increase in incidences of fire and the potential fire consequences associated with them, an increased understanding of the relationship between fire and the tropical forest is necessary. As such research activities should be centered on effects and role of forest fire on tropical forest ecosystem such as vegetation, soil, water and air. In the tropical forest plantations, an effective forest fire management programme should be developed. This involves investigations on the fuel characteristics and development of fire danger rating system. Use of fire as a silviculture tool in forest plantations should also be studied. Preliminary study shows that use of fire in regeneration of *Acacia mangium* is positive. With the advent of computer technology in forestry, researchers could use GIS and remote sensing technologies to classify fuel types and high risk areas and detect fire hotspots. Research on the contribution of forest fire and biomass burning on greenhouse gases and haze should also be caried out. In short there are lots of work that should be carried out to understand the role of fire in tropical ecosystems. This effort needs a multi-disciplinary approach and cooperation from various agencies and scientists.

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## THE POTENTIAL OF USING REMOTE SENSING/GIS IN THE MANAGEMENT OF FOREST FIRE

*by*

**Ibrahim Selamat, Kamaruzaman Jusoff, Muhamad Kamal Azidy Musa, Norizan Abd. Patah** and **Ahmad Nadzri Mohamed**
Centre for Remote Rensing, Malaysia

### ABSTRACT

Forest is not only managed for the production of wood, but also as a safeguard for environment. One of the main factors causing environmental degradation is the occurrence of uncontrolled wildfire and controlled burning which effects the atmospheric condition, ecology and soil. This paper highlights the potential of using remote sensing / GIS in the management of forest fire, particularly in forest fire detection and mapping, fire risk estimation, fire damage assessment and assessment of fire risk. Problems anticipated in forest fire management are also discussed. A theoretical framework to utilise remote sensing data and GIS capability in forest fire management is also presented. This information may be use by Malaysian Forestry Department and related agencies in the management of local forest fires.

## SESSION E
## RESEARCH AND DEVELOPMENT IN FOREST FIRE MANAGEMENT

### KEYNOTE ADDRESS: DEVELOPMENT RESEARCH ON THE IMPACT OF TRANSBOUNDARY POLLUTION ON FOREST RESOURCES

*by*

**Gerald L. Geernaert** and **A. Bastrup-Birk**
Atmospheric Environment Department
National Environmental Research Institute (NERI)
Denmark

# PROGRAMME

**SUNDAY, 1 DECEMBER 1996**

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| | Arrival of Participants. |
| 1400 | Hotel Registration. |

**DAY 1: MONDAY, 2 DECEMBER 1996**

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|---|---|
| 0800 | Registration of Participants. |
| 0830 | Arrival of Invited Guests. |
| | **OPENING SESSION** |
| 0900 | Arrival of Y. B. Cik Siti Zainab bt. Dato' Sheikh Abu Bakar, Deputy Minister of Primary Industries, Malaysia. |
| 0905 | Remarks by En. Haron Abu Hassan<br>Director of the AIFM and Chairman of the Organising Committee. |
| 0915 | Remarks by Dato' Ismail bin Awang<br>Director General of Forestry, Peninsular Malaysia, and Chairman, Project Steering Committee for AIFM. |
| 0930 | Opening Address by Y. B. Cik Siti Zainab bt. Dato' Sheikh Abu Bakar, Deputy Minister of Primary Industries, Malaysia. |
| 1000 | Group Photo and Refreshment. |

## SESSION A: AIRBORNE POLLUTION - TRANSBOUNDARY EFFECTS ON TROPICAL FORESTS

**Chairman: Assoc. Prof. Dr. Kamis bin Awang**
**Secretary: Dahlan bin Taha**

1030 **Keynote Address**: *The Haze Problem in Relation to Forestry and the Environment* by Mr. Narayanan Kanan, Ministry of Primary Industries, Malaysia.

1055 **Paper 1**: *Airborne Pollutions and its Transboundary Effects on Forests* by James Dawos Mamit, Natural Resources and Environment Board Sarawak , Malaysia.

1120 **Paper 2**: *Acid Deposition and Haze in Malaysia and Indonesia: Causes, Relationships and Consequences* by Gregory Ayers, R. W. Gillet, P. W. Selleck, J. C. Marshall, H. Granek, Leong Chow Peng, Lim Sze Fook, Henry Harjanto, Tuti Mhw and D. Parry, CSIRO, Australia.

1145 **Paper 3**: *Transboundary Pollution Impact on Tropical Forests in Relation to Climate Change* by E. Philip and N. Manokaran, Forest Research Institute of Malaysia.

1210 **Paper 4**: *Regional Air Pollution of Aerosols and Ozone by Forest Fires in Tropical East Asia- A Case Study of the 1994 Episode* by Haruo Tsuruta, National Institute of Agro-Environmental Sciences, Japan.

1235 **Paper 5**: *Technical Aspects of the Transboundary Pollution Haze Formation Over Indonesia and Adjoining Area* by Paulus Agus Winarso, Meteorological and Geophysical Agency, Indonesia.

1300 Lunch.

### ABUNDANCE OF TROPICAL BIODIVERSITY AND CONSEQUENCES OF FOREST FIRE

*by*
**A. H. Zakri** and **A. Latiff**
Universiti Kebangsaan Malaysia (UKM)

**ABSTRACT**

The tropics and in particular the tropical South-east Asian region is endowed with one of the richest biodiversity in the world. South-east Asian tropical rain forest is believed to harbour at least 35,000 species of plants. At least three countries, viz. Indonesia, Malaysia and Papua New Guinea are considered as megadiversity areas. In Malaysia, forests constitute about 55% of the total and area and most of these are rich with biodiversity and of these about 7.6% have been set aside for its conservation. Plant diversity is represented by 12,000 species and in Peninsular Malaysia alone, trees are represented by 2830 species and with 30% endemicity. Over the years the region faces many natural and man-induced factors that may deplete the biodiversity; and among them is the consistent transformation of the humid tropical rain forests to other land-uses. One of the consequences is the proliferation of secondary vegetation with reduced biomass, altered structure and composition. These secondary vegetation in the montane and submontane areas and in dry monsoon climatic regimes are prone to forest fires. And forest fires are known to obliterate vegetation and could lead to a series of ecological succession of weeds and less economic pioneer species.

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### PROGRESS IN SMOKE CHARACTERIZATION AND MODELLING

*by*
**Darold E. Ward** and **Robert J. Yokelson**
Intermountain Fire Sciences Laboratory, Fire Chemistry Project, USA

**ABSTRACT**

The composition, dispersion, and health effects of smoke from biomass fires is being studied through a collaboration of the US Forest Service and the University of Montana. Instrumentation for studying smoke composition includes gas chromatography, open-path Fourier transform infrared spectroscopy, nephelometers, and other techniques making it possible to analyze for hundreds of the constituents of smoke. Analytes include particulate matter (PM2.5), $CO_2$, CO, hydrocarbons, oxygenated and halogenated organic compounds, and nitrogen and sulfur compounds. This instrumentation has been deployed above controlled fires in our laboratory and in the field; or on aircraft probing individual fires or regional haze in the United States, Brazil, and Africa. Laboratory and tower deployments focus on detailed source characterization coupled with measurement of fire effects on soils. Airborne deployments of our instrumentation primarily research the transport of smoke. Both measurements provide data for photochemical plume models. A comprehensive assessment of the health effects of smoke is also nearing completion. Future deployments of our instrumentation are planned for Southeast Asia as part of the SEAFIRE program.

## FOREST FIRE AND SMOKE MANAGEMENT: MALAYSIAN EXPERIENCE

by
**Thai See Kiam**
Forestry Department of Peninsular Malaysia.

### ABSTRACT

Malaysian experience in forest fire management is limited due to the rare occurrence of major forest-fire in the natural forests where the conditions are generally moist. However, with large areas of forest being converted into oil palm, rubber and forest plantations in the past two decades, the potential threat of serious fire occurring in this country should not be overlooked. A National Contingency Plan for Forest and Plantation Fire has been proposed to coordinate and enhance response system among relevant agencies in the event of a major forest fire. In this respect, there is a need to develop forest fire-fighting capability through human resources development both in the Forest Department as well as the National Fire Services Department. The implementation of ASEAN Action Plan on Forest Fire can further enhance the forest fire-fighting capability in this country through various training activities and sharing of expertise and resources.

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## FOREST FIRE AND SMOKE MANAGEMENT: THAILAND EXPERIENCE

*by*
**Siri Akaakara**
Royal Forest Department, Thailand

### ABSTRACT

Fire has long been playing a vast destructive role in forest ecosystem of Thailand. However before 1980 vary little attention was paid to such problem, though the annual forest area burned was estimated at 18.7 millions ha. In 1980 the vary first forest fire control program had been implemented at Doi Suthep-Pul National Park in Chiangmai by the King initiatives. This has been followed by the cabinet resolution on tackling down fire crisis in 1981. Such resolution brought about the nation-wide active fire control program ever since. At present, the responsible agency, Forest Fire Control Division of the Royal Forest Department, is able to launch the efficient fire prevention campaign via all kinds of medias throughout the country all year round. With respects to fire suppression, there are 59 forest fire control stations nation-wide with total of 3,500 full time fire crew ready for the task. These suppression teams are supported by 200 small fire engines, 10 fire tenders, 10 helicopters and 6 fixed-wing planes. The success of the effort is obvious. The annual burned areas were brought down from 3.5 millions ha. in 1985 to 0.7 millions ha in 1994.

## SESSION B: TERRESTRIAL POLLUTION EFFECTS ON TROPICAL FORESTS

**Chairman: Tan Sri Wong Kum Choon**
**Secretary: Chin Yue Mun**

1400 **Keynote Address**: *Fire and Sustainability of Tropical Forests* by Dato' Dr. Baharuddin bin Hj. Ghazali, International Tropical Timber Organization (ITTO) Regional Consultant for the Asia Pacific Region, Kuala Lumpur

1425 **Paper 6**: *Forest Fire Management and its Influence on Forest Development in ASEAN* by Haron Abu Hassan and Antonio C. Manila, ASEAN Institute of Forest Management, Kuala Lumpur.

1450 **Paper 7**: *Forest Fire Effects on Commercial Timbers and Forest Productivity: Philippines Experience* by Egidio F. Costales Jr., Rhandy S. Tubal and Luciano C. Bato, Cordillera Administrative Region (CAR), Department of Environment and Natural Resources, Philippines.

1515 **Paper 8**: *Regional Vegetation Fire Patterns in South and Southeast Asia. A Satellite - Based Assessment* by Jean Paul Malingreau, S. H. Jones and E. Dwyer, Space Application Institute, JRC - European Commission, Italy.

1540 Refreshment

1555 **Paper 9**: *Biomass Burning in Indonesian Tropical Forest* by Sumaryati and Rosalina Naitutu. National Institute of Aeronautic and Space, Bogor, Indonesia.

1620 **Paper 10**: *Meteorological Monitoring Network of Forest Fire and Smoke Management in Malaysia* by Leong Chow Peng, Meteorological Services, Malaysia.

1645 Adjournment

DAY 2: TUESDAY, 3 DECEMBER 1996

## SESSION C: ASEAN FOREST FIRE FORUM

**Chairman: Dr. Johann G. Goldammer**
**Secretary I: Harmut Abberger**
**Secretary II: Dr. Antonio C. Manila**

0800 **Paper 11**: *Initial Thoughts Towards Cooperation in Fire and Smoke Research and Management in ASEAN Region* by Johann G. Goldamer, IFFM/GTZ, Samarinda, Indonesia and Max Planck Institute for Chemistry, Germany.

0825 **Paper 12**: *Impacts and Feedback Loops of Global Change in South-east Asia: A Perspective of Forest Fire Management* by Daniel Murdiyarso, BIOTROP-GCTE, South-east Asian Impacts Centre, Bogor, Indonesia.

0850 **Paper 13**: *Forest Fire Management in ASEAN Through Regional Cooperation* by John F. Goodman, and Carla Hogan Rufelds, Canadian International Development Agency (CIDA), Canada.

0915 **Paper 14**: *ASEAN Forest Fire Management Action Plan* by Haron Abu Hassan and Dahlan Taha, ASEAN Institute of Forest Management, Kuala Lumpur.

0940 Formation of Working Groups on Regional Cooperation.

# MANAGEMENT OF SMOKE DURING PRESCRIBED BURNING FOR FOREST FIRE MANAGEMENT: AN AUSTRALIAN EXPERIENCE

*by*

**Richard J. Sneeuwjagt**
CALMfire Branch, Department of Conservation and Land Management
Western Australia

## ABSTRACT

Land management agencies responsible for forests and conservation reserves on public lands in Australia regularly have to confront unplanned fires which can burn extensive areas and cause loss of life and property and cause enormous damage to public assets and timber resources. Given the extremely hot and dry weather conditions that prevail in most summers, the only practical and environmentally acceptable means of preventing such damaging wildfires is fuel reduction by prescribes burning. An unavoidable result of prescribed burning is the production of smoke. Prescribed burns conducted by the Western Australian Department of Conservation and Land Management (CALM) on forest blocks up to 300 km south of Perth, can result in the development of smoke haze in the Perth metropolitan area. This smoke haze can significantly reduce visibility along highways and airports, and upset residents who perceive there may be health risks associated with smoke concentration. Active smoke management programs for burns close to Perth began in 1974, and smoke management has more recently been extended to all forest areas in the South-west of the State. Studies on the impacts of various weather parameters and operational factors on the incidence of smoke haze in Perth indicated that the most important factors included atmospheric stability conditions, wind directions, location of burn in relation to other burns, accumulated areas of burns, timing of burns, and distance of burn from Perth. A set of smoke management guidelines have been developed and tested successfully over four fire seasons. The guidelines have been incorporated into a decision model for fire managers. The model is presented in the form of a series of simple decision charts. Further research into prediction of smoke transport and dispersion is being undertaken between CALM and the WA Regional Bureau of Meteorology. The Australian national position on managing smoke during prescribed burning operations is presented.

## FOREST FIRE AND SMOKE MANAGEMENT: MALAYSIAN EXPERIENCE

by
**Thai See Kiam**
Forestry Department of Peninsular Malaysia.

### ABSTRACT

Malaysian experience in forest fire management is limited due to the rare occurrence of major forest-fire in the natural forests where the conditions are generally moist. However, with large areas of forest being converted into oil palm, rubber and forest plantations in the past two decades, the potential threat of serious fire occurring in this country should not be overlooked. A National Contingency Plan for Forest and Plantation Fire has been proposed to coordinate and enhance response system among relevant agencies in the event of a major forest fire. In this respect, there is a need to develop forest fire-fighting capability through human resources development both in the Forest Department as well as the National Fire Services Department. The implementation of ASEAN Action Plan on Forest Fire can further enhance the forest fire-fighting capability in this country through various training activities and sharing of expertise and resources.

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## FOREST FIRE AND SMOKE MANAGEMENT: THAILAND EXPERIENCE

*by*
**Siri Akaakara**
Royal Forest Department, Thailand

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## SESSION B: TERRESTRIAL POLLUTION EFFECTS ON TROPICAL FORESTS

**Chairman: Tan Sri Wong Kum Choon**
**Secretary: Chin Yue Mun**

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1450 **Paper 7**: *Forest Fire Effects on Commercial Timbers and Forest Productivity: Philippines Experience* by Egidio F. Costales Jr., Rhandy S. Tubal and Luciano C. Bato, Cordillera Administrative Region (CAR), Department of Environment and Natural Resources, Philippines.

1515 **Paper 8**: *Regional Vegetation Fire Patterns in South and Southeast Asia. A Satellite - Based Assessment* by Jean Paul Malingreau, S. H. Jones and E. Dwyer, Space Application Institute, JRC - European Commission, Italy.

1540 Refreshment

1555 **Paper 9**: *Biomass Burning in Indonesian Tropical Forest* by Sumaryati and Rosalina Naitutu. National Institute of Aeronautic and Space, Bogor, Indonesia.

1620 **Paper 10**: *Meteorological Monitoring Network of Forest Fire and Smoke Management in Malaysia* by Leong Chow Peng, Meteorological Services, Malaysia.

1645 Adjournment

## SOME ALTERNATIVE METHODS OF REDUCING SMOKE EMISSIONS WHEN DISPOSING OF DEBRIS FROM FOREST CONVERSION OPERATIONS

*by*

**James C. Sorenson**

Fire & Aviation Management, USDA Forest Service

Atlanta, Georgia

### ABSTRACT

Smoke, the visible pollution contributing to many of the problems associated with timber production and other agricultural activities in the area encompassed by ASEAN member nations, can usually be traced to *incomplete combustion* of vegetative debris which is commonly disposed of by careless burning. Because of improper piling, incorporation of large amounts of soil into the pile, and other factors, this method usually results in unsatisfactorily high levels of remaining debris, and more important to the subject of this conference, to unacceptably high levels of smoke and other harmful emissions. There are means available to deal with the debris to minimize the production of undesirable levels of smoke. Any of them will add to the cost to doing business beyond that of simply piling and burning. It will be necessary for governments to require practices which will result in lower emissions; but it is also their obligation to seek low-cost alternatives to the inefficient methods. This paper discusses two possibilities, the *air curtain destructor*, and *the use of debris for power generation.*

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| 1000 | Refreshment |
| 1015 | Start of Working Group Sessions |
| 1300 | Lunch |
| 1400 | Working Group Reports |
| 1500 | Discussion and Recommendations |
| 1600 | Refreshment |
| 1615 | Discussion and Recommendations (continued) |
| 1700 | Adjournment |

*or*

0800 **FIELD EXCURSION TO FOREST SITES AND MELAKA**

DAY 3: WEDNESDAY, 4 DECEMBER 1996

## SESSION D: FOREST FIRE AND SMOKE MANAGEMENT

**Chairman: Prof. Dato' Dr. Zakri bin Abdul Hamid**
**Secretary: Mohd. Puat bin Dahalan**

0800 **Keynote Address**: *Overview of Fire and Smoke Management Issues and Options in Tropical Vegetation* by Dr. Johann G. Goldammer, GTZ-Integrated Forest Fire Management Project and Max Planck Institute for Chemistry Fire Ecology and Biomass Burning Research Group, Germany.

0825 **Paper 15**: *Some Alternative Methods of Reducing Smoke Emissions When Disposing of Debris From Forest Conversion Operations* by James C. Sorenson, USDA Forest Service, USA.

0850 **Paper 16**: *Management of Smoke During Prescribed Burning for Forest Fire Management: An Australian Experience* by Richard J. Sneeuwjagt, Fire Protection Branch, Department of Conservation and Land Management, Australia.

0915 **Paper 17**: *Forest Fire and Smoke Management: Malaysian Experience* by Thai See Kiam, Forestry Department of Peninsular Malaysia.

0940 **Paper 18**: *Forest Fire and Smoke Management: Thailand Experience* by Siri Akaakara, Royal Forest Department, Thailand.

1005 **Paper 19**: *The Abundance of Tropical Biodiversity and Consequences of Forest Fire* by Zakri A. Hamid and A. Latif, Universiti Kebangsaan Malaysia.

1030 **Paper 20**: *Progress in Smoke Characterization and Modeling* by Darold E. Ward and Robert J. Yokelson, University of Montana, USA.

1055 Refreshment

## SESSION D
## FOREST FIRE AND SMOKE MANAGEMENT

### KEYNOTE ADDRESS: AN OVERVIEW OF FIRE SMOKE MANAGEMENT ISSUES AND OPTIONS IN TROPICAL VEGETATION

*by*

**Johann G. Goldammer**
GTZ-IFFM Project and Max Planck Insitute for Chemistry, Fire Ecology and Biomass Burning Research Group, Germany

## FOREST FIRE MANAGEMENT IN ASEAN THROUGH REGIONAL COOPERATION

*by*
**John F. Goodman and Carla Hogan Rufelds**
Canadian International Development Agency (CIDA)
Canada

### ABSTRACT

Forest fires and their impact continue to be a major issue globally and in ASEAN influencing the quality of life, land, air, and water. Fire and its products recognize no boundaries. In ASEAN unacceptable resource losses and transboundary pollutants need immediate attention by ASEAN nations and international partners. Forest sustainability, public health and economic opportunities area at risk. Recent progress has been made bilaterally, multilaterally and regionally on this critical regional issue by ASEAN nations and development assistance partners. In order to address the global and transboundary consequences of forest fire in the ASEAN region, this work now needs to be targeted, coordinated and enhanced using well founded existing national and regional programs supported by the countries in the region and the international community. However, the world of development assistance is involving and traditional donor/recepient models are being adjusted to reflect funding realities, address common goals and promote equitable partnerships. Assistance for fire management programs will be premised on a Regional ASEAN approach with shared outcomes and projects coordinated across national boundaries. Financing of future investments in this area will be levered and resources in ASEAN brought to bear on the issue. This investment will not only come from regional and international governmental agencies but also the private sector - an important partner in national and regional sustainable development and economic growth. Coordinated forest fire assistance programs will be a prerequisite to ensure national and regional outputs are collaborative and synergistic. Canada has the technology and has been and is a willing partner in a new environment where key participants co-invest in addressing the forest fire challenges in ASEAN.

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## ASEAN FOREST FIRE MANAGEMENT ACTION PLAN

*by*
**Haron Abu Hassan** and **Dahlan Taha**
ASEAN Institute of Forest Management (AIFM)
Kuala Lumpur

In the ASEAN Cooperation Plan, the AIFM's role has been expanded to include the upgrading of skills and capabilities of ASEAN member countries in the field of forest fire management. The proposed project will enhance the region's capabilities in forest fire management with the latest technology in the prevention and combating forest fires through the establishment of linkages with developed and multilateral organizations; and also through the establishment of a regional training centre. A regional forest fire rating system and strategy for responding to forest-fire emergencies will be developed to enable ASEAN to work as a team in eliminating the transboundary atmospheric pollution due to forest fires.

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## SESSION E: RESEARCH AND DEVELOPMENT IN FOREST FIRE MANAGEMENT

**Chairman: Dr. Wan Razali Wan Mohd**
**Secretary: Mohd Nasaruddin Abd. Rahman**

1110 **Keynote Address**: *Development Research on the Impacts of Transboundary Pollution on Forest Resources* by Dr. Gerald L. Geernaert, National Environmental Research Institute (NERI), Denmark.

1135 **Paper 21**: *Research and Development Needs in Forest Fire Management* by Kamis Awang, Ahmad Ainuddin Nurudin and Mohd. Basri Hamzah, Faculty of Forestry, Universiti Pertanian Malaysia.

1200 **Paper 22**: *The Potential of Using GIS/RS in the Management of Forest Fire* by Ibrahim Selamat, K. Jusof, M. K. Azidy, N. A. Patah and A. N. Mohamed, Centre for Remote Sensing, Malaysia.

1225 **Paper 23**: *Carbon Conservation and Sequestration in Tropical Forests: Research Status and Perspective* by Abd. Rahim Nik and Abdul Razak Mohd. Ali, Forest Research Institute of Malaysia.

1250 **Paper 24**: *Training and Development in Forest Fire Management* by Peter Fuglem and Tom Niemann, B.C. Forest Service, Canada

1315 Lunch

1400 **Paper 25**: *ITTO Activities in the Protection of Tropical Forests Against Fires* by Efransjah, International Tropical Timber Organization (ITTO), Japan.

1425 **Paper 26**: *Aspects and Possibilities of Community Based Forest Fire Management in East Kalimantan/Indonesia* by Harmut Abberger, Integrated Forest Fire Management (IFFM) Project, East Kalimantan, Indonesia.

1450 **Paper 27**: *Fire as a Tool in Tropical Land Management* by Ahmad Ainuddin b. Nuruddin, Zakariya Abdullah, Mohd Basri Hamzah and Norazmi Talib, Faculty of Forestry, Universiti Pertanian Malaysia.

1515 Refreshment

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## INITIAL THOUGHTS TOWARDS COOPERATION IN FIRE AND SMOKE RESEARCH AND MANAGEMENT IN THE ASEAN REGION

by

**Johann G. Goldammer**
IFFM/GTZ, Samarinda, Indonesia, and Max Planck Institute for
Chemistry, Germany

### ABSTRACT

The introductory paper gives an overview on the fire environment in insular and mainland SE Asia. Fire has been present in the SE Asian biota since the Pleistocene. Long-term climate variability (glacial vs. non-glacial climate) and short-term climate oscillations caused by the El Nino - Southern Oscillation (ENSO) event have repeatedly created conditions that make even rain forest subjected to wildfires. The occurrence of wildfires is increasing with modern land-use changes. Forest degradation and repeated fires lead to the formation of fire climax grasslands (alang-alang) of low productivity and short-return interval fires. In monsoon forests of mainland South Asia annual fires during the dry season have shaped the composition and productivity of this forest environment by selecting fire-tolerant species. Severe problems of land degradation (erosion, loss of nutrients) are the consequence of fires in these seasonally dry forests. Fire protection (fire exclusion) leads to a progressive development towards a more species-rich forest ecosystem. Fire climax pine forests are found in all SE Asian mountain regions. Burning of agricultural crop residuals, especially rice straw burning, adds to the smoke generated by conversion fires and wildfires. The fire events of in SE Asia in the seasons of 1982-83, 1987, 1991, and 1994 led to several national and international initiatives, especially in Indonesia. The Bandung Conference of 1992 developed a "Long-Term Integrated Forest Fire Management Strategy" for Indonesia. Examples are given on the implementation of the Bandung Strategy. Furthermore the paper describes the role of fire-generated emissions from SE Asia on global cycles. The South East Asian Fire Experiment (SEAFIRE) intends to clarify the mechanisms of origin, transport and impacts of fire emissions on the regional and global atmosphere. Several ASEAN meetings and political activities on "Transboundary Haze Pollution" have provided initial information on regional cooperation in smoke pollution management. A strong pan-ASEAN Fire Management Program is proposed. This program should take advantage and coordinate all national fire management programs in the region, through the "ASEAN Forest Fire Management Action Plan", and include various other initiatives in fire research and management. AT the end of the ASEAN Forest Fire Forum it is expected to draft recommendations for the various regional fire management objectives and implementation procedures.

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## IMPACTS AND FEEDBACK LOOPS OF GLOBAL CHANGE IN SOUTHEAST ASIA: A PERSPECTIVE OF FOREST FIRE MANAGEMENT

*by*

**D. Murdiyarso**
BIOTROP-GCTE Southeast Asian Impacts Centre
Bogor, Indonesia

### ABSTRACT

Land-use (and land-cover) change is one of the important components of global change. It occurs in massive scale and rapid rate that one generation can observe. In Southeast Asia it is usually associated with deforestation where fire is extensively used. The impacts or feed-forward to the ecosystem would be the emission of greenhouse gases which is another important component of global change. It was indicated that at any scale and intensity of land-use change, emissions are resulted rather than sequestration. On the other hand, the feedback to the climate system which is not noticeable, however, receives more attention and speculated widely. It has caused, to a large extent, land-use change viewed as less important, hence, lack of mitigation options. As far as forest fire management is concerned, it is worth considering the long-term impacts on biochemical cycles. The understanding of the trajectory of the changes should be used to minimise the negative impacts and maximise the positive impacts. Complex ecosystems with long fallow period prove to be more sustainable than mono-species, high-yielding and intensively-managed systems.

## SESSION C
## ASEAN FOREST FIRE FORUM

## SESSION F : RESOLUTIONS AND RECOMMENDATIONS

**Chairman: Dato' Ismail bin Awang**
**Secretary: Haron Abu Hassan**

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|---|---|
| 1530 | Presentation and Adoption of Conference Resolutions and Recommendations |
| 1615 | **CLOSING SESSION** |
| | Closing Address by Dato' Ismail bin Awang<br>Chairman, Project Steering Committee for AIFM |
| 1630 | Adjournment |

**POSTER SESSION AND FIREXHIBIT 96'**

Day 1, 2 and 3

## FIELD EXCURSION

### Melaka - A Legacy of History and Culture

The State of Malacca or Melaka, as it is now known, is located on the West Coast of Peninsular Malaysia facing the Straits of Melaka. It is about 150 kilometres south of Kuala Lumpur, almost sandwiched between the States of Negeri Sembilan and Johor. It is accessible by excellent roads and super highways from Kuala Lumpur and other major towns. The State is serviced internally by a very good network of roads leading to all historical places of interest. It covers an area of 658 square kilometres and is divided into three districts namely Alor Gajah, Melaka Tengah and Jasin. Since founded by Parameswara almost 600 years ago, Melaka rose to become a prosperous and powerful nerve centre of trade between the East and the West, and eventually became an empire. It is here that gold, silk, tea, opium, tobacco, perfumes and countless other items from nearby countries and from as far away as Europe and South America changed hands.

Control of Melaka changed hands from the Malay Sultan to the Portuguese in 1511. Then the Dutch took over followed by the English until Malaysia obtained her independence in 1957. Melaka, then had its first local Governor. Each western rule and influence left its mark behind and today this charming town, shed of its former pomp and sovereignty, is filled with relics too big to be housed by any museum. Every street and monument tells its own story of conquest and valour, avarice and victory.

The mid-conference field excursion will take you to historical Melaka, and among others, the following interesting spots will be visited.

**Air Keroh Recreational Forest**
Set amidst a splendid green environment where one can view rich, untouched tropical forests with more species than you can ever imagine. The trees are labelled making it fun and educational for a quick lesson in Malaysia's rich flora and fauna. It is an ideal setting for jungle tracking, hiking, jogging, camping, picnicking, cycling, staying in houses on tree-tops and also taking advantage of the available barbecue facilities and children's playground.

**Mini Malaysia**
A stupendous theme complex to enable visitors to vie the traditional houses of the 13 States of Malaysia on a single visit. The complex displays life-size authentic houses of Malaysia crafted by master builders. Each house has been furnished with corresponding elements adding ambience of originality that capture the houses in their traditional setting.

**Sultanate Palace.**
Built based on the description and reference to the palace in 'Sejarah Melayu (the Malay Annals), the wooden replica houses the Cultural Museum of Melaka. Situated at the foot of St. Paul's Hill, it is the only Malay palace left from Melaka's glorious past built with such detail and refinement.

***A Famosa***
The hallmark of Melaka and perhaps the most photographed subject next to the Stadthuys. Built by the Portuguese in 1511 as a fortress it sustained severe structural damage during the Dutch Invasion. The Dutch had set to destroy it but timely intervention by Sir Stamford Raffles in 1808 saved what remains of *A Famosa* today.

While in Melaka, please listen hard. You might just be able to hear the pounding of cannons and war cries at the *A Famosa* or the babble of foreign tongues raised high in the market place in Melaka - where it all began. Have a pleasant trip !.

## BIOMASS BURNING IN INDONESIAN TROPICAL FOREST

*by*
**Sumaryati** and **Rosalina Naitutu**
Indonesian National Institute of Aeronautic and Space
Bandung, Indonesia

### ABSTRACT

In Asian region, the recent biomass burning in regional scale occurred in 1991 and 1994. Tropical forest fire over Indonesia has been estimated the emissions of carbon and nitrogen. A set data was obtained through on forest fire area monitoring by the Director of Forest Protection. Ministry of Forestry in Bogor, Indonesia from 1984 to 1995. The data is including all of burning which may happened. The area burnt and the estimation of dry matter of plant burnt and the estimation of carbon and nitrogen emissions by fire are presented.

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## THE METEOROLOGICAL NETWORK AND ITS ROLE IN FOREST FIRE AND SMOKE MANAGEMENT IN MALAYSIA

*by*
**Leong Chow Peng and Lim Sze Fook**
Meteorological Services, Malaysia

### ABSTRACT

Effective management of forest fires and smoke can be achieved through the implementation of a proper system of prevention and control. The meteorological network is presently acknowledge to be an important component in the development and operation of an early warning system for the occurence of forest fires. In remote areas, meteorological satellite imageries often provide the first indication of an outbreak of active fires and associated transboundary haze problem. Once a large forest fire is detected, air pollution dispersion models are often used as a tool in the identification of areas likely to be affected by the resulting haze and in providing predictions of pollutant concentration levels. The accuracy of these models rely very much on information concerning the source(s) as well as the prevailing meteorological conditions. This paper describes the role played by the Malaysian Meteorological Service in past regional haze episodes. Mention is also made of the cooperative action plan developed by ASEAN national meteorological service in support of regional efforts to manage transboundary haze.

## REGIONAL VEGETATION FIRE PATTERNS IN SOUTH AND SOUTH-EAST ASIA: A SATELLITE-BASED ASSESSMENT

*by*

**Jean Paul Malingreau, S. H. Jones** and **E. Dwyer**
Space Applications Institute-Joint Research Centre
of the European Commission, Italy.

### ABSTRACT

Establishing the impact of transboundary pollution related to fires in vegetation requires a regional perspective on the distribution of active sources. Such information is usually difficult to obtain since it is produced in a distributed and often irregular manner; its rapid exchange necessitates good international coordination. Satellite observations provide by their nature synoptic and repetitive views of large areas and can be used as the foundation for regional, near-real time environmental assessments. Satellite based for monitoring techniques have been developed with success at national level in various countries of Asia but, so far, few regional assessments have been produced. The paper presents the first such analysis based on the NOAA satellite data acquisitions over South and South-east Asia during the dry seasons of 1992 and 1993. Regional fire patterns and calendars have been derived from the thermal channels of the AVHRR (Advanced Very High Resolution Radiometer) instrument using state-of -the-art information extraction techniques. They reveal interesting and sometimes intriguing patterns of biomass burning in the forest, grassland and agricultural ecosystems of the region. The paper will clarify the unique potential and the inherent limitations of the approach in view of maintaining an exhaustive and permanent account of regional fire situations. Steps toward the establishment of biomass burning assessments at the global level will be described. The research reported here is an activity of the European Commission and the IGBP Data and Information System Project.

## SESSION A
## AIRBORNE POLLUTION - TRANSBOUNDARY EFFECTS ON TROPICAL FORESTS

## KEYNOTE ADDRESS: THE HAZE PROBLEM IN RELATION TO FORESTRY AND THE ENVIRONMENT

by

**Narayanan Kanan**
Ministry of Primary Industries, Malaysia

## AIRBORNE POLLUTION AND ITS TRANSBOUNDARY EFFECTS ON FORESTS

*by*
**James Dawos Mamit**
Natural Resources and Environment Board, Sarawak, Malaysia

### ABSTRACT

Air pollutants emitted into the atmosphere are both anthropogenic and natural. Since the last century, the levels of air pollutants discharged into the atmosphere have been increasing at an alarming rate causing serious health problems and degradation to the environment. The effects of air pollution to forest ecosystems are mainly related to their functional ability to acts as carbon sinks. Air pollutants will accumulate several kilometers above in the stratosphere. They are known to be transported and deposited over several hundred kilometers away and sometimes beyond any political boundaries, causing serious environmental problems to neighbouring countries. The impacts of air pollution sush as acid rains, global warming (greenhouse effects) or global ozone depletion are well documented in developed countries. However, little or no comprehensive baseline studies have been conducted to determine the extent of damages of air pollution in the tropics. Considering the current rate of emissions or air pollutants emitted in the tropical developing countries contributed by rapid industrialisation, the tropical rain forest may soon suffer the same fate as those in the temperate regions. Countries sharing common boundaries may face serious air pollution emitted and transported from the neighbouring countries. Therefore, neighbouring countries should focus or regional collaboration to combat and address these pertinent issues. Bilateral cooperation in controlling and monitoring air pollution threatening millions of lives and the immediate ecosystems is mandatory to ensure that the world is a healthy place to live in.

## FOREST FIRE MANAGEMENT AND ITS INFLUENCE ON FOREST DEVELOPMENT IN ASEAN

*by*
**Haron Abu Hassan** and **Dr. Antonio C. Manila**
ASEAN Institute of Forest Management (AIFM)

### ABSTRACT

Forest fires are of great concern in ASEAN due to their devastating effects on the sustainability of the forests as such as they are to the environment. Most of the documented occurrences of forest fires in the region are man-made caused through traditional farming systems and related activities in agricultural and forest land areas. At present, each country in ASEAN is at varying stages of their developmental activities geared towards forest fire prevention and control as inherent and indispensable component of the overall strategy in the management of the forests. In view of the transboundary pollution effects of forest fires and fires of other sources, the ASEAN Institute of Forest Management (AIFM) has developed a multi-faceted forest fire action plan that would promote regional cooperation with shared resources and outputs coordinated across national boundaries. Considering the real problems associated with forest fires and the consequent negative impacts of smoke and haze phenomena, a number of key participants are encouraged to share their expertise and resources in order to translate the action plan into reality.

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## FOREST FIRE EFFECTS ON COMMERCIAL TIMBERS AND FOREST PRODUCTIVITY: PHILIPPINES EXPERIENCE

*by*
**Egidio F. Costales, Jr.**
Ecosystem Research and Development Service, Philippines.

### ABSTRACT

An assessment on the effects of fire on forest resource particularly timber and productivity is presented. The focus of the discussion is on the Benguet pine (*Pinus kesiya* ex Gordon) forest of the Cordillera, Northern Luzon, Philippines where forest fire occurrences are prevalent during the dry months starting from November to May every year. The most affected stand compositions are seedlings, saplings and some pole-sized timbers including understory vegetation which are dominated by grasses like *Imperata cylindrica* and *Themeda trianra*. Likewise, other forest productivity parameters such as soils (physical and bio-chemical properties) and some hydrologic attributes were evaluated. Results showed varying responses depending on the fire intensity, time of occurrence, amount of fuelmass available, stand age and height as well as frequency of burning.

## SESSION B
## TERRISTARIAL POLLUTION EFFECTS ON TROPICAL FORESTS

### KEYNOTE ADDRESS: FIRE AND SUSTAINABILITY OF TROPICAL FORESTS

by
**Dato' Dr. Baharuddin bin Haji Ghazali**
International Tropical Timber Organization (ITTO)
Regional Consultant for the Asia Pacific Region
Kuala Lumpur

# ACID DEPOSITION AND HAZE IN MALAYSIA AND INDONESIA: CAUSES, RELATIONSHIPS, AND CONSEQUENCES

*by*
**G.P. Ayers, R.W. Gillet, P.W. Selleck, J.C. Marshall, H. Granek, Leong Chow Peng, Lim Sze Fook, Hery Harjanto, Tuti Mhw and D. Parry**
Acidity and Aerosols Project, Division of Atmospheric Research, CSIRO
Australia.

## ABSTRACT

Anthropogenic emissions of a wide range of reactive and photochemically active species are known to lead to such regional scale phenomena as acid deposition and endemic haze, wherever the anthropogenic emissions dominate regional atmospheric chemistry. This is the case almost universally in the urban/industrial regions of Asia and South-east Asia, where economic development has led to burgeoning atmospheric emissions of a wide range of reactive species over the last couple of decades.

Recent measurement and modeling activities focused on urban/industrial areas in Malaysia and Indonesia, when contrasted with similar measurements in unpopulated parts of tropical Australia, reveal the large magnitude of the atmospheric chemical perturbation caused by anthropogenic emissions in Malaysia and Indonesia. Consequences in terms of very high acid deposition fluxes and aerosol (haze) loading are revealed by the measurements, and will be discussed in terms of linkages between these and other "global change" issues stemming from anthropogenic effects upon the atmospheric environment. The transboundary nature or these issues will be highlighted in the analysis and discussion.

## TRANSBOUNDARY POLLUTION IMPACT ON TROPICAL FORESTS IN RELATION TO CLIMATE CHANGE

*by*
**E. Philip** and **N. Manokaran**
Forest Research Institute of Malaysia

### ABSTRACT

Many urgent global environmental problems confronting society such as climate change and depletion of the stratosphere ozone layer are connected with man-made changes in the state and composition of the atmosphere and its interactions with other environmental media. Pertinent issues like pollution and green house gases and their impact on various ecosystems and human health have invariably posed many questions to both policy makers and researchers. Hence a study was formulated to examine chemical composition factors associated with pH of precipitation, stream flow and through fall at Bukit Lagong forest Reserve, adjacent to Kuala Lumpur. Data were collected on a monthly basis between 1993-1995 and where possible after every rainfall. In addition, the climatic variations at Bukit Lagong Forest reserve were also analysed. One incident of acid precipitation was observed in 1994 and a further 6 in 1995. As a result of it the mean annual pH of precipitation in 1995 had reduced to 5.4 in comparison with 1993, where it was 5.8. It was assumed that accelerated leaching of nutrients occurred as a result of this acid precipitation. Ions like K and Mg were the most vulnerable to acid precipitation. On the other hand, uptake of anions like $SO_2$ had increased as well. The sensitivity of the ecosystem to climate change has yet to be documented but possible implications are outlined.

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## REGIONAL AIR POLLUTION OF AEROSOLS AND OZONE BY FOREST FIRES IN TROPICAL EAST ASIA, A CASE STUDY OF THE 1994 EPISODE

*by*
**Haruo Tsuruta**
National Institute of Agro-Environmental Sciences, Japan

### ABSTRACT

Tropical East Asia has suffered from forest fires in large scale every three to five years since 1980's, and which generally produce a large amount of primary and secondary air pollutants such as greenhouse gases. In the latter half of 1994, one of the largest forest fires occurred in Tropical East Asia, and which induced transboundary pollution of haze in regional scale. Although there was no systematic field measurement for this air pollution, we have so many data of air pollutants, meteorology, and satellite imagery measured at the surface, in troposphere and from space in many countries, indicating a part of this regional air pollution, and some of the data were already analyzed independently. In order to make clear the total picture of the regional air pollution by the 1994 forest fires, we are analyzing aerosols and ozone, which have the radioactive forcing described in the IPCC report of 1995, by using all the data. So many researchers from many countries are cooperating in our group, and will publish a multi-authored pare for the 1994 episode in the near future.

## TECHNICAL ASPECTS OF THE TRANSBOUNDARY POLLUTION HAZE FORMATION OVER INDONESIA AND ADJOINING AREA

*by*
**Paulus Agus Winarso**
Indonesia Meteorological and Geophysical Agency

### ABSTRACT

This paper will describe the technical aspect for the transboundary haze formation over Indonesia and adjoining area. The discussion of the atmospheric condition during the occurrence of this phenomena last 1991 and 1994 might give the idea for further used especially in the forest management over this region. Looking at the experience with occurring the forest fire last 1982, 1987, 1991, 1994 where at those times the drought have been occurred over Indonesia region. It might give the impact of the dry condition over the region and it encouraged the fires occurred over large area not only over Indonesia region but also over Australia with the so called the bush fires. The strong inversion layer due the heating above (emitting volcanic ash of Pinatubo, 1991) cooling below due to the large spreading ash in the atmosphere at that time gave the inversion layer to occurred for the long time. And at 1994 cooling Sea Surface Temperature due to the oceanographic condition for formation of the inversion layer in the atmosphere for long period. Referring these years with the global circulation of the atmosphere, they are the years of the occurring of the El Nino Southern Oscillation. The managing of the climatological and meteorological data, analyses and forecast might to the best consideration for the forest management.