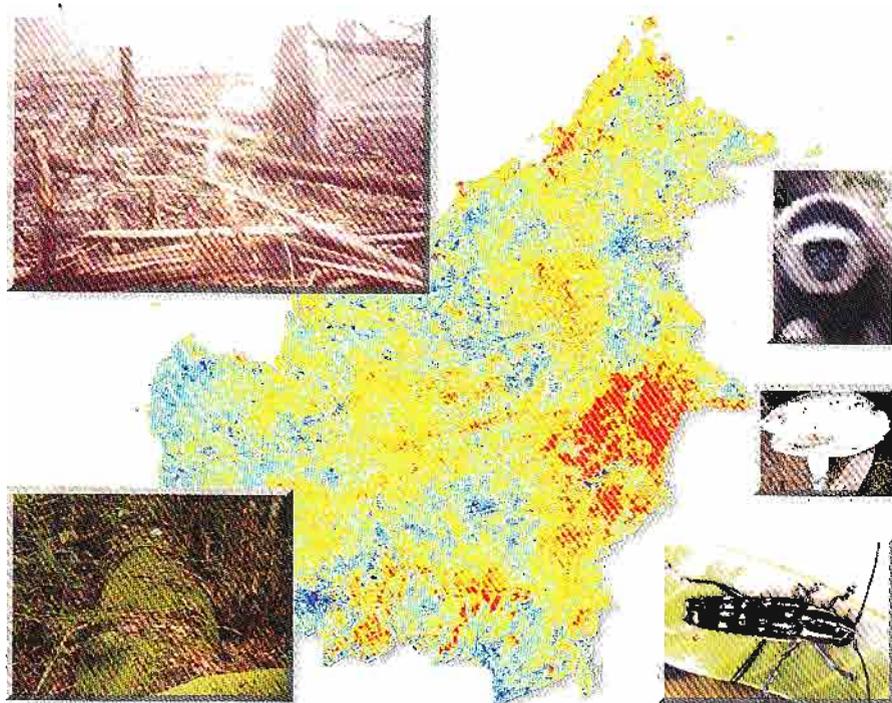


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Indonesian Forest Fire and its Environmental Impacts

—The 15th Global Environment Tsukuba—



Edited by Hideyuki Shimizu
January, 2002

Center for Global Environmental Research



National Institute for Environmental Studies



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**The Joint Workshop for the Indonesian Forest Fire and its Environmental Impacts
The 15th Global Environment Tsukuba**

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Center: Differential NDVI image of SPOT-4 VGT acquired in Apr. 1998 and Apr. 2000. Red color shows vegetation recovery area between both periods. (C) CNES <1998-2000>/ Distribution Spot Image (processed by H. Saito).

Upper Left: Slash and burn at Lahei, Central Kalimantan in Aug. 1997 (photo taken by Dr. H. Simbolon).

Lower Left: Bryophytes grown on a rotten wood under forest at Bukit Bankirai, East Kalimantan in Feb. 2001 (photo taken by H. Shimizu)

Upper Right: *Hylobates muelleri* at Bukit Suhalt, East Kalimantan in May 1996 (photo taken by T. Oka)

Middle Right: *Russulla* sp. at Bukit Bankirai, East Kalimantan in Feb. 2001 (photo taken by T. Akema)

Lower Right: *Glenea elegans* at Sebulu, East Kalimantan in Dec. 2001 (photo taken by H. Makihara)

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Foreword

The progress of science and industry in the modern age, which has brought us prosperity never before experienced in human history, has also led to drastic changes in and degradation of the global environment. Environmental crises, such as global warming, depletion of stratospheric ozone, deposition of acidic and oxidative substances, marine pollution, destruction of tropical forests, desertification, and loss of biodiversity, have become increasingly evident and are threatening global ecosystems and human existence. Although actions to counter these global environmental problems are increasing worldwide, the accumulation of much more scientific knowledge is required for more effective solutions.

Large-scale forest fires in developing tropical countries, in particular the fires in Indonesia in 1997–1998, are caused by a combination of socio-economic, natural and meteorological factors. These fires have a considerable impact on nature and society. From the viewpoint of global environmental protection, these forest fires are a serious problem related to atmospheric chemistry, meteorological phenomena, global warming, natural resources, biodiversity, and the human dimension. Therefore, it is desirable that such forest fires should be studied strategically from a global perspective.

It is essential to strengthen global observations, monitoring and research to provide a basis for further scientific understanding of the impacts of human activities on the global environment and the impacts of environmental change on nature and human society. The Center for Global Environmental Research (CGER) was established in 1990 within the National Institute for Environmental Studies (NIES) to contribute broadly to the elucidation of and solutions to our alarming environmental problems. CGER has been actively working to achieve this goal by promoting the integration of global environmental research, providing research-support facilities, and conducting global environmental monitoring.

This CGER report compiles some of the papers presented at the “Joint Workshop for the Indonesian Forest Fire and its Environmental Impacts”, which was “The 15th Global Environment Tsukuba” held in March 2000 to exchange the latest information related to the forest fires in 1997–1998 in Indonesia. It would be our great pleasure if this publication could contribute to further progress in research on global environment problems such as the Indonesian forest fires and other related issues.

January 2002



Shuzo Nishioka

Executive Director

Center for Global Environmental Research
National Institute for Environmental Studies

Preface

Global environmental change is recognized as one of the twenty-first century's most serious threats both to the sustainable development of local, regional and global ecosystems and to the survival of humankind.

The large-scale forest fires arising repeatedly in developing tropical and subtropical countries have been considered to be not simply a local problem but a regional environmental problem closely related to global environmental change. The forest fires in Sumatra and Kalimantan in Indonesia during 1997–1998 were particularly large in respect to area and duration, and they greatly impacted on air quality, forest productivity, biodiversity, human health, etc. Haze produced by the fire extended beyond the Indonesian border and affected human health and industrial activities throughout South-East Asia. These forest fires, which were mostly caused by human activity, such as slash-and-burn agriculture and construction of large-scale plantations, seemed to be exacerbated by the extraordinary dryness originating from the El Niño event. Thus, the causes and effects of forest fires in South-East Asia are very complicated, related to both socio-economics and to natural/meteorological phenomena.

One of the first steps in understanding the cause and effect and in considering countermeasures against forest fires is to share the latest information and knowledge concerning the problems of Indonesian forest fires for leading researchers and authorities in each field, both Indonesian and overseas.

To foster integration of research and exchange of information, CGER has been organizing a series of symposiums named “Global Environment Tsukuba” on topics of global environmental concern. In March 2000, we organized “The Joint Workshop for the Indonesian Forest Fire and its Environmental Impacts” as “The 15th Global Environment Tsukuba” in collaboration with the Japan Wildlife Research Center (JWRC) and the University Research Group/Japan Science and Technology Corporation (JST). Ten researchers invited from overseas, mainly Indonesia, and 9 Japanese researchers presented new knowledge on aspects of “Climate and Atmosphere (Session I)”, “Biodiversity and Ecosystems (Session II)” and “Human Dimension and Environmental Security (Session III)”.

This publication is the proceedings of the joint workshop. We hope that various researchers and other people interested in the problems of forest fires will find this publication useful for understanding this complicated phenomena and for conducting further research related to forest fire events.

January 2002



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Peat Land Forest Landscape Modification and Forest Fire: A Case Study at Central Kalimantan, Indonesia

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Abstract

Modification of peat land forest to agricultural area in Central Kalimantan lead to ecosystem destruction. Drainage development caused over drained process and drought. Landsat image in 1998 and 1999 interpretation showed that some burnt areas were detected in the same place. It means that the area can not recover to its initial state since succession process was disturbed. Therefore to rehabilitate burnt area and to suppress fire must be initiated by re-functioning the hydrological system.

Key words: peat land forest, modification Landsat, succession process, rehabilitate

Background

Under the so-called Mega-Rice Project, approximately 1.5 millions hectare of peat land/swamp forests in Central Kalimantan were modified for Transmigrasi area (settlement, irrigation and paddy field). It was planned that the area will be inhabited by 356 000 families of farmer (Simanjuntak, 1999). Each family was granted 2 ha of lands. Until 1999, there were 13 512 families living in the area (Anonymous, 1999). In the year of 2000, the program was cancelled by the Government of Indonesian Republic.

After large conversion of forests, Central Kalimantan is to be a vulnerable place to forest fire. Efforts to rehabilitate the ecosystem and to manage forest fire in the area fire are urgently needed. Part of the effort activities are to observe fire occurrence across the landscape and to identify where as well as in what kind of habitat fire occurs.

Methods

Study area is situated in Central Kalimantan, within the previous area of Mega-Rice Project (Fig. 1). Two time series of Landsat/TM images taken in 29 March 1998 and 8 September 1999 are utilized. After geo correction, visual interpretations of burnt area are conducted.

Environmental Setting of the Study Area

The elevation of the study area is relatively even. The elevation ranges from 0 in the south to 30 meter above the sea in the north.

The study area receives precipitation about 2 339 mm/year. The rainy season is from November to April, while dry season extends from May to October, whereas August is the driest month.

About 50% (8.6 millions hectare) area of Central Kalimantan is peat land. The depth of peat varies from 50 cm to more than 300 cm (Fig. 2) (Forestry Faculty - IPB, 2000).

The study area is dominated by bush. Most of forest area in the study area was converted to other uses in 1996. The remaining forests are located in southern part of the province. Private forests are still can be found in riparian area.

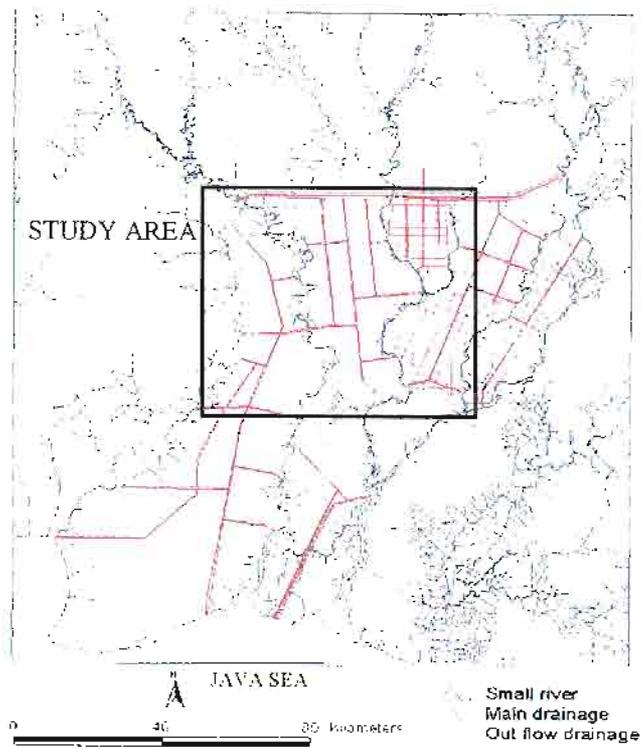


Fig. 1. Study Area

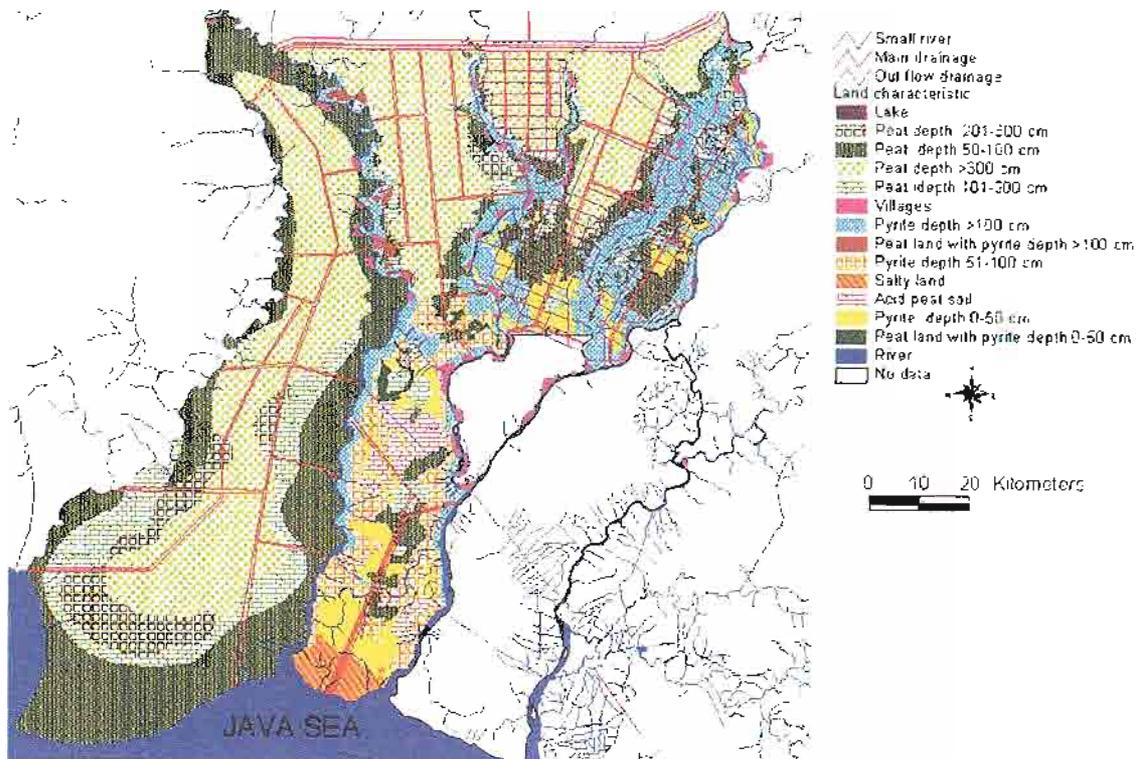


Fig. 2. Soil Map

Result and Discussion

Image data recorded in 1998 is interfered by haze, while image data in 1999 is covered by cloud. Under this condition, it is impossible to perform supervised digital interpretation. To overcome the difficulties, interpretation of fire occurrence is conducted by visual interpretation. Result of the images interpretation is presented in Fig. 3a and Fig. 3b. Figure 3a shows condition of land cover and the forest fire occurrence in March 1998, while 3b represents land cover and forest fire occurrence in September 1999 (yellow polygons).

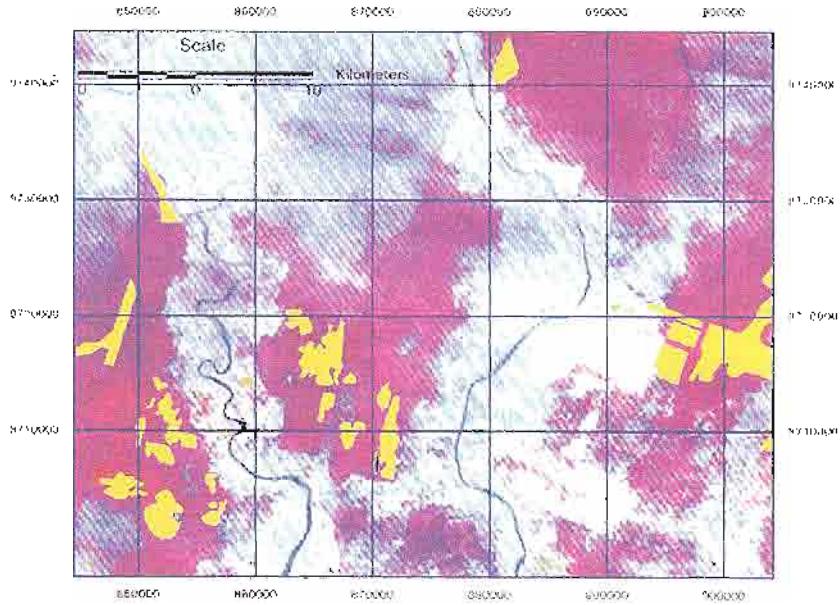


Fig. 3a. Land-cover and Fire Occurrence in March 1998

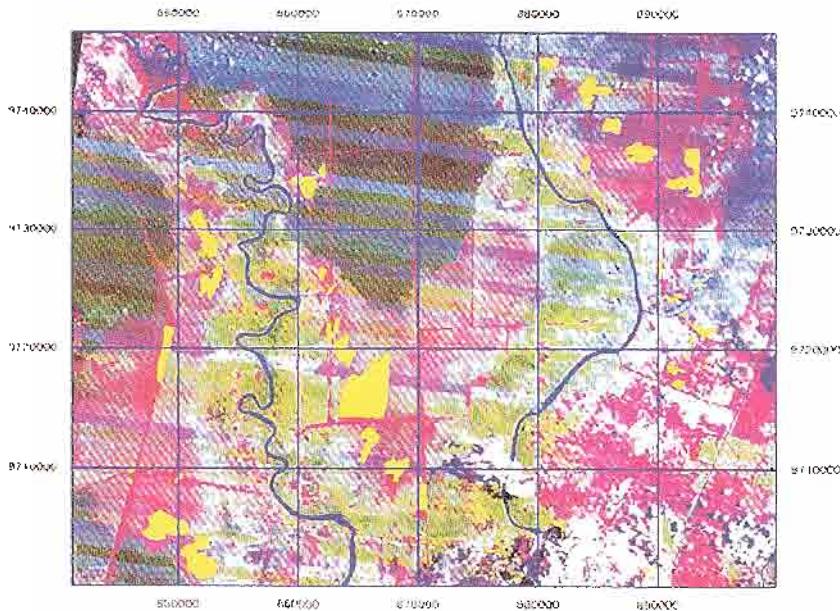


Fig. 3b. Land cover and Fire Occurrence in September 1999

Two images show clearly the impacts on peat land forest modification and drainage development as shown in Fig. 1. One of the impacts is drought condition, which can be seen as reddish color on both of the images. Drought area clearly is detected in non-forest area especially during long dry season in 1998. Even in rainy season during 1999, drought areas are found in surrounding drainage. The facts show that over drained phenomenon as stated by FAO (1988) is occurring.

Drought condition as a result of climate condition, forest clearance and over drained process, lead to fire occurrence. Fig. 3a and 3b, shows that fire are happening in non-forest area, near the drainage. Moreover, some burnt area in 1998 and 1999 are detected in the same place. It means that the area can not recover to its initial state since succession process was disturbed.

Effort to rehabilitate burnt area and to suppress fire must be initiated by re-functioning the hydrological system.

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