UNDERSTANDING INDONESIAN PEAT FIRE TYPOLOGY FOR FIRE CONTROL AND PREVENTION MEASURES

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Abstract

Severe forest and peat fires in Indonesia have occurred more frequently in recent years. These fires have been associated with various types of ecosystems and land uses, ranging from the simplest to the most complex ones. However, recent fire control efforts in the country have primarily focused on fire suppression efforts instead of preventive measures. Fire prevention efforts are mostly statements of empty jargon rather than specific actions or policies. Fire suppression activities have been greatly preferred but have proceeded without properly accounting for whether the fires are on mineral soils or occurring within peat soils. Efforts to extinguish fires should be based upon their typology to be effective, especially for peat fires that having the distinct behavior of smoldering within the peat soils. However, field observations have shown that generalized approaches for extinguishing fire are undertaken on bot mineral soils where flaming surface fires predominate and peat soils where smoldering ground fires are common. Peat fires cannot be extinguished using the same suppression measures used for flaming surface fires and will, therefore, not achieve effective results without consideration of their unique burning typology. The severe peat fires in 2015 should be taken into account as a lesson learned and impetus for better peat fire control and prevention in the future.
Keywords: Peat fires, fire typology, fire control, fire prevention

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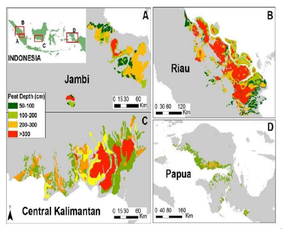
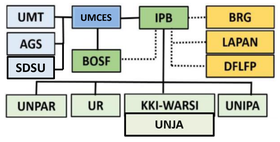
INTRODUCTION

- ✓ It has been scientifically demonstrated beyond reasonable doubt that fire has been part of the natural ecosystem in Indonesia for many thousands of years. The vulnerability of Indonesian forest is also linked to more fundamental issues of forest management and the role of communities and local governments.
- ✓ Poor logging practices, failure by the government and concessionaires to protect logged forests and close old logging roads led, conversion of forests to rubber and oil palm plantations had increased the fire risk dramatically. Evidence also suggests that fires burned mostly easily in secondary forests that had already been disturbed through (frequently illegal) timber operations.
- ✓ With the stepping up of economic activities in Indonesia's outer islands, forest and land fires have become commonplace, occurring every year.
- ✓ During pronounced El Nino years, when conditions are usually dry, fire and smoke problems tend to be much more serious. Vegetation fires in Indonesia could become very severe under severe El Nino and quasi-El Nino conditions, like in 1982/83, 1997/1998, 2002, 2004, 2006, 2009, and 2015.
- ✓ Fire prevention management and control in Indonesian tropical peat, therefore, should be based on the field information and peat characteristics to avoid time and money consuming.
- ✓ General approaches for extinguishing fire are undertaken for both mineral peat soils
- ✓ Considerable variation in emissions may exist between peat fires of different Indonesian peat formations at disturbed and undisturbed and the need for additional regional field emissions measurements for parameterizing peatland emissions models for all of Indonesia's major peatland areas.
- ✓ Continuous mutual research collaboration between the Indonesian and USA scientists, we will implement our standardized field-based analyses of fuels, hydrology, peat burning characteristics and fire emissions to characterize the three major Indonesian peatland formations across four study provinces (Central Kalimantan, Riau, Jambi and West Papua).

SITES AND PARTNERS





Lead Institution: UMCES
Project Leader: Mark A. Cochrane
U.S. Partners: UMT, SDSU, AGS
Indonesian Partners:
Indonesian Coordinator:
Bambang H. Saharjo - IPB
Univ.: UNJA, UR, UPR, UNIPA
NGO: KKI-WARSI
Govt: BRG, LAPAN, DFLFP

OUR WORKS

1. Field data collection

- ✓*Fire detection:* Daily email updates of hotspots from NASA's Aqua and Terra satellites
- ✓*Fire scene evaluation*: Using a standardized fire scene evaluation (FSE) form developed from research phase-1
- ✓*Water table depth: will monitor periodically using dipwells*
- ✓*Peat moisture content, rate of peat fire spread, volume of peat lost from the burn*

2. Locating emissions from peat fires

- ✓In-situ smoke samplings

3. Fire detection with MODIS and VIIRS

4. Land cover change/burn mapping with Landsat

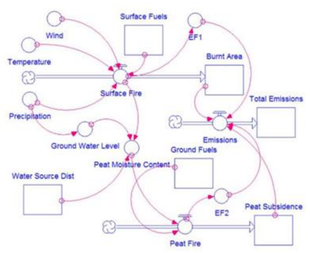
5. Susceptibility to burning (TRMM and GPM data)

Peat core sampling method away from the fire interface for moisture content analysis (upper), recording peat fire spread rate (middle), and peat volume loss measurements across irregular surfaces (lower)

6. ***Estimation of biomass burning emissions from satellites***

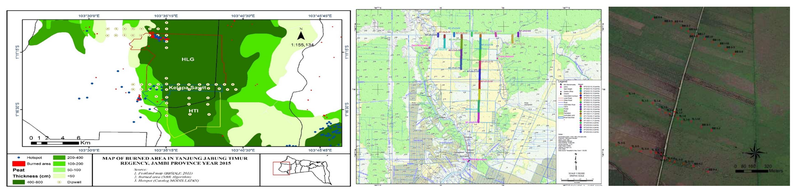
- ✓Estimation of biomass burning emissions across Indonesia by using VIIRS
- ✓Calculation of smoke emission rate
- ✓Generation of daily and diurnal patterns of fire emission rates

7. Modelling peat fire dynamics and associated GHG emissions



PEAT FIRE SUPRESSION AND HYDROLOGY PLOTS MONITORING

- ✓ The use of expensive high-tech solution (water bombing, retardant use) was not effective to suppress the fires, if the infrastructure and fire-fighting capacities on the ground are inefficient.
- ✓ There was no effective ways can be used to fight those fires except heavy rains. Lessons learned is, do not solve fire problems at a time when fires are in burning condition.
- ✓ The fire problem can only be solved when there are no fires, this means by anticipation, prevention and pre-suppression measures and by changing policies behind the problem.
- ✓ Peatland fires are promoted by deforestation, forest degradation and peat drying linked to peatland drainage, and can be stopped in the longer term only if these root causes are dealt with. There are three main in situ mechanisms which can be done for fire suppression in smoldering fire; through cooling, smothering, and burn-out. The first two mechanisms are based on physical and chemical processes which plays a role in smoldering the combustion.
- ✓ There are smoldering propagation in vertical and horizontal directions, the tendency of the movement of propagation depends on the availability of fuel and oxygen in the smoldering combustion.
- ✓ In order to get better management of peatland in term of fire prevention, then fire prevention through early warning system through water management is one of the best solution, combined with community base fire management with the land preparation without fire.
- ✓ Here, we conduct groundwater level monitoring from 3 research sites: Jambi, Riau and Central Kalimantan.

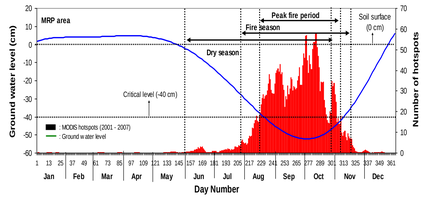


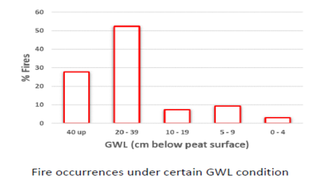
Dipwells in Jambi (left), Central Kalimantan (middle) and Riau (right)

Dipwells establishment and groundwater level measurement

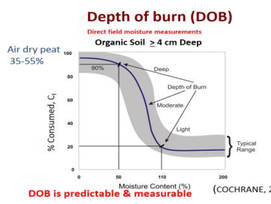
Community Based Fire Management on Peatland

GROUND WATER LEVEL AND PEAT FIRE BEHAVIOUR





Fire occurrences under certain GWL condition



DOB is predictable & measurable

(COCHRANE, 20

Depth to the water table is a prime determinant of the peat that can burn

(COCHRANE, 2014)

CONCLUDING REMARKS

- ✓ Ground water level could monitor regularly so that the sensitivity of peat to the fire around the site could be estimated
- ✓ Severe fires occurrences in Jambi, South Sumatra and Riau Provinces clearly shown the relation between ground water level and fire occur
- ✓ Lack of water in the canal as ground water level far from base line (-40 cm below the peat surface) proved that the peat is at risk to the fire
- ✓ Fighting fires using heavy machines such as helicopter seems no effective as it not linked with the ground water level information
- ✓ Fire prevention and control couldnot depen only on the ground level data, but it must be supported also by good canal blocking and the participation of the communities through land preparation activties without fires in the peat land
- ✓ Early warning systems and the role of the communities is one of the best answer to reduce peat fires that finally will reduce high green house emission from peat fires

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