ASEAN Peatland Forests Project (APFP) &
Sustainable Management of Peatland Forests in Southeast Asia (SEApeat)

ASEAN Technical Workshop on the Development of the ASEAN Peatland Fire Prediction and Warning System

Workshop Report

20-21 March 2012
Kuala Lumpur, Malaysia

Project funded by

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Workshop Summary

Under the on-going GEF/IFAD ASEAN Peatland Forest Project (APFP), an ASEAN Technical Workshop on Development of the ASEAN Peatland Fire Prediction and Early Warning System was held on 20-21 March 2012 in Kuala Lumpur, Malaysia. The Workshop aimed to identify the remaining gaps of the existing fire danger rating and hotspot monitoring systems in the region, to improve the systems that are acceptable by the countries and to design a peatland fire prediction and early warning system which could be used in the ASEAN region. The Workshop was jointly organised by the ASEAN Secretariat and the Global Environment Centre (GEC) as Regional Project Executing Agency of APFP and also supported by the ASEAN Specialised Meteorological Centre (ASMC) and Malaysian Meteorological Department (MMD). The Workshop was attended by officials from relevant government agencies, experts, and researchers from Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, and Thailand who have been working on peatlands and fire and haze monitoring.

Important conclusions of the workshop:

1. Fire Danger Rating Systems (FDRS) remain as an important tool in enhancing fire prevention in the ASEAN region.
2. Indonesia and Malaysia already have national FDRS systems. Regional FDRS maps are generated on a daily basis by Malaysia based on available information through the Global Telecommunication System, the telecommunication system utilized by the World Meteorological Organisation's (WMO) member countries for real time exchange of meteorological information and reports.
3. Significant progress has been made over the past two years in the development of FDRS systems in the region including:
    - A significant expansion of Automatic Weather Stations (AWS) providing data for FDRS;
    - Inclusion of overlays of peatland distribution and other geographic information; enhancement of data through use of satellite and radar data collection in remote areas.
    - Further fine tuning and calibration of the indices;
    - Enhancement of prediction and early warning capability;
    - Enhancement use of the information in the system;
    - Preliminary work to develop short term forecasts.
4. Existing FDRS systems can be further developed by:
    - Continue the fine tune and enhance the indices used for prediction
    - Upgrade the software and use of supplementary geographic data layers such as fire prone peatlands, forests etc.
    - Enhance data availability in the Mekong region and the Philippines, and other regions with limited data
    - Add short term prediction facility (1-3 days);
5. The usage level of FDRS should be enhanced through a number of measures including:
    - Develop a generic Standard Operational Procedure (SOP) for dissemination of FDRS information
    - Incorporate the system into existing fire and haze, peat working group SOPs

- Promote usage to priority user groups
- Monitor and feedback on the use and effectiveness of the system
- Formalise policy for the use of the system as a tool for forest fire prevention and monitoring for the ASEAN region

The Workshop provided a forum for an in-depth discussion to agree on a mechanism for a practical peatland fire prediction and early warning system for the ASEAN region. A good mix of government technical officials and experts enabled more relevant discussions and hopefully workable recommendations from the Workshop. It would be valuable to establish a specific follow up mechanism to further develop the FDRS in the region including establishment of an *ad- hoc* group to support the technical development of the system and to report periodically to ASEAN. This group should initially comprise experts and agency representatives from Indonesia and Malaysia who have been involved in the development of FDRS that supported by the ASEAAN Secretariat and APFP/SEApeat projects.

1. Introduction

The ASEAN Technical Workshop on the Development of the ASEAN Peatland Fire Prediction and Early Warning System was held in Kuala Lumpur on 20 and 21 March 2012 and attended by 39 participants from various government agencies, research institutions, experts and NGOs within the ASEAN region. Under the framework of ASEAN Peatland Forest Project (APFP) and SEApeat Project funded by IFAD-GEF and European Union, the Workshop was organised to support the implementation of the ASEAN Peatland Management Strategy 2006-2020. The workshop served as the platform for specialised institutions and key agencies to identify gaps among the existing systems used in the countries, make proposals developing and improve peatland fire prediction and early warning system.

The Workshop was organised by the ASEAN Secretariat and the Global Environment Centre as the Regional Project Executing Agency in association with the Ministry of Natural Resources and Environment (NRE) Malaysia and Forestry Department of Peninsular Malaysia. The workshop was also supported by the ASEAN Specialised Meteorological Centre (ASMC) and Malaysian Meteorological Department (MMD). Their efforts and supports are gratefully acknowledged.

The expected outputs from this workshop were:

- Identification of gaps and constraints of the existing systems;
- Identification of Countries needs for system enhancement;
- Updates from AMS on progress towards the development of the regional fire prediction and early warning system for peatlands;
- Proposals for enhancing implementation of the FDRS at national and regional levels

2. Background

The *ASEAN Agreement on Transboundary Haze Pollution (AATHP)* was signed in 2002 and entered into force in 2003. Additionally, the *ASEAN Peatland Management Strategy (APMS)* was endorsed by the ASEAN Environment Ministers in November 2006 to act as a framework to guide the sustainable management of peatlands in the period 2006-2020. One of the key strategies under the APMS is on Fire Prevention, Control and Monitoring in order to minimise occurrence of fire and associated haze.

This workshop builds upon an international workshop held in July 2010 under the ASEAN Peatland Forests Project (APFP), which brought together experts from Brunei Darussalam, Indonesia, Malaysia, Singapore and Thailand, and a number of meetings with key agencies in Indonesia (in September 2011), Malaysia (between March – August 2011) and Thailand (in December 2011) to design a peatland fire prediction and early warning system that could be used in the ASEAN region.

3. Summary of The Meeting

The workshop consisted of a total of 10 presentations by the ASEAN Secretariat; MMD; ASMC; Indonesian Meteorological, Climatological and Geophysical Agency (BMKG); Department of National Parks, Wildlife and Plants Conservation of Thailand; Indonesian National Institute of Aeronautics and

Space (LAPAN); Indonesian Ministry of Agriculture; and the Regional Southeast Asia Wildland Fire Science and Management Network (RSAWFSMN) on the updates of the current and ongoing status and progress of the fire monitoring efforts in the region. Two break-out group discussions were held to identify options to materialise the development of a workable ASEAN peatland fire prediction and early warning system. The detailed programme is attached as **ANNEX 1** while the List of participants is in **ANNEX 2**. The papers are summarized below and included in the Annexes.

3.1 Presentations Session 1

Presentation 1: Overview of Fire Danger Rating System in the ASEAN Region Under the Umbrella of the ASEAN Agreement on Transboundary Haze Pollution and the Development of ASEAN Peatland Fire Prediction and Monitoring System - Dr. Raman Letchumanan, ASEAN Secretariat (see ANNEX 3)

Dr Raman provided an overview of deliberations of governments in relation to FDRS in the ASEAN region. He emphasised that since 2010 several Ministerial Steering Committee (MSCC) meetings have agreed to support the refinement and development of an ASEAN regional FDRS based on relevant national early warning systems. He emphasised that such system will only be possible if all parties cooperate and share the necessary data. He provided a summary of earlier meetings organised by ASEAN on the issue and outlined the proposed framework fro FDRS for peatlands.

Presentation 2: Regional Early Warning: a Key Component of national to Local Fire Management –Dr. Bill de Groot, Canadian Forest Service(See Annex 4)

Dr. Bill de Groot who has been working in developing the FDRS in Southeast Asia for years addressed the meeting via video conference from his office in Canada. He gave an overview of FDR systems and their importance. Rather than helping to justify emergency budgets and air quality reporting, FDRS is more important in helping to plan and implement mitigation measures during a crisis, thus averting wildfire disasters. He supported the idea of a regional FDRS system, which will help to support existing systems and provide early warning for countries that don't have their own FDRS. He provided guidance on the use of FDRS for Prevention and Detection Planning as well as a Pre-Suppression Planning and also stressed out that FDRS is all about communication, information and resource sharing. The following steps need to be take should be including technology transfer, local decision aids development and training of trainers to enhance capacity building.

Regarding discrepancy between the global FDRS map and the local FDRS map generated by Indonesia, Dr. de Groot pointed out that the global map uses forecasted data, and also that the calibration differs. The global map is only indicative as it uses general calibration value. Therefore, it is important for each country to have their own map which is calibrated to local conditions. In addition, global maps are usually not matched with the regional map. Regional maps should be recalibrated considering there may be some information that needs to be fine-tuned to produce better results. Communication and technology transfer are critical to ensure the practical use of the system.

Dr. de Groot also pointed the importance to empower the community and transfer the technology/knowledge to the local community. This should be integrated into the system as it is important for local management. Furthermore, some kind of mechanism to spread information and integrate into the national SOP should be developed.

Presentation 3: Action Plan to Refine the FDRS to Reduce the Impact of Peat Fires in Malaysia- Mr. Kang Thean Shong, Malaysian Metrological Department (MMD)(See Annex 5)

Mr. Kang Thean Shong gave a brief overview of the Fire Danger monitoring methods used in Malaysia and standard criteria used for issuing a fire alert. For the last couple of years, MMD has increased the number of Automatic Weather Stations (AWS) supplying data for the FDRS from 39 to 168 to get better readings. In refining the system, peatland areas have been added into an overlay map. Peat maps were acquired from the Department of Agriculture and digitised from land use maps. This helps to identify the fire prone peat areas on the overall FDRS map. Verification of the codes was coordinated by the Malaysian Ministry of Natural Resources and Environment (NRE) while ground truthing was done by the Department of Environment, Forestry Department and Global Environment Centre. A new map for the whole of Malaysia, with peatlands overlaid has been layered onto Google Map. This can be viewed at http://met.gov.my/fdrs.

To help monitor fire prone areas, the voluntary civil corps (RELA) has also been engaged to monitor and alert the community and plantations of fire risks. Future plans include using Numerical Weather Prediction (NWP) data to produce forecast maps, a software update, increasing the number of weather stations, redefining fire danger (severity) codes and calibration. MMD is working on a 3-day forecast FDRS for future use. However, it is still in the developmental stage and yet to be publicised. The current generated FDRS Maps are produced using the latest weather information (3 hours lag time). Due to the limitation of computer capacity, the current NWP products of MMD can only be used to generate fire behaviour codes and indices forecast for 1 day.

A Fire Danger Rating System (FDRS) covering most ASEAN countries is available online and is currently being hosted by MMD. The FDRS Map does not cover some member states due to lack of national data. The system is being further refined and Malaysia is taking the lead in implementing this task. The data set from some ASEAN Member States (AMS) are not available in the GTS. For temporary solution, it is hoped that the data can be made available through emailing to MMD on daily basis before 0600UTC. The Workshop agreed that MMD will request for the data directly with their counterpart meteorological agencies, and MMD will only be able to develop the FDRS map only for those countries that are able to provide data, or from data that can be accessed from global data platforms such as from WMO coordinated GTS system .

Presentation 4: Updates on Indonesian FDRS - Mr. Mulyono Prabowo, Meteorological, Climatological and Geophysical Agency of Indonesia/BMKG (See Annex 6)

Mr. Mulyono updated the meeting on the progress of Fire Danger Rating System in Indonesia. He gave an overview of the Indonesian FDRS fire weather data processing flowchart, detailing the process from modelling to information sharing to end users. Maps, generated based on real time and current data,

are produced for the whole of Indonesia, and later refined according to major islands such as Kalimantan and Sumatera. The maps are uploaded on the BMKG website and sent out to provincial level that is responsible to disseminate information. For future development, BMKG is planning to add more weather stations and to use an integrated Radar network as well as forecasting using NWP products. One target is to produce medium range forecasts (1-2 months).

Presentation 5: Fire Prevention and Control Mechanism in Peatland of Thailand - Ms. Chonthida Chernkhunthod, Department of National Parks, Wildlife and Plant Conservation (DNP) Thailand (See Annex 7)

Ms. Chonthida from Department of National Parks, Wildlife and Plant Conservation (DNP) Thailand presented main fire prevention activities for peatlands such as forest fire units, water level maintenance, fire prevention campaigns through education programmes, exhibitions, billboards and materials to raise awareness and volunteer fire brigades. Several fire detection methods are used including ground and aerial patrols. Daily hotspot reports are generated and put up on a website. MODIS hotspot validation exercises have shown that the accuracy of the reports is very high. For suppression purposes, equipment is prepared in advance. Fire towers are built and people are trained to handle fires efficiently. She indicated that at present there is no national FDR System in Thailand. Although Thailand doesn't have FDRS yet, the country has the most advance firefighters and fire team. Thailand plans to l provide early warning information in the future.

3.2 Presentations Session 2

Presentation 6: Regional Southeast Asia Wildland Fire Science and Management Network and the Challenges to Reduce Greenhouse - Dr. Bambang Hero Saharjo, Regional Southeast Asia Wildland Fire Science and Management Network (RSWFSMN) (See Annex 8)

Dr. Bambang Hero Saharjo of the RSWFSMN presented the challenges in reducing greenhouse gas emission due to forest fires at regional level. With the high number of hotspots in Southeast Asia, Dr Bambang cited the ASEAN Agreement on Transboundary Haze Pollution which was signed in 2002 and its principles, its contents, prevention, monitoring, etc to combat the problem of haze in the region.

The Workshop noted that the current fire danger rating system in the region is based on the Canadian FDRS. The use of the Canadian system should be maintained as it has enabled FDRS to operate for 10 years in the region. Several existing networks/mechanisms were identified which could be linked with FDRS activities in Southeast Asia. This linkage could provide input into further development and refinement of the FDRS and access to data sets on land cover etc. Also, enhancing learning and exchange on outreach and development of EWS based on FDRS is important.

ASEAN Haze online website (http://www.haze.asean.org) can be accessed to share information regarding haze in the region. South East Asia Regional Information Network (SEARIN) is another regional group which was established in Manila in 1993. This Network is linked to GOLD aim to strengthen collaboration in Southeast Asia through the network. The focus is on Forest Fire Research including Greenhouse Gas emissions from biomass burning, land use change, etc. Linking the development of

FDRS systems by government agencies with the existing expert networks in the region and globally is ultimately important.

Presentation 7: Concept plan for a GIS Based Fire Monitoring and Prediction System - Mr. Chiam Keng Oon, ASEAN Specialised Meteorological Centre (ASMC) (See Annex 9)

Mr. Chiam Keng Oon from ASMC Singapore presented a Concept plan for GIS based Fire monitoring system. Following the current trend of using GIS to examine geospatial data, it is necessary to adopt a GIS based system to monitor hotspots and peatland fires. All information will then be consolidated into a central repository. A GIS based system can possibly combine relevant information to examine crisis/danger situations and help decision makers to deal with the problem. For implementation, there is a need to take stock of the pros and cons. Analysis such as water table and land use information should be performed.

Presentation 6: Achievements of The Ongoing JST-JICA Wildfires and Carbon Management in Peat Forest in Indonesia: Fire Detection and Fire Prediction system– Dr. Orbita Roswintiarti, Indonesian National Institute of Aeronautics and Space (LAPAN) (See Annex 10)

Dr. Orbita from LAPAN shared the achievements of an on-going JST-JICA project in Indonesia. This project is undertaken in cooperation with University of Hokkaido, Japan by examining sites in Block B and C of the ex-Mega Rice Project in Central Kalimantan. She also introduced the structure of the Forest Fire Component with 7 purposes, 11 outputs and various activities. Among the project activities is validating hotspots using Unmanned Air Vehicles (UAVs) equipped with optical & infrared cameras. The results are uploaded to JICA-JST SATERPS project website. MODIS Hotspot database is being operated and alert system is currently being developed by LAPAN through SMS in collaboration with TELKOM, the widest communication networking in Indonesia. The trial server will be located in Palangkaraya as the city already has their own fire fighters and fire-suppression community. This effort could be scaled up to cover the ASEAN region in the future.

Remote sensing methods can estimate surface water tables as well as create land cover maps. There is also a spectrum library for data collected using a spectroradiometer in this project. For example, there is a map of spectral reflectance from 10 dominant tree species in a peat swamp forest.

Presentation 7: Indonesian Peat Fires and Emission Reduction through Prevention Activities - Dr. Bambang Hero Saharjo (See Annex 11)

Dr. Bambang presented on fire and emission reduction via prevention activities. He provided overview on forest fires in Indonesia and also presented haze maps and a comparison of burning peat versus non-peat areas. Reducing emissions means reducing hotspots, reducing burnt areas and increasing the local government & community capacity to control burning in their areas. Training modules need to be developed and FDRS further developed. There is a need for commitment to reduce fires.

In terms of prevention, a project with JICA is on-going with a focus on community-based fire management, readiness for fire management, early detection at provincial level. Among activities to

reduce burning is composting in communities. While there have been forward progression on this, new issues often arise, and further refining become necessary.

Presentation 8: Map of Peatlands distribution using hydrological unit in Indonesia -Mr. Djayawarman Alamprabu, Ministry of Agriculture Indonesia (see Annex 12)

Mr. Djayawarman Alamprabu from the Ministry of Agriculture, Indonesia presented a series of maps relevant to the distribution of peatland areas in Indonesia using remote sensing methods. The focus is mainly on Kalimantan, Sumatera and Papua. The maps were collected from various sources including Wetlands International, Canada and Australia. While in some areas ground survey is lacking, there have been quite a lot of groundwork done in Sumatera previously. However, in many cases, the peat depth was under-estimated.

3.3 Group Presentations from Group Discussions on Day 1

On this session, participants were divided into two groups. Group one was led by Mr. Kang Thean Shong from MMD and Group Two was led by Dr. Orbita Roswintiarti from LAPAN. The discussions were guided by the following questions:

i) Is there a need for enhancement of existing FDRS?
ii) Should we focus on a regional or country system, or a combination of both?
iii) Do we need a standard system design or can it be varied?
iv) What is the role of hotspot data in relation to FDRS?
v) What are the opportunities from linkage to other networks?

Both groups agreed that the current FDRS system at regional and country level is very valuable and the systems are complementary to each other. The groups identified a number of areas for enhancement of the FDRS systems, which are:

- Continue the fine tune and enhance the indices used for prediction
- Upgrade the software and use of supplementary geographic data layers such as fire prone peatlands, forests etc.
- Enhance data availability in the Mekong region and the Philippines, and other regions with limited data
- Add short term prediction facility (1-3 days);

It was agreed that it would be best that national systems would be broadly compatible. However, there was a need to adjust the indices and thresholds in the system especially in the northern ASEAN region. It was also agreed that hotspot information complements the FDRS although each system has a different purpose. For peatland fire, FDRS is more important as by the time a peat fire is large enough to be detected as a hot spot, it will be extremely difficult to control. Hence for peatland prevention measures are needed based on FDRS before fires can start. The linkages should be enhanced between regional and global expert groups on fire and the development of FDRS systems in the region.

The Workshop emphasized that ultimately each AMS have the responsibility to develop their own FDRS map. Malaysia, which has indicated its interest to provide the FDRS map for the other member states, can only do so provided necessary information is supplied by member states to generate the FDRS map. The design, resolution and coverage will depend on the type of information provided. Regional cooperation should therefore focus on sharing expertise and information for each member state to develop their own FDRS Map, and this has to be demand-driven by the countries concerned.

The summaries of discussion feedback from Group 1 & 2 are attached as **Annexes 13 & 14** respectively.

3.4 Group Presentations from Group Discussions on Day 2

On this session, participants were divided into 3 groups. Group 1 comprised participants from Malaysia and Brunei, Group 2 from Indonesia and Group 3 comprised participants from Philippines and Mekong countries. The summary of the group discussions are attached as **Annexes 15-17** respectively.

The Workshop acknowledged that BMKG runs both weather and FDRS forecast in Indonesia while LAPAN provides remote sensing data. Fire weather combined with vegetation index on the fire prone area will be the focus of FDRS. Furthermore, Indonesia has agreed to focus on four prone areas, which are Riau, South Sumatera, Central Kalimantan and West Kalimantan. Coordination and collaboration urgently needed for Indonesia to develop FDRS system since various agencies have developed their own system. Ministry of Environment was appointed as the leading agency to coordinate with other agencies and ministries and will provide data for daily FDRS. Ministry of Agriculture will be the leading agency to determine peatland area reflected on a peat map and Ministry of Forestry will do the ground check. The development of FDRS in Indonesia will also involve academicians from Institut Pertanian Bogor (IPB) to check the accuracy of FDRS and do modeling and data.

The Workshop also noted that Indonesia will enhance the existing system integrated with fuel map and peatland. BMKG will review the accuracy and limitation of existing FDRS (FDRS forecast, FDRS seasonal prediction). From June to August 2012, assessment of new calibration will be completed. The new calibration will be then implemented in September 2012.

The groups discussed the specific follow up steps which were needed to advance the Development and implementation of FDRS. Some of the key measures to enhance the use of FDRS were identified as:

- The development of a generic Standard Operational Procedure (SOP) for dissemination of information of the FDRS
- Incorporation into existing fire and haze, peat working group SOPs
- Promote usage to priority user groups
- Monitor and feedback on the use and effectiveness of the system
- Formalise policy for the use of the system as a tool for forest fire prevention

4.0 Conclusions and Closing Remarks

Faizal Parish from Global Environment Centre summarised some of the key discussions in the meeting and identified some of the next steps in advancing the FDRS system. Dr. Raman Letchumanan from the ASEAN Secretariat made closing remarks for the meeting. The ASEAN Secretariat will be preparing a briefing paper outlining the relevant decisions and latest development of FDRS for the ASEAN region, to be reported at the 13th Meeting of the Sub-Regional Ministerial Steering Committee (MSC) on Transboundary Haze Pollution in Brunei Darussalam in May 2012. The responsibilities of various parties at regional and country levels need to be clarified so that we can enhance the development of the Peatland Fire Prediction and Warning System. Although the existing system is for general guidance, Dr. Raman encouraged each country to develop their own system including specific national procedures for use of the FDRS warnings. Malaysia and Indonesia should be able to provide assistance in the process. With good coordination and cooperation, an effective system addressing key needs should be possible within the next two years.

The workshop was conducted in the spirit of ASEAN cordiality and cooperation.

Annex 1

Final Programme

ASEAN Technical Workshop on Development of the ASEAN Peatland Fire Prediction and Early Warning System

20-21 March 2012, Sunway Putra Hotel Kuala Lumpur

DAY 1 – 20 March 2012	
Time	**Programme**
8.30 – 9.00	Registration
9.00 – 9.10	Remarks by ASEAN Secretariat
9.10 – 9.40	Overview of hotspot monitoring and Fire Danger Rating Systems in the ASEAN region under the umbrella of ASEAN Agreement on Transboundary Haze Pollution and the development of ASEAN Peatland Fire Prediction and Monitoring System *by Dr. Raman Letchumanan, ASEAN Secretariat*
9.40 – 10.10	Special session (Video Conference): Regional Fire Early Warning: a key component of national to local fire management *by Dr. W.J. (Bill) de Groot, Canadian Forest Service*
10.10 – 10.30	Tea break
	Session 1 **Chair: Dr. Raman Letchumanan, ASEAN Secretariat**
10.30 – 10.50	Action Plan To Refine the Fire Danger Rating System (FDRS) to Reduce The Impact of Peat Fires in Malaysia *by Mr. Kang TheanShong, Malaysian Meteorological Department*
10.50 – 11.10	Updates on Indonesian Fire Danger Rating System *by Mr. Mulyono RahardiPrabowo, Center of Meteorology for Public, BMKG*
11.10 – 11.30	Fire Prevention and Control Mechanism in Peatland of Thailand *by Ms. Chonthida Chernkhunthod, Department of National Parks, Wildlife and Plants Conservation*
11.30 – 11.50	Regional Southeast Asia Wildland Fire Science and Management Network and the Challenges to Reduce Greenhouse Gas Emission due to Forest Fires at Regional Level *by Prof. Dr. Bambang Hero Saharjo, Regional Southeast Asia Wildland Fire Science and Management Network (RSWFSMN)*
11.50 – 12.30	Q&A session
12.30 – 14.00	**Lunch break**
	Session 2 **Moderator: Mr. Faizal Parish, RPEA**
14.00 – 14.20	Concept Plan For a GIS-based Fire Monitoring & Prediction System *by Mr. Chiam Keng Oon, ASEAN Specialised Meteorological Centre, Singapore*
14.20 – 14.40	Achievements of the on-going JST-JICA "Wildfires and Carbon Management in Peat Forest in

	Indonesia: Fire Detection and Fire Prediction System" *by Dr.Orbita Roswintiarti,Indonesian National Institute of Aeronautics and Space (LAPAN)*
14.40 – 15.00	Indonesian Peat Fires and Emission Reduction through Prevention Activities *by Prof. Dr. Bambang Hero Saharjo, Forest Fire Laboratory, Bogor Agricultural University (IPB)*
15.00 – 15.20	Map of Peatlands distribution in Indonesia *by Mr. Djayawarman Alamprabu, Ministry of Agriculture, Indonesia*
15.20 – 15.40	Q&A Session
15.40 – 16.00	**Tea break**
16.00 – 18.00	Break-out group discussions 1 • Enhancement/integration of existing systems • System Operation and Mechanism
	End of Day 1
DAY 2 – 21 March 2012	
09.00 – 10.00	Group Presentation and Q&A session
10.00 – 11.00	Break-out Group Discussions 2 and Tea Break Options to be undertaken to support the development of the System: • At national level • At regional levels
11.00 – 11.45	Group Presentation and Q&A session
11.45 – 13.00	Wrap Up of the Workshop and Closing
13.00	End of the Workshop and Lunch

Annex 2

LIST OF PARTICIPANTS ASEAN TECHNICAL WORKSHOP ON DEVELOPMENT OF ASEAN PEATLAND FIRE PREDICTION AND EARLY WARNING SYSTEM
20-21 MARCH 2012, SUMWAY PUTRA HOTEL, KUALA LUMPUR, MALAYSIA

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Annex 3

Overview of fire danger rating system in the ASEAN region under the umbrella of the ASEAN Agreement on Transboundary Haze Pollution and the development of ASEAN Peatland Fire Prediction and Monitoring System

RELEVANT DECISIONS OF VARIOUS ASEAN MEETINGS ON REGIONAL FIRE DANGER RATING SYSTEM

Meeting	Relevant Decision
10th MSC, 29 Jul 2010, Kuching, Malaysia	Agreed to encourage and support the further development and refinement of the FDRS and urged all relevant agencies in ASEAN Member States (AMS) and ASMC to collaborate on this effort. The FDRS will be a useful complement to the weather and hotspot monitoring being done by ASMC
6th TWG Mekong, 20-21 Sep 2010, Nay Pyi Taw, Myanmar	supported the further development and refinement of the FDRS, and noted that Indonesia, Malaysia and the ASMC are working together to develop the proposal for this activity
COP-6, 13 Oct 2010, Brunei Darussalam	• recognised that the FDRS will be a useful complement to the weather and hotspot monitoring being done by ASMC. • agreed that the relevant agencies in AMS and ASMC collaborate in the further development and refinement of the FDRS to improve its effectiveness. • acknowledged that Malaysia will develop a proposal to further refine the FDRS

RELEVANT DECISIONS OF VARIOUS ASEAN MEETINGS ON REGIONAL FIRE DANGER RATING SYSTEM

Meeting	Relevant Decision
11th MSC, 17 Feb 2011, Singapore	• noted the progress of the refinement of FDRS in Malaysia, and that preparations to test the FDRS in the peatland pilot sites in Selangor, Malaysia are ongoing, under the framework of the ASEAN Peatland Forests Project. • noted that Malaysia requested ASEAN Member States (AMS) to provide relevant meteorological data and peatland data in order to refine FDRS to cover ASEAN region • encouraged countries to provide the requested relevant data to Malaysia, for further development of the ASEAN-wide FDRS.
1st MSC Mekong, 25 Feb 2011, Krabi, Thailand	
12th MSC, 23 Sep 2011, Bangkok, Thailand	

RELEVANT DECISIONS OF VARIOUS ASEAN MEETINGS ON REGIONAL FIRE DANGER RATING SYSTEM

Meeting	Relevant Decision
COP-7, 18 Oct 2011, Phnom Penh, Cambodia	• noted the progress of the refinement of FDRS by Malaysia, including the ongoing testing of the FDRS in the peatland pilot site in Selangor, Malaysia under the framework of the APFP. • requested AMS to provide the relevant meteorological data to Malaysia, for the further development of the FDRS for the ASEAN region.
2nd MSC Mekong, 29 Feb 2012, Hanoi, Viet Nam	• agreed to continue to participate in the refinement and development of an ASEAN-wide Fire Danger Rating System based on relevant national early warning systems.

The Singapore workshop (February 2008) identified: (funded by AADCP)

Biophysical Factors of peatland fires identified were:

- Peat drying determines fuel availability
- There is a link of drainage/water level with fires - Groundwater level needs to be sufficiently low so that the surface layer of peat can dry
- Peat seems to catch fire from woody material burning
- People generally do not deliberately burn peat but burn dead biomass that then sets fire to peat
- Low (or no) rainfall periods needs to be long enough for the surface layer of peat and large woody fuels to dry

The Singapore workshop (February 2008) identified: (funded by AADCP)

- Peatlands can burn when rain is low for 10 days
- Peatlands can burn when rain is below 100 mm per month (occurs in January, February, May, June, July and August depending on location)
- Above average temperatures increase drying of fuels
- Intense wind events facilitates rapid fire spread
- Forest canopy cover is a factor by shading peat and fuels

Follow up tasks identified from Singapore Workshop

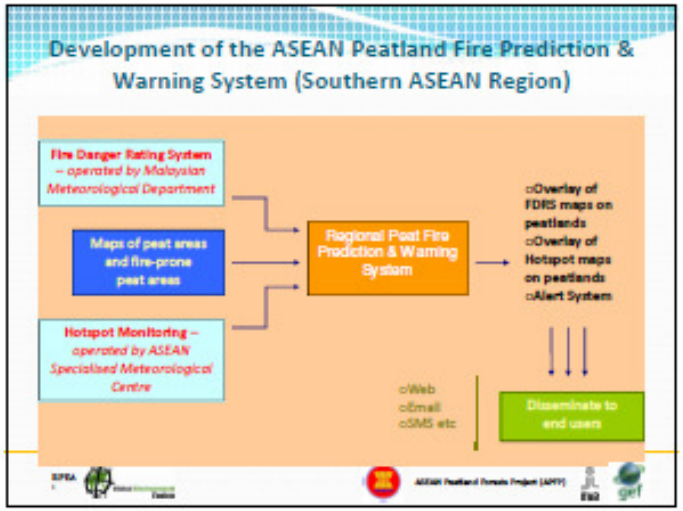
TASK 1 - Testing and refinement of the SE FDRS for peat fuels.

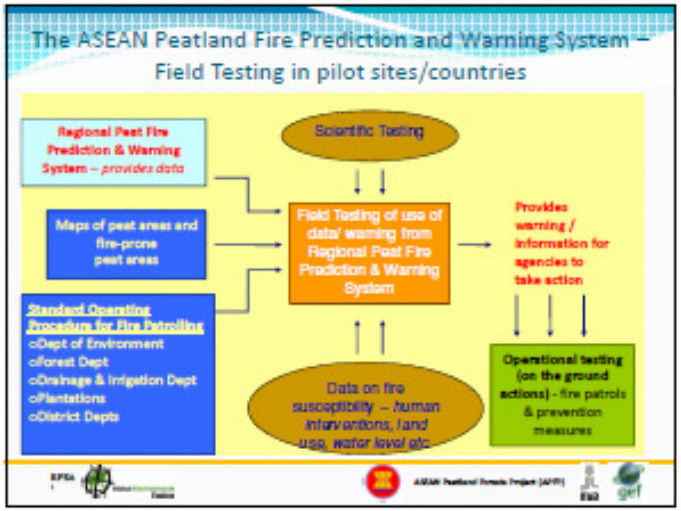
- collect and review data on peatland extent and depth
- collect and review existing data on peatland fire location, fire history and hotspot data
- collect and review water level data for peatlands and role of water control devices for managing water levels in peatland areas.
- Test further the use of the Duff Moisture Code and the Drought Code for peatland areas
- Enhance effective use of fire danger rating for operational purposes such as development of SOPs and alert levels for usage

Follow up tasks identified from Singapore Workshop

TASK 2 – Identify key indicators of human actions that contribute to peatland fires.

- Obtain information on the Agricultural crop and land preparation cycles
- Analyse the human factors in fire danger in peatlands in combination with land use, land cover and hotspots to identify trends and indicators.
- Develop methods of communicating FDR to key target audiences





Proposed actions from KL Workshop (July 2011)
(under ASEAN Peatland Forests Project - funded by IFAD-GEF)

FDRS system

- Undertake comparison between FDRS done by MMD based on ground stations versus FDRS by LAPAN using satellite data
- Undertake comparison by FDRS + hotspots (ongoing MMD + LAPAN + Japan)
- Capacity building – training for users
- Set target date to update software (e.g. 3-5 years)
- Increase the availability of data for prediction of fires through both automatic and manual weather stations in fire prone peatlands and remotely-sensed data sources.

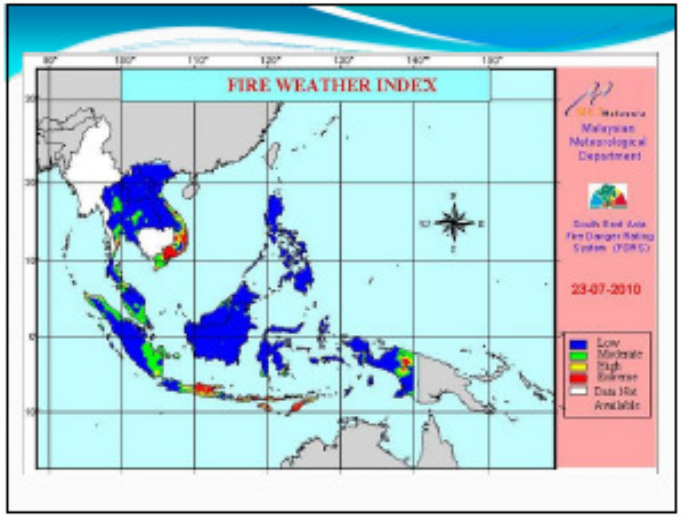
Proposed actions from KL Workshop (July 2011)
(under ASEAN Peatland Forests Project - funded by IFAD-GEF)

Fire prevention through FDRS

- Develop susceptibility and risk maps and fire prevention plans for all fire prone peatlands.
- Set up an effective outreach programme to disseminate fire danger alerts to fire prone peatlands/ground level through web, SMS and media.
- Establish, enhance or disseminate Standard Operating Procedures (SOPs) for peatland fire prevention to guide the work of government, private sector and communities.
- Engagement of local communities and private sector in fire prevention

Immediate Needs

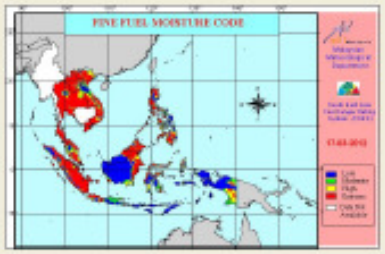
- Establishment of task force to develop the system involving key agencies in the region
- Refinement of the FDRS code for peatland fire monitoring
- Map for regional peatland fire prediction and monitoring which overlay peatland distribution with hotspot and FDRS
- Examine and integrate the drainage, land use, land cover, water table and other aspect of fire susceptibility and risk into the FDRS map



Annex 4

Regional Fire Early Warning:
a key component of national to local fire management

GOFC-GOLD



W.J de Groot
J.G Goldammer

Canada

Presentation Outline

1. Fire danger and early warning
2. Overview of the Global EWS
3. Regional early warning
4. National and local applications

Global EWS website at
FIRE GLOBE Global Fire Monitoring Center:

http://www.fire.uni-freiburg.de/gwfews/index.html

2

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What is Fire Early Warning?

Wildland Fire Danger – a measure of the potential for fire to start, spread, and have significant impact.

Fire danger is a primary fire management decision-aid tool.

3

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Why do we need fire danger rating?

Fire Danger Rating is used to:

- Justify annual budgets, and emergency funding
- Carbon emissions reporting (UNFCCC)
- Air quality hazard reporting
- Model post-fire succession and biodiversity
- Simulate climate change impacts and management adaptations
- Public information - extreme burning conditions
- Planning prescribed burns
- Determine fire suppression resource requirements and strategic positioning

4

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What is Fire Early Warning?

Early warning is advanced knowledge of future fire danger conditions

Fire early warning provides:

1. Time to implement fire management actions that mitigate or prevent wildland fire disaster before fires occur
2. Guidance in the planning and appropriate use of prescribed fire

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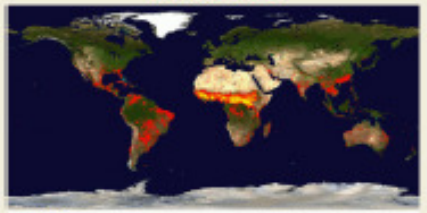
Global EWS for Wildland Fire

2009 Global fires



Purpose is to reduce global wildland fire disaster through early warning, and promotion of information and resource-sharing

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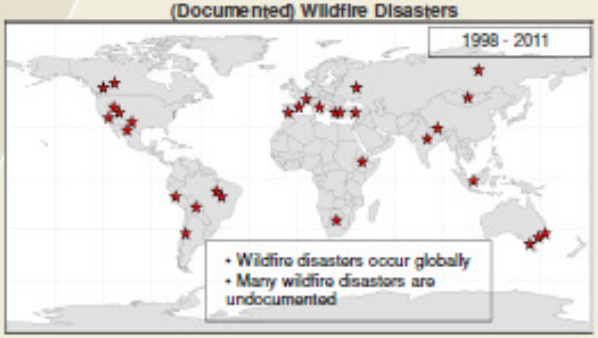
Examples of Recent (Documented) Wildfire Disasters



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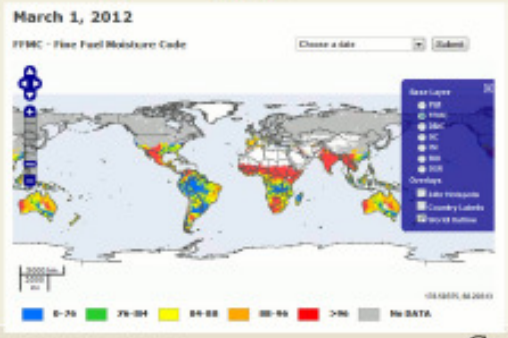
Global Early Warning System for Wildland Fire



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Global EWS for Wildland Fire: Basic Structure

Global	• International coordination – global information, disaster assistance
Regional	• Regional information - locally calibrated, quickly updated fire risk
National	• Direct national resource movements • Set national standards • training, equipment
Sub-National or Local	• Field level fire management • Operational decision-making

Global to Local Connection

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Role of Regional Early Warning

- Provide "locally" calibrated fire risk data (regional and national)
- Provide updated daily forecasts (in local time zone)
- Supports existing national FDR systems, and provides an FDRS for countries without a national system

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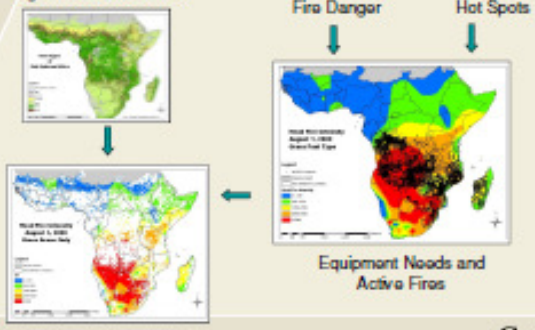
Africa Example – Regional prototype

Vegetation Classification

Fire Danger

Hot Spots



Equipment Needs and Active Fires

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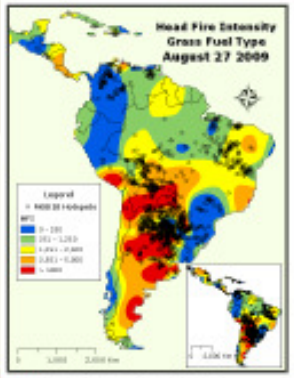
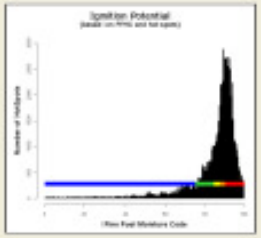
Regional EWS Prototype: Central and South America





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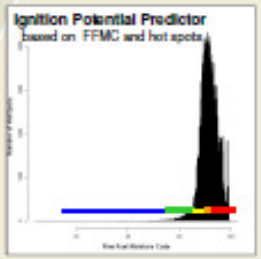
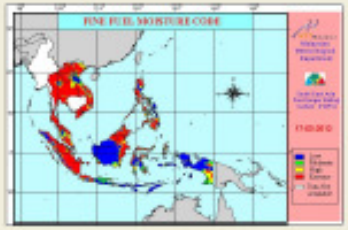
Southeast Asia – Calibration of FFMC





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Early Warning Applications: National and Local Level

- Provide rapid updates of fire danger from local weather network
- Used to determine daily fire prevention, detection, and suppression activities at local level
- Based on locally-derived guidelines for prescribed fire and fire control

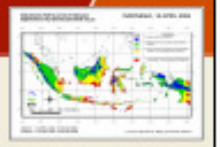

Photo: Working on Fire

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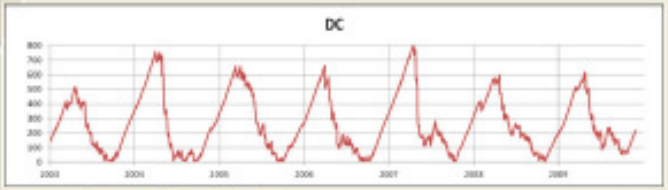
NW Thailand Calibration Example [1]

- Calibration to extreme events of 2004 and 2007
- Based on Total Particulate Matter emissions
- DC threshold of 650



[1] Robert Field, Columbia University

15

Canada

Prevention and Detection Planning Guide

			Detection	
Potential Ignition Level		Prevention Activity	Activity	Period
Low		None	None	None
Moderate		Post local warning signs	towers	mid-day
High		Local media warnings Prescribed fire restrictions	towers vehicle patrol	all day mid-day
Extreme		TV and radio warnings Prescribed fire exclusion Local community meetings	towers vehicle patrol aircraft patrol	all day all day mid-day

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Pre-Suppression Planning Guide

Wildfire Threat Level	Resources on Standby	Alert Period	Dispatch Time
Low	crews, hand tools	mid-day	60-min
Moderate	crews, hand tools	all day	30 min
	pumps, water tanks	mid-day	60 min
High	crews, hand tools	all day	15 min
	pumps, water tanks	all day	30 min
	control line-building equipment	mid-day	60 min
Extreme	crews, hand tools	all day	15 min
	pumps, water tanks	all day	15 min
	control line-building equipment	all day	30 min
	aircraft, burnout equipment	mid-day	60 min

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Communication and Cooperation

- Fire management collaboration occurs most often between closely-related countries
- International agency resource-sharing happens most frequently at a regional level
- Regional communication and information sharing will lead to enhanced collaboration
  - Supported by early warning and fire risk intelligence
  - Leads to resource-sharing, cross-training, exchange of expertise

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Next Steps in Regional Early Warning

1. Training in FDRS/EWS and fire management
2. Develop local decision-aids
3. Train the trainer – local capacity building

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Thank You

GOFC-GOLD

GOFC-GOLD Global Fire EWS Project Team

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JG Goldammer	Global Fire Monitoring Centre
J San-Miguel-Ayanz	Joint Research Centre, European Commission
CO Justice	University of Maryland/FIRMS
TJ Lynham	Canadian Forest Service
A Csiszar	NOAA/NESDIS
E Chuvieco	University of Alcala
T Brown	Desert Research Institute

Global EWS website at
FIRE GLOBE Global Fire Monitoring Center:

http://www.fire.uni-freiburg.de/gwfews/index.html

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Annex 5

Refinement on Fire Danger Rating System (FDRS)
to Reduce Peat Fires in Malaysia

By MMD & DOE

ASEAN Technical Workshop on Development of the ASEAN Peatland Fire Prediction and Early Warning System

Kuala Lumpur, Malaysia
20 - 21 March 2012

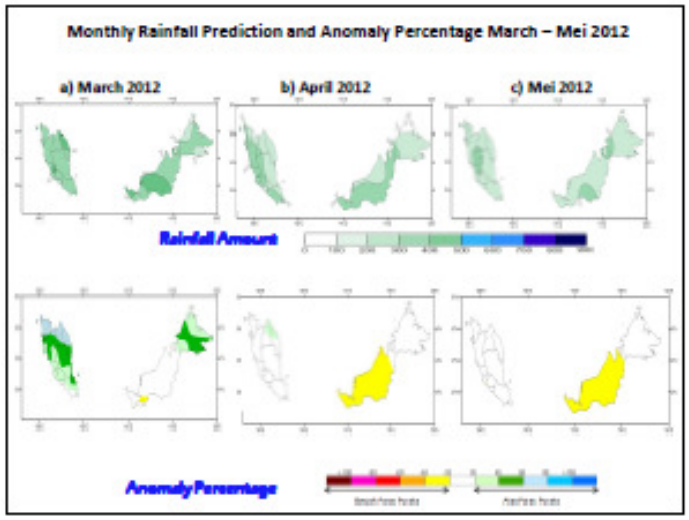
Contents

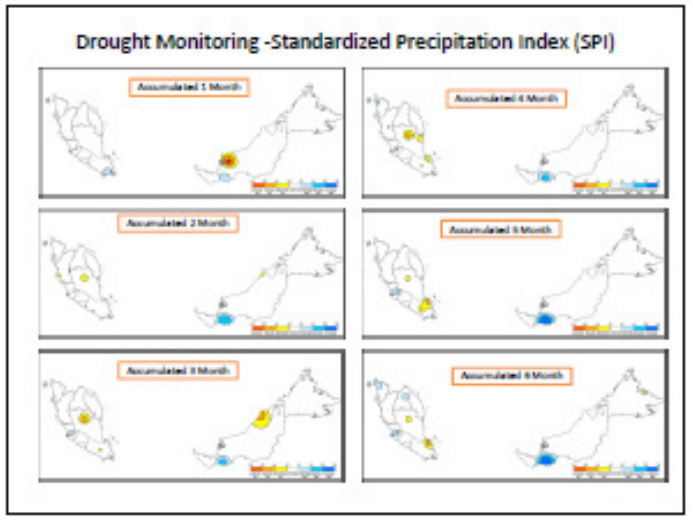
- Development on Drought Monitoring, Fire Prediction and Early Warning System in Malaysia
- History of FDRS
- FDRS Pilot Project in State of Selangor, Malaysia
- Current Products and Applications of FDRS
- Future Plan

Development on Drought Monitoring, Fire Prediction and Early Warning System in Malaysia

Development on Drought Monitoring, Fire Prediction and Early Warning System in Malaysia.

- Seasonal Forecast
- Drought Monitoring (SPI)
- Report by Climate & Hydrology Section of non-raining days
- Satellite Hot Spot Monitoring
- Report by Environmental Studies Division During haze condition.
- Watch Tower, Air & Land Surveillance





Criteria For DROUGHT ALERT/WARNING

Alert

a) Total cumulative rainfall for the last 3 months is 65% below the long term average

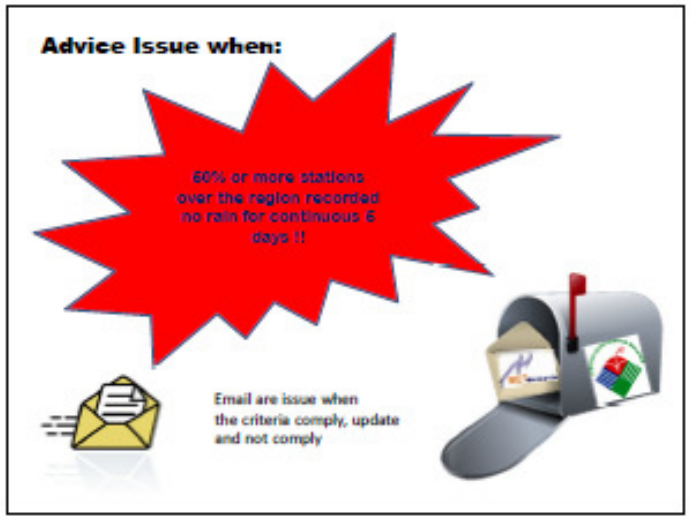
b) SPI of the last month is less than -1.5

DROUGHT WARNING

a) Total cumulative rainfall for the last 3 months is 65% below the long term average AND Total cumulative rainfall for the last 6 months is 65% below the long term average.

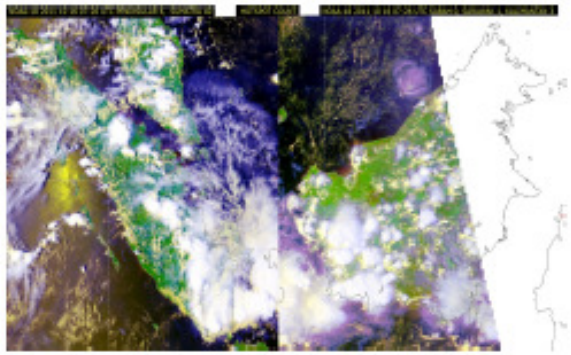
b) SPI of the last month is less than -1.5

- SOP for Drought is follow when this Criteria is fulfill

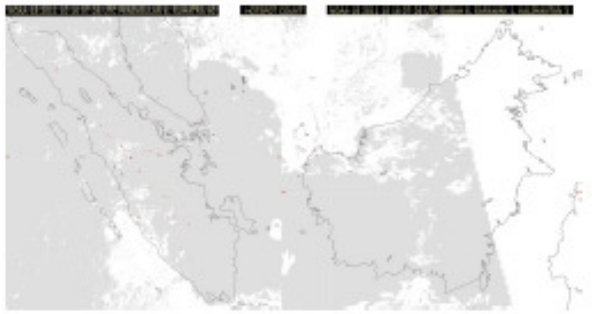


Advice on open burning ban

Hot Spot Monitoring



Hot Spot Monitoring



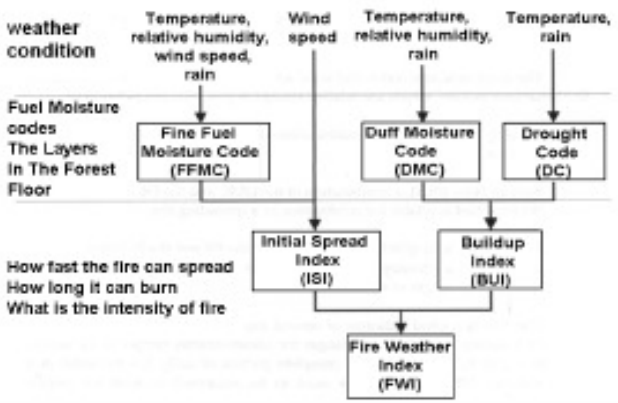
Daily Report by Environmental Studies Division During haze condition.

History of FDRS

FDRS In METMalaysia

- Fire Danger Rating System for Malaysia is computed and displayed on MMD website since 2003
- Also for Southeast Asia
- Based on the Canada Forestry Service (CFS) through CIDA

THE CANADIAN FOREST FIRE INDEX SYSTEM

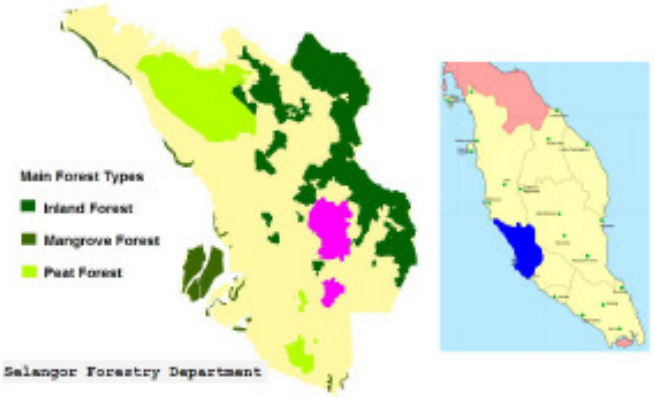


- 12th Informal ASEAN Ministerial Meeting on the Environment : 6th Meeting of the Conference of the Parties to the ASEAN Agreement on Transboundary Haze Pollution (October 2010 Brunei Darul Salam) endorsed the Development of FDRS for the ASEAN Region
- To Refine FDRS

FDRS Pilot Refinement Project in State of Selangor, Malaysia

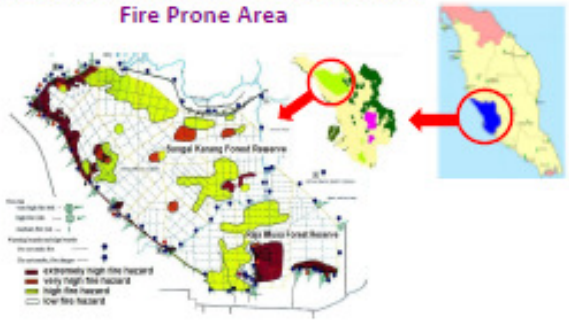
FDRS Pilot Project Over Peatland Area.

Peat Forest in Selangor



Pilot Project the State of Selangor

The North Selangor Peat Forest Reserve
Fire Prone Area



VERIFICATION OF FDRS CODES

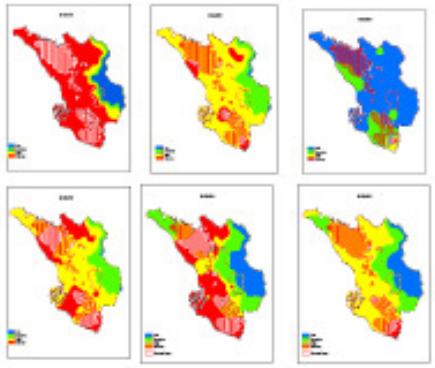
- Coordinated By NRE
- Observations/Ground truth By DOE, JPSM & GEC
- Phase 1 - Verification was carried out from 15 June 2011 to 31 July 2011
- Phase 2 - Verification in progress from 1 August 2011 to 30 September 2011

Pilot Project the State of Selangor

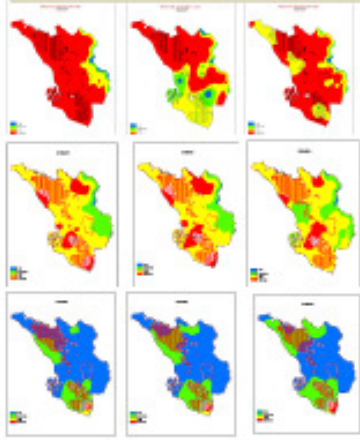
Burning in Parit 4 dan Parit 5, Raja Musa Forest Reserve on 20/6/2011 for FFMC, DMC, DC, ISI and FWI.

Based observation on 20 Jun 2011:

reflect with actual situation where most places show all FDRS indices are in high category with high probability to ignite fire except for DC Typical wet-season conditions and severe haze periods are unlikely. More than 30 dry days until DC reaches threshold at which point severe haze is highly likely



Pilot Project the State of Selangor



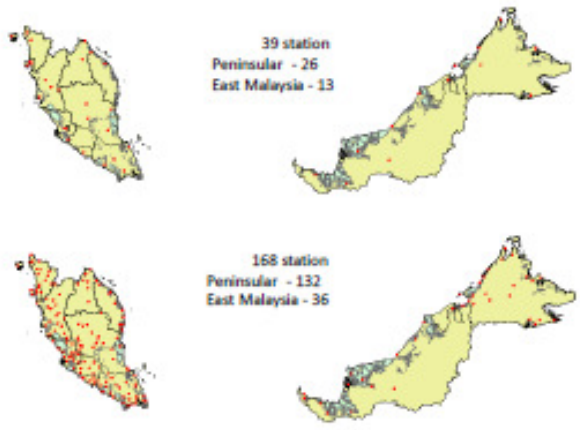
FFMC : Burning Was Observed in Johor Setia On 21/6/2011, 22/6/2011 and 25/6/2011

DMC For 21/6/2011, 22/6/2011 dan 25/6/2011

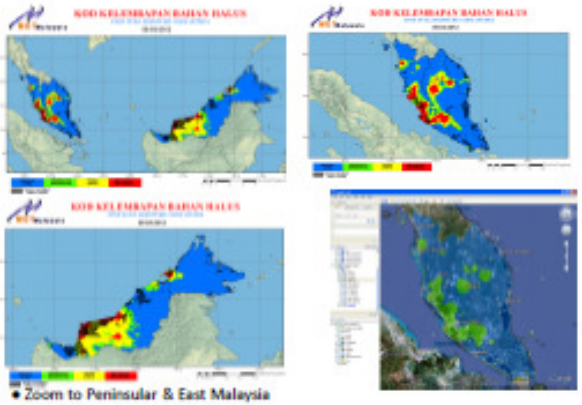
DC on 21/6/2011, 22/6/2011 and 25/6/2011

Current Products and Applications of FDRS

Increase station number from 39 to 168

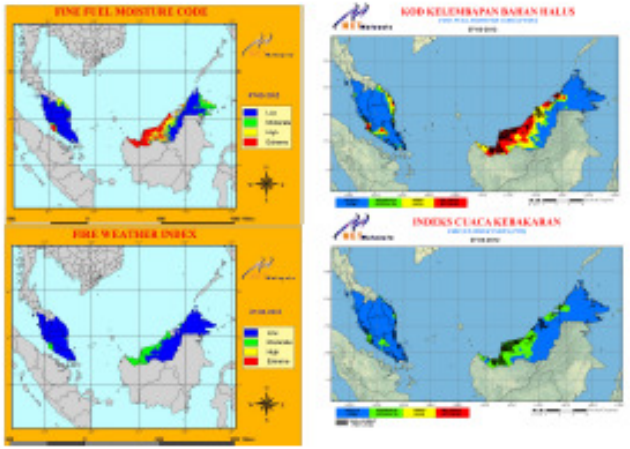


http://www.met.gov.my/fdrs/



- Zoom to Peninsular & East Malaysia
- Google Map
- Peatland area

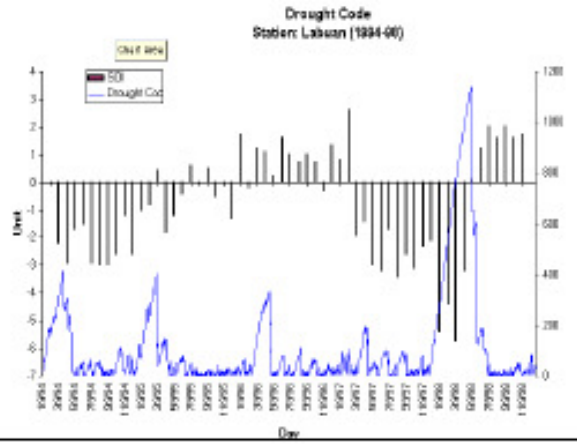
Differences between the old and new Malaysian FDRS



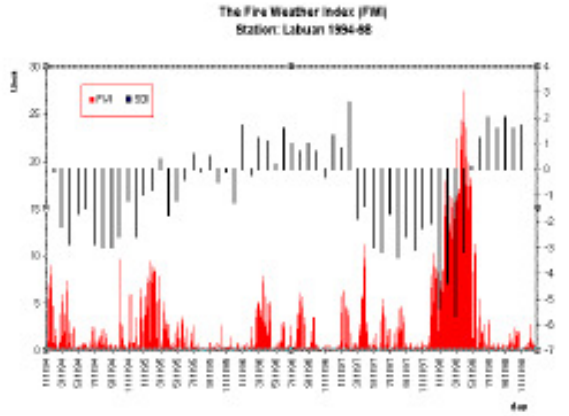
Different between old and new Malaysian FDRS

- Better resolution
- Refinement of initial data from 37 principal station to all 168 weather station
- FDRS product now are more detail and accurate.

Analyses done on some of the FDRS products



Analyses done on some of the FDRS products



Effort work towards refinement of FDRS

Malaysian Meteorological Department & Department of Environment, Malaysia

Applications of FDRS

- DOE use FDRS as early warning system in order to take appropriate action on the ground to curb land and peat fires that cause deterioration of air quality with particular attention during hot and dry weather

SATELLITE IMAGE MAPPING AND COORDINATES

- Verification of fire incidence was done :
  - By having hotspot map superimpose to google map and having GIS system to indicate the spesific location of hotspots;
  - Ground truthing is done by sending enforcement officers from DOE/local authorities patrolling the potential fire risk areas.

- Engage local community such (English) RELA to monitor the fire prone area - fire suppression by engaging BOMBA/DID/MGD to ready with structures to mitigate fire breakout

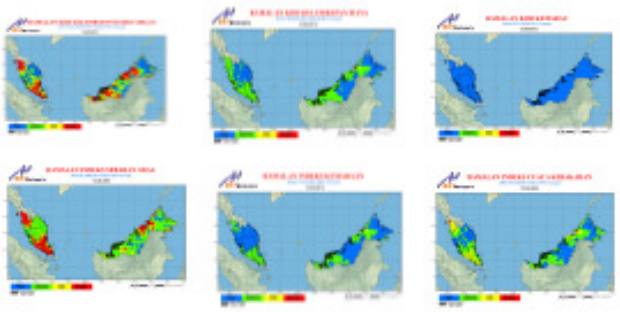
- Use of FDRS as an alert system to the enforcement officer to monitor the area of concern such as peatland, forest, plantation area, waste disposal area and shrubs.

Future Plan for FDRS

Future Plan for FDRS

- Using NWP data to produce FDRS forecast maps
- Software Update
- Increase the number of the weather stations
- Redefine fire danger (severity) code

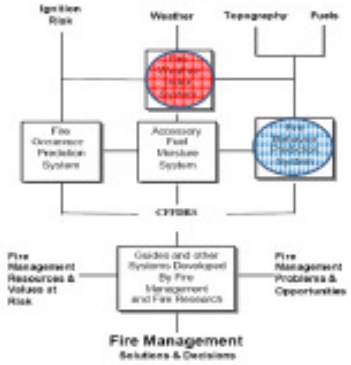
FDRS Forecast Product



- Still in the development stage
- Need verification

ABSTRACT OF CANADIAN FORESTRY FDRS SOFTWARE

Canadian Forest Fire Danger Rating System (CFFDRS)



- Currently FWI only
- Future Plan, FBPS

Collaboration of MMD and DOE

- Installation of a new Automatic Weather Station (AWS) in peatland area.
- Future Plan, minimum one AWS for each district .

Thank You

Annex 6

FDRS DEVELOPMENT FOR LAND AND FOREST FIRE PREVENTION AND MITIGATION

BMKG

Presented on:

"ASEAN Technical Workshop on Development of the ASEAN Peat Land Fire Prediction and Early Warning System"
Kuala Lumpur, 20-21 March 2012

AGENCY FOR METEOROLOGY CLIMATOLOGY AND GEOPHYSICS

Scope of presentation :

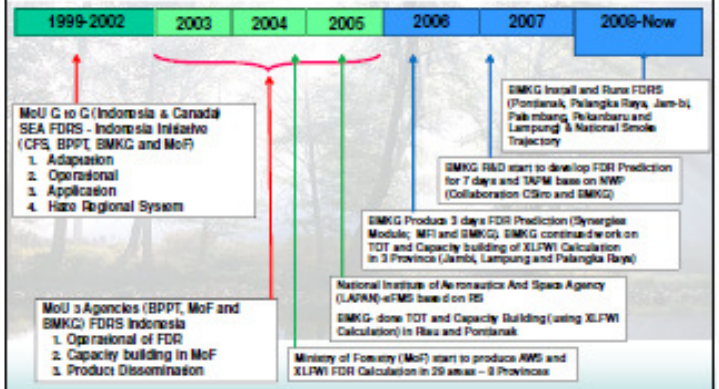
1. Fire Danger Rating System
2. FDRS Implementation Phases
3. FDR Development (1999 – 2002)
4. FDR Operation (2003 – now)
5. Product Of FDRS: Current Status
6. Smoke Dispersion and Trajectory Forecast Model
7. Dessimination of FDRS information
8. FDRS Future Development Program

BMKG

1. Fire Danger Rating

- Evaluation of (meteorological) factors that influence fire danger
- A system for fire danger rating to evaluate the fire environment on regular intervals and in objective way.
- Provides information and guidelines for fire management

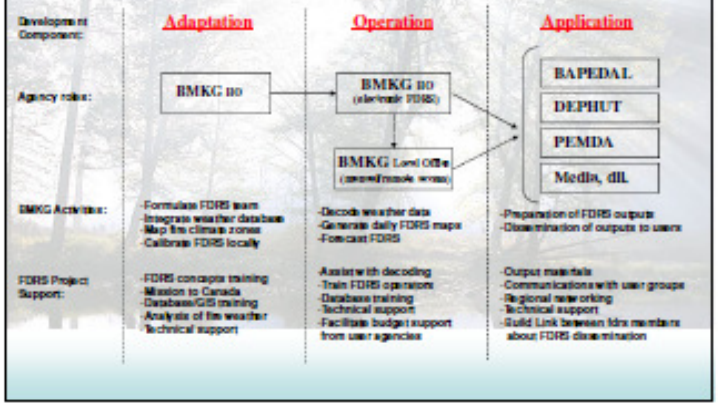
2. FDRS Implementation Phases



3. FDR Development (1999-2002)

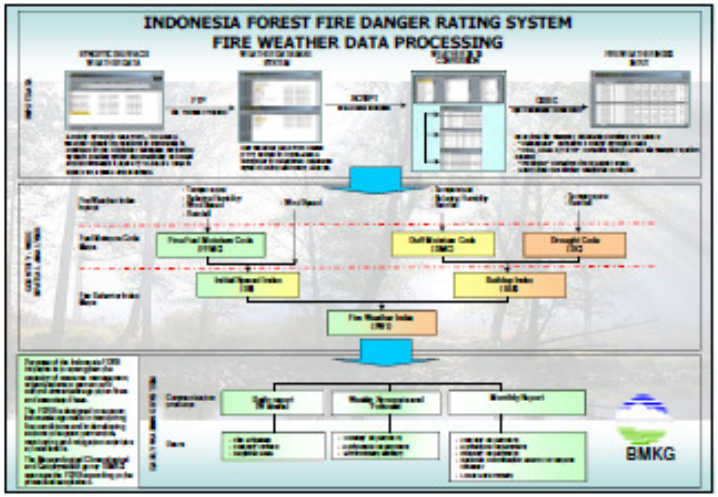
- Institutions:
  - Agency for Meteorology Climatology and Geophysics (BMKG)
  - National Institute of Aeronautics and Space (LAPAN)
  - Ministry of Forestry (MoF)
  - Agency for Assessment and Application of Technology (BPPT)
  - Canadian Forest Service (CFS)
- Pilot project areas:
  - Riau Province
  - West Kalimantan Province

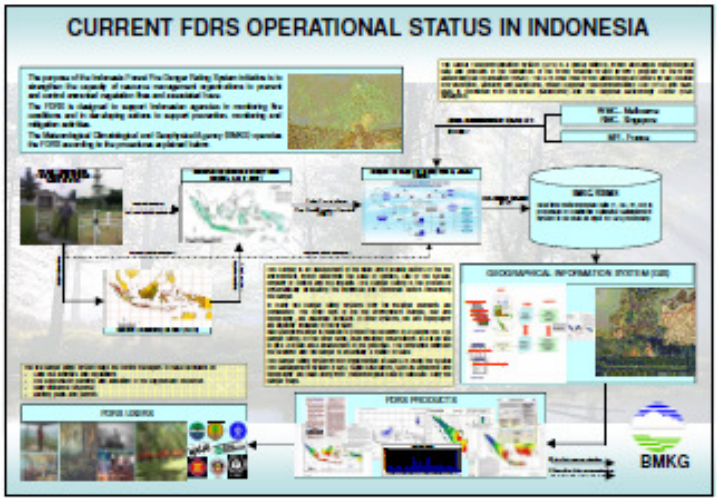
3. FDR Development (1999-2002)

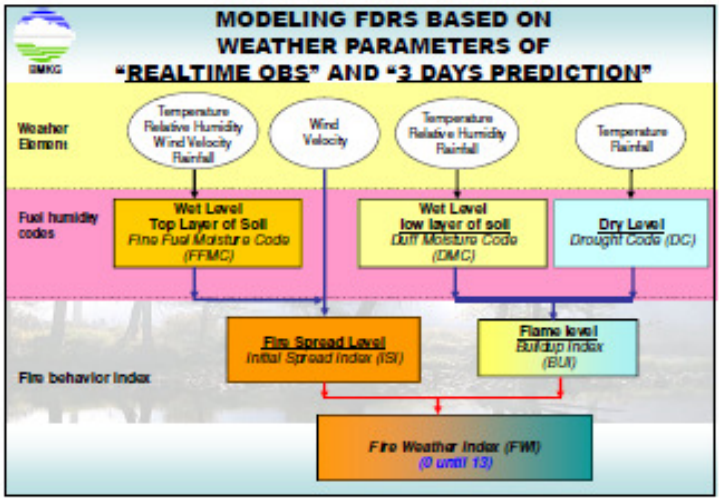


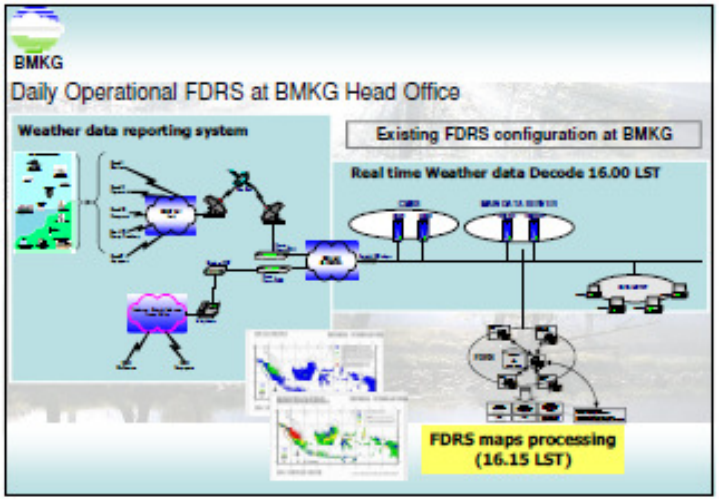
4. FDR Operation (2003 – now)

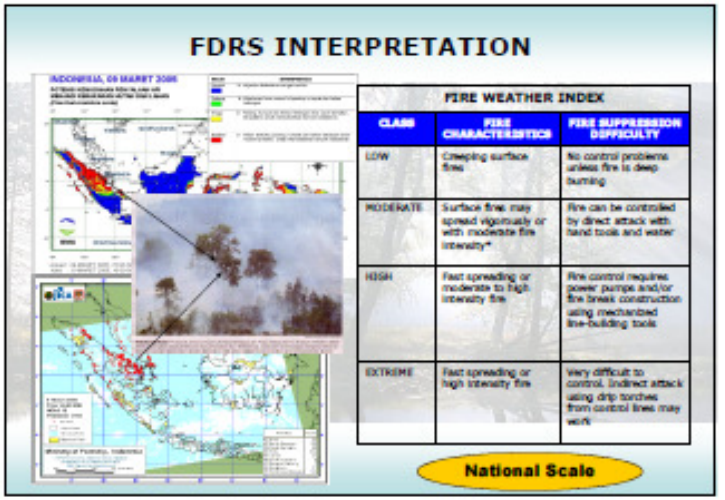
- Information providers:
  - BMKG (since February 2002) → weather station based, spatial information
  - LAPAN (since 2005) → satellite remote sensing-based, spatial information
  - Ministry of Forestry (since 2005) → Single weather station based-ExcelFWI Calculation (29 Operation areas for 8 Provinces)
- Users:
  - Ministry of Forestry
  - Ministry of Environment
  - Disaster Management Agency
  - ASEAN Secretariat
  - CARE Indonesia
  - Etc.




CURRENT FDRS OPERATIONAL STATUS IN INDONESIA
BMKG

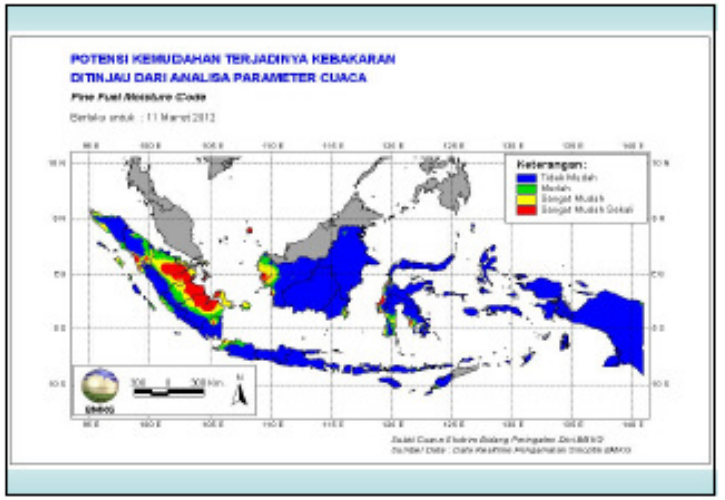

MODELING FDRS BASED ON
WEATHER PARAMETERS OF
"REALTIME OBS" AND "3 DAYS PREDICTION"
BMKG
Weather Element
Temperature
Relative Humidity
Wind Velocity
Rainfall
Wind Velocity
Temperature
Relative Humidity
Rainfall
Temperature
Rainfall
Fuel humidity codes
Wet Level
Top Layer of Soil
Fine Fuel Moisture Code (FFMC)
Wet Level
low layer of soil
Duff Moisture Code (DMC)
Dry Level
Drought Code (DC)
Fire behavior index
Fire Spread Level
Initial Spread Index (ISI)
Flame level
Buildup Index (BUI)
Fire Weather Index (FWI)
(0 until 13)

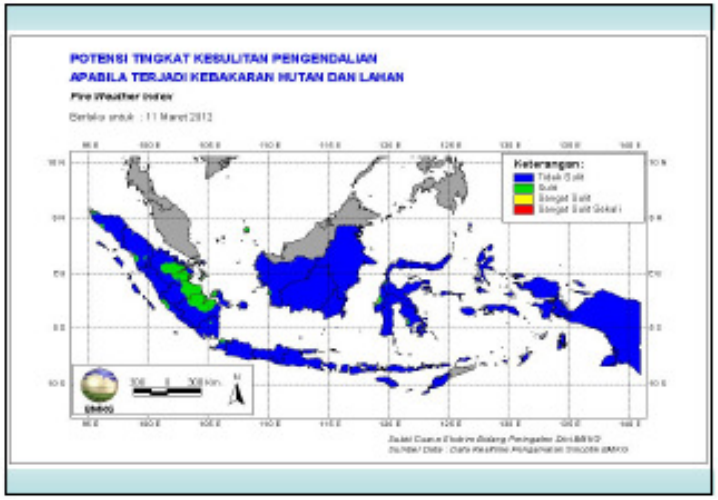

BMKG
Daily Operational FDRS at BMKG Head Office
Weather data reporting system
Existing FDRS configuration at BMKG
Real time Weather data Decode 16.00 LST
FDRS maps processing
(16.15 LST)

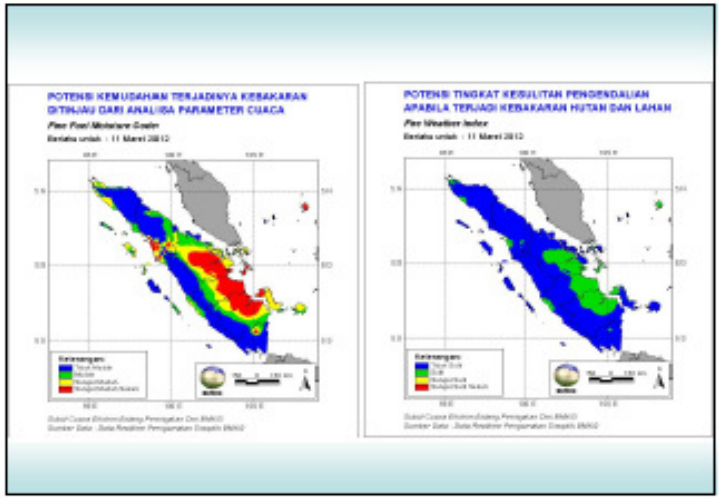

FDRS INTERPRETATION
FIRE WEATHER INDEX
CLASS
FIRE CHARACTERISTICS
FIRE SUPPRESSION DIFFICULTY
LOW
Creeping surface fires
No control problems unless fire is deep burning
MODERATE
Surface fires may spread vigorously or with moderate fire intensity*
Fire can be controlled by direct attack with hand tools and water
HIGH
Fast spreading or moderate to high intensity fire
Fire control requires power pumps and/or fire break construction using mechanized line-building tools
EXTREME
Fast spreading or high intensity fire
Very difficult to control. Indirect attack using drip torches from control lines may work
National Scale

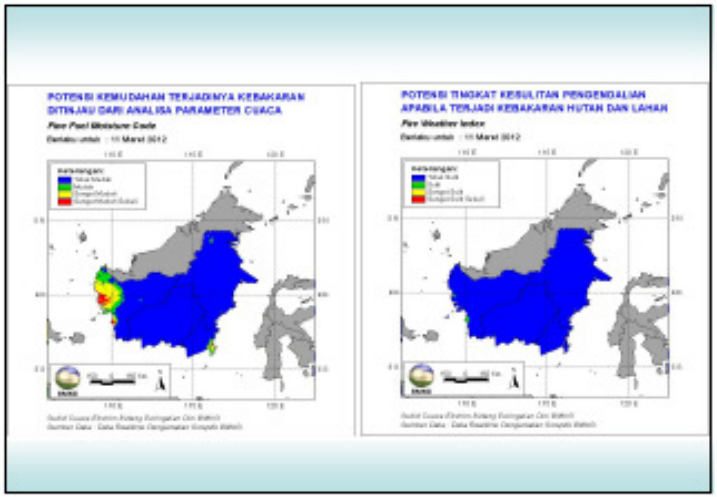
5. PRODUCT OF FDRS: CURRENT STATUS

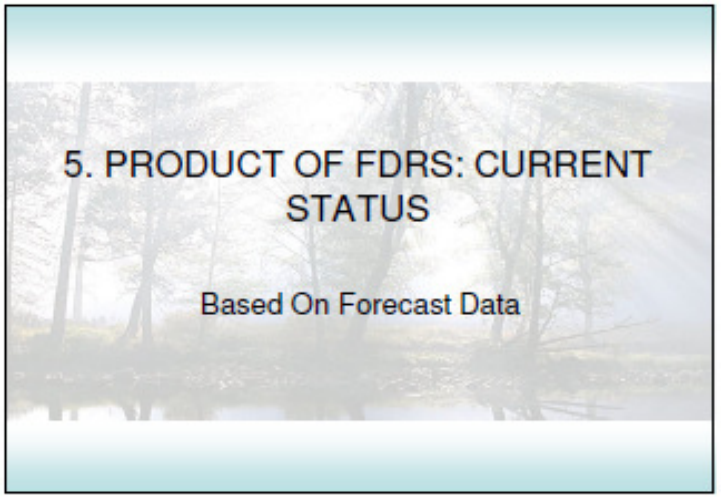
Based On Synoptics Data

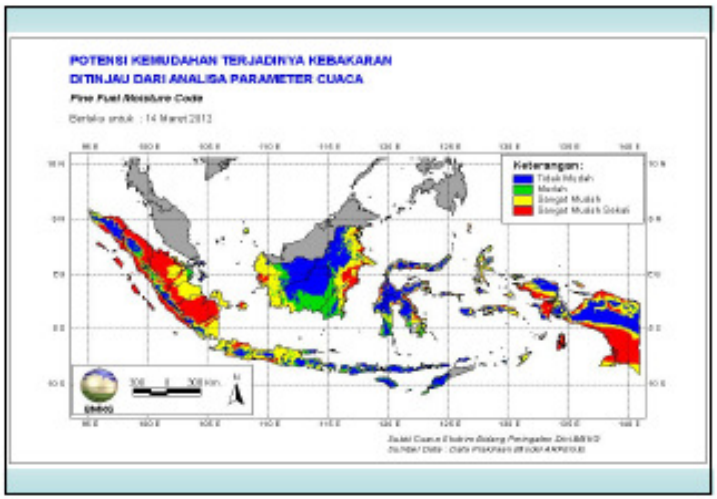


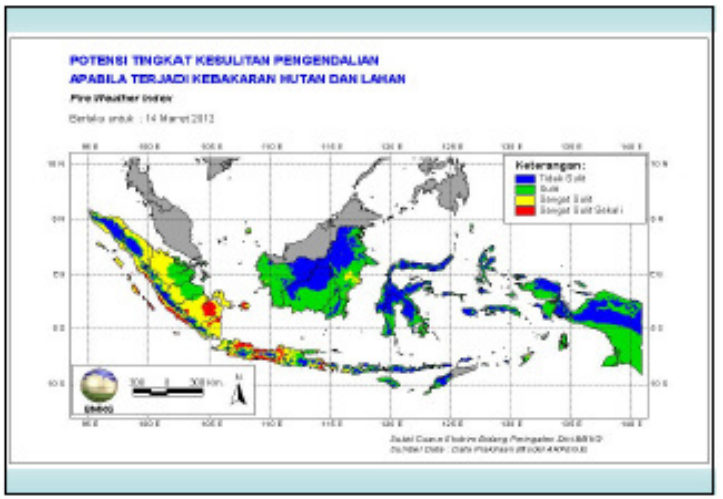


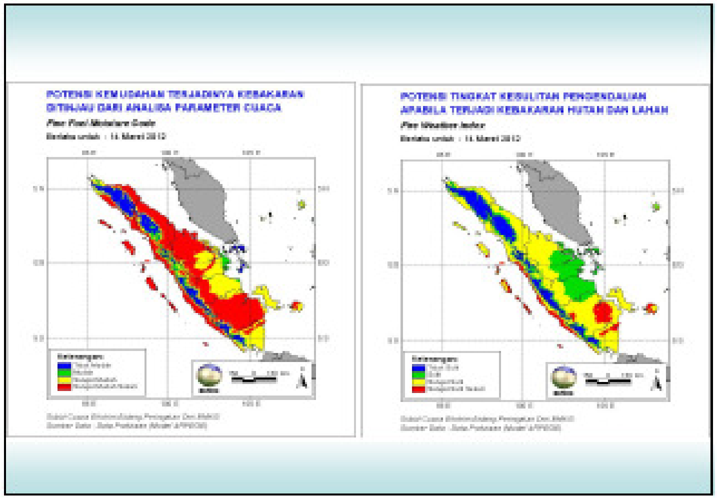


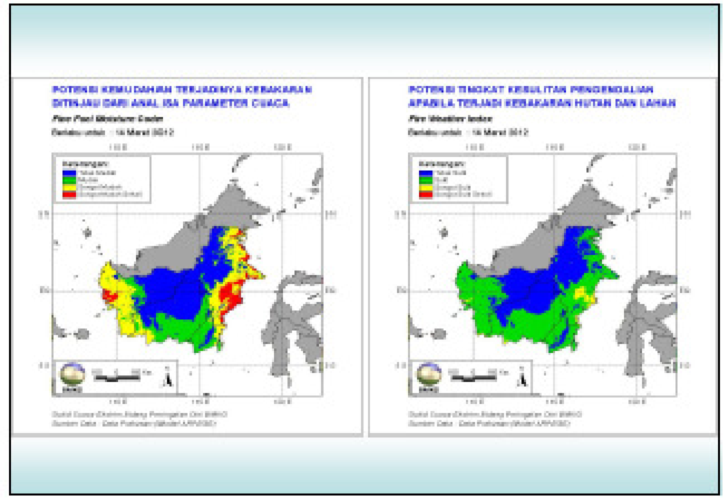

POTENSI KEMUDAHAN TERJADINYA KEBAKARAN
DITINJAU DARI ANALISA PARAMETER CUACA
Fine Fuel Moisture Code
POTENSI TINGKAT KESULITAN PENGENDALIAN
APABILA TERJADI KEBAKARAN HUTAN DAN LAHAN
Fire Weather Index

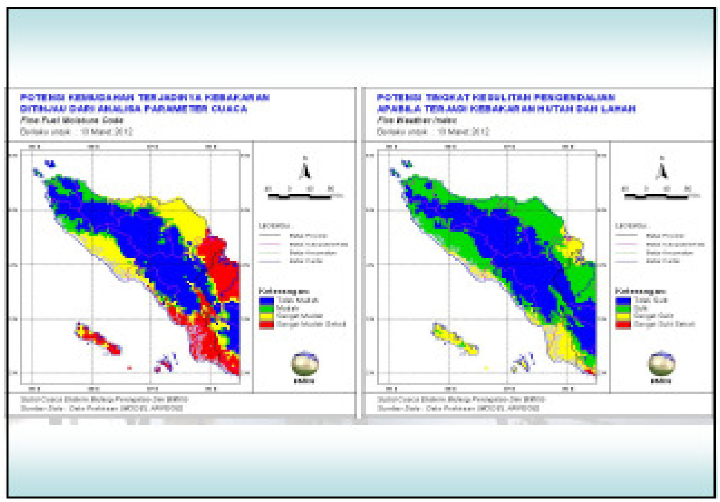

5. PRODUCT OF FDRS: CURRENT STATUS
Based On Forecast Data

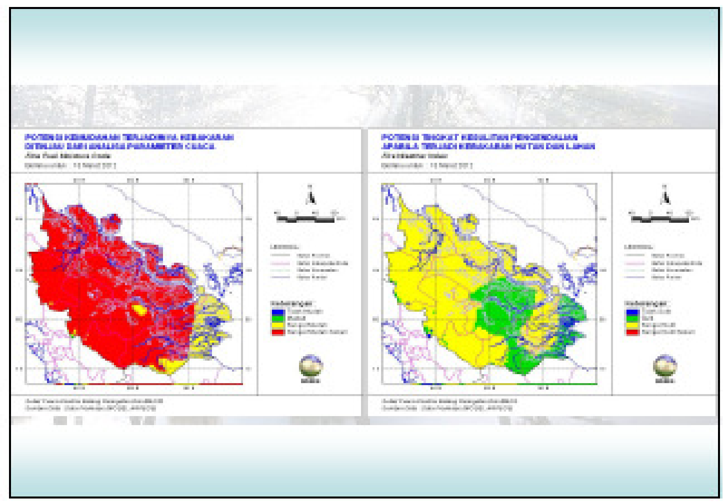

POTENSI KEMUDAHAN TERJADINYA KEBAKARAN
DITINJAU DARI ANALISA PARAMETER CUACA
Fine Fuel Moisture Code
Keterangan:

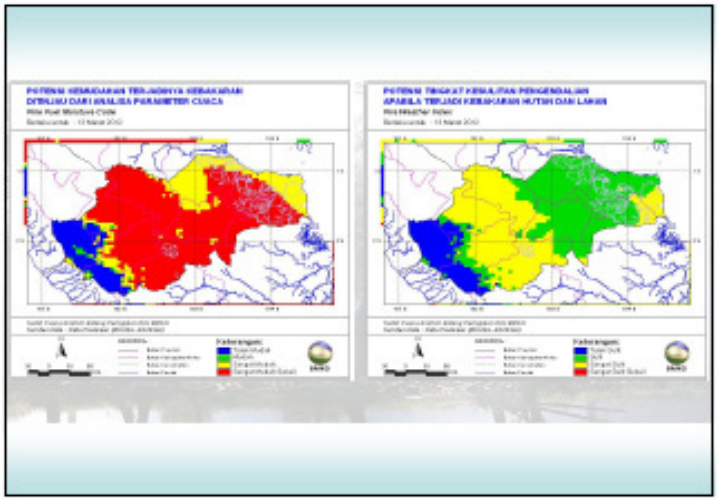

POTENSI TINGKAT KESULITAN PENGENDALIAN
APABILA TERJADI KEBAKARAN HUTAN DAN LAHAN
Fire Weather Index
Keterangan:


POTENSI KEMUDAHAN TERJADINYA KEBAKARAN
DITINJAU DARI ANALISA PARAMETER CUACA
POTENSI TINGKAT KESULITAN PENGENDALIAN
APABILA TERJADI KEBAKARAN HUTAN DAN LAHAN

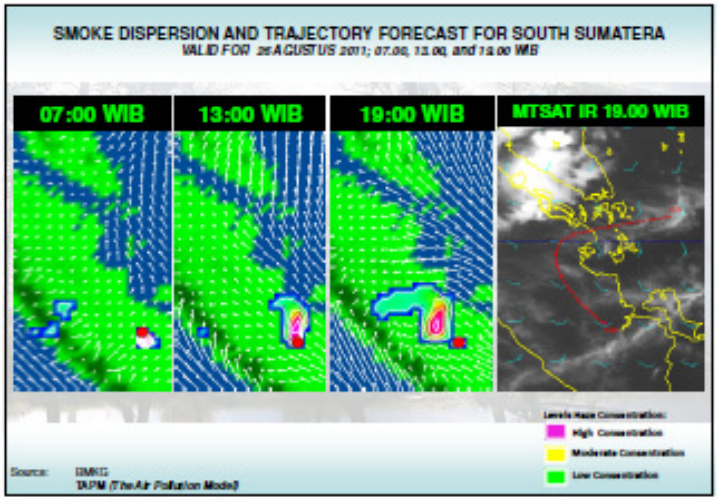

POTENSI KEMUDAHAN TERJADINYA KEBAKARAN
DITINJAU DARI ANALISA PARAMETER CUACA
POTENSI TINGKAT KESULITAN PENGENDALIAN
APABILA TERJADI KEBAKARAN HUTAN DAN LAHAN

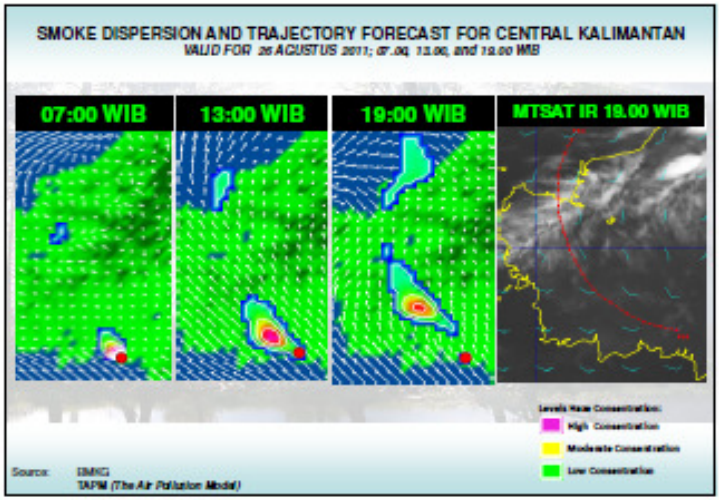

POTENSI KEMUDAHAN TERJADINYA KEBAKARAN
DITINJAU DARI ANALISA PARAMETER CUACA
POTENSI TINGKAT KESULITAN PENGENDALIAN
APABILA TERJADI KEBAKARAN HUTAN DAN LAHAN


POTENSI KEMUDAHAN TERJADINYA KEBAKARAN
DITINJAU DARI ANALISA PARAMETER CUACA
POTENSI TINGKAT KESULITAN PENGENDALIAN
APABILA TERJADI KEBAKARAN HUTAN DAN LAHAN



6. HAZE DISPERSION AND TRAJECTORY FORECAST MODELS

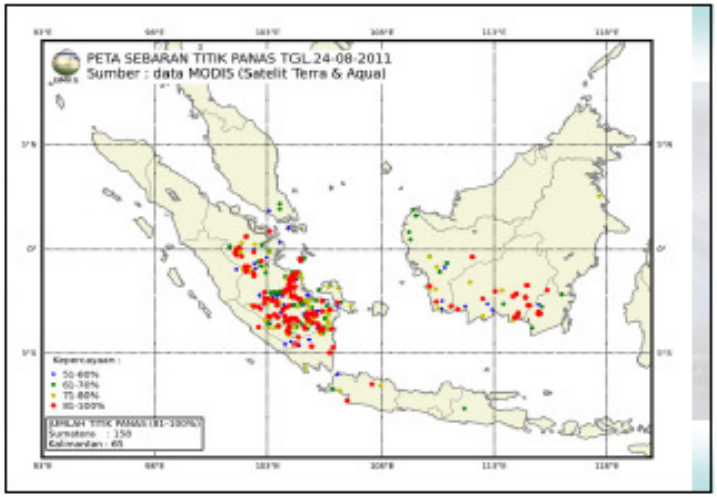




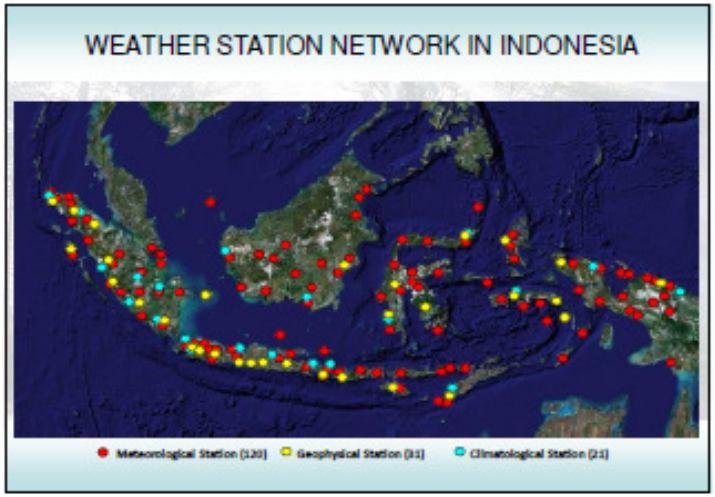
7. DESSIMINATION OF FDRS INFORMATION

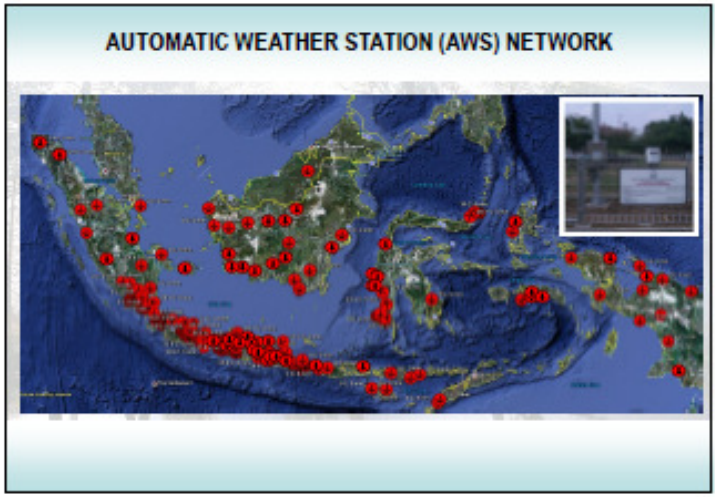
Daily Operational FDRS at BMKG

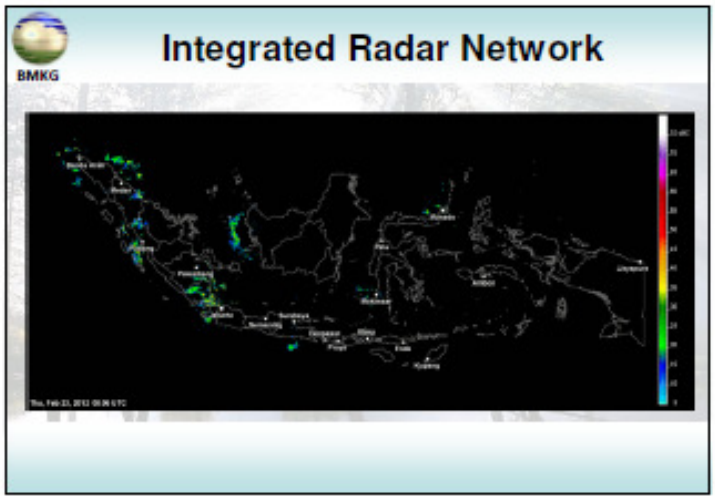
Existing FDRS information at BMKG

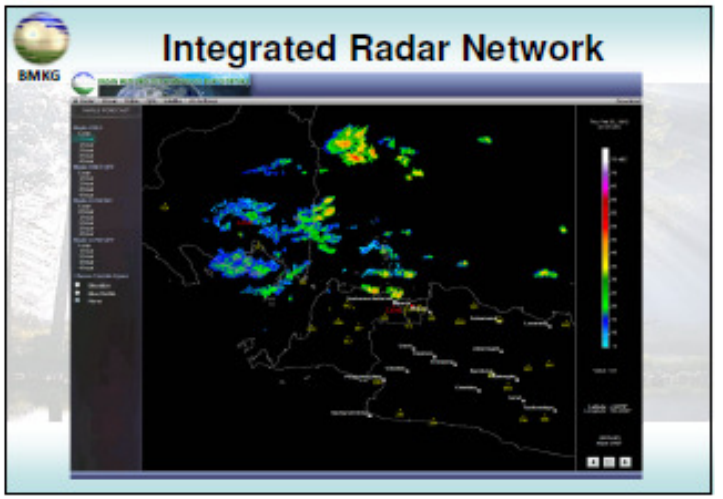


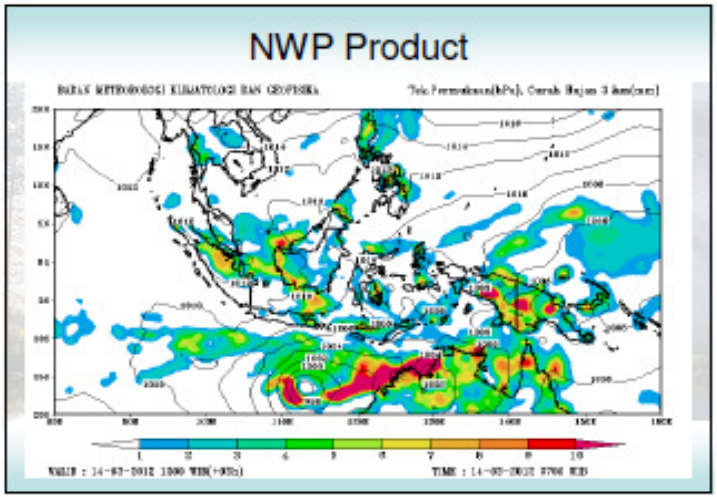
8. FUTURE DEVELOPMENT

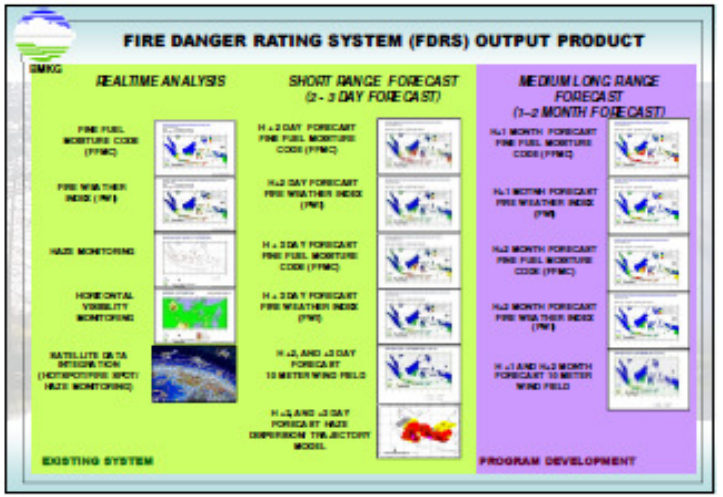

WEATHER STATION NETWORK IN INDONESIA
Meteorological Station (120)
Geophysical Station (31)
Climatological Station (21)

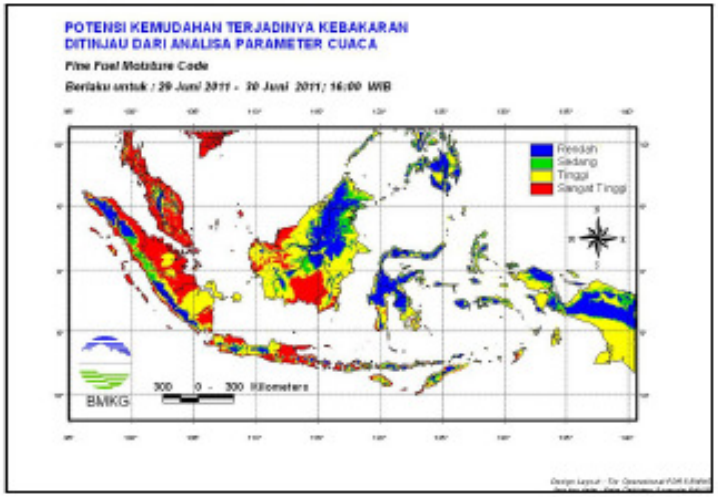

AUTOMATIC WEATHER STATION (AWS) NETWORK

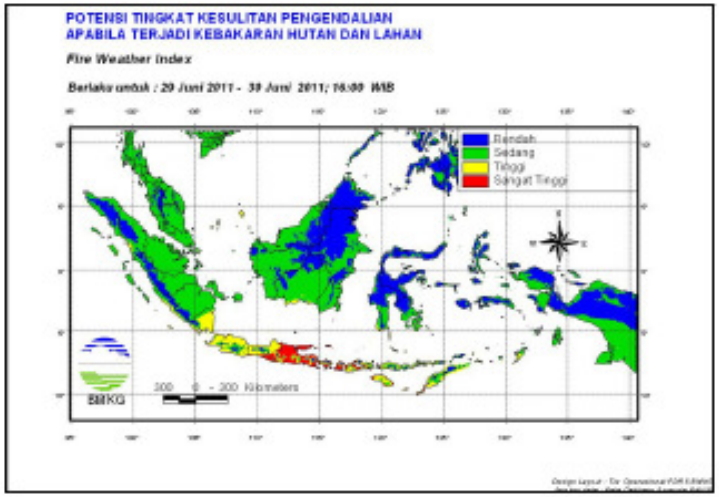

BMKG
Integrated Radar Network


BMKG
Integrated Radar Network


NWP Product

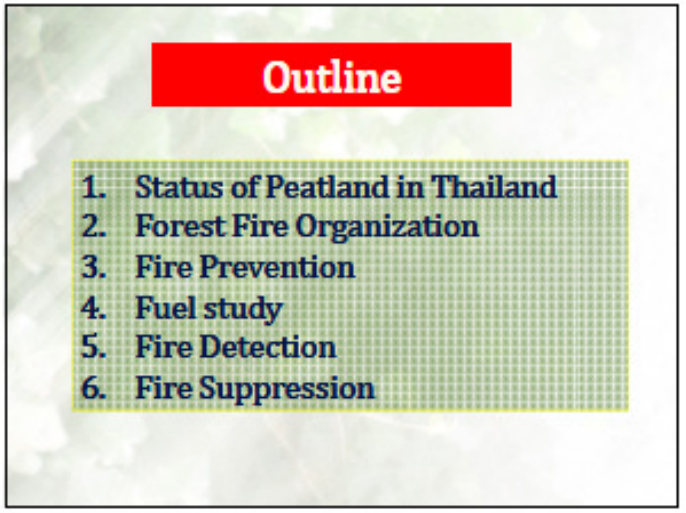

FIRE DANGER RATING SYSTEM (FDRS) OUTPUT PRODUCT
BMKG
REALTIME ANALYSIS
SHORT RANGE FORECAST
(2 - 3 DAY FORECAST)
MEDIUM LONG RANGE FORECAST
(1–2 MONTH FORECAST)
FINE FUEL MOISTURE CODE (FFMC)
FIRE WEATHER INDEX (FWI)
HAZE MONITORING
HORIZONTAL VISIBILITY MONITORING
SATELLITE DATA INTEGRATION (HOTSPOTS/FRP/ HAZE MONITORING)
H + 2 DAY FORECAST FINE FUEL MOISTURE CODE (FFMC)
H+2 DAY FORECAST FIRE WEATHER INDEX (FWI)
H + 3 DAY FORECAST FINE FUEL MOISTURE CODE (FFMC)
H + 3 DAY FORECAST FIRE WEATHER INDEX (FWI)
H+2, AND +3 DAY FORECAST 10 METER WIND FIELD
H+2 AND +3 DAY FORECAST HAZE DISPERSION TRAJECTORY MODEL
H+1 MONTH FORECAST FINE FUEL MOISTURE CODE (FFMC)
H+1 MONTH FORECAST FIRE WEATHER INDEX (FWI)
H+2 MONTH FORECAST FINE FUEL MOISTURE CODE (FFMC)
H+2 MONTH FORECAST FIRE WEATHER INDEX (FWI)
H+1 AND H+2 MONTH FORECAST 10 METER WIND FIELD
EXISTING SYSTEM
PROGRAM DEVELOPMENT

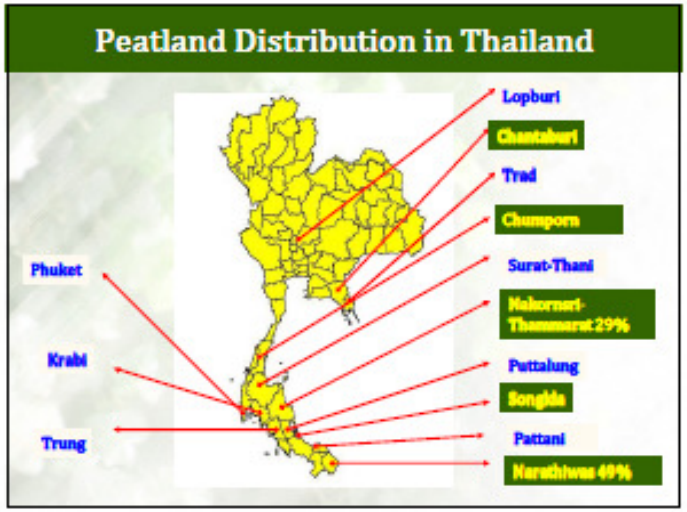

POTENSI KEMUDAHAN TERJADINYA KEBAKARAN
DITINJAU DARI ANALISA PARAMETER CUACA
Fine Fuel Moisture Code
Berlaku untuk : 29 Juni 2011 - 30 Juni 2011; 16:00 WIB
Rendah
Sedang
Tinggi
Sangat Tinggi
BMKG
300 0 300 Kilometers


POTENSI TINGKAT KESULITAN PENGENDALIAN
APABILA TERJADI KEBAKARAN HUTAN DAN LAHAN
Fire Weather Index
Berlaku untuk : 29 Juni 2011 - 30 Juni 2011; 16:00 WIB
Rendah
Sedang
Tinggi
Sangat Tinggi
BMKG
300 0 300 Kilometers

Annex 7


Fire Prevention and Control
Mechanism in Peatland of Thailand
ASEAN Technical Workshop on Development of The ASEAN
Peatland Fire Prediction and Early Warning System
20 – 21 March 2012, Kuala Lumpur, Malaysia
Chonthida Chernkhunthod
Department of National Parks,
Wildlife and Plant Conservation
chonthida64@gmail.com


Outline
1. Status of Peatland in Thailand
2. Forest Fire Organization
3. Fire Prevention
4. Fuel study
5. Fire Detection
6. Fire Suppression


Peatland Distribution in Thailand
Lopburi
Chantaburi
Trad
Chumporn
Surat-Thani
Nakornsri-Thammarat 29%
Puttalung
Songkla
Pattani
Narathiwas 49%
Phuket
Krabi
Trung


Area of Peatland in Thailand
Total Area of Peatland in Thailand is 64,555 ha.
0.13 % of country area
Protected area 23
National reserved forest
+ Agricultural
development area 77

Threat to Peatland

Causes of Fire in Peatland

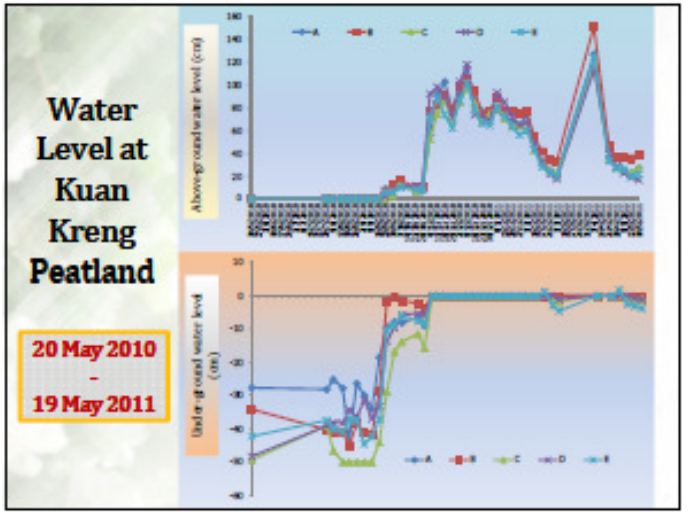
Cause	Percent
1. Agricultural debris burning	40
2. Illegal logging	35
3. Gathering forest non-timber products	10
4. Other causes	10

Forest Fire Organization


Fire Prevention: Maintain Water Level
Water Control Gates


Fire Prevention: Maintain Water Level


Fire Prevention: Maintain Water Level
Water level measuring point


Water Level at Kuan Kreng Peatland
20 May 2010 - 19 May 2011

Fire Prevention Campaign:

24 February "National Fire Campaign day"

Fire Prevention Campaign:

Fire Campaign Mobile Unit

Fire Prevention Campaign :

Education Program

Fire Prevention Campaign :

Campaign on mass media

Fire Prevention Campaign :
Fire Exhibition

Fire Prevention Campaign :
Billboard

Fire Prevention Campaign :
Printed Materails

Fire Prevention Campaign :
Fire Volunteer Brigade

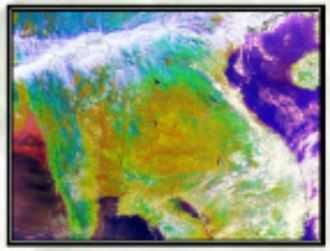
Fuel Study:
thickness & quantities of peat

Firebreak Construction

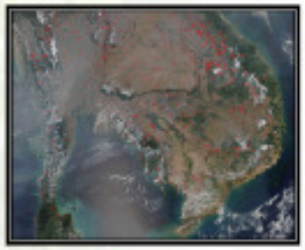
Forest Fire Detection Methods: Ground patrol;

Forest Fire Detection Methods: By aerial;

Forest Fire Detection Methods: By satellites:



NOAA 18



MODIS Terra/Aqua

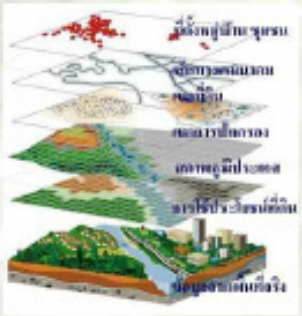
MODIS – daily hotspot

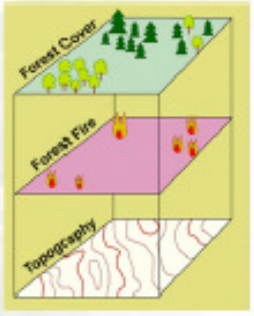
FAS_Indochina Subsets

Started: 2007

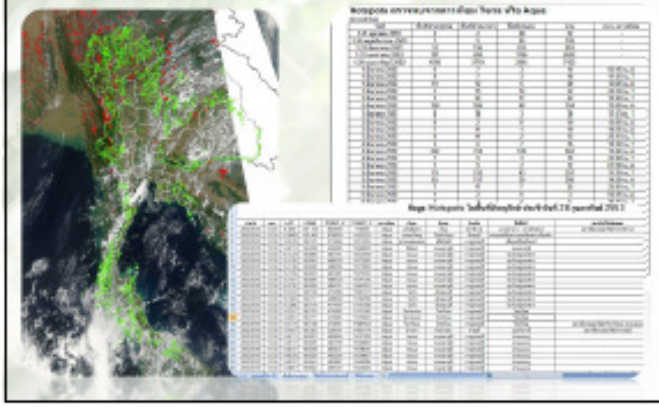
DNP (Thailand) + FIRMS (FAO)

ArcMap – intersect political boundary (subdistric, distric, province), protected area, national researved forest, agriculture area, forest fire station responsible area





Daily report contains hotspots within protected, reserved, and agricultural area



www.dnp.go.th/forestfire

Field Validation (2007-2009)

MODIS hotspot validation

MODIS Hotspot Validation over Thailand

Veerachat Tangpijit [1,*], Kiyoshi Honda [1] and Preeyanuch Nuchdee [1]

Remote Sens. **2009**, *1*, 1043-1054; doi:10.3390/rs1041043

OPEN ACCESS

Remote Sensing

ISSN 2072-4292

www.mdpi.com/journal/remotesensing

Recording period of hotspots	Hotspots	Validated	%Validated	Found	%Found	Not Found	%Not Found
1. Mar 07–Apr 07	2,114	478	22.61	439	91.84	39	8.16
2. Oct 07–Apr 08	4,167	773	18.55	739	95.60	34	4.40
3. Dec 08–May 09	4,308	972	22.56	948	97.53	24	2.47
Total	10,589	2,223	20.99	2,128	95.64	80	4.36

Source: Forest Fire Control Division, National Park, Wildlife, and Plant Conservation Department, 2009.

Fire Suppression: Prepare the Equipments

Fire Suppression: Fixed the Fire Tower

Fire Suppression: Training

Used the equipments on the water tank

Fire Suppression

Conclusion

- Fire Prevention in Peatland of Thailand
  - Maintain water level
  - Awareness & education campaign
- Fuel Management
  - Study on thickness & quantities of peat
- Fire Detection
  - Ground and air patrol
- Fire Suppression

Annex 8

REGIONAL SOUTHEAST ASIA WILDLAND FIRE SCIENCE AND MANAGEMENT NETWORK AND THE CHALLENGE TO REDUCE GREENHOUSE GAS EMISSION DUE TO FOREST FIRES AT REGIONAL LEVEL

BAMBANG HERO SAHARJO

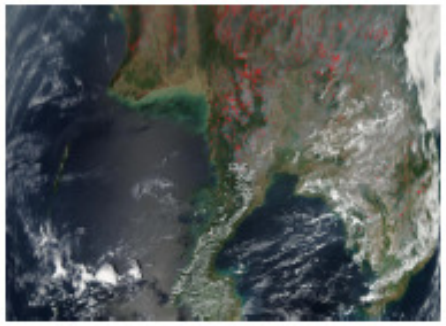
CHAIR REGIONAL SOUTHEAST ASIA WILDLAND FIRE SCIENCE AND MANAGEMENT NETWORK

CONTENT

- ASEAN Agreement on Transboundary Haze Pollution
- SEA-FIRE DANGER RATING SYSTEM (2002-2011)
- SOUTH EAST ASIA REGIONAL INFORMATION NETWORK (SEARIN)
- REGIONAL SOUTHEAST ASIA WILDLAND FIRE SCIENCE AND MANAGEMENT NETWORK

ASEAN

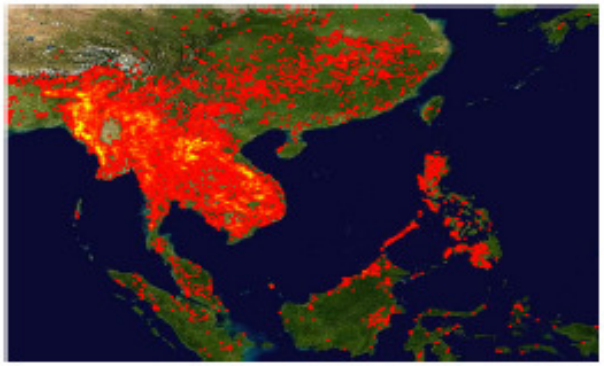
GFMC, 01 MARCH 2012



Smoke from open burning of agricultural waste is depicted by this image captured by the MODIS instrument on NASA's Aqua satellite on 01 March 2012 for 250 m resolution image click on the image).

Bangkok Post, 18 March 2012

BIOMASS BURNING IN SE-ASIA 2010
(Anja Hoffmann, 2011)



ASEAN Agreement on Transboundary Haze Pollution

- Signed on 10 June 2002 in Kuala Lumpur by all ASEAN Member States
- Entered into force on 25 November 2003

OBJECTIVE:

Prevent and monitor transboundary haze pollution as a result of land and/or forest fires which should be mitigated, through concerted national efforts and international cooperation

ASEAN Agreement on Transboundary Haze Pollution

Principles

- Ensure that activities within the jurisdiction do not cause damage to the environment and harm to human health
- Strengthen cooperation and coordination
- Take precautionary measures where there are threats of serious or irreversible damage
- Manage natural resources in a sustainable manner
- Involve all stakeholders

ASEAN Agreement on Transboundary Haze Pollution

Contains :

- Monitoring and assessment
- Prevention
- Preparedness
- National and joint emergency response
- Procedures for deployment of people, materials and equipment across borders
- Technical cooperation & scientific research

Implementation of the Haze Agreement

Prevention

- Guidelines for implementation of zero burning policy
- Dialogues with plantation and timber companies
- Guidelines for controlled burning practices
- Community-based fire management programmes through pilot projects in fire-prone areas
- Demonstrations and workshops
- Public and community awareness programmes
- Training and capacity building on investigation, prosecution and enforcement against open burning

Monitoring

- ASEAN Specialised Meteorological Centre (ASMC) based in Singapore - provision of hotspot and smoke haze maps, satellite imageries, monthly weather & haze outlook, haze modelling
- Comprehensive regional early warning system to be developed
- Workshop involving relevant experts and agencies to discuss on how to enhance the reporting of weather and haze outlook, incl. simulation/ modeling of haze transport and incorporating data on PM10 which will be a useful indicator to track the extent of haze – early 2009 in Singapore

Mitigation / Fire Suppression

- Fire Suppression Mobilisation Plans in fire-prone areas
- Online regional inventory of fire-fighting resources to facilitate sharing of resources during emergencies
- Standard Operating Procedures (SOP) for monitoring, assessment and joint emergency response
- Regional table-top and simulation exercises to strengthen coordination and response

- **Panel of ASEAN Experts on Fire and Haze Assessment and Coordination Sub-Regional Groups**

> Southern ASEAN region
Brunei Darussalam, Indonesia, Malaysia, Singapore, Thailand

➢ Northern ASEAN region (Mekong sub-region)
Cambodia, Lao PDR, Myanmar, Thailand, Viet Nam

- **Sub-Regional Ministerial Steering Committee (MSC) on Transboundary Haze Pollution**
- **Sub-Regional Ministerial Steering Committee (MSC) on Transboundary Haze Pollution in the Mekong Sub-Region (MSC Mekong)**
- **Technical Working Group on Transboundary Haze Pollution in the Mekong Sub-Region (TWG Mekong)**

ASEAN HAZE ACTION ONLINE

http://haze.asean.org

- daily-updated information on fire-and-haze and info on ASEAN cooperation on transboundary haze pollution
- consist of public information and intranet services
- fire-and-haze situation reports
- hotspot and smoke haze maps from ASMC
- online inventory of fire-fighting resources
- online Regional and National Detailed Implementation Plans
- database of projects & documents

SEA-FIRE DANGER RATING SYSTEM
(2002-2011)

The Southeast Asia FDRS

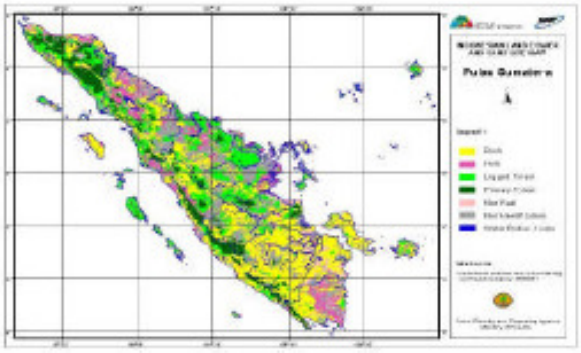
- The Southeast Asia FDRS Project was regional Canadian International Development Agency initiative.
- The project is executed by the Canadian Forest Service with partner agencies in Indonesia, Malaysia, Brunei,
  and at the ASEAN level.
- Its purpose is to enhance the capacity of resource management organizations at regional, central and local levels in Southeast Asia to manage vegetation fires and associated haze.

SEA-FIRE DANGER RATING SYSTEM

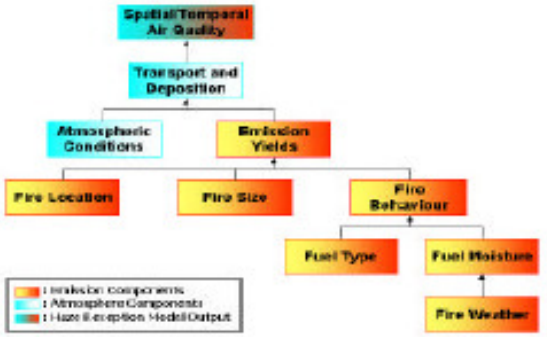
> The purpose of the Southeast Asia FDRS is to provide early warning of critical burning periods when emissions from land and forest fires will be greatest or most damaging.

➢ Using this advance information, fire management and regulating agencies can minimize haze problems by implementing land burning restrictions and enhancing forest fire detection in anticipation of serious burning conditions.

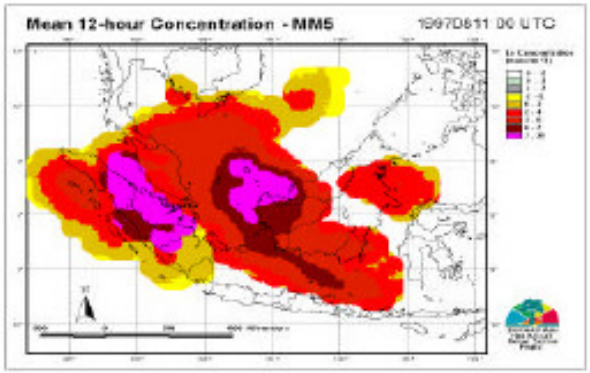
Fuel Mapping



FDRS-Haze Forecasting



Forecasting results for the 1997 haze event



SEA-FIRE DANGER RATING SYSTEM

- The operational FDRS early warning systems exist across Southeast Asia to identify the forest/land fires conditions.
- These systems have been linked to the operational procedures of land management agencies to trigger fire prevention and pre-preparedness measures.
- The operational FDR Systems are being run at:

** Malaysian Meteorological Service (MMS) for regional ASEAN
** Indonesian Meteorological, Climatological and Geophysical Agency (BMKG) for Indonesia
** Indonesian National Institute of Aeronautics and Space (LAPAN) using the assimilation of satellite data for western Indonesia

(LAPAN, 2011)

SOUTH EAST ASIA REGIONAL INFORMATION NETWORK (SEARIN)

➢1993: Network is established in Manila, Philippines for development of an operational methodology for monitoring LUCC

➢1994: common method and data collection protocols were initiated

➢1998 :

- all the participating countries have produced their country reports, in hard and soft copies.
- Individual countries also set their own web page in LUCC project which are linked to SEA START network

> 1999:

- Develop case studies to determine deforestation dynamics
- Regional network was expanded through involvement of more scientists and case studies

> 2000:

- Development of regional integrated metadata system was also initiated (SEA START RC, DIF)

> 2004:

- SE-Asia Burnt Area Workshop in Selangor, Malaysia

> 2009

- NASA-LCLUC Science Team Joint Meeting with MAIRS, GOFC-GOLD and SEA START in Khon Kaen Thailand

Situations of Network

- Lack of funding for projects to keep up activities and strength of the network

  -> scientists work on their own resources
- Network is not recognized by local government

  -> difficult to take further actions on mitigation process

(Anja Hoffmann, 2011)

25

REGIONAL SOUTHEAST ASIA WILDLAND FIRE SCIENCE AND MANAGEMENT NETWORK

- Part of GLOBAL FIRE MONITORING CENTER (GFMC)
- CONSIST OF FOREST FIRES PANEL EXPERT
- HAVE KNOWLEDGE AND EXPERIENCES AT DIFFERENT TERM AND CONDITION
- TRY TO STRENGTHEN THE COLLABORATION AMONG ASEAN COUNTRIES TO SOLVE THE PROBLEMS ON FIRES THROUGH AVAILABLE DATA PROVIDED BY INSTITUTIONS AT EACH COUNTRY OF ASEAN

THROUGH THE NETWORK

- CONDUCT RESEARCH AND DEVELOPMENT
- TRAINING AND CAPACITY BUILDING
- SEMINAR/WORKSHOP (TECHNICAL/NON TECHNICAL)
- EXCHANGE SCIENTIST, KNOWLEDGE AND EXPERIENCES
- FIELD WORK
- INFORMATION DISTRIBUTION
- COMMUNITY BASED FIRE MANAGEMENT

SOUTHEAST ASIA ISSUE ON THE FOREST FIRE RESEARCH

- Fire and emission regarding the greenhouse gas produced during biomass burning from different land-use
- Modelling the greenhouse gas produce during burning its content and dispersion
- The changing of Land use by using fire and the greenhouse gas produced
- The role of moratorium fire and logging increased above ground biomass and carbon stock
- Wildfire and carbon management in peat fires
- Reduction emission through community based forest fire management
- Contributing carbon emission reduction by monitoring and controlling wildfire

- Fire fighting using MODIS hotspot
- The impact of prescribed fire to the small scale agriculture on peat
- Evaluation of burned area and carbon emission in Mega Rice Project
- GHG inventory at different land use due to fire
- Trace gas produce during burning
- The impact of fire to the wildlife
- Using canal blocking to give better environment for burned peat swamp forest

Table Percentage articles classified in related forest fire topics (Ainuddin et al, 2011)

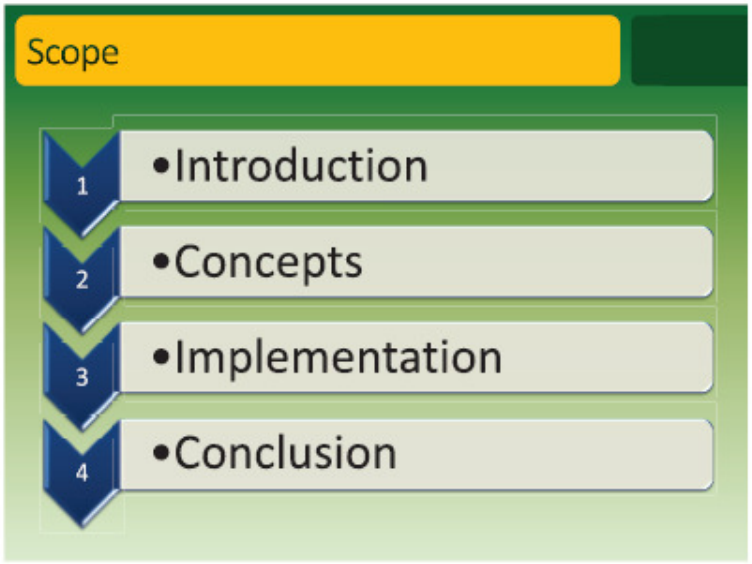
Topic	No. of articles	Percentage
Fire impact	127	17.4
Atmospheric pollution	96	13.1
Remote sensing	96	13.1
Fire ecology	76	10.4
Policy	40	5.5
Human-Fire interaction	39	5.3
Carbon	37	5.1
Fire management	30	4.1
Fire technology	29	4.0
Forest fuel	27	3.7
Palaeoclimatology and palaeoecology	20	2.7
Fire risk assessment	19	2.6
Forest rehabilitation	19	2.6
Biomass emissions	16	2.2
Forest landscape	15	2.1
Fire climate	10	1.4
Climate change	9	1.2
Fire history	9	1.2
Fire modeling	9	1.2
Atmospheric chemistry	6	0.8
Biogeography	2	0.3

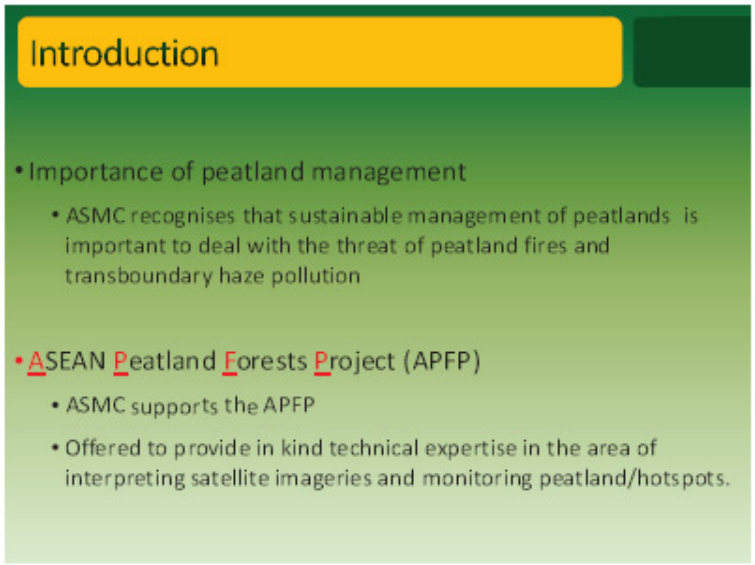
Table Number of articles published in respective Journals (Ainuddin et al, 2011)

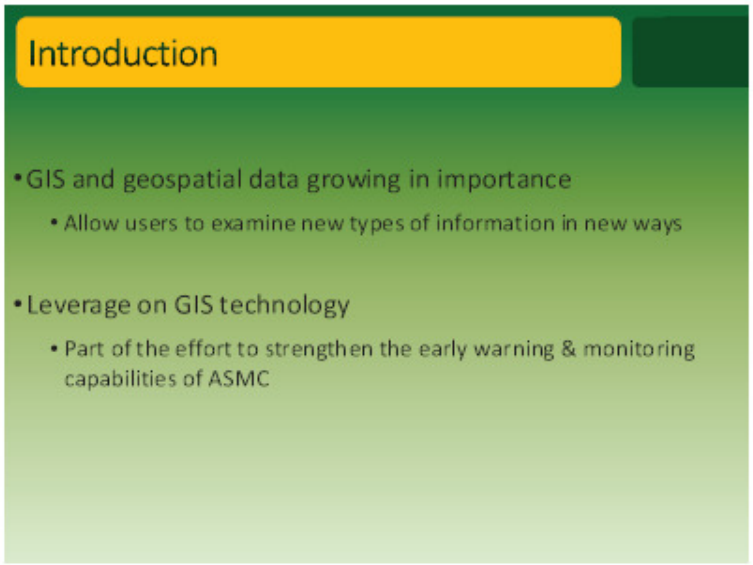
Journal Title	No. of articles	Percentage
Atmospheric Environment	42	5.8
Journal of Geophysical Research D: Atmospheres	38	5.2
Chinese Journal of Applied Ecology	23	3.2
Forest Ecology and Management	23	3.2
International Journal of Remote Sensing	14	1.9
Mitigation and Adaptation Strategies for Global Change	14	1.9
Journal of Natural Disasters	13	1.8
Ecological Research	12	1.6
Biodiversity and Conservation	9	1.2
Chinese Journal of Ecology	9	1.2
Beijing Linye Daxue Xuebao / Journal of Beijing Forestry University	8	1.1
International Journal of Wildland Fire	8	1.1
Journal of Forest Research	8	1.1
Palaeogeography, Palaeoclimatology, Palaeoecology	8	1.1
Atmospheric Chemistry and Physics	7	1.0
Ecological Modelling	7	1.0
Environmental Monitoring and Assessment	7	1.0
Journal of Tropical Forest Science	7	1.0
Nature	6	0.8

Annex 9


Concept Plan
For a
GIS-based Fire Monitoring & Prediction System
ASEAN Technical Workshop On Development Of The ASEAN Peatland Fire Prediction & Early Warning System
20 March 2012
Kuala Lumpur, Malaysia
by
Chiam Keng Oon
ASMC
ASEAN Specialised Meteorological Centre


Scope
1
•Introduction
2
•Concepts
3
•Implementation
4
•Conclusion


Introduction
•Importance of peatland management
• ASMC recognises that sustainable management of peatlands is important to deal with the threat of peatland fires and transboundary haze pollution
•ASEAN Peatland Forests Project (APFP)
• ASMC supports the APFP
• Offered to provide in kind technical expertise in the area of interpreting satellite imageries and monitoring peatland/hotspots.

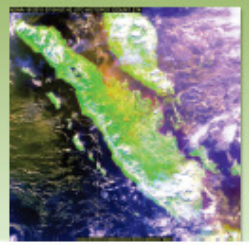

Introduction
•GIS and geospatial data growing in importance
• Allow users to examine new types of information in new ways
•Leverage on GIS technology
• Part of the effort to strengthen the early warning & monitoring capabilities of ASMC

Concept

- Rationale to adopt a GIS-based approach to enhance our Fire Monitoring & Prediction System
  - Consolidate all useful data into a central repository
  - Analysis data are geospatial in nature
  - GIS "layering" feature allow for more insight into the situational analysis

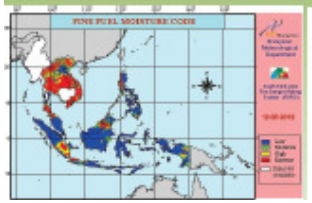
Concept

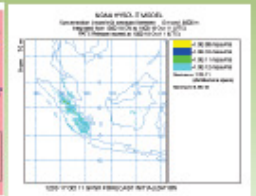
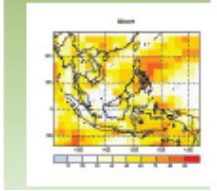
- Potential usage of a GIS based system
  - Observation data in GIS layers can be drawn into the framework to facilitate analysis
    - Example: overlaying of satellite imagery depicting smoke haze with air quality data on the ground
  - Able to infer the extent of the smoke haze



Concept

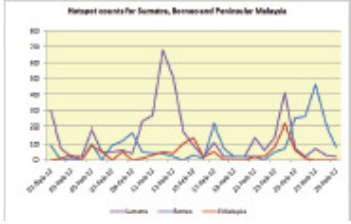
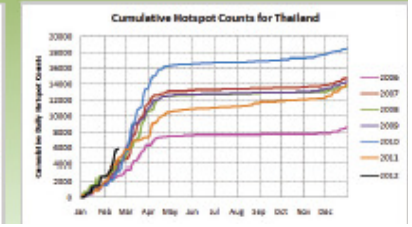
- Potential usage of a GIS based system
  - Forecast products can be overlaid to create a prognosis of the situation
    - Example: dispersion output indicate likely path the haze will take, other forecasts may indicate general dryness/wetness over the location
      ⟹ likely escalation/subduing of the situation



Concept

- Potential usage of a GIS based system
  - Statistical data can also be analysed coherently with current data to identify historical trends
    - Example: Are the hotspot counts observing a similar trend over the same location over the years?

Implementation

- To move forward, need to take stock of
  - What is available and what is lacking
    - ASMC has information such as hotspot data, satellite imagery
    - Need to translate information to format suitable for GIS usage
      - Example: SHP files, GEOTIFF
- Require the following specifically for peatland fire analysis
  - Peatland distribution and depth database
    - Require geo-referenced peatland data of ASEAN region
  - Water table information
  - Land use database

Implementation

- Other considerations for the system
  - Ability to export suitable layers to the eventual APFP system
  - Hardware, software, capacity building etc

Conclusion

- ASMC is concurrently looking at leveraging GIS technologies for fire and haze monitoring
- Welcome any feedback/suggestions to the system
- Contribute and cooperate to make the APFP a success

Thank you

Annex 10

Achievements of the on-going JST-JICA "Wildfires and Carbon Management in Peat Forest in Indonesia: Fire Detection and Fire Prediction System Component" Project

Orbita Roswintiarti
Indonesian National Institute of Aeronautics and Space (LAPAN)

Outline

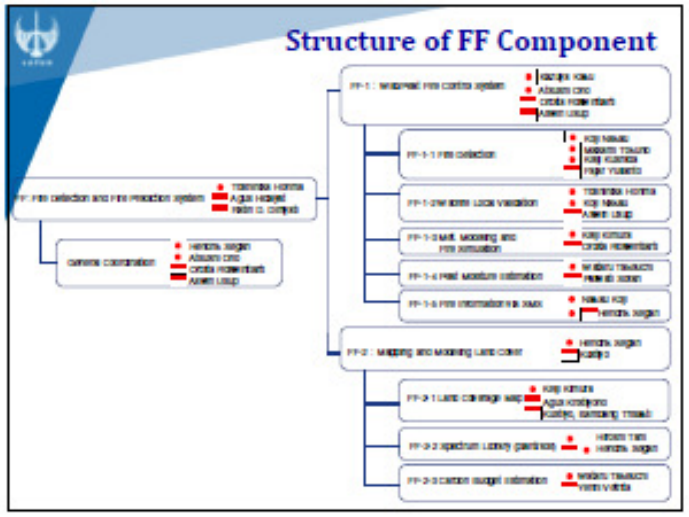
- Introduction on JST-JICA "Wildfires and Carbon Management in Peat Forest in Indonesia: Fire Detection and Fire Prediction System" Project
- Fire Detection and Fire Prediction System (FF) component
- Accomplishments of the FF component
- Future plan

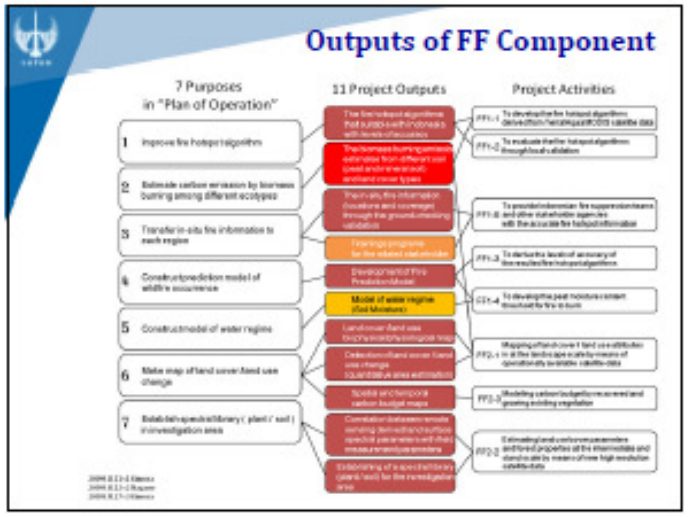
Wildfires and Carbon Management in Peat Forest in Indonesia

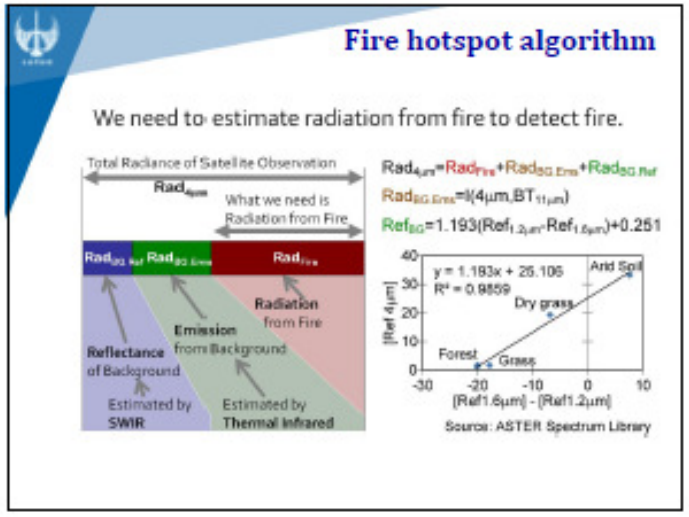
- **Executing agencies:**
  - Indonesia: National Standardization Agency of Indonesia (BSN)
  - Japan: JICA is responsible for the implementation of the Project in-closed cooperation with JST.
- **Implementation agencies:**
  1. Hokkaido University
  2. University of Palangka Raya (UNPAR)
  3. Indonesian Institute of Sciences (LIPI)
  4. Indonesian National Institute of Aeronautics and Space (LAPAN)
  5. Forest Research Development Agency, Ministry of Forestry (FORDA)
  6. Ministry of Research and Technology
- **Project sites:**
  Block C and Forest Research Development Agency, Ministry of Forestry's site of Block B of Ex-Mega Rice Project site in Central Kalimantan

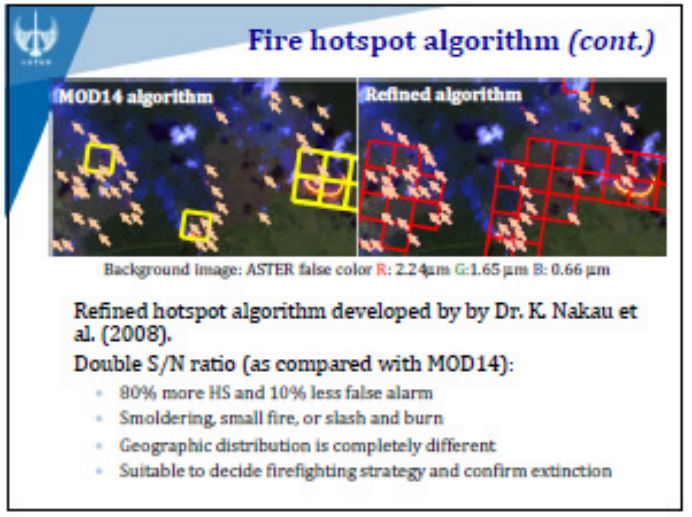
Wildfires and Carbon Management in Peat Forest in Indonesia

- **Activities:**
  1. **Fire Detection and Fire Prediction System Component (FF: Fire Detection and Fire Prediction)**
  2. Carbon Assessment Component (CA: Carbon Assessment)
  3. Carbon Management Component (CM: Carbon Management)
  4. Integrated Peat Management Component (PM: Peat Management)


Structure of FF Component


Outputs of FF Component
7 Purposes in "Plan of Operation"
11 Project Outputs
Project Activities

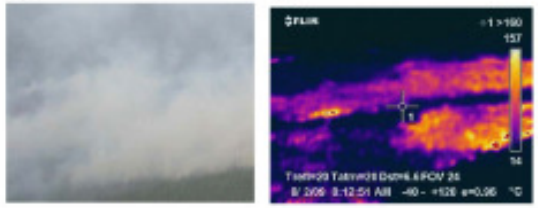

Fire hotspot algorithm
We need to estimate radiation from fire to detect fire.
Total Radiance of Satellite Observation
What we need is Radiation from Fire
Radiation from Fire
Emission from Background
Reflectance of Background
Estimated by SWIR
Estimated by Thermal Infrared
Arid Soil
Dry grass
Forest
Grass
y = 1.193x + 25.105
R² = 0.9859
Source: ASTER Spectrum Library


Fire hotspot algorithm (cont.)
MOD14 algorithm
Refined algorithm
Background image: ASTER false color R: 2.24μm G:1.65 μm B: 0.66 μm
Refined hotspot algorithm developed by by Dr. K. Nakau et al. (2008).
Double S/N ratio (as compared with MOD14):
80% more HS and 10% less false alarm
Smoldering, small fire, or slash and burn
Geographic distribution is completely different
Suitable to decide firefighting strategy and confirm extinction

Fire hotspot validation

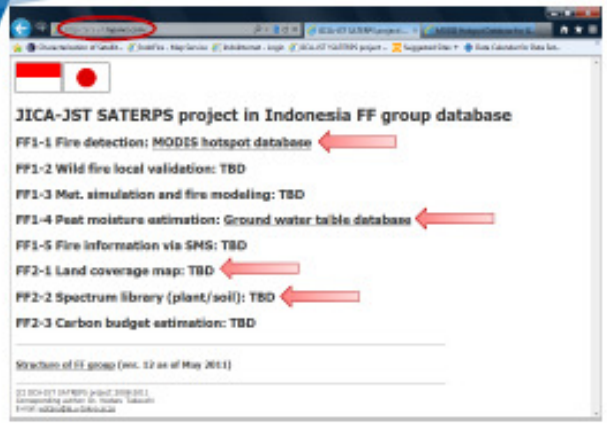
To verify the hotspot data obtained by satellites, aerial photographs were taken by the electrically-powered unmanned aerial vehicle (UAV) equipped with optical camera and infrared camera.

RGB IR

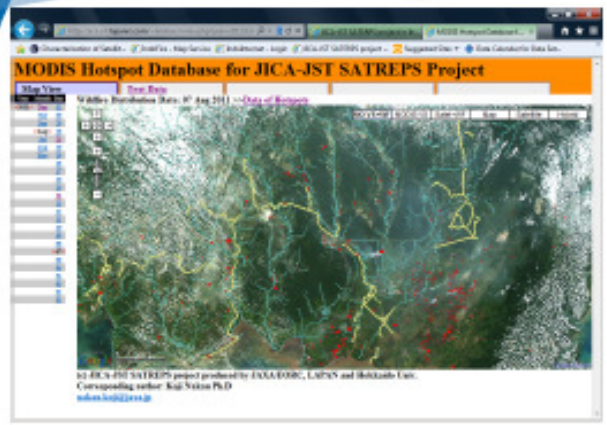


Example of thermography images of flight observation

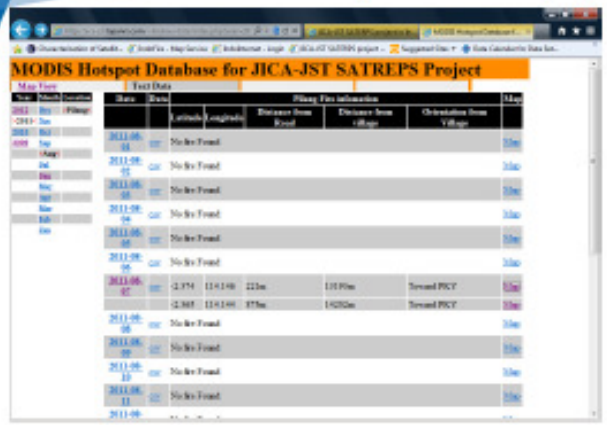
JST-JICA FF Component Website

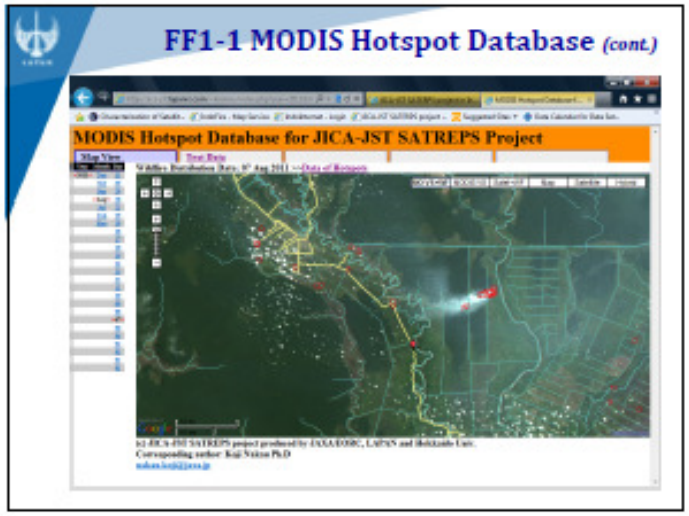


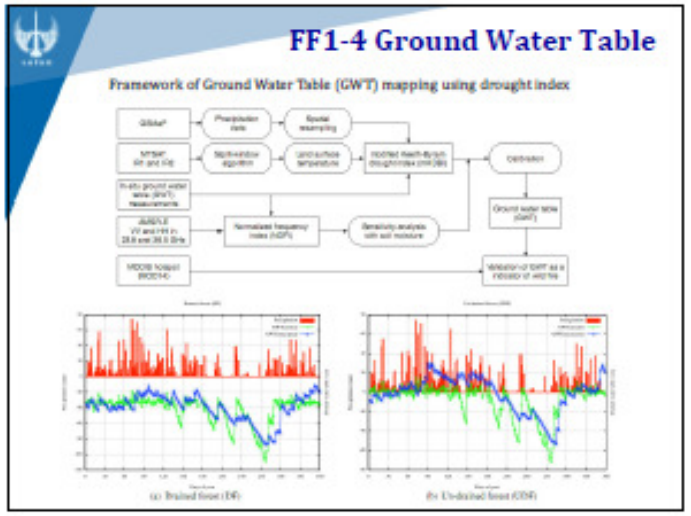
FF1-1 MODIS Hotspot Database

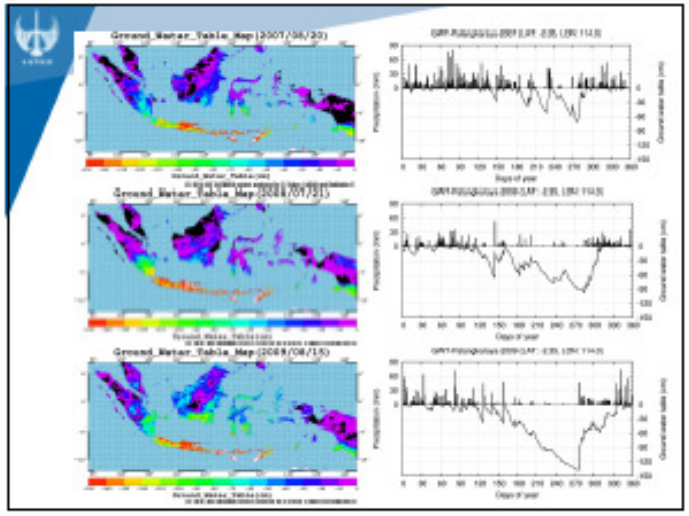


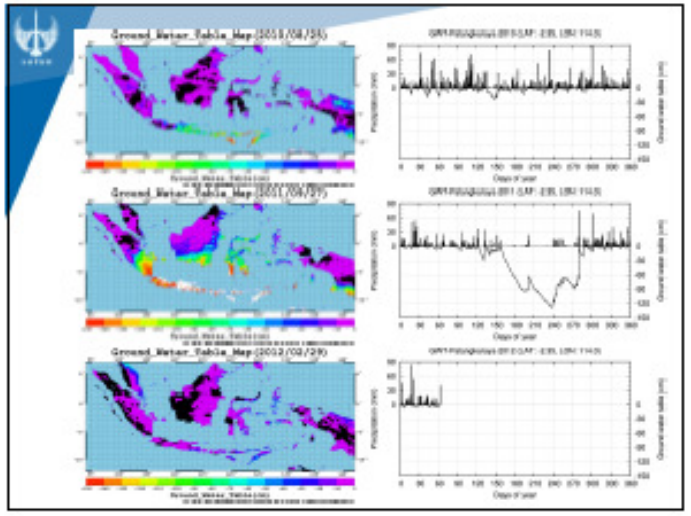
FF1-1 MODIS Hotspot Database *(cont.)*



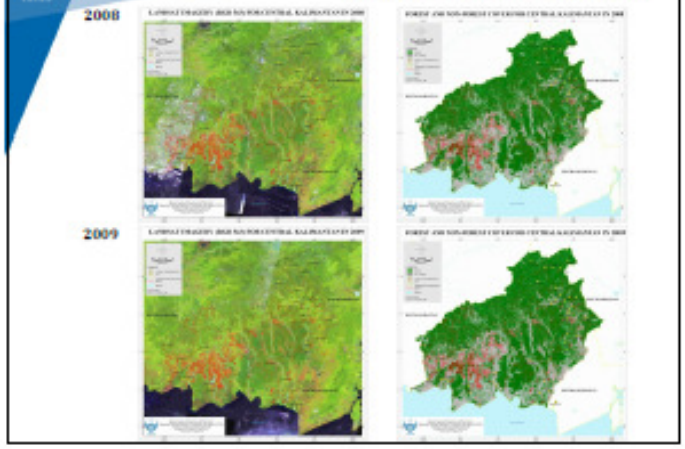

FF1-1 MODIS Hotspot Database (cont.)
MODIS Hotspot Database for JICA-JST SATREPS Project


FF1-4 Ground Water Table
Framework of Ground Water Table (GWT) mapping using drought index





FF 2-1 Land Cover Map

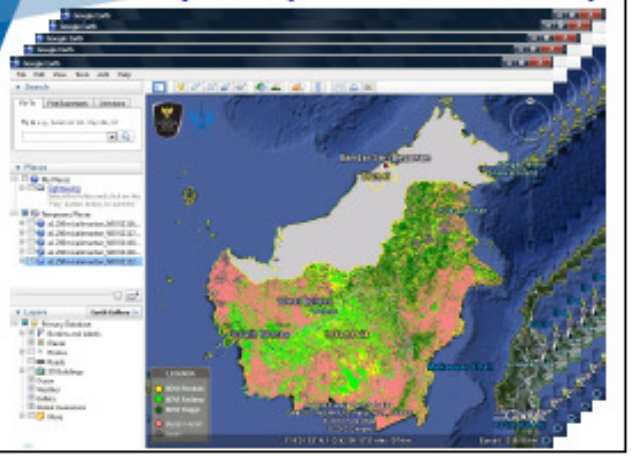


FF 2-1 Land Cover Map *(Cont.)*

Year	Forest area (ha)	Forest area compared with area (%)	Forest change (ha)
2000	9,007,164	58	-
2001	9,047,939	59	40,775
2002	8,971,911	58	-76,028
2003	8,801,951	57	-169,960
2004	8,683,361	56	-118,590
2005	8,625,535	56	-57,826
2006	8,578,507	56	-47,028
2007	8,425,437	55	-153,070
2008	8,390,578	54	-34,859
2009	8,573,513	56	182,935

Note: Area of Central Kalimantan was 15,399,228 ha in 2008 (Source: Bakosurtanal)

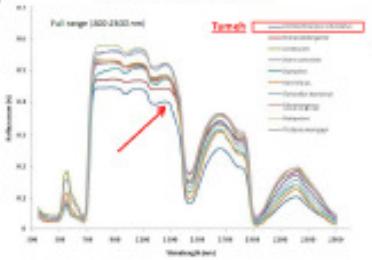
16-day NDVI (250meter resolution)

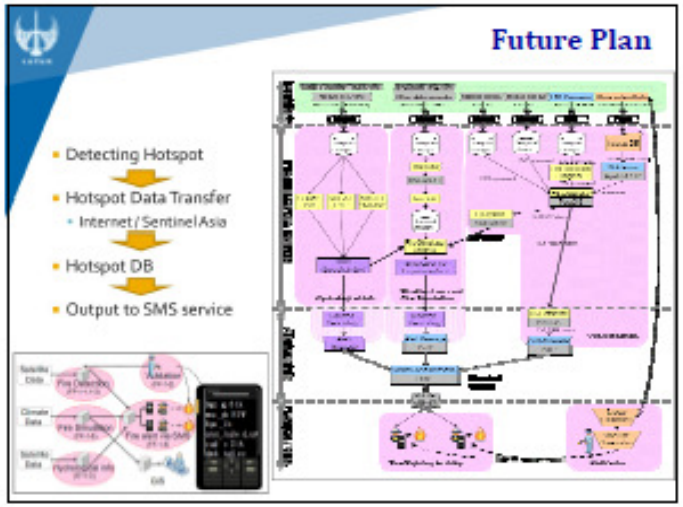


FF 2-2 Spectrum Library

Data collection activities

Spectral reflectances from 10 dominant tree species in peat forest



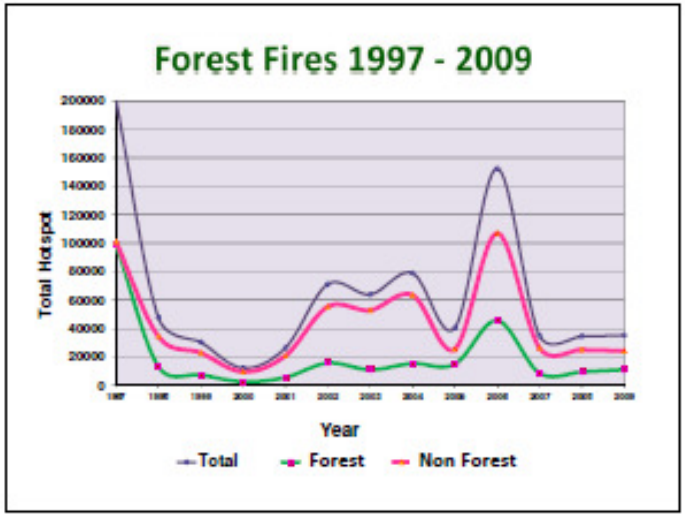


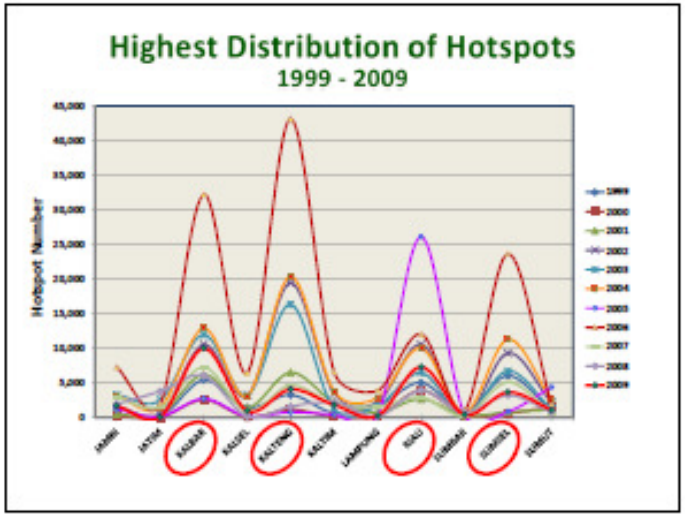
Thank you
for
your attention

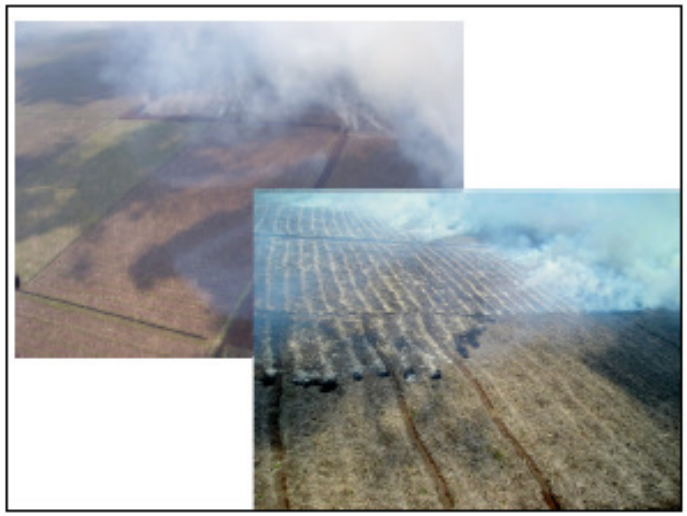
Annex 11

INDONESIAN FOREST FIRES

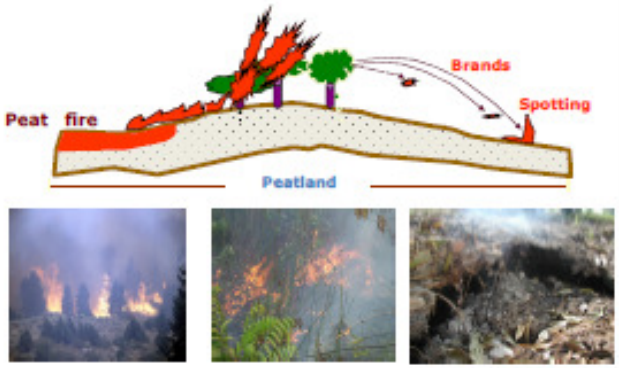
No.	Year	Remarks (ha)
1	15,510 BC-1650 AD	Firstly recognized in East Kalimantan
2	1877	Recorded for the first time
3	1915	80,000
4	1982/1983	3,600,000
5	1987	66,000
6	1991	500,000
7	1994	5,110,000
8	1997/1998	10-11,000,000
9	2006	8,000,000





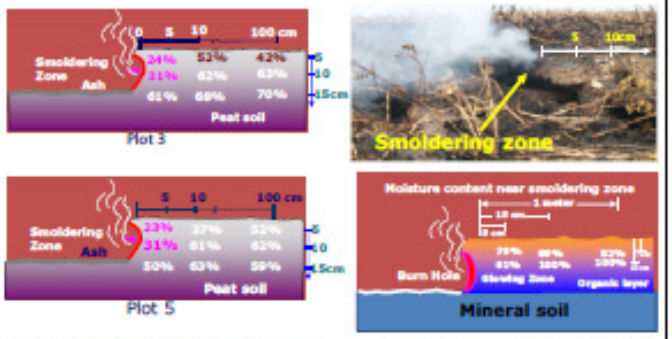


Fire propagation regimes in tropical peatland



(Aswin Usuf, 2011)

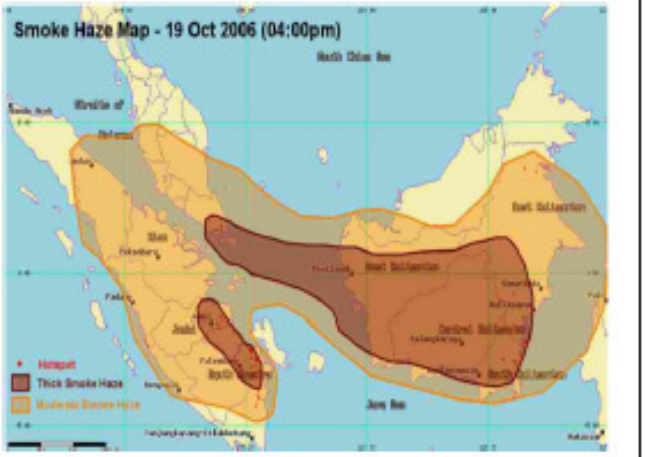
Peat moisture near smoldering zone

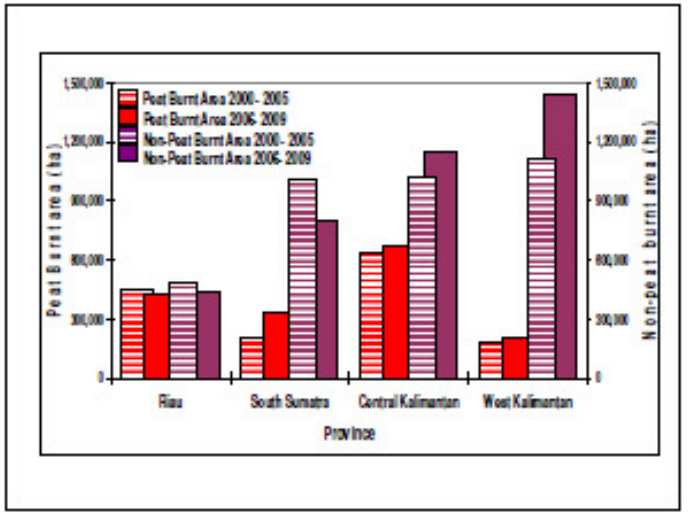


Peat moisture near smoldering zone at plot 3 and 5

(Aswin Usuf, 2011)

Peat moisture near smoldering zone in Seney NWR Michigan USA (Hungerford, 1996)





BURNT AREA (2000-2009)

Province	Burnt area (ha)
Riau	1,803,610.72
South Sumatra	2,341,078.03
SUMATRA	4,144,688.75
Central Kalimantan	3,476,373.91
West Kalimantan	2,930,145.31
KALIMANTAN	6,406,519.22
TOTAL	10,551,207.97

Peat

Province	2000-2005	2006-2009
Riau	452,694.74	429,982.56
South Sumatra	200,211.01	335,463.21
Central Kalimantan	639,220.44	673,325.78
West Kalimantan	178,180.51	197,867.38
Total	1,470,306.7	1,636,638.93

Non-peat

Province	2000-2005	2006-2009
Riau	439,060.93	481,872.49
South Sumatra	797,412.46	1,006,991.35
Central Kalimantan	1,145,497.53	1,018,330.16
West Kalimantan	1,439,657.47	1,114,439.95
Total	3,821,628.39	3,621,633.95

C02 EMISSION

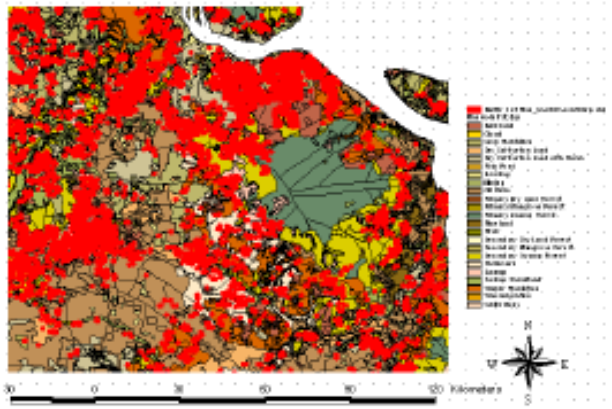
FIRES ON PEAT

Province	2000-2005	2006-2009
Riau	1,0641,59.36	1,046,347.24
South Sumatra	451,215.04	706,853.54
Central Kalimantan	1,856,530.89	1,951,667.59
West Kalimantan	577,749.46	1,856,530.89
Total	3,949,654.75	5,561,399.26

FIRES ON MINERAL SOIL

Province	2000-2005	2006-2009
Riau	3,437,058.77	3,825,063.27
South Sumatra	4,868,042.98	6,834,500.14
Central Kalimantan	9,252,991.92	8,180,427.71
West Kal.	11,989,502.06	10,002,068.31
Total	29,547,595.73	28,842,059.43

Burnt Area Bengkalis, 2000 - 2010



(CHALLENGE) TO THE EMISSION REDUCTION
>>> INDONESIA (BAPPENAS,2009)

- emissions from oxidation of 220 Mt CO2/yr
- fire emissions estimate of 470 Mt CO2/yr
- loss of AGB of 210 Mt CO2/yr

TARGETS:

- Reduction of hotspots in Kalimantan, Sumatera and Sulawesi -20% per year
- Area of forest burned reduced -50% compared to the condition of year 2008
- Increased capacity of local government and community in controlling forest fire hazard in 30 Operational Areas

WHAT HAD BEEN DONE ?

The Cooperation Agreement for Indonesian National Guidelines Signed

➢As a consequence of the fires and smoke pollution in Indonesia between 1982 and 1994 a cooperation agreement was made to develop a project "Integrated Forest fire Management in Indonesia Phase I: National Guidelines on the Protection of Forests against Fires".
➢The cooperation agreement between:
>> The International Tropical Timber Organization (ITTO),
>> The Common Fund for Commodities (CFC),
>> The Directorate General of Forest protection and Nature Conservation, Ministry of Forestry,
>> Faculty of Forestry, Bogor University of Agricultural Sciences,

<<< signed on 21 October 1996

Curriculum of Basic Training consisted of :
A. Law, Regulation and Policy on Forest Fire Management,
B. Basic knowledge on forest fire,
C. Forest fire management,
D. Fuel source management,
E. Fire detection,
F. Fire control equipment,
G. Fire control tecnique and strategy, and
H. Mopping up

➢Training instructors come from staff and experts:
➢Directorate General Nature Protection and Conservation (PHPA),
➢Faculty of Forestry IPB,
➢GTZ,
➢JICA
➢USA

FIRE DANGER RATING SYSTEMS

➢ FUNDED BY CIDA-PROJECT, SEA-FDRS STARTED AROUND 2000
➢ INDONESIAN SIDE:
+ MINISTRY OF FORESTRY
+ BPPT
+ BMG
+ UNIVERSITY
+ LAPAN (Indonesian Aeronautical and Space Agency)
➢ FIELD WORKS, DATA COLLECTING, STRENGTHENING THE COLLABORATION, MODELING, CALIBRATING, MAPPING, SPREADING
➢ OPERATIONAL COMMENCED ON AUGUST 2002
➢ THE PRODUCTS: MAP (FOR EARLY WARNING)
➢ CALIBRATING AND ADAPTATING: ??????????

MINISTRY OF FORESTRY

- As a strong commitment to reduce fire occurrences in Indonesia, since 2002 Government of Indonesia through Ministry of Forestry (MoFr) has built Manggala Agni Fire Brigade in 10 fire prone provinces (North Sumatra, Riau, Riau Island, Jambi, South Sumatra, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, South Sulawesi) with total number of 30 Operational Area *(Daerah Operasi/Daops)*.
- The Brigade, consists of 107 groups with 1.605 personnel, is equipped with complete infrastructure (including office, equipments, storage, etc).
- Additionally the MoForestry has established fire brigades in 30 National Park and Natural Resources Conservation Unit *(Balai Konservasi Sumber Daya Alam/BKSDA)* which consist of 60 groups of fire brigade with 900 personnel.

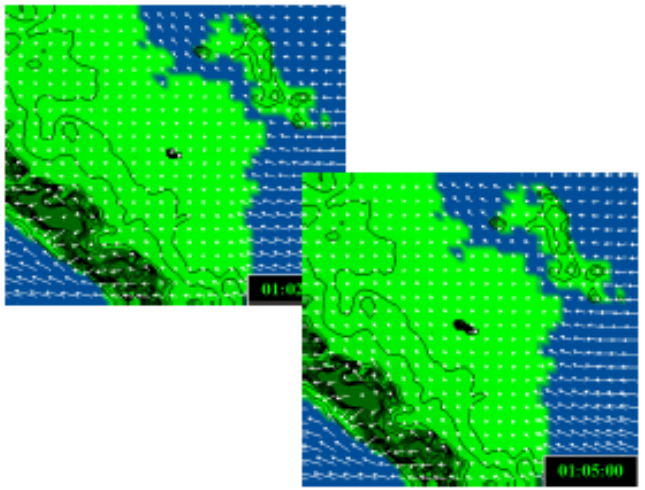
- To strengthen the fire early warning system, supported by the AusAid and the Landgate International (from the government of Western Australia), MoF has worked closely with the Indonesian Aeronautical and Space Agency (LAPAN) to develop Indofire hotspot monitoring system using MODIS satellite.
- This system was launched in October 2009 and can be accessed through http://indofire.dephut.go.id or http://indofire.lapanrs.com.

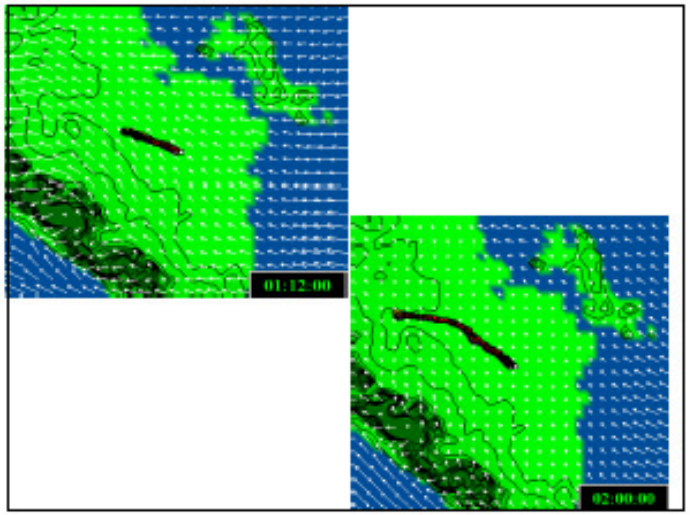
PREVENTION

- Since 2010, for the periode of 5 years, MoFr and Japan International Agency (JICA) has developed a new project of the Community Development of Fires Control in Peatland Area, which is located in Siak District – Riau as well as Bengkayang and Kubu Raya District – West Kalimantan.
- This 510 million Yen or approximately US $ 5.7 mililion project is aimed to strengthen the capacity building of local people in peat forest and land fire prevention.

COMMUNITY BASED FIRE MANAGEMENT

- Furthermore, during the period of 2006-2010 (and will be continued in the future), MoFr developed Fire Community *(Masyarakat PeduliApi/MPA) with* total number of 8.830 personels in 19 provinces : North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Lampung, Bengkulu, West Java, Central Java, East Java, Yogyakarta, Bali, West Nusa Tenggara, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, South Sulawesi and Central Sulawesi. This MPA is the front liner in preventing forest fires in the areas which are closed to the communities.

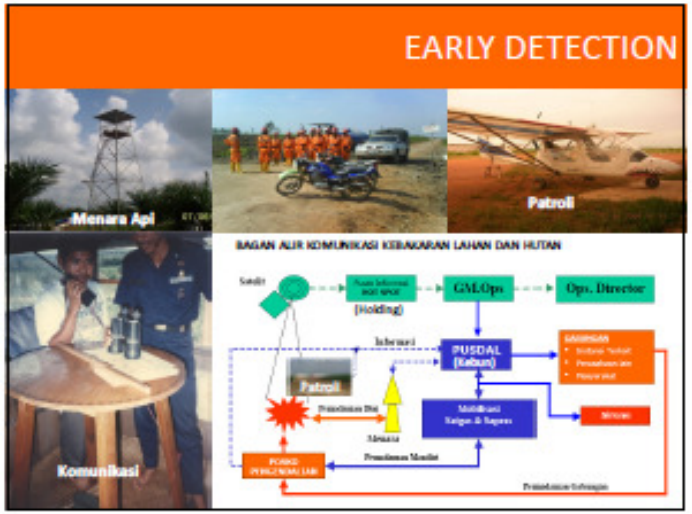


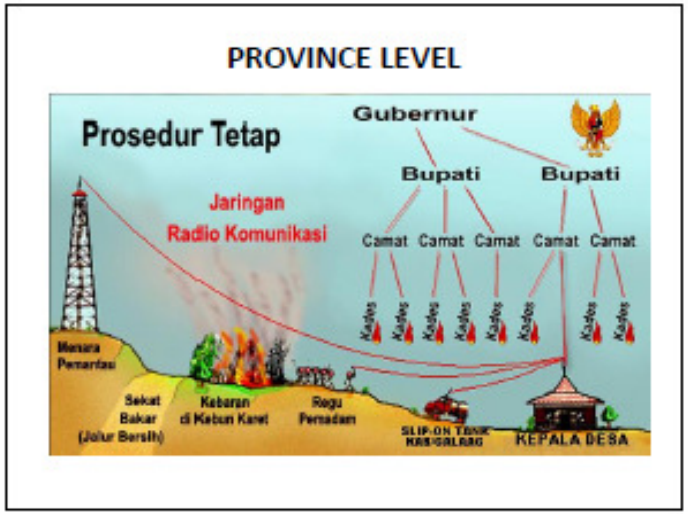


Readiness Level for Fire Management

Determination of Readiness Level follows Fire Danger Rating, Weather forecasting, Hotspot, Smoke-Haze conditions, and Fire Management Activities

	normal	Level III	Level II	Level I
1	Regularly monitor, analyse and process all information and reporting of fire data from field patrols, weather station as well as internet	Regularly monitor, analyse and process all information and reporting of fire data from field patrols, weather station as well as internet	Regularly monitor, analyse and process all information and reporting of fire data from field patrols, weather station as well as internet	Daily monitor, analyse and process all information and reporting of fire data from field patrols, weather station as well as internet
2	Update and disseminate fire information regularly to Field Office, CFR Posko as well as other adjacent plantations.	Update and disseminate fire information regularly to Field Office, CFR Posko as well as other adjacent plantations.	Update and disseminate fire information minimum 5 days a week to Field Office, CFR Posko as well as other adjacent plantations.	Update and disseminate fire information daily to Field Office, CFR Posko as well as other adjacent plantations.
3	No patrols or tactical detection necessary	Patrols or tactical detection performed as needed by local conditions	Patrols and tactical detection by CFR member occur minimum 5 days per week	Based on fire information and instructed by forest manager, the Fire Suppression/Prevention Mobilization (FSPM) plan takes place to suppress all vegetation fires in the area





KEY ELEMENTS:

- EARLY WARNING/DETECTION SYSTEMS WORKS
- SPREADING THE INFORMATION
- RESPONSE !!!!!!
- ACTIONS !!!!!!!!!!!!!

CONCLUSION

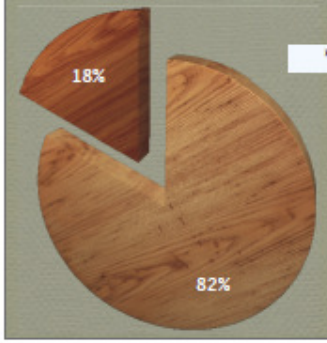
- NO MORE FIRE USED FOR LAND PREPARATION
- PREVENTING FIRES THROUGH EARLY WARNING AND EARLY DETECTION SYSTEM
- PREVENTING FIRE IS BETTER THAN SUPPRESSION
- COMPLETED THE AREA WITH INFRASTRUCTURE AND SKILL PERSON WITH REGULARLY TRAINING
- ESPECIALLY FOR PEAT, KEEP WATER TABLE AT LEAST no more than 30 CM BELOW THE GROUND HIGH

Annex 12

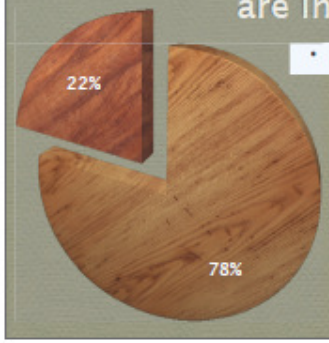
Indonesia Peatland Area

Djayawaman Alamprabu. MComn
Ministry of Agriculture of Indonesia
Directorate General of Estate Crops
djayawarman@gmailcom

In 1990 Approximately 27 million or 82 % ha of peatlands in Southeast Asia



in 2002 Southeast Asia peatland area decreases from 33 million ha to around 27 million ha, and 21Million or 78 % ha of Southeast Asia peatland area are in Indonesia



- Source : Wahyunto et al, 2006; Wetlands International – Indonesia Programme, 2003; 2004

Indonesia's peatlands was estimated to be 3000 to 30 000 years old.

- Source : Dipa Satriadi Rais HIDROLOGI LAHAN GAMBUT DAN PERANANNYA DALAM KELESTARIAN LAHAN GAMBUT TROPIS, 2011

Peatland age estimation in Kalimantan

Location	Age	Source
	Sungai Kahayan, Central Kalimantan 11000 Years of age	Rieley et al., 1992
	Palangkaraya, Central Kalimantan 8.145 – 9.600 Years of age	Neuzil, 1997
	Teluk Keramat, West Kalimantan 4.040 – 1.980 Years of age	Staub and Esterly, 1994

Source : Wetlands International – Indonesia Program, 1997

Lets Start with the map



Sumatra, 7.2 million ha

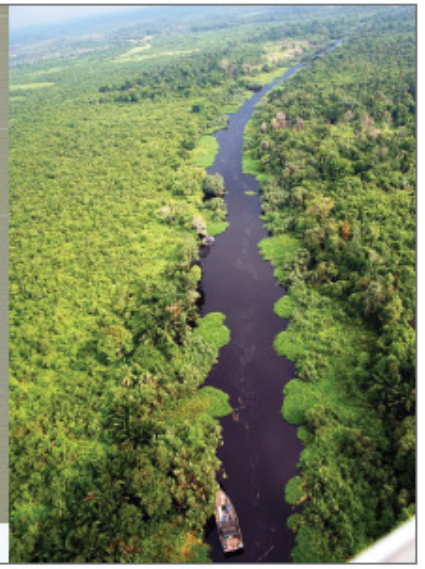
Kalimantan 5.8 million ha

Papua
8 million ha

- Source : Wahyunto et al, 2006; Wetlands International – Indonesia Programme, 2003; 2004

Indonesia
Peatland Characteristic

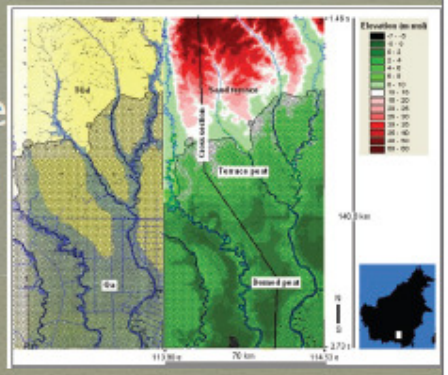
Thickness
1–8m
to 12– 24 m
gambut Air Hitam
Laut Giam Siak Riau



Source : Dipa Sastradi Rais HIDROLOGI LAHAN GAMBUT DAN PERANANNYA DALAM KELESTARIAN LAHAN GAMBUT TROPIS, 2011; Riau Post Giam

Indonesia
Peatland Characteristic

Type of dome
coastal peatland
basinal dome-shaped
peatland
&



- Source : Dipa Sastradi Rais HIDROLOGI LAHAN GAMBUT DAN PERANANNYA DALAM KELESTARIAN LAHAN GAMBUT TROPIS, 2011

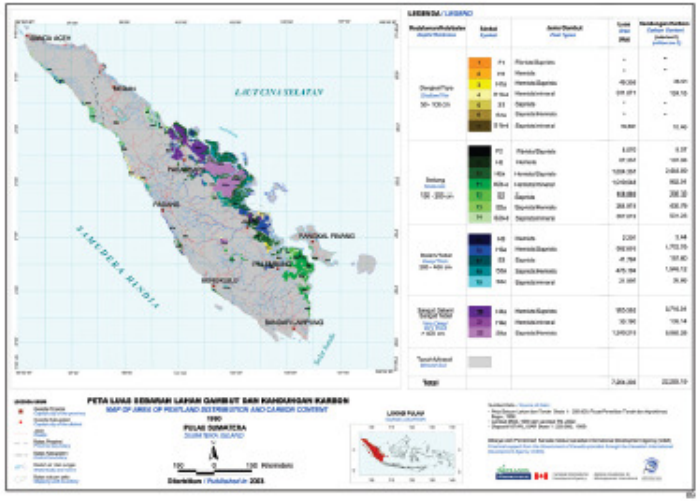
Sumatra,
7.2 million
ha

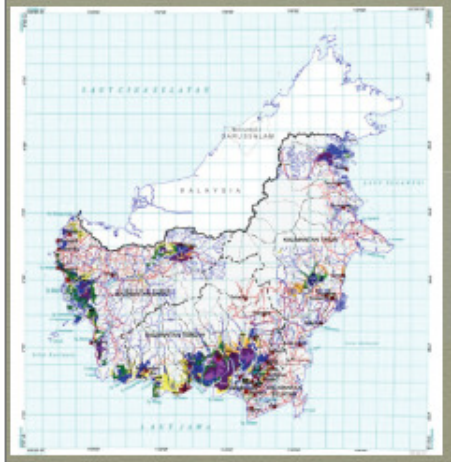
Sumatra peatland area grouping based on its thickness

Very shallow (< 50 cm)	0,682 million ha	(9,5 %)
Shallow/Thin (50 – 100 cm)	1,241 million ha	(17,2 %)
Moderate (100 – 200 cm)	2,327 million ha	(32,3 %
Deep (200 – 400 cm)	1,246 million ha	(17,3 %)
Very Deep/Very Thick (> 400 cm – 800 cm)	1,705 million ha	(23,7 %)

Sumatra, Peatland area distribution mainly on low lands along east coast line

Riau	4,044 million ha	56,1 % of total Sumatra's peatland area
South Sumatra	1,484 million ha	
Jambi	0,717 million ha	
North Sumatra	0,325 million ha	
Nanggroe Aceh D	0,274 million ha	
West Sumatra	0, 210 million ha	
Lampung	0,88 million ha	
Bengkulu	0, 63 million ha	





Kalimantan 5.8 million ha

Peatland area based on its areas length in Kalimantan

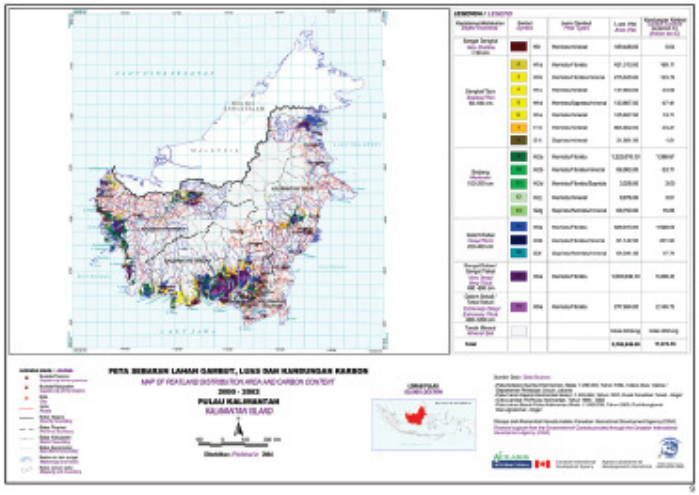
Central Kalimantan	3,011 million ha	52,2 % of Indonesian peatland area)
West Kalimantan	1,730 million ha	30,0 % of Indonesian peatland area)
East Kalimantan	0,697 million ha	12,1 % of Indonesian peatland area)
South Kalimantan	0,278 million ha	5,7 % of Indonesian peatland area)

© Wetlands International – Indonesia Programme, 2003

Peatland area based on its Kalimantan peatland area grouping based on its thickness

Very shallow (< 50 cm)	0,190 million ha	(3,3 %)
Shallow/Thin (50 – 100 cm)	1,741 million ha	(30,2 %)
Moderate (100 – 200 cm)	1,391 million ha	(24,1 %
Deep (200 – 400 cm)	1,105 million ha	(19,1 %)
Very Deep/Very Thick (> 400 cm – 800 cm)	1,065 million ha	(18,5 %)
Extreme deep Peatland (> 800 cm–14m)	0,278 million ha	(4,8%)

© Wetlands International – Indonesia Programme, 2003



© Wetlands International – Indonesia Program, 2003

Papua
8 million
ha

- Source : Wahyunto et al, 2006; Wetlands International – Indonesia Programme, 2003; 2004

Papua Peatland area distribution

Papua Province	5,689 million ha	71.3% from Papua peatland total
East Irian Jaya Province	1,311 million ha	16.4% from Papua peatland total
West Irian Jaya Province	0,974 million ha	12.2% from Papua peatland total

- Source : Wahyunto et al, 2006; Wetlands International – Indonesia Programme, 2003; 2004

Papua peatland area grouping based on its thickness

Very shallow (< 50 cm)	180,493 ha	(3,3 %)
Shallow/Thin (50 – 100 cm)	5,376,379 ha	(30,2 %)
Moderate (100 – 200 cm)	701,236 ha	(24,1 %
Deep (200 – 400 cm)	1,717,347 ha	(19,1 %)

- Source : Wahyunto et al, 2006; Wetlands International – Indonesia Programme, 2003; 2004

SOURCES:

Wahyunto, Suparto, Bambang H., dan Hasyim Bhekti. 2006. Sebaran Lahan Gambut, Luas dan Cadangan Karbon Bawah Permukaan di Papua. Proyek Climate Change, Forests and Peatlands in Indonesia. Wetlands International – Indonesia Programme dan Wildlife Habitat Canada. Bogor.

Wetlands International – Indonesia Programme. 2003. Peta luas sebaran lahan gambut dan kandungan karbon di pulau Sumatera 1990 – 2002.

Wetlands International – Indonesia Programme. 2004. Peta sebaran lahan gambut, luas dan kandungan karbon di Kalimantan 2000 – 2002.

Page, S.E. & J.O. Rieley. 1998. Tropical peatlands: a review of their natural resource functions, with particular reference to southeast asia. Intl. Peat Jornal,

Thank you, Terima kasih,
Khk khkb khun khun, Xie Xie,
Salamat sa inyo, Sukriya, Cam on ban

Annex 13:

Break-out Group I: Enhancement/integration of existing systems

Group members

1	Mr. Kang Thean Shong	Malaysia,	Malaysian Meteorological Department
2	Mr. Abdul Azis bin Haji Mohamad	Brunei Darussalam	Fire and Rescue Department
3	Prof. Dr. Bambang Hero Saharjo	Indonesia, B	Bogor Agricultural University (IPB)
4	Mr. Kurnia Rauf	Indonesia,	Directorate of Forest Fire Control, Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry
5	Mr. Mulyono Rahardi Prabowo	Indonesia,	The Center of Meteorology for Public
6	Mr. Purwasto Saroprayogi	Indonesia,	Ministry of Environment
7	Mr. Sumantri	Indonesia,	Directorate of Forest Fire Control, Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry
8	Ms. Nathalia Marthaleta	Indonesia,	ASEAN Secretariat
9	Mr. Faizal Parish	Malaysia	Global Environment Centre
10	Mdm. Nor Rashidah Mohd. Ghazali	Malaysia,	Department of Environment
11	Mr. Mohd Amir bin Ismail	Malaysia,	Department of Environment
12	Ms. Nor Azura Md Ali	Malaysia,	Environmental Management and Climate Change Department, Ministry of Natural Resources and Environment
13	Assoc. Prof. Dr. Ahmad Ainuddin Nuruddin	Malaysia,	Universiti Putra Malaysia
14	Mr. Chiam Keng Oon	Singapore	ASEAN Specialised Meteorological Centre (ASMC)
15	Ms. Chonthida Chernkhunthod	Thailand,	Department of National Park, Wildlife and Plant Conservation
16	Mr. Khairul Azman Mohamad	Malaysia	Global Environment Centre (GEC)
17	Ms. Chin Sing Yun	Malaysia	Global Environment Centre (GEC)
18	Ms. Lew Siew Yan (Serena)	Malaysia	Global Environment Centre (GEC)

Is there a need for enhancement of existing FDRS systems?

In general the systems used in Indonesia and Malaysia/Regional level are good. In the last 2 years, the systems have been improved by:

a) Expand the sites for data collection, inclusion of overlays of peat distribution and Google maps in Malaysia;
b) Enhance data generation (AWS and satellite data) and addition of short and medium term forecasting in Indonesia.

However, there is an urgent need to make some further enhancements, including:

a) Further fine tuning and calibration of the indices
   E.g. Use of Duff Moisture Code vs Drought Code for drained peatlands
   Possible different threshold for drought code in Mekong region
b) Improving meteorological data availability
   E.g. Enhancing information submitted by countries to WMO database, adding new automatic weather stations
c) Inclusion of Additional data layers
   E.g. fire prone areas, peatlands
d) Enhancing the prediction and early warning capability
   Short term (1-7 days) medium term (1-2 months)
e) Enhancing use of the information in the system
   Dissemination to local users and development of SOPs for action.

These are discussed further below:

a) Verification and further fine tuning and calibration of the indices
   - Information in the FDRS need to be cross checked with the on the ground situation
   - System needs to be continually monitored/adjustment – for example System in Canada is still being adjusted after 60 years.
   - Importance to calibrate the data for accuracy
   - May need to consider sub-region differences and consider differences in major fuel types between e.g. southern and northern ASEAN.

   Preliminary testing in Malaysia in 2011 indicated that Duff Moisture Code may be a better indicator of fire risk for drained/degraded peatlands vs. Drought Code may be better for intact peatlands.

   Recent research indicates a possible different threshold for the drought code in Mekong region.

   Analyses can be done for frequency of hotspots in areas with different FDRS danger levels.

b) Improving meteorological data availability

   Two countries in the region (Cambodia and Myanmar) are not currently submitting data to WMO database and so MMD cannot access the data to prepare FDRS maps for these countries

Countries can enhance the data availability by adding new automatic weather stations (AWS) or enhancing level of information submitted to WMO database.

New stations can be established near fire prone peatlands (as has been done in Malaysia with the new station next to raja Musa PSF).

Satellite data is being used by Indonesia to supplement data in areas without AWS.

Malaysia is considering use of radar to expand rainfall data availability.

c) Inclusion of Additional data layers

Four specific actions for additional data layers to be included in FDRS maps were identified:

- Peatlands
- Fire prone areas
- Geographic features (roads, rivers, towns etc.)
- Land use

Other possible data could be Fuel type and ground water level/soil moisture

The initial priority for inclusion were Peatlands, Fire prone areas and Geographic features

Concerns on using an overlay with landuse map is that it may cause the image to be overcrowded and also that land use classification varies between countries – with e.g. Indonesia having 22 land use categories and Malaysia only 10.

Information availability

Information availability was reviewed for all countries in the group as follows:

Potential information for overlays	Malaysia	Indonesia	Thailand	Brunei
Land use Map	x	x	x	x
Peatland distribution	x	x	x	x
Fire prone area	x	x	x	x
Geographic data	x (Google Earth)	x	x	x

Malaysia has already started overlay of peatland map and Google earth (for geographic data), Indonesia is in the process of overlaying peatland distribution & fire prone area.

MMD can help Thailand and Brunei if basic information is provided.

d) Enhancing the prediction and early warning capability

Indonesia has proposed to incorporate Short term (1-7 days) medium term (1-2 months) forecasting into the FDRS system.

Malaysia is experimenting with 2-3 day forecasting.

Constraint with forecasting is the complex models and the large amount of data and long model run time.
For regional level this could be simplified by use of simpler models for indicative (less accurate – but maybe adequate) predictions.
This could be refined at country or site level through local weather prediction systems

Regional system should have both existing ground situation and develop longer range forecast. E.g. 3-10 days forecast for regional use and general reference then country to modify based on national condition.

e) Enhancing use of the information in the system

It is very important to enhance the use of the information in the system and use it for fire prevention and control purposes.

There is experience in different countries in how to engage local users and communities.

It is important that information and alerts are given in a way that is easily understood by the respective target audiences.

Indonesia (Ministry of forestry) has experience in promoting the use of the system to plantation companies and local communities. They developed simple information sheets, display boards and flags to signify danger rating as well as use of mascots and simple ways for local community to update information based on rainfall even if they don't get a formal update.

Clear interpretation/guidance is needed on the actions needed by different stakeholders based on the Danger level is needed.

The system should also be publicised better e.g. through workshops, training courses and mass media

For example

- MMD since 2011 is organising a regular Climate Forum to promote information in predictions/warnings related to floods and haze.
- MOF Indonesia has installed 30 Automatic Weather stations near peat, 60 personnel trained for peat fire risk assessment and warning
- Indonesia has trained the plantation on the action to be taken based on the FDRS.

Do we need Regional or country system or both?

It was agreed that we need both country systems in large countries with significant areas of peatlands or fire prone areas (such as Indonesia and Malaysia) as well as regional systems to provide guidance for other countries with les significant fire problem or less capability to establish own system.

Regional system

- Regional system to continue to help countries without own system (i.e. all ASEAN countries except Indonesia and Malaysia).
- At regional level, dissemination of information and better information sharing for all countries is crucial.
- However, if different threshold is used for the south ASEAN country and North Mekong countries, the change of source code will need to be considered.

Country system

- Country system for country with more info/capacity.
- Training is important for local agencies/people

Do we need a standard system design or it can be varied?

Currently both the country (Malaysia and Indonesia) and the Regional systems are based on the Canadian FDRS system.It was agreed that the use of the Canadian system should be maintained as it has enabled FDRS to operate for 10 years in the region.

For the future it is important to obtain updated or open source versions of the software to enable enhancement of some of the features. For the country systems – adjustments could be made if necessary to the features and maybe thresholds of the system – according to local situations and needs of users. Cooperation between existing FDRS agencies i.e. MMD (Malaysia) and BMKG (Indonesia) should be maintained and enhanced to enable sharing of experience and joint development of new features.

What is role of Hotspot data in relation to FDRS?

Hotspot data can complement FDRS information – however once a fire becomes large enough to be detected as a hotspot it will be difficult (especially for peatlands) to control.

It is more important to focus on the use of FDRS for prevention measures.

Hotspots can be used to validate threshold levels for FDRS – i.e. by comparing hotspot occurrence with different Fire danger levels.

It is useful to overlay hotspots on Fuel type (e.g. peatlands) and Fire prone areas – to enable special alerts to be given e.g. based on number of hotspots on peat.

Recent work has indicated that MODIS satellite appears more sensitive and efficient in detecting hotspots and minimising false alarms. Recent refinement of the algorithms for MODIS has enhanced the accuracy further. It is recommended that use of MODIS for hotspot determination is enhanced.

It is noted that ASMC still uses NOAA data as the main hotspot detection system to enable comparisons over long time periods on the trends. However it is suggested that ASMC in future monitors MODIS in parallel with NOAA.

ASMC is also encouraged to overlay hotspot information on fire prone areas and peatlands to enhance options for alerts as well as determine trends in hotspots and results of fire prevention measures.

Ground truthing of hotspots remains an important issue as well as feedback on results to ASMC and hotspot monitoring agencies.

What opportunities and benefits from linkage with other Networks related to fire and FDRS

Several existing networks or mechanisms were identified which could be linked with FDRS activities in SE Asia including

- Global Fire Monitoring Centre – based in Germany
- Global Observation of Forest and Land Cover Dynamics (GOFC-GOLD) - Fire Mapping and Monitoring Theme

At a regional level links could be made with

- ASMC,
- SE Asia Regional GOFC-GOLD Network (SEARIN),
- SEA Regional Wildfire Science Management Network (regional network of the GFMC)

The benefits of such linkages could include

a) Technical aspect for the refinement of the system
   Collaboration with regional and global fire related networks could facilitate input into the further development and refinement of the FDRS systems and access to data sets on land cover etc. for overlays.
b) Operational – EWS/outreach
   Linkage to the networks could enhance learning and exchange on outreach and development of early warning systems based on FDRS.

Annex 14

Break-out Group II: Enhancement/integration of existing systems

Group members

	Dr. Orbita Roswintiarti	Indonesia	Indonesian National Institute of Aeronautics and Space (LAPAN)
1	Mr. Keo Piseth	Cambodia	Wetlands and Coastal Zone Department
2	Mr. Djayawarman Alamprabu	Indonesia	Directorate of Estate Crop protection of The Directorate General of Estate Crops Ministry of Agriculture
3	Mr. Huda Achsani	Indonesia	Ministry of Environment
4	Mr. Kukuh Ribudiyanto	Indonesia	The Center of Meteorology for Public
5	Ms. Riena Prasiddha	Indonesia	ASEAN Secretariat
6	Ms. Oudomchit Bouangeun	Lao PDR	Department of Meteorology and Hydrology
7	Mr. Ahmad Fairudz Bin Jamaluddin	Malaysia	Malaysian Meteorological Department
8	Mr. Tan KahPoh	Malaysia	Malaysian Meteorological Department
9	Ms. Murni Bt. Samsuddin	Malaysia	Forest Plantation and Forest Protection Division, Forestry Department Peninsular Malaysia
10	Ms. Nurizana Amir Aziz	Malaysia	Malaysian Meteorological Department
11	Mr. Azmi Bin Che Man	Malaysia	Jabatan Bomba dan Penyelamat Malaysia
12	Prof. Dr. habil. Biswajeet Pradhan	Malaysia	Universiti Putra Malaysia
13	Dr. NarisaraThongboonchoo	Thailand	King Mongkut's Institute of Technology Ladkrabang
14	Mr. Anthony Joseph R. Lucero	Philippines	Climatology and Agrometeorology Division PAGASA
15	Mr. TY Chee	Malaysia	GEC
16	Ms. Julia Lo	Malaysia	GEC
17	Ms. Noor Azura Ahmad	Malaysia	GEC

Should we focus on regional or country system or combination?

We need both regional and country system. However, regional system needs more contribution from member countries. The countries with no experience on FDRS will have to figure out how to find source of required information for FDRS in their own countries. The involvement will start from sharing the data for regional system and then build their own countries system when have enough experience and resources. There are also technical issues on the current system since we could not keep up with newer version of FDRS such as GIS software and operating system. Although there is an urgent need of FDRS, the synchronization depends on each country.

What are the gaps that need to be addressed?

There are different need/applications among regional and country system. Regional system usually use to present which countries are at risk for fire while country system may be used for different purposes such as for farming, harvesting, etc. As a result, we need to build a system that fit their needs. It is also acknowledged that there are different on knowledge about FDRS. The inexperience countries need to gain more experience from the countries that have more experience. There are also missing data/information from several countries such as Cambodia, and Myanmar, therefore it needs to figure out whether it is a technical or data communication issue. Running a met model such MM5, WRF and etc. to fill in missing data should also be considered. We need to review and gain more knowledge on some technical term and definition such as definition of DMC & DC. It is also noted that overlay with Peatland/ forest cover/fire prone area is more complicated than we thought.

Do we need a system to meet the need of South ASEAN and North Mekong countries?

Yes, even though there are differences in need /application.

Annex 15: Discussion Outputs (Group 1 – Malaysia and Brunei)

Who uses the system at present?

- Forestry Department
- Department of Environment (DOE)
- Natural Resources and Environment Board (Sarawak)
- Department of Agriculture (DOA)
- Fire and Rescue Department
- Potential future users
- Plantations (FELDA, Sime Darby, MPOB, LGM, etc.)
- Drainage and Irrigation Department (DID)
- Mineral and Geoscience Department (MGD)
- BKN – act as planning and coordination, came in when needed
- Universities
- State government
- Local government
- NGOs
- Local communities

How users use the application

- Forestry Department/DOE - use for patrolling the forest reserve related to fire prevention
- DOE/ NREB (Sarawak) - as an additional information to approve the large scale burning/ controllable burning
- Fire Department - fire mitigation

Potential for new users

- DOA - fire prevention in agricultural areas
- DID - to check the dam water level in peat areas
- MGD - tube well and fire prone operation
- BKN - drought operation
- Universities - use for prediction modelinglong term risk and vulnerability, susceptibility
- State government - fire prevention & resource allocation for disaster units
- NGOs – awareness, fire prevention
- Local communities – education, fire prevention
- Local government – prevention, patrolling, resources, awareness

How to outreach/promote

- exhibition
- forums (e.g. Climate forum)
- road shows

- training courses
- workshops
- mass media – TV news/ newspaper/ social network/ radio
- billboard/ signboard (e.g. DOE, Forestry department)

- Inclusion in SOP for fire prevention and fire control
- DOE already have the SOP under the Peatland programme which is based on the rainfall. MMD can send report daily to ensure continuous monitoring.
- FDRS can be used to decide the size of the patrolling team based on the FDRS level such as medium, high etc.
- DOE can use the FDRS as a trigger data (supportive data) in their SOP.
- Action – Modification of DOE SOP to better include revised FDRS system.
- Development of Generic SOP for FDRS

Steps for Malaysia to refine the national system

- Using open source/updated software from Canada
- Evaluate to use radar data for areas with few AWS
- Long term forecasting – can link to development of
  - susceptibility map
  - hazard map
  - risk map
  - vulnerability map
- Short term forecasting (1 – 3 days)
- Overlay of fire prone areas for FDRS system
- Overlay of forest reserves
- Report results of workshop to National Haze Action Committee 22 March 2012
- Report to Regional workshop in Brunei on 23 March
- Include FDRS in World Meteorological day activities
- Include FDRS in outreach and education programme of MMD and other agencies

Annex 16: Discussion Outputs (Group 2 - Indonesia)

Indonesian Commitment on how to move forward with FDRS

Recognize needs

1. Formal decision to use FDRS as one of the tools for early warning system
2. Review for accuracy and limitation of existing FDRS system – fdrs forecast and its seasonal prediction
3. Enhance the existing system
    - Integrate with fuel map and peat map
    - Identify fire prone areas for four (4) pilot provinces: Central Kalimantan, West Kalimantan, Riau and south Sumatra
4. Identify agencies/ who's doing what
    - MOE : national focal point, national coordinator, monitoring and evaluating
    - BMKG : weather forecast, FDRS forecast, seasonal prediction, FDRS seasonal prediction
    - MOF : ground check, FDRS user
    - MOA : peatland map, FDRS user
    - IPB: modeling and data
    - LAPAN: modeling and data
5. FDRS users
    - Ministry of Forestry
    - Ministry of Agriculture
    - National board for disaster management (Badan Nasional Penanggulangan Bencana, BNPB)
    - Kementerian Koordinator Bidang Kesejahteraan Rakyat (MENKOKESRA)
    - Provincial government
    - Police
    - Manggala Agni (Fire Prevention Community)
6. Target
    - April: FDRS formalisation draft (TOR, proposal FDRS enhancement
    - June – July: assessment calibration
    - September: trial on the new calibration

Annex 17: Discussion Outputs (Group 3 - Mekong Sub Region and Philippines)

Focal point

Identification of Technical focal point

- Thailand, Lao PDR, and Philippines: could identify the technical focal point
- Cambodia and Myanmar: need to go back and discuss with Haze agreement focal point to assign a technical focal point

Mechanism to establish country level FDRS

- Go back and convince policy maker (director, minister) to make commitment
- Form technical working group
- Capacity building: Training and find resources/information to establish the system for the country
- Establish a system, Pilot testing and refinement
- Develop Standard Operation Procedure (SOP) for stakeholder/institution

Obstacles and limitations

- Each country will need allocate funding and resource to establish and maintain the system
- If there is no internal resource, they might seek funding from international funding agency.
- How to communicate with policy maker to see benefit of FDRS?
- Thailand need more sophisticated system than regular fire danger rating system, i.e. Fire Behavior

Other issues

- Philippines have already committed to establish FDRS and looking for more detailed technical information such as document, software, etc. to start the project
- Philippines could request guidance from MMD on the process to establish the system