International Symposium on Grids & Clouds (ISGC) 2022 Virtual Conference Deeper Understanding of Natural Disasters:

Joint DMCC, UMD & Environmental Computing Workshop, 21-25 March 2022

Updates of Fire - Smoke Haze and ASEAN Hydro-Informatics Data Center Activities

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Contents

- Overview and Current Situation
- Some Solutions Suggestions and Recommendations
- Challenges, Opportunities and Final Words
- ASEAN Hydro-Informatics Data Center

Overview

Source: Google Earth Pro



Overview



Overview:

- Mountainous areas but not very high (The highest is Doi Inthanon at 2,565 m)
- Many valleys Thermal or Temperature and Subsidence Inversion during dry season but without any field measurement
- Many indigenous tribes up in the mountain
- Deciduous Forest shading leaves as the main forest
- Mono-crop Maize to feed into animal feed industry
- Changing from Shifted Cultivation to Rotation Crop practice
- Hunting, non-timber products, conflicts
- Smoke haze transboundary, not really clear, no field validation data only active fire data and results from WRF-Chem

Overview

Source: Earth Map Products: MODIS Burned Areas (MCD64A1 V6)



Overview

Source: Earth Map Products: MODIS Burned Areas (MCD64A1 V6)



Current situation

Source: Earth Map Products: MODIS Burned Areas (MCD64A1 V6)



Global Fire Emissions Database, version 4s

Citation: van der Werf et al. (2017, ESSD)



GEE Link - https://globalfires.earthengine.app/view/gfedv4s

FIRECAM On-line with 5 Global Emission Databases

https://globalfires.earthengine.app/view/firecam

Earth Engine Apps



GitHub: Code/Info

Input Parameters

1) Select Time Range	9:
Start Year:	2007
End Year:	2020
Note: GFEDv4s emissi preliminary	ons for 2017-20 are
2) Select Bounds Typ	e: Country/ Sub-Region \$
Select Region:	Thailand 😂
3) Select Species:	CO2 - Carbon Dioxide 🗘
	Submit
Legend	
BA-AFA Discrepan Metric 1: normalized	cy difference
Contraction of the International Contractional	



Keyboard shortcuts 👘 Map data ©2022 Google, TMap Mobility 🛛 200 km 📖

Terms of Use







Cloud/Haze Obscuration Metric 2: fractional, FRP-weighted

Google

FIRECAM On-line with 5 Global Emission Databases https://globalfires.earthengine.app/view/firecam

Monthly Fire Emissions

Emissions (Tg CO2)



- 1. Global Fire Emissions Database (GFEDv4s) | van der Werf et al. (2017, ESSD)
- 2. Fire Inventory from NCAR (FINNv1.5) | Wiedinmyer et al. (2011, GMD)
- 3. Global Fire Assimilation System (GFASv1.2) | Kaiser et al. (2012, Biogeosci.)
- 4Quick Fire Emissions Dataset (QFEDv2.5r1) | Darmenov and da Silva (2013, NASA Technical Report)
- 5. Fire Energetics and Emissions Research (FEERv1.0-G1.2) | Ichoku and Ellison (2014, ACP)

Current situation

Source: Earth Map Products: MODIS Burned Areas (MCD64A1 V6)



Month



Source: Earth Map Products: MODIS Burned Areas (MCD64A1 V6)



Some solutions we have tried so far

- No burning period and no burning policy.
- Single command, Direct order from the PM to reduce PM2.5.
- Military supports for fire suppression and control.
- Strong laws enforcement including increasing penalty.
- A lot of research funding in the north.
- Many quick development mobile applications to use most likely HS information, low-cost air sensor info, and getting permission for burning from the governor office.
- Prescribed burning where will be burned anyway, but it has to be under control by the single command.
- Forest innovation value added products.

Some solutions we have tried so far

- Changing monoculture practice to multi-culture or other cash crops or agroforestry (3 Forest Types 4 Benefits).
- Extreme Pressure and pushing hard from urban peopleand politicians to have "Clean Air Act" and higher air quality stds, so a lot of low-cost air quality sensors installed throughout urban areas with mobile app and new proposed AQI standards and clean air zones project such as at schools.
- National forest restoration by all parties to increase more water storage, higher carbon sink, better fire prevention and mitigate climate change.
- Increase moisture in the forested land by check dams.

Some solutions we have tried so far

- Foods distribution during dry season for people in the Huanamdang National Park which had good results.
- New National Park, Wildlife Protection and Community Forest Law in 2019, people can live legally in the protected areas to reduce conflicts which lead to forest fire.
- National Committee of Land Right for People in protected areas, forest reserves and Agricultural Land Reform Areas where you can get the land right, but if you found out later that you ignited forest fire your land right will be provoked.
- Community-based Fire and Water Management holistic approach as Land Management with indigenous wisdoms.

Total Rain Accommulation by Thailand Met. Dept.



Concept of Community-based Fire and Water Management

It is basically the combination or integration of Community-based Fire Management and Community Water Resource Management together due to the fact that "where is more water there will be less fire concept."

More water means more incomes which will improve livelihood in the community and sustain such management approach.

More disaster resilient community.

Sustainability and adaptability to Climate Change are the ultimate goal!!!



Community-based Fire and Water Management

- 1. Community committee
- 2. Community Forest Conservation Agreement
- 3. Land Use Management Agreement on exiting zoning
- 4. Sustainable Management Practice Agreement
- 5. Community Regulations
- 6. Penalty for breaking the community rules
- 7. Sustainable incomes
- 8. Community market
- 9. Community fund
- 10. Common Rights

Source: Integrated Highland Wildfire, Smoke and Haze Management in the Upper Indochina Region, APN Progress Report NOV 2019

APN Science Bulletin

2021, Volume 11, Issue 1, 133-143, e-ISSN 2522-7971

Integrated highland wildfire, smoke, and haze management in the Upper Indochina region



Source - https://www.apngcr.org/bulletin/article/integrate d-highland-wildfire-smoke-andhaze-management-in-the-upperindochina-region/

Kobsak Wanthongchai^{a*}, Veerachai Tanpipat^a, Prayoonyong Noochaiya^b, Nion Sirimongkonlertkun^c, Ronald Macatangay^d, Lattana Thammavongsa^e, Thaung Naing Oo^f,

Sherin Hassan Bran^d, Raman Solanki^d

... Climate change and economic pressure have modified the life of locals, including fire practices in daily life and other fire uses. The land use of forest cover (mostly deciduous forest in highland area has shifted) to cultivation, with the application of slash-and-burn technique. This results in frequent unplanned fires causing pollution in the form of smoke and haze. A zero-burn policy has been implemented to tackle this problem but such a policy may not be appropriate as people still need fire as a basic tool for agriculture land preparation. Moreover, the deciduous forest is a fire-dependent ecosystem to maintain its ecosystem. Frequent burning by local people or excessive government intervention in preventing fires can impact this ecosystem. In the highlands, shifting cultivation has gradually been replaced by rotational agricultural practice with a cycle of 2 to 5 years. However, the fuel load for a 2-year rotation period is only 0.25 t ha⁻¹ higher than that of a mixed deciduous forest. New fire risk maps classified according to forest types were produced for Thailand, Lao PDR, and Myanmar. We report that the mixing height in Chiang Mai Province was, on average, 500 m during March, with common occurrence of subsidence inversion resulting in further lowering of air quality during this month. A participatory process to develop a Community Based Fire Management (CBFiM) was undertaken and it was observed that a successful implementation would need a <u>community with a strong leadership.</u>







บวกควายตองตึง



บวกทำบุญ





ต่าเคโด่ Dupunu Bancha Buharr, 2021 ภูห้วยปู

Doi Chang Pa Pea, Lumpoon Province



Installed during 26-28 July 2021

Dupunu Bancha Buharr, 2021

Doi Chang Pa Pea, Lumpoon Province

https://hazemon.in.th/v2/map.html#

New benchmark needed for fires WRITER: KASEMSAN MANOMAIPHIBOON & VEERACHAI TANPIPAT PUBLISHED : 10 DEC 2021 AT 04:00 (https://www.bangkokpost.com/opinion/opinion/2229559/new-benchmark-needed-for-fires)

As our concluding remark, we point out two simple but practical weatherlinked issues and suggested to regional and local agencies that there is an urgent need for a certain rebenchmarking for benefit the assessment of fire control efforts.

First, the government must <u>compare</u> fire counts in two different years with <u>similar weather conditions</u>, with an <u>emphasis on precipitation</u>.

An aerial photograph of a forest fire in Chiang Mai last year. (Photo: Chiang Mai Volunteer Drone Team)

Second, complement both the assessment and fire monitoring with appropriate satellite monitoring technology.

WELCOME TO King's Earth Observation and Wildfire Research Group

National Centre for Earth Observation

NATURAL ENVIRONMENT RESEARCH COUNCIL

Source:

https://wildfire.geog.kcl.ac.uk/

Source: https://www.cifor.org/knowledge/ photo/35053675074 **Croba Gold Forest Fire Experts Exchange**: Royal Thai Army, Royal Forest Department, US Army Washington National Guard during 1-3 March 2022 at Chiangmai-Lumpang, Thailand - More collaborations are coming!

in Thailand Understanding **Toward Fire Weather**

On-site weather monitoring for prescribed burning, wildfire and emergency response applications.

EXTREME ENVIRONMENTS EXTREMELY RELIABLE

15 minutes. 1 person. No tools.

The FTS Quick Deploy portable weather station is the fire community's most widely used weather station for prescribed burns and temporary monitoring applications.

The last GOES and GPS antenna you'll ever need.

The EON2 CS2 requires no assembly, and no aiming in most locations. Rugged by design, it is completely sealed for marine environments and dome-shaped for superior ice/snow shedding. Smaller, lighter and more durable than a Yagi.•

Key Features:

- Increased reliability
- No assembly
- Lasts longer (better investment than Yagis)
- Does not need aiming in most locations
- Optional aimable mount available if aiming required
- Cabinet top mounting eliminates exposed wiring
- Extremely rugged
- Optional: Integrated GPS Antenna available.
- Optional: aim-able mount (if required).

Real-time weather conditions on demand.

The optional AirTalk gives you mobility by allowing you to call in to the QD via any DTMF capable voice radio for current weather conditions.

- Allows multiple access codes for different sets of weather information—get only the data you need, based on the inquiry code sent.
- Minimizes air time, saves radio power and improves safety by conserving air time for others.
- Instant voice alerts of exceeded weather parameter thresholds provide real-time decisionmaking, maximizing firefighter and public safety.

If the foot spikes won't penetrate the ground, rotate the legs 180° and pile rocks on the unique, hinged "lilypad" feet.

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RFD QD

Name	Latest Value	Last Updated
Fire Weather Index	19.4	Feb 21, 2022 12:00:00 PM (+7:00)
Fine Fuel Moisture Code	87.2	Feb 21, 2022 12:00:00 PM (+7:00)
Duff Moisture Code	119.2	Feb 21, 2022 12:00:00 PM (+7:00)
Drought Code	300.5	Feb 21, 2022 12:00:00 PM (+7:00)
Initial Spread Index	4.4	Feb 21, 2022 12:00:00 PM (+7:00)
Build Up Index	119.7	Feb 21, 2022 12:00:00 PM (+7:00)
Air temperature	25.3 C	Feb 22, 2022 12:00:00 PM (+7:00)
Relative humdity	61 %	Feb 22, 2022 12:00:00 PM (+7:00)
Fuel temperature	29.9 C	Feb 22, 2022 12:00:00 PM (+7:00)
Fuel moisture	9.8 %	Feb 22, 2022 12:00:00 PM (+7:00)
Wind speed	4.1 m/s	Feb 22, 2022 12:00:00 PM (+7:00)
Wind direction	47 deg	Feb 22, 2022 12:00:00 PM (+7:00)
Deletell	0.0	5-b 33 3033 43 00 00 DM (7.00)

FTS Quick Deploy Fire Weather Telemetry 3rd March 2022 at Lumpang Province

On going paper regarding *"Community-based Fire and Water Managment"* with *Tropenbos International, the Netherlands-Tropical Forest Issues #61* under **"Towards fire-smart landscapes"** theme involving HII, WFSRU, DNP and RFD.

Community-based fire and water management in Thailand

Veerachai Tanpipat, <u>Expert and Consultant, Hydro-Informatics Institute, Ministry of Higher Education,</u> <u>Science, Research and Innovation (MHESI), Bangkok, Thailand</u> <u>Royboon Rassameethes, Deputy Director, Hydro-Informatics Institute, Ministry of Higher Education, Science,</u> <u>Research and Innovation (MHESI), Bangkok, Thailand</u> <u>Kobsak Wanthongchai, Dean, Upper ASEAN Wildland Fire Special Research Unit, Forestry Research Center,</u> <u>Faculty of Forestry, Kasetsart University, Bangkok, Thailand</u> <u>Prayoonyong Nhuchaiya, Chief of Special Fire Suppression Unit,</u> Department of National Parks, Wildlife and <u>Plant Conservation, Ministry of Natural Resources and Environment, Bangkok, Thailand</u> <u>Jittisak Yodcum, Chief of Fire Science Section,</u> Royal Forest Department, Ministry of Natural Resources and Environment, Bangkok, Thailand

Note: All authors must be affiliated to a single organization. Emails will be added in the List of contributors

A plan to collect field data of an annual rotation crops burning land preparation by a Laod Tribe in Nan Province, Northern Thailand with FTS QD for fire weather information, fuel load before and after, thermal images by a drone in last week of March by 2 Ph.D students from Faculty of Forestry, KU.

Indonesia Forest Fire Brigades would like to have a series of webinars by inviting Forest Fire Brigades within ASEAN countries in the near future which would include Indonesia, Thailand, Malaysia and Vietnam. Workshop for Sharing Best Practices on Forest Fire Management at the World Forestry Congress, Seoul-Korea May 3-8, 2022.

Two technical-level government officials and forestry experts involved in national forest fire management and related work, especially who have been involved in forest fire management from Asian Forest Cooperation Organization (AFoCO)'s Member States.

Suggestions and Recommendations

- Develop an effective management system with rules, regulations, and restrictions to ensure effective prevention and minimize damage and loss from fire and smoke haze.
- Build a network to share knowledge, lessons learned, problems, best practices, and find solutions in Forest Fire Management Information System (FFMIS). In addition, study more on fire, smoke haze behaviors for better decision making.
- 3. Find an easier and simpler communication schema to deliver scientific information to decision-makers and policy-makers to ensure their support for effective fire prevention and management at all administrative levels.

Suggestions and Recommendations

- 4. Raise public awareness and inform the public about fire prevention and control in all possible ways to get their full cooperation such as campaigns, training or personal visits, etc.
- 5. Implement community-based fire and water management with a holistic ethical approach to sustainability. It is imperative to combine modern knowledge of fire management with deep local wisdom.
- 6. Try to understand the nature and timing of burning in including thermal inversion phenomena in each particular areas and find solutions that need to be adapted to the local and regional context.

Suggestions and Recommendations

- 7. Try to understand human behaviors underlined in causes of forest fire, considering underlying socio-economic and conflict factors.
- 8. Integration of modern and indigenous knowledge and wisdoms perhaps using "fires to manage fires" is the way
- 9. Strengthen all kinds of regional and international cooperation and collaborations through real commitments toward effectively address and resolve the problems of fire and smoke haze problems and issues.
- 10. Have a cloud-based centralized fire and smoke haze information and early warning decision supporting system where anybody can easily access and use in his or her context.

Challenges and Opportunities

- Have a same mind set
- Have correct fire and smoke science fundamental information
- Increase incomes, improve local economy and continuous funding
- Create sustainability with a holistic approach
- Build conservation and preservation mind set within individual

Opportunities:

Challenges:

- Improve livelihood and restore degraded lands
- Integrate the old and new knowledge and wisdoms of science, technology, engineering, and social
- Establish solid international collaborations

Final Words

The fire and smoke haze situation in Thailand seem to be improved, but is it because of unusal rains during fire seasons or management? This fire season 2022 is also less fires becuase of more rains. The CBFWM holistic approach with the integration of indigenous and modern knowledge/wisdoms is needed. People ignite fire because of the economy and social issues, improving livelihood is the way to reduce ignition rate. Smoke haze will be a problem that needs to be reduced. Sustainability, Resilience and Adaptation are our Goals - **"Think Globally, Act Locally!!**

Regional Level

ASEAN

Hydroinformatics Data Centre (AHC)

ASEAN Centre of hydroinformatics and related technologies for water, weather and disaster risk management.

Framework

Knowledge Sharing 🚔

To create a platform for knowledge and information sharing on the role of science and technology for disaster risk reduction and learning from experiences of other countries for climate change adaptation

To build the capacity of the young water expert and young researcher in ASEAN countries

Technology Matching

To match and exchange technology that is applicable to other countries

AHC 5 Thematic Areas

AHC Roadmap

2020 - 2021	2022 - 2025	2026 - 2030		
Phase 1: Data	Phase 2: Technology*	Phase 3: Application		
Knowledge Sharing & Capacity Building	Technology Matching & Capacity Building	Technology Matching & Capacity Building		
Agreement on the thematic areas Define key persons from each country (Focal Point/ CIO role) TA1 and TA3	Capacity building program for research & development to the first group of member	 Expansion of Phase 2 to the second group of member 		

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Expected Outcome

Regional collaboration and learning-based platform for hydroinformatics

Key scientific information, knowledge and good practices of S&T implementation for hydroinformatics

Knowledge sharing on centralized database for policy makers and practitioners to promptly respond to normal and crisis situations and consequently reduce disaster risk

Partnership for new knowledge and regional contribution to capacity building

AHC website

Sharing of information and real-time monitoring data

**The information is shared in "Information" page

- Contributed by AHC -

- Collaboration with External Partner "Himawari-8" by JAXA & HII

<u>www.aseanwater.net</u>

"Hydroinformatics for Disaster Management in ASEAN" by ASEAN Hydroinformatics Data Centre (AHC) and ASEAN CIO Association (ACIOA)

Online Activities

Participated countries in the online activities from AHC, ACIOA, and other relevant agencies

Cambodia Malaysia

- Thailand
- Indonesia Myanmar Singapore Vietnam

Philippines

Activity Timeline

Initiate 3 Communication Channels for disaster communication

- Comments, feedback, and response from ASEAN information sharing activity
- Sharing of "Rainfall and Weather Forecast information" via 3 Communication Channels

- Sharing of the Japanese Geostationary Meteorological Satellite "H imawari" for ASEAN
- Update situation from ASEAN countries

3 Communication Channels

1. AHC Website

2. WhatsApp Group

Hydro Di Aung, HAII,	sasterMNGT HAII, HAII, HAII, HAII, HAII, Hongsi	n, Khin, +60 16	-488 6623		
ARE - PREVENTS Forecast Vietnam	The second seco	c (7am in 16:29	•		
+84 93 7	26 05 94 ~Nguyễn Hoàng		10 20 742	NA: C: End	9/8/202
(MHEN)	VEN KHOM HỌC KHỂ TURNO THỦU VĂN VÀ HẾN ĐỘC KHỈ HẶC THUNG TÂM NGHIỆN CỦU KHÌ TUQNG - KHÌ HẠU	5	+66 81 620 4953 Flood Warning!!	~Chai Tanpipat II 12:09	
		400 400 400 100 100 100 20 10 5 5	+66 81 620 4953	- Chail Tanpipat In the North, Nor t Coast), Thailand Filod and flash floo Filod and flash floo In the State of the State of the State State of the State o	theast, East, dl 8-11 S 30 S 30 S 30 S 31 S 31 S 31 S 31 S 31 S 31 S 31 S 31

On 7 September 2021 www

Hydro Disaster MNGT

3. Facebook page "ASEAN Water Hub" contributed by AHC Myanmar

ASEAN Water Hub

The new Chairmanship

From 1 January 2022 – 31 December 2023

AHC

<u>Chairman</u>

Prof. Law Wing Keung, Adrian

Professor of Civil Engineering, School of Civil & Environmental Engineering and Director, Environmental Process Modelling Centre, Nanyang Environment and Water Resources Institute, Nanyang Technological University (NTU), Singapore

Vice-Chair

Associate Professor Doctor Huynh Thi Lan Huong

Vice Director of Vietnam Institute of Meteorology, Hydrology and Climate Change (IMHEN), Ministry of Natural Resources and Environment (MONRE),

Vietnam

Vietnam

Singapore

Knowledge Sharing Plan for Further Collaboration

Align with AHC Framework: Knowledge Sharing, Technology Matching, and Capacity Building

Meeting	Date (Quarterly)	Торіс	Duration	Means
1 st workshop	Mar 2022	 TA2: Big Data & Data Analytics → Proposed: MY-Big Data & Data Analytics/ SG-Soft sensoring of drainage channels/TH-Big Data: HII experience → Topic: (TBC.) 	3 hrs.	Online
2 nd workshop	June 2022	 TA4: Modeling → Proposed: KH-Hydro-meteorological Modeling/ ID, MM, VN-Modeling/ TH-Modeling in application → Topic: (TBC) 	3 hrs.	Online
3 rd workshop	Sep 2022	 TA5: Sustainable Water Management → Proposed: MM-Sustainable Water Management/ SG-water reclamation, and desalination/TH-Community Water Resources Management → Topic: (TBC) 	3 hrs.	Online
4 th workshop	Dec 2022	TA3: Observation Technology → Proposed: ID-Observation Technology/SG-Satellite and UAV on water quality/ TH-Telemetry → Topic: (TBC)	3 hrs.	Online
5 th workshop	Mar 2023	TA1: HIC Development → Proposed: MY-HIC Development/TH-Hydroinformatics → Topic: (TBC)	3 hrs.	Online