

# GOFC-GOLD



Global Observations of Forest  
Cover and Land Use Dynamics

**Krishna Prasad Vadrevu, Chris Justice and Garik Gutman**

Krishna.p.Vadrevu@nasa.gov

<https://gofcgold.org>



## Program Focus

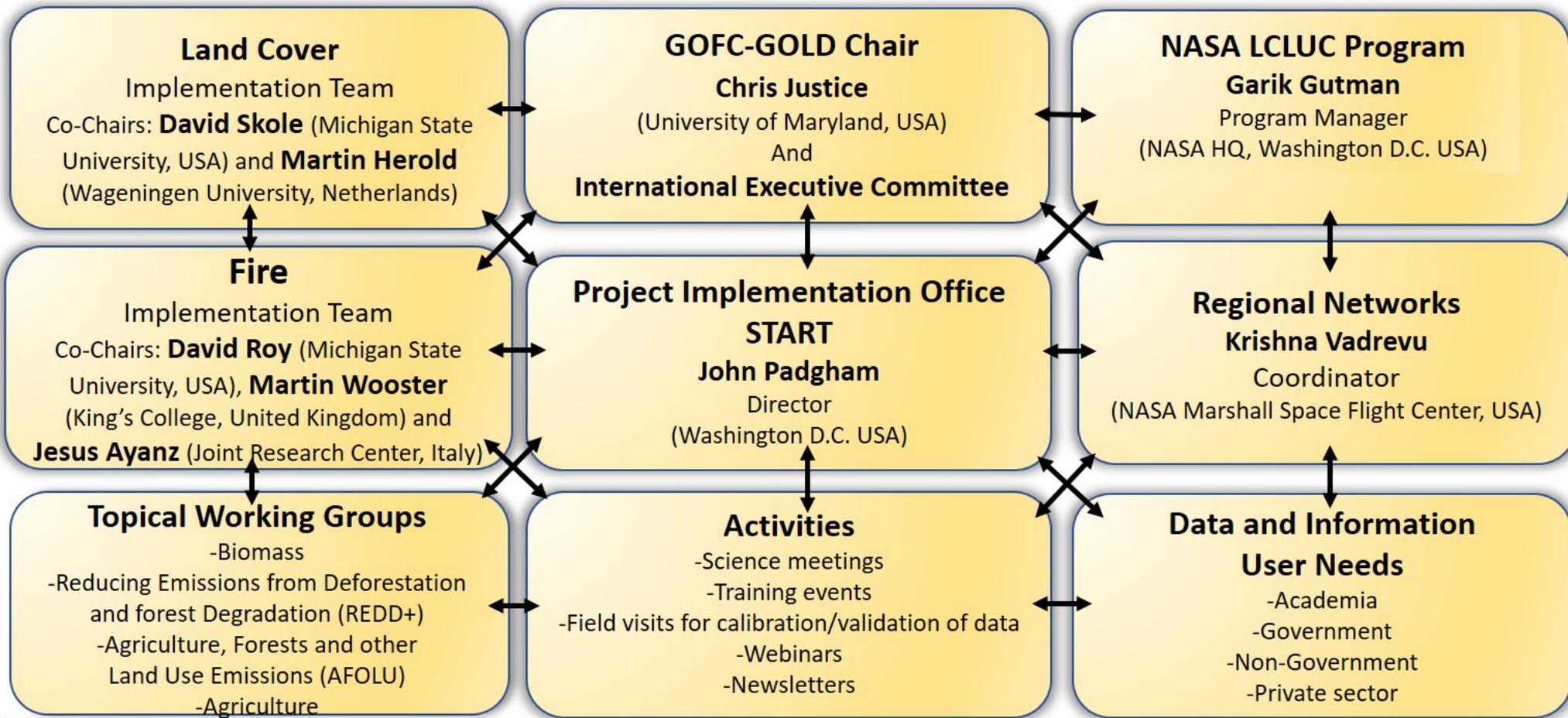
- **Coordination of Spaceborne and In-Situ Measurements of Land cover change and Fire**
- **Derived Data and Information Products**
- **Data Availability and Access**
- **Assistance for Improved Data Utilization through Regional Science Networks (with the START Program)**
- **Communication between Science and Decision Makers**
- **Coordination with other programs – e.g. UN REDD+, GCOS ECVs, CEOS LPV, GEOGFOI, GEOGLAM, etc.**

**An international forum for coordination concerning Earth Observations**



# GOFC-GOLD Structure

## Global Observations of Forest Cover and Land Use Dynamics (GOFC-GOLD)



# GOFC-GOLD Chair

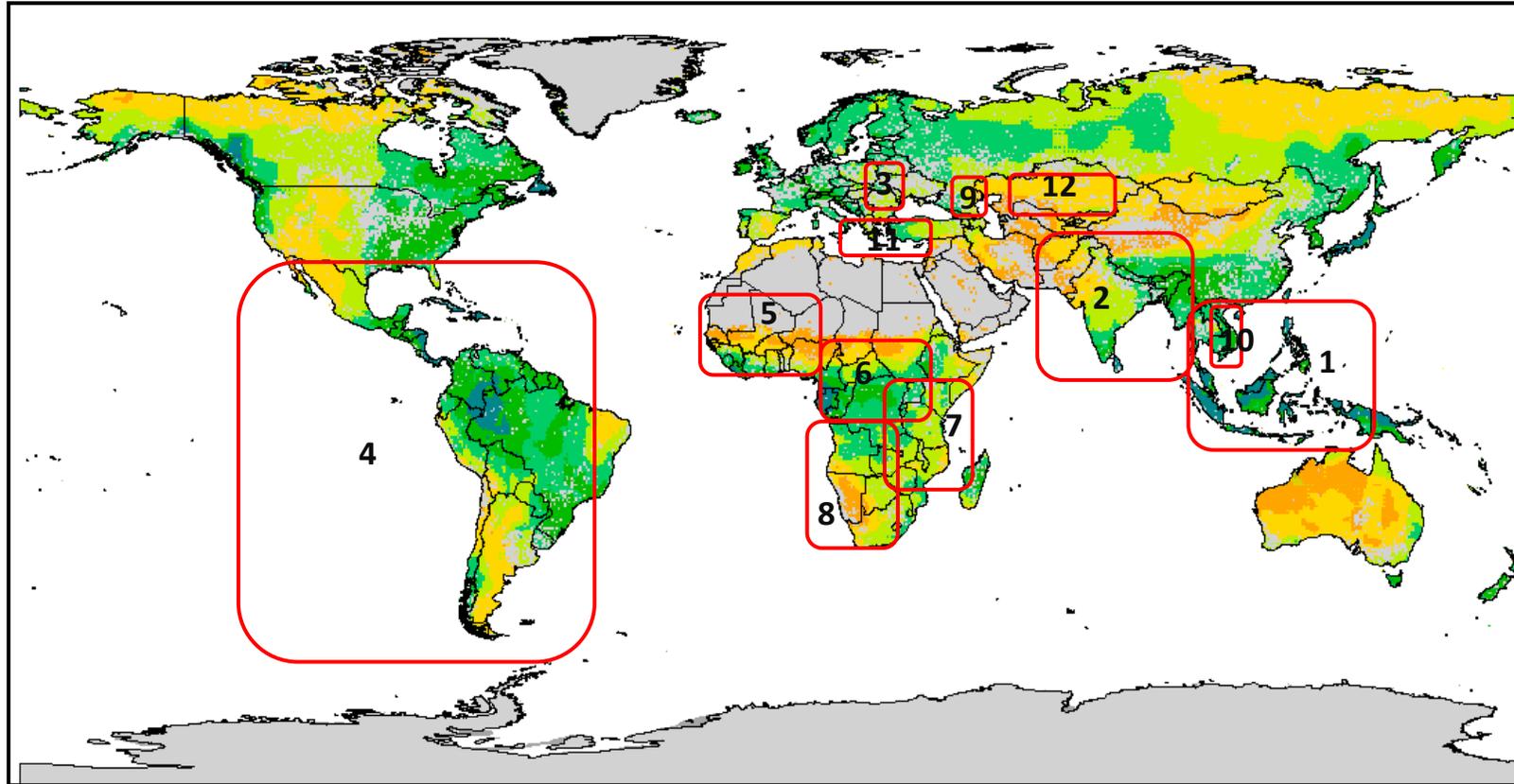


**Dr. Tony Janetos**  
**Boston University**  
**1954-2019**  
**GOFC-GOLD Chair Till mid-2019;**



**Prof. Chris Justice**  
**University of Maryland College Park**  
**GOFC-GOLD Chair Since end of 2019**

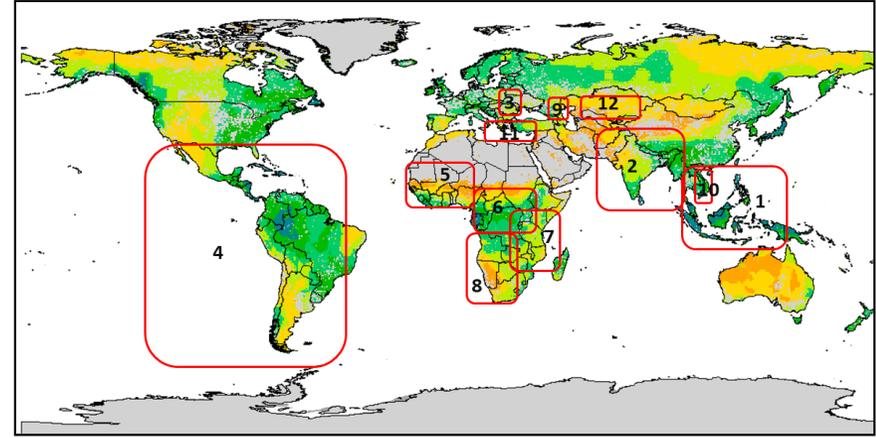
# GOFC-GOLD Regional Networks



Currently active GOFC-GOLD regional networks. 1. Southeast Asia Regional Research and Information Network (SEARRIN); 2. South Asia Regional Information Network (SARIN); 3. South Central European Regional International Network (SCERIN); 4. Red Latinoamerica de Teledeteccion e Incendios Forestales (RedLaTIF); 5. West African Regional Network (WARN); 6. Observatoire Satellital des Forets d'Afrique Central (OSFAC); 7. Miombo Network (MIOMBO); 8. Southern Africa Fire Network (SAFNET); 9. Caucasus Regional Information Network (CaucRIN); 10. Mekong Regional Information Network (MekRIN); 11. Mediterranean Regional Network (MedRIN); 12. Central Asia Regional Information Network (CARIN)

# Role of Regional Networks

- ❖ Strengthen involvement of local scientists for improved validation of satellite products.
- ❖ Play increased role in future satellite missions/products through responding to questionnaires/surveys from agencies.
- ❖ Share local data more openly and assist in product calibration and validation.
- ❖ Focus on evaluating satellite products, and link with GOFC related themes including policy.
- ❖ Interact with the other Regional network scientists and GOFC Executive Committee members to secure funding from International agencies.
- ❖ Improve and extend capacity building and training activities in the region through involving local/regional researchers.



<https://gofcgold.org>

# GOFC-GOLD 20<sup>th</sup> Anniversary Celebrated Sep 13-16<sup>th</sup> 2018, Tbilisi, Georgia

## Summary of the GOFC-GOLD Twentieth-Anniversary Regional Networks Summit

*Krishna Prasad Vadrevu, NASA's Marshall Space Flight Center, krishna.p.vadrevu@nasa.gov*  
*Giorgi Ghambashidze, Scientific-Research Center of Agriculture, Georgia, giorgi.ghambashidze@srca.gov.ge*  
*Cheikh Mbow, START International, Inc., cmbow@start.org*  
*David Roy, South Dakota State University, david.roy@sdsu.edu*  
*Martin Herold, Wageningen University, Netherlands, martin.herold@wur.nl*  
*Tony Janetos, Boston University, ajanetos@bu.edu*  
*Chris Justice, University of Maryland, College Park, cjustice@umd.edu*  
*Garik Gurman, NASA Headquarters, ggutman@nasa.gov*

### Introduction

Global Observation for Forest and Land Cover Dynamics (GOFC-GOLD) is a coordinated international program working to provide ongoing space-based and *in situ* observations of the land surface to support sustainable management of terrestrial resources at different scales. The GOFC-GOLD program acts as an international forum to exchange information, coordinate satellite observations, and provide a framework for and advocacy to establish long-term monitoring systems. It was established as a part of a Committee on Earth Observation Satellites (CEOS) pilot project in 1997, with a focus on global observations of forest cover. Since then, the program has expanded to include two Implementation Teams: Land Cover Characteristics and Change, and Fire Mapping and Monitoring. In addition, two working groups—Reducing Emissions from Deforestation and Forest Degradation (REDD), and Biomass Monitoring—were also formed. GOFC-



GOFC-GOLD Twentieth Anniversary meeting participants. Photo credit: Agricultural University of Georgia team

September 13-16, 2017. There were 45 people from 20 countries in attendance—including participants from Africa, Asia, South America, Eastern and Southern Europe, and the U.S. The Summit was jointly hosted

meeting summaries

**GOFC-GOLD in-person meeting planned in Argentina (UNDP-co-funding), 2020, however due to COVID, the meeting has been postponed.**

**In place for 2023**

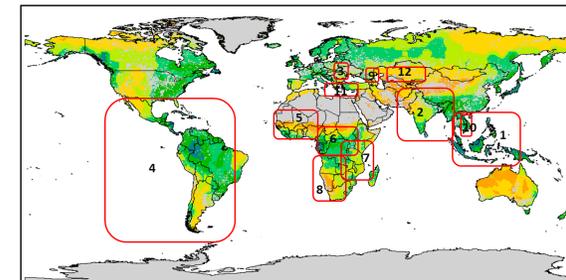
# The last in person Fire IT Meeting (Pre-COVID) – Rome, October 2019



# GOFC-GOLD Regional Networks were Active During COVID

## Virtual Meetings

11th Southern African Fire Network (SAFNet) Meeting	07/28/2021 - 07/29/2021
OSFAC Virtual Seminar on "Congo Basin Forest Monitoring For Sustainable Management"	07/12/2021 - 07/13/2021
Joint MedRIN and SCERIN Virtual Capacity Building Workshop: Pre-Recorded Research Highlights	06/15/2021 - 06/17/2021
Joint MedRIN and SCERIN Virtual Capacity Building Workshop	06/15/2021 - 06/17/2021
CARIN Virtual Meeting	05/06/2021 - 05/07/2021
RedLaTIF Annual Meeting	04/22/2021 - 04/23/2021
GOFC-WARN Regional (Virtual) Workshop	03/24/2021 - 03/25/2021
MEDRIN 2021 Annual Event	02/25/2021 - 02/25/2021
SCERIN Hot-topics Seminar on Bark Beetle Damage, Open to all GOFC-GOLD RINs	01/21/2021 - 01/22/2021
Second CARIN Workshop	05/12/2022-05/13/2022
SCERIN-8 Virtual Workshop	05/30/2022-06/01/2022



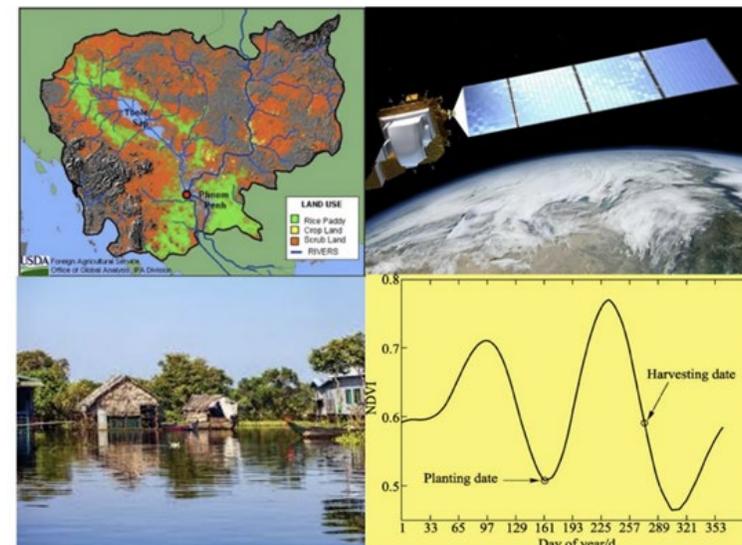
# In-person meeting after 2-years of COVID In Cambodia - GOFC South/Southeast Asia Networks

International Workshop On Land Cover/Land  
Use Changes, Forestry, and Agriculture in  
South/Southeast Asia, Phnom, Penh,  
Cambodia

Meeting: 8-10<sup>th</sup>, August, 2022

Training: 11-12<sup>th</sup>, August, 2022

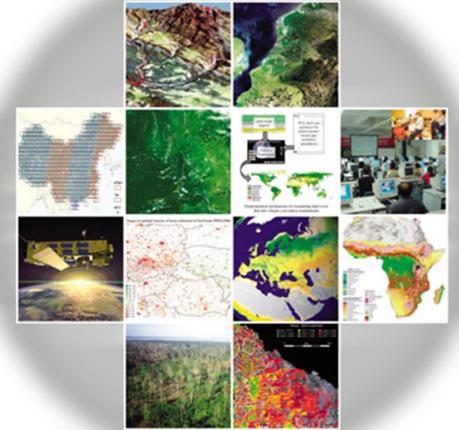
<https://sari.umd.edu/meetings/international-workshop-land-coverland>



# GOFC-GOLD Ex-Com Feedback

- **GOFC Ex-COM**

- As COVID subsides, at least 1-in-person meeting every year
- Combine and rotate virtual meetings with in-person meetings for different networks
- In addition to meetings, plan virtual training events on GOFC themes
  - Involve trainers from the US, Europe, and the region



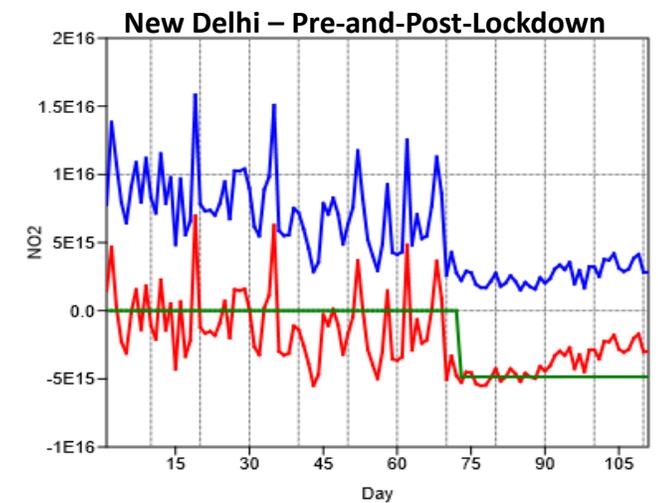
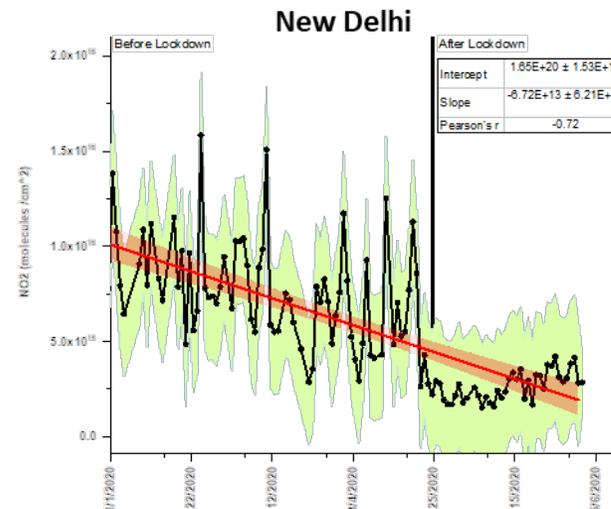
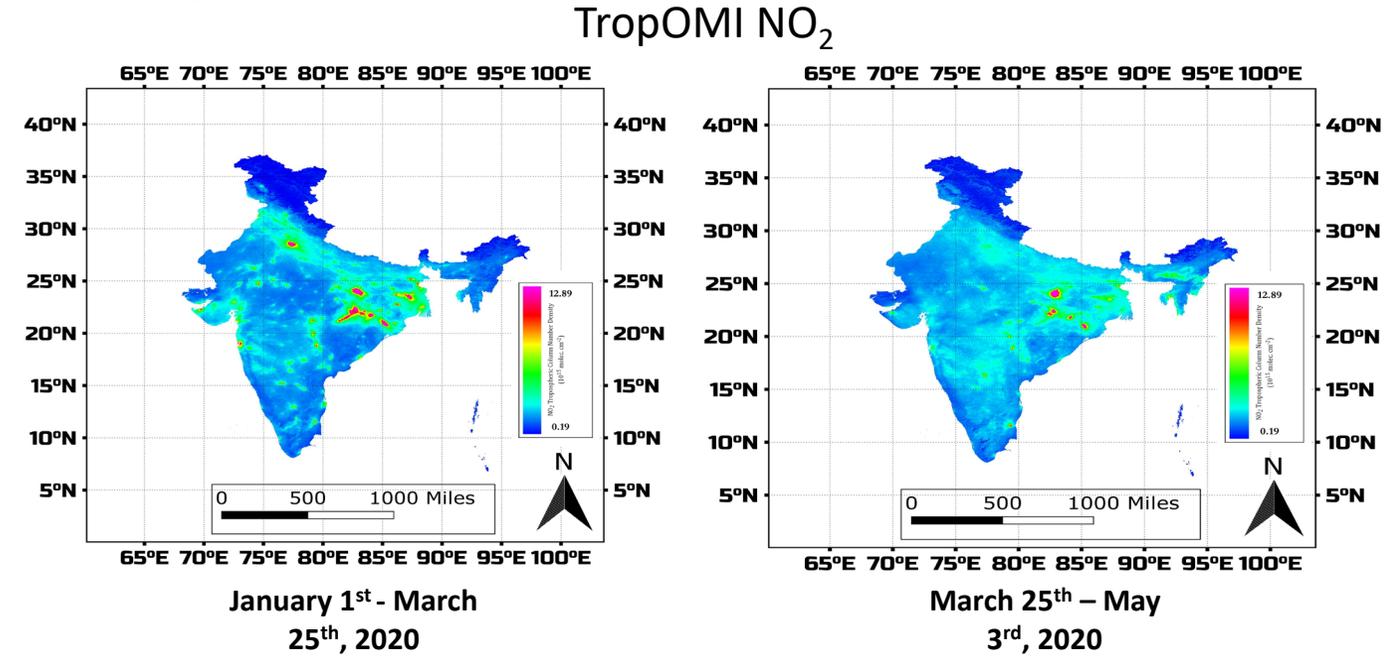
# Ex-COM Feedback To Network Leads and Researchers

- Strengthen the network involving more researchers. Ask your colleagues to join networks
- Build projects through international collaborations – GOFC support and through the US leads
- Establish Thematic working groups if needed;
- Develop a clear “road map” with short-term and long-term goals
- Update your research/projects through the GOFC-GOLD website
- Share the data/publications through GOFC-GOLD website
- Identify capacity building needs and priorities and reach out to Ex-Com
  - Training topics
  - Focused science themes
- Share the data/publications through GOFC-GOLD website
- Please try to attend other GOFC regional network meetings

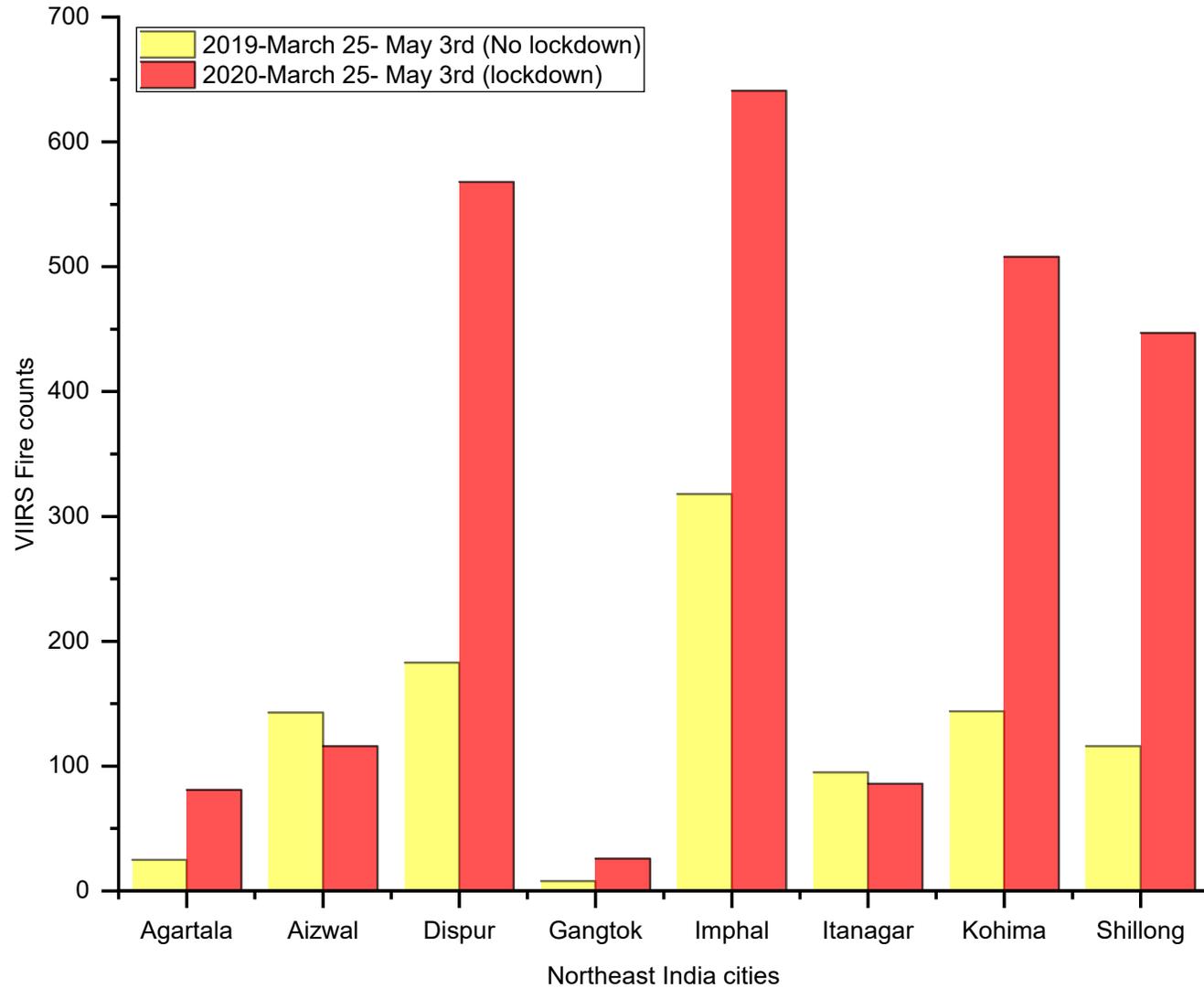
# Recent Fire Situation in South/Southeast Asian Countries

# Spatial and temporal variations of Air pollution over 41 cities of India during the COVID-19 lockdown period

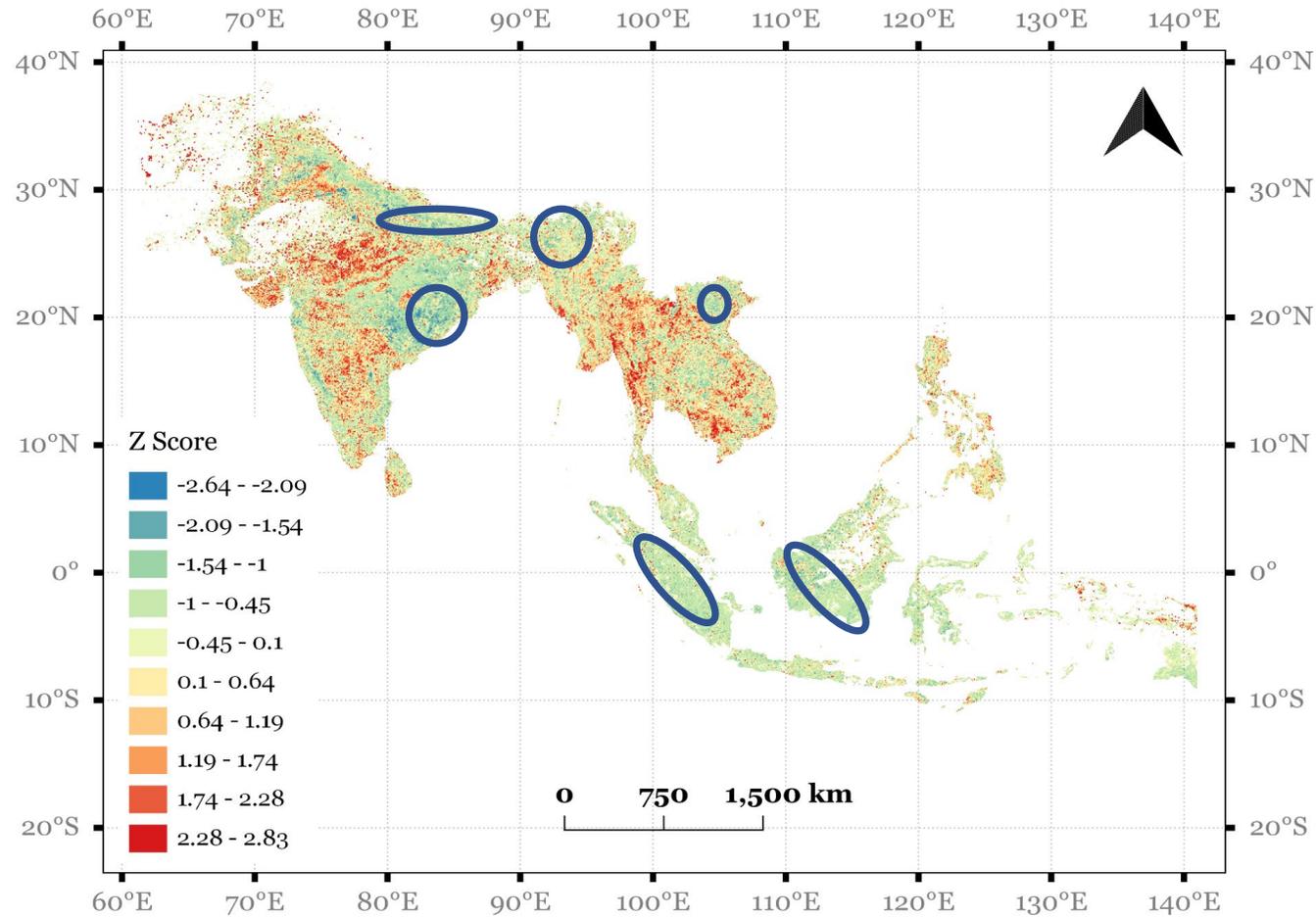
- How much was NO<sub>2</sub> pollution reduced during Phase-1 and 2 of the COVID-19 full country lockdown (March 25-May 3<sup>rd</sup>, 2020)?
- Specifically, how did NO<sub>2</sub> in the 2020-lockdown compare to the same period in 2019, when there was no lockdown?
- Which cities had the highest and least reduction in NO<sub>2</sub>? Are there scaling effects in NO<sub>2</sub> levels in cities, i.e., based on the spatial distance to the city center?
- How do satellite derived NO<sub>2</sub> compare with ground-based measurements?
- What was the overall reduction in NO<sub>2</sub> for major cities across India and are the differences statistically significant?



# NO<sub>2</sub> pollution in Northeast Indian cities DID NOT decrease during the COVID lockdown due to Vegetation Fires

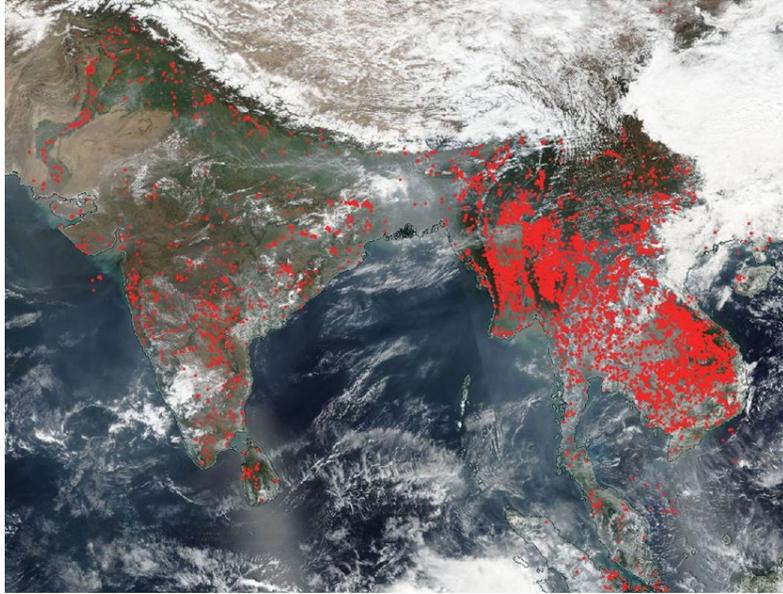


# Spatial variations in vegetation fires and emissions in South and Southeast Asia during COVID-19 and pre-pandemic



$$\text{Z score FC (pandemic year 2020)} = \frac{(2020 \text{ FC} - \text{Mean FC of 2012 to 2020 (non-pandemic years)})}{\text{Standard deviation (2012-2020)}}$$

# Significant decrease in Fires in Several South/Southeast Asian Countries during COVID-2020 and related Total Particulate Matter Emissions



VIIRS FC, March 11<sup>th</sup>, 2020 in Asia

Countries	2020 COVID year FC	2019 FC	Percent Increase/decrease in FC
Afghanistan	2164	856	152.80
Bangladesh	11054	10965	0.81
India	470667	531727	-11.48
Pakistan	50865	52647	-3.38
Nepal	8409	31299	-73.13
Bhutan	478	605	-20.99
Sri Lanka	7534	7185	4.85

Countries	2020 COVID year FC	2019 FC	Percent Increase/decrease in FC
Brunei	183	240	-23.75
Cambodia	200712	180640	11.11
Timor Leste	4217	7421	-43.17
Indonesia	87853	427265	-79.43
Laos	177161	172356	2.78
Malaysia	9333	19973	-53.27
Myanmar	409866	377443	8.59
Philippines	37398	42814	-12.65
Thailand	219482	234860	-6.54
Vietnam	70178	72266	-2.88

**South Asia:** 2020-COVID year had an overall reduction of ~0.26Tg TPM emissions compared to previous non-COVID years and 0.14Tg less than 2019 non-COVID year.

**Southeast Asia:** 2020-COVID year had an overall reduction of ~1.11Tg TPM emissions compared to previous non-COVID years and 1.75Tg less than 2019 non-COVID year.

5th GOFC-GOLD Fire IT and  
Global Wildfire Information System  
(GWIS)

Stressa, Italy  
21-23 June 2022

# **FIRE MONITORING IN SOUTHEAST ASIA**

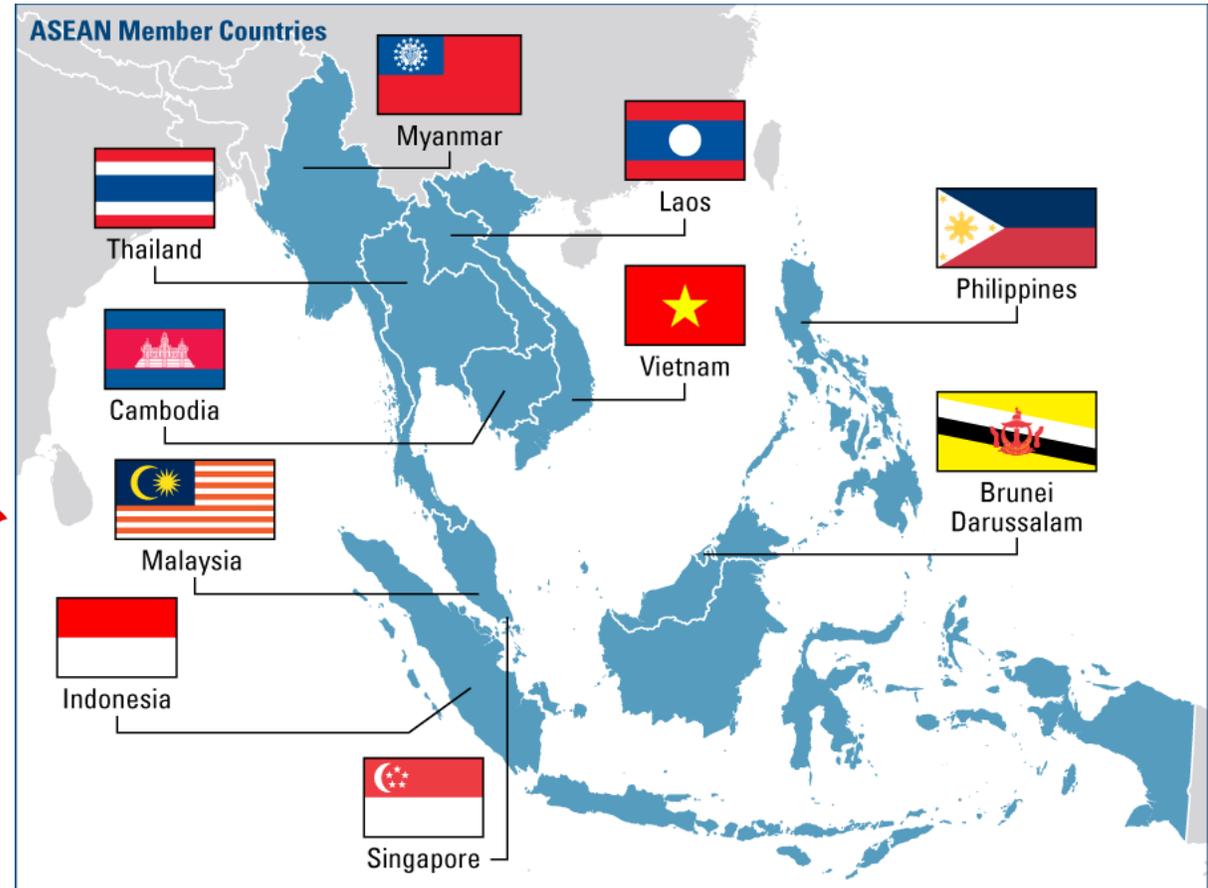
**Dr. Israr Albar**  
SEARRIN

# ASEAN Region

ASIAN



ASEAN



# 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
- Ratified by all ASEAN Member States

## Objective

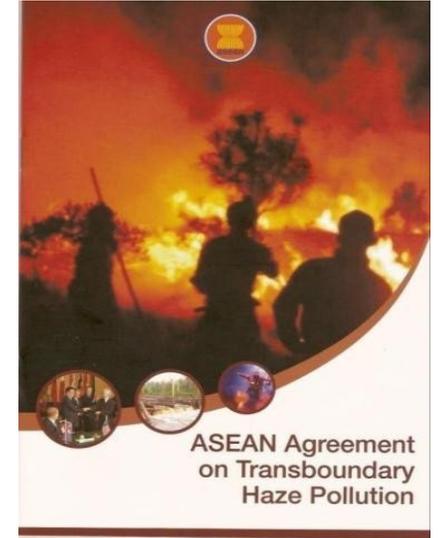
Prevent, monitor, and mitigate land and forest fires to control transboundary haze pollution through concerted national efforts, regional and international cooperation

## General Obligations

- Cooperate in developing and implementing measures to prevent, monitor, and mitigate transboundary haze pollution
- Respond promptly to a request for relevant information sought by a State or States that are or may be affected by the haze pollution
- Take legal, administrative and/or other measures to implement their obligations under the Agreement

## Areas of cooperation

- Monitoring and assessment
- Prevention and preparedness
- Mitigation, joint emergency response, and assistance
- Technical cooperation and scientific research



# ASEAN Coordinating Centre for Transboundary Haze Pollution

## Functions

- Establish and maintain regular contact with the respective National Monitoring Centres regarding the **data, including those derived from satellite imagery and meteorological observation**, relating to: Land and /or forest fire; Environmental conditions conducive to such fires; and Air quality and levels of pollution, in particular haze arising from such fires.
- Facilitate cooperation and coordination among the Parties to increase their **preparedness** for and to respond to land and/or forest fires or haze pollution arising from such fires.
- Facilitate coordination among the Parties, other States and relevant organisations in taking effective measures to **mitigate** the impact of land and/or forest fires or haze pollution arising from such fires.
- Assist the Parties in the preparation of **standard operating procedures (SOP)**.

# Strengthening Collaboration among SEA countries



## "FOREST FIRE PREVENTION: EARLY WARNING, MONITORING, AND FIELD IMPLEMENTATION"

The 5th Webinar Series

THURSDAY, NOVEMBER 25, 2021 | 02.00 - 04.00 PM (GMT+7 JAKARTA TIME)

"LESSONS LEARNED FROM SUPPORTING THE ROLE OF KPMS IN FIRE PREVENTION IN WEST KALIMANTAN"



Guest Speaker

**Georg Buchholz**

GIZ-Germany

CHAIR PERSON



**Dr. Erianto Indra Putra**

Department of Silviculture Faculty of Forestry and Environment IPB University

"BMKG'S FIRE DANGER RATING SYSTEM FOR FOREST FIRE MITIGATION AND PREVENTION"



**Dr. Agie Wandala**

Meteorological, Climatological, and Geophysical Agency

"VIETNAM FOREST FIRE MONITORING SYSTEM: OVERVIEW OF TECHNOLOGY AND OPERATION"



**Dr. Hoang Viet Anh**

Vietnamese Academy of Forest science (VAFS)

Free E-Certificate

Registration Link :

<https://ipb.link/fires5thwebinarseries>

The Webinar is Supported by The ITTO-Indonesia MoEF Project "Capacity Building on Forest and Land Fire Management in Indonesia" Which was Funded by The Government of Japan.



## "FOREST FIRE PREVENTION MANAGEMENT AND REHABILITATION"

The 6th Webinar Series

TUESDAY, DECEMBER 21, 2021 | 02.00 - 04.00 PM (GMT+7 JAKARTA TIME)

Guest Speaker



"SCIENCE-BACKED BURN-FREE FARMING CAMPAIGN"

**Sue Yip**  
Executive Director BRACE

Guest Speaker



"LOW-COST, EASY AND YIELD-BOOSTING BURN-FREE FARMING SOLUTIONS"

**Hilario Padilla**  
Project Manager (Regenerative Agriculture) BRACE



"FOREST FIRE PREVENTION, RESPONSE AND MANAGEMENT: PHILIPPINE CONTEXT"

**Jhun B Barit**  
Senior Forest Management Specialist DENR-Forest Management Bureau Forest Resources Conservation Division



"THE CHALLENGES, OPPORTUNITIES AND PROSPECTS OF MAPPING INDONESIA'S FIRE HISTORY USING REMOTE SENSING DATA"

**Dr. Yenni Vetrira**  
Research Organization for Aeronautics and Space (LAPAN), National Research and Innovation Agency (BRIN)

Chair Person



"REVEGETATION OF TROPICAL PEATLANDS FOR FIRE MANAGEMENT 2021"

**Dr. Janice Ser Huay Lee**  
Assistant Professor on Asian School of the Environment and Earth Observatory of Singapore, Nanyang Technological University of Singapore



**Prof. Dr. Ir. Bambang Hero Saharjo M Agr**  
Professor on Forest Protection, Faculty of Forestry and Environment, IPB University

Free E-Certificate

Registration Link :

<https://ipb.link/fires6thwebinarseries>

The Webinar is Supported by The ITTO-Indonesia MoEF Project "Capacity Building on Forest and Land Fire Management in Indonesia" Which was Funded by The Government of Japan.



## "FOREST FIRE PREVENTION IS REALLY NEEDED"

The 7th Webinar Series

THURSDAY, JANUARY 27, 2022 | 02.00 - 04.00 PM (GMT+7 JAKARTA TIME)

Guest Speaker



**Dr. Michael Allen Brady**  
Principal Scientist at CIFOR



**Mr. Peter Thavone**  
Planning and Cooperation Division Department of Forestry, Ministry of Agriculture and Forestry, Lao PDR



**Dr. Veerachai Tanpipat (วีรชัย ตันพิพัฒน์) D.Eng.**  
Research Scientist at Upper ASEAN Wildland, Fire Special Research Unit, Forestry Research Center, Kasetsart University, Thailand



**Mr. Sihol Aritonang**  
President Director PT.RAPP/APRIL, Indonesia

Chair Person



**Dr. Yenni Vetrira**  
Research Organization for Aeronautics and Space (LAPAN), National Research and Innovation Agency (BRIN)

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# AFoCO Training on Forest Fire Management Information Systems

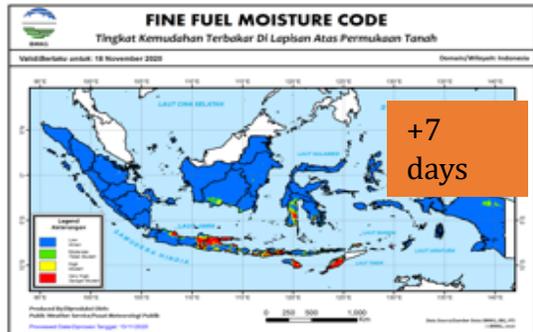


**Asian Forest Cooperation Organization (AFoCO)** with the aim of imparting an understanding of the application of technologies in the management of fire information from 1-5<sup>th</sup> Nov. The training welcomed 47 participants from AFoCO member countries who have been involved in forest fire management. During the training course, a total of 8 lectures were led by experts from various organizations, including Thailand Kasetsart University, National Research and Innovation Agency, President Office of Indonesia, Planning, Directorate of Forest and Land Fire Management of Indonesia, Kyungpook National University, and the AFoCO Secretariat.

# Indonesia Fire Early Warning System

## Early Warning

Fire Danger Rating System



Daops Rengat (19/2)

## Early Detection

MoEF-  
[sipongi.menlhk.go.id](http://sipongi.menlhk.go.id)

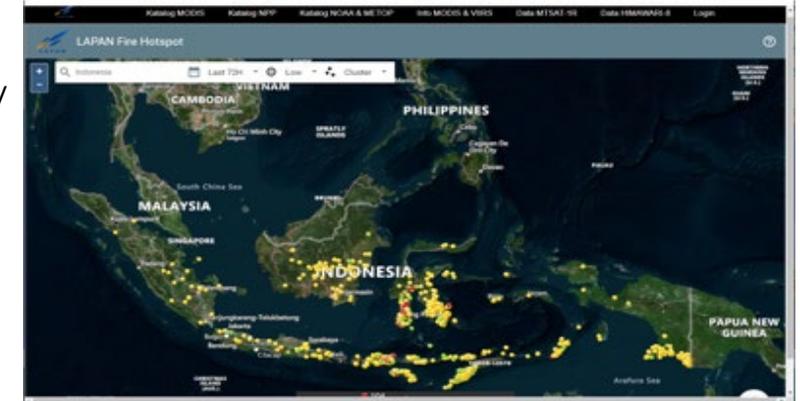


LAPAN-<http://modis-catalog.lapan.go.id/monitoring/index#>



NOAA, Terra/Aqua, SNPP, Landsat, Himawari

<http://modis-catalog.lapan.go.id/monitoring/>

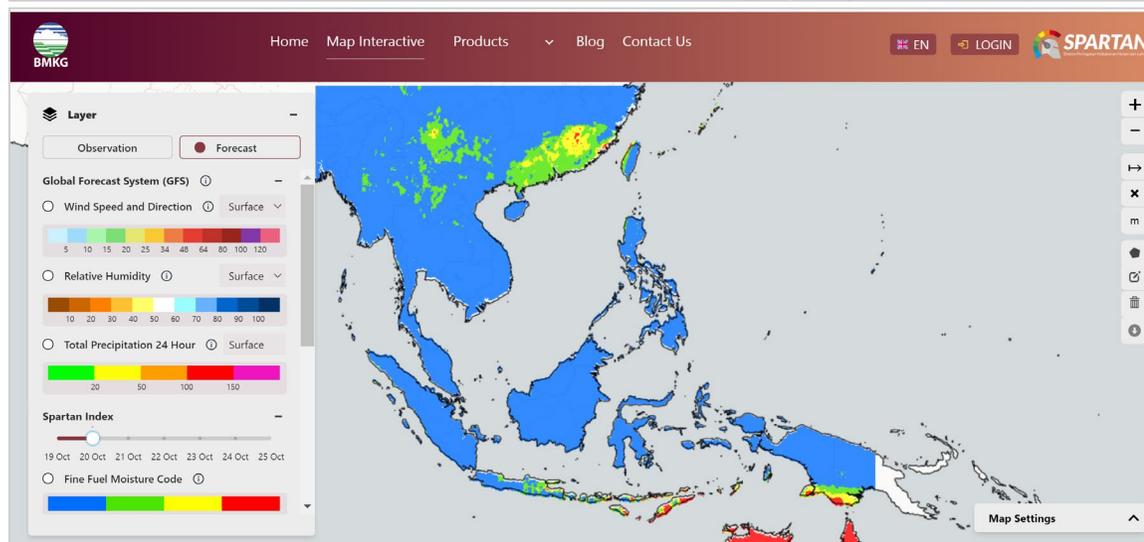
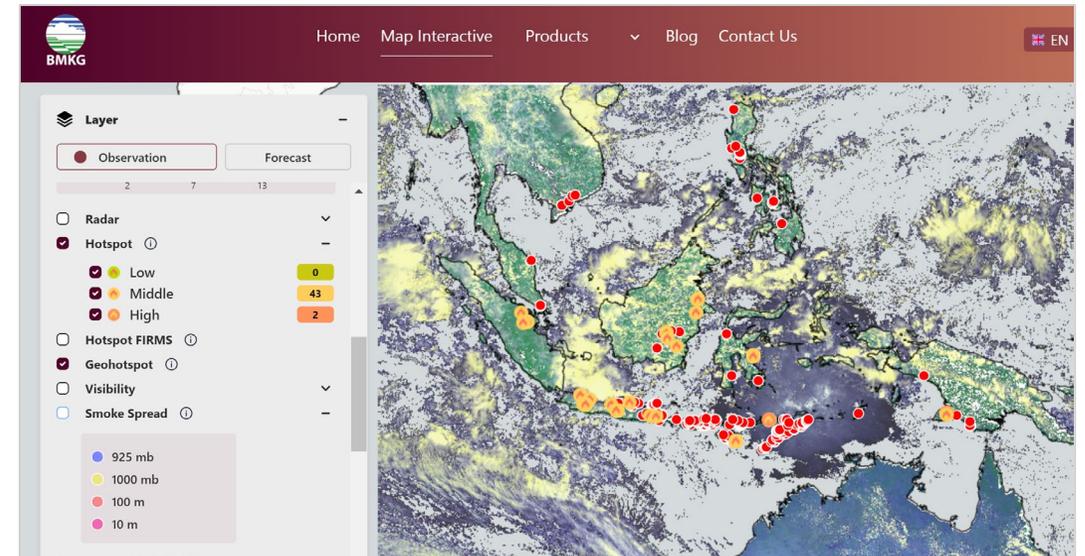
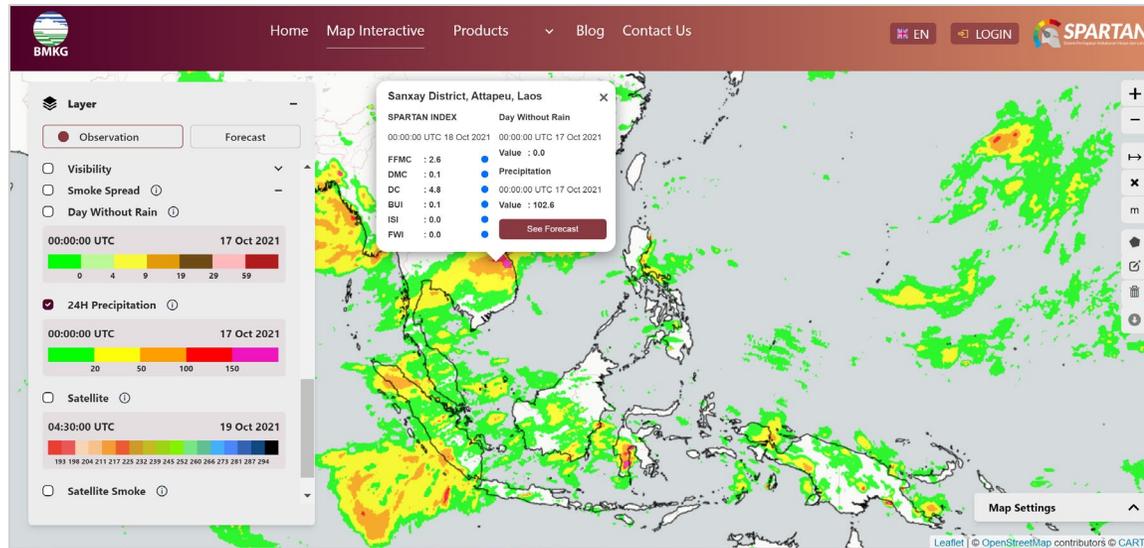


<http://sipongi.menlhk.go.id/home/main>



Since 1997 we developed and improved our early detection called SIPONGI where we employ NOAA, Terra/Aqua, SNPP and now Landsat 8 to detect active fire. Additionally, Himawari satellite -captured by BMKG- also completed us with daily smoke distribution and Geo-hotspot.

# Latest Technology on Fire Danger Rating System



Risk assessment strategies for early detection of ASEAN regions called **SPARTAN (Integrated and Interactive Forest Fire Warning System)**  
Website: [spartan.bmkg.go.id](http://spartan.bmkg.go.id)

6-month in advance predictions

# From Space to the Ground

## Daily Hotspot Monitoring (MODIS) (28/3/2022)



Pesisir Selatan Regency, West Sumatera

## Ground Check (29/3/2022)



## Suppression by Manggala Fire Brigades and stakeholders (29/3-2/4/2022)



## Burned area estimation (Landsat/Sentinel) (11/4/2022)



# Real-time Haze Monitoring & Forest Fire Detection Information Centric Networks

To build and validate low-cost haze monitoring sensors that can be deployed in remote rural areas to warn rural citizens when too much haze is present.

<https://canarin.net/seahazemon/map.html>

Thailand : 44 nodes

Philippines : 7 nodes

Indonesia : 3 nodes

Laos : 2 nodes



# Challenges and opportunity for strengthening regional network

- Exchange knowledge and information among experts and practical on fire management in South East Asia.
- Enhancing Capacity of National Monitoring Center (NMC) on fire monitoring through training/workshop.
- Collaboration on air quality data collection (Thailand, Malaysia, Indonesia) through SEA-Hazemon
- Involvement of scientists and researchers from all partners provides opportunities for interactions improving research and technical competencies.

