



TRAINING REPORT

# Forest Fire Management Information System (FFMIS)

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1 – 5 November 2021

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## TRAINING REPORT

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1 – 5 November 2021

## Notes to Readers

The training report was prepared by the AFoCO Regional Education and Training Center to the Short-Term Training Course on "Forest Fire Management Information System" virtually organized on 1 – 5 November 2021

The Secretariats AFoCO and ITTO are grateful for the support and resources provided by participants of the Member Countries: Bhutan, Brunei Darussalam, Cambodia, Indonesia, Kazakhstan, Kyrgyzstan, Lao PDR, Malaysia, Mongolia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam.

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## ABBREVIATIONS AND ACRONYMS

API	Air Pollutant Index
ASCCC	ASEAN Socio-Cultural Community Council
ASEAN	Association of Southeast Asian Nations
ASMC	ASEAN Specialized Meteorological Centre
BFP	Bureau of Fire Protection
BFRD	Brunei Fire and Rescue Department
BDA	Big Data Analytics
BNCCP	Brunei national Climate Change Policy
DDMC	District Disaster Management Center
DILG	Department of Interior & Local Government
DNP	Department of National Parks
DSS	Decision Support System
EMB	Environmental Management Bureau
FDRS	Fire Danger Rating System
FFDMS	Forest Fire Detection and Monitoring System
FFMIS	Forest Fire Management Information System
FNCRR	Forest and Nature Conservation Rules and Regulation
ForFIS	Forest Fire Information System
FMU	Forest Management Unit
GIS	Geographic Information System
IoT	Internet of Things
MAFF	Forest Fire Prevention Measurement
MYSA	Malaysian Space Agency
NASA-FIRMS	NASA Fire Information for Resource Management System
NaSOP	Brunei Darussalam National Standard Operating Procedure
NCCAP	National Climate Change Action Plan
NDCs	Nationally Determined Contributions
NEA	National Environment Agency
NEC	National Environment Commission
NEMA	National Emergency Management Agency
NSPSF	North Selangor Peat Swamp Forest
NTFP	Non-Timber Forest Product
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
REDD+	Reduced Emissions from Deforestation and Degradation-Plus
RGoB	Royal Government of Bhutan
SCDF	Singapore Civil Defense Force
TMC	Weather Modification Technology
UAV	Use of Remote-controlled Aerial Vehicles
WMO	World Meteorological Organization

## 1. BACKGROUND

Forest fires are a hazard with physical, biological, ecological, and environmental consequences. Both natural processes and anthropogenic activities cause forest fires, but over 90 percent are human caused. In spite of having beneficial effects on some ecosystems, such as forest rejuvenation for some species, they can bring about a serious threat to the natural environment and humankind. Demographic pressure, the expansion of agricultural land, and the conversion of forest land into other land use increase the risk of human-induced fire.

To improve forest fire management, information management and technology must be capitalized and incorporated into practical operations. In 2020, Australian bushfires, the term used for a forest fire or wildfire, burnt an estimated 18.6 million hectares, burnt buildings, and some people died. In the northern summer of 2021, damaging fires occurred in the USA and Canada, Turkey, Greece, Southern Italy, the Arctic circle, and South America. In most areas, even though fires play a vital part of forest ecology and regeneration in some cases, fires also play one of the most destructive roles in the forest ecosystem, resulting in drastic deterioration of the environment. Large damaging forest fires occur in remote and wildland fire urban interface (WUI) areas. The basic rule of fire suppression and control is the faster the fire is detected, and the more rapidly fire suppression is undertaken, the easier that fire will be under control with the less the damages and impact to the ecosystem. However, with management of forest fire control in United State of America where there has been an emphasis on fire suppression and the effects of climate change, many countries mentioned above face unprecedented challenges such as increasing fire size and intensity which results in rapidly increasing cost of suppression, and so on. Nowadays, early warning systems, near real time or real-time fire detection, and reporting are becoming important components in effective forest fire readiness to enable rapid response and reduce damage and loss. There are already a number of free and open forest fire detection and monitoring systems in operational use, and we need to learn and explore what would be the most suitable for the region.

This training course provides an understanding of the applications of technology for fire and smoke haze information (Fire and Smoke-Infomatics) and fire management. The intention is that all the accumulated knowledge and experiences provided by the training can be applied and transferred to improve forest fire control and management in AFoCO Member Countries. Furthermore, the interventions from the training course will be part of the baselining information for the development of a regional initiative to be discussed at the "High-Level Workshop on Forest-related Disaster Management and Impacts of Climate Change" in 2022.

## 2. OBJECTIVES

The objectives of the training course are to 1) describe and enhance the understanding of integrated forest fire management, 2) explore the available forest fire detection and monitoring systems and relevant forest technology, and 3) share the knowledge and experience of the best practices of forest fire management in AFoCO Member Countries.

Eight sessions were provided by the trainers and various experts from international organizations, universities, research institutes, and government agencies. The overview of the lectures is in **Attachment-1**.

### 3. PARTICIPANTS ANALYSIS

#### 3.1 INFORMATION OF PARTICIPANTS

This course welcomed 47 technical-level government officials and forestry experts involved in forest landscape restoration and related work of the Member Countries. Those involved for a minimum of one year of serving the government was invited from the respective member countries.

**Table 1. Number of participants from the member countries**

No.	Country	No. of Participants
1.	Bhutan	2
2.	Brunei Darussalam	2
3.	Cambodia	2
4.	Indonesia	12
5.	Kazakhstan	2
6.	Kyrgyzstan	2
7.	Lao PDR	2
8.	Malaysia	5
9.	Mongolia	2
10.	Myanmar	2
11.	Philippines	6
12.	Singapore	2
13.	Thailand	2
14.	Vietnam	4
	<b>Total</b>	<b>47</b>

**Table 2. Position of participants**

No.	Position	No. of Participants
1.	Deputy Director / Deputy Chief	6
2.	Forest Management Specialist	9
3.	Forestry Officer	11
4.	Manager	2
5.	Researcher	5
6.	Technical Officer	7
7.	Lecturer	4
8.	Assistant Director	3
	<b>Total</b>	<b>47</b>

## 3.2 PURPOSE OF PARTICIPATION

Country	Purpose of Participation
Bhutan	<ul style="list-style-type: none"> <li>• What are the appropriate ways to tackle and put down forest fires in mountainous terrain?</li> <li>• What are the scope and way forward to improve forest fire management in ASEAN member countries in the coming years?</li> </ul>
Brunei	<ul style="list-style-type: none"> <li>• To gain knowledge, experiences and lessons learned on Forest Fire Management by other AFoCO member countries.</li> <li>• To learn of new methods in forest fire prevention and control technologies.</li> </ul>
Cambodia	<ul style="list-style-type: none"> <li>• How is strategy to mainstream local community contributes fire suppression and poverty reduction?</li> <li>• What is technology to detect wildfire?</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>• What strategies should be taken to improve forest fire management information system (FFMI) in Indonesia?</li> <li>• How to involve the community and manage them to restore and prevent fires?</li> <li>• Who are the stakeholders that should take part in the forest fire management?</li> </ul>
Kazakhstan	<ul style="list-style-type: none"> <li>• Exchange of experience in extinguishing steppe fires, as well as crown fires.</li> <li>• How forest and steppe fires are detected.</li> </ul>
Kyrgyzstan	<ul style="list-style-type: none"> <li>• Exchange of experience in extinguishing forest fires, preventive measures, extinguishing fires in border areas (joint coordination).</li> <li>• Application of new fire prevention technologies, how forest fires are detected.</li> </ul>
Lao PDR	<ul style="list-style-type: none"> <li>• Exchange and share work experiences, knowledge and lessons learned of forest fire system management and forest fire control technologies in other country.</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>• To explore the use of technologies in preventing and managing forest fire in Malaysia especially peat fires.</li> <li>• To recognize the opportunities offered by developed countries in terms of funding.</li> </ul>
Mongolia	<ul style="list-style-type: none"> <li>• How can we have the forest fire risk system at the national level? Who can be able to work with us for this purpose?</li> </ul>
Myanmar	<ul style="list-style-type: none"> <li>• How can we do the forest fire management with the participation of local communities?</li> <li>• How do we develop in controlling and management of forest fire for conserving natural environment by learning the experiences implementing in the other countries?</li> </ul>
Philippines	<ul style="list-style-type: none"> <li>• Gain more knowledge on the recent technology, innovations, tools, and methods on early detection of forest fire occurrences.</li> <li>• Acquire good practices and approaches applied from other countries in prevention and suppression of forest fire.</li> <li>• To become potential technical lead/expert in forest fire management in the Country.</li> </ul>
Singapore	<ul style="list-style-type: none"> <li>• Singapore's nature reserves are centralized and due to the small size of our remaining nature reserves, small fires (not just large ones) will also have a great impact on our biodiversity. We would like to find out if there are any more effective methods in detection and monitoring of these fires in tropical forests with very dense canopy before they reach a large-scale causing extensive damage (including technological solutions).</li> <li>• Singapore has many offshore islands which are accessible by ferry. What should be equipped on the island to keep it ready in case of any forest fires? How about evacuation routes considering that some islands only have one jetty.</li> </ul>
Thailand	<ul style="list-style-type: none"> <li>• Learn about forest fire prevention and forest fire control technologies.</li> <li>• Exchange and share work experiences, knowledge and lessons learned of forest fire management from all AFoCO member countries.</li> <li>• Gain new perspectives and ideas from various experts.</li> </ul>
Viet Nam	<ul style="list-style-type: none"> <li>• How to early detect forest fire?</li> <li>• Which measure can be used to reduce damage from forest fire?</li> </ul>

(Note: Information excerpted from Country Reports submitted by Participants)

### 3.3 CORE PROBLEMS

#### · Core Problem per Country

Country	Core Problems
Bhutan	• Need to re-stock and enrich degraded forests
Brunei	• Low productive and resilient landscape: Forest landscape restoration were public domain (perception) or responsibility
Cambodia	• Low survival of Native Forest Restoration
Indonesia	• Inadequate timber production in forest and non-forest land
Kazakhstan	• Implementation of forest and land rehabilitation is slow
Kyrgyzstan	• N/A
Lao PDR	• Deforestation and forest degradation
Malaysia	• Forest degradation
Mongolia	• Ongoing deforestation and forest degradation
Myanmar	• Inadequate integration of FLR in existing reforestation initiatives
Philippines	• Unsustaining FLR implementation
Singapore	• High rate of deforestation in Timor Leste
Thailand	• High rate of degraded forest landscapes in the Northern region
Viet Nam	• N/A

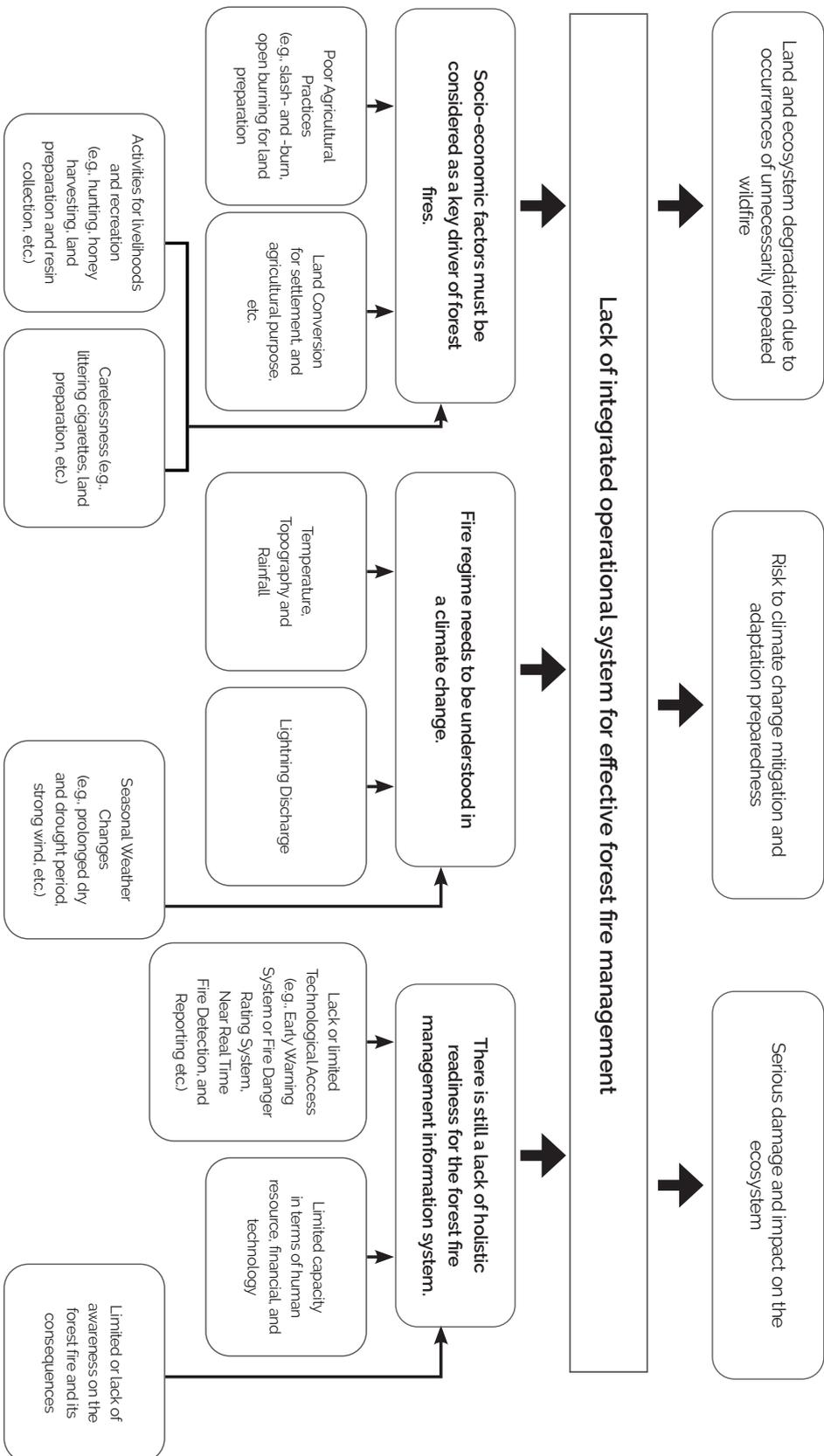
(Note: Information excerpted from Country Reports submitted by Participants)

· **Underlying Causes of Forest Fire in AFoCO Member Countries**

Activities	Member Countries
1. Carelessness (e.g., accidental human activities or negligence)	Bhutan, Brunei Darussalam, Cambodia, Lao PDR, Singapore, Thailand, Myanmar
2. Human activities for daily livelihood and recreation (e.g., hunting, honey harvesting, resin collection, etc.)	Bhutan, Cambodia, Indonesia, Lao PDR, Myanmar, Thailand, Viet Nam
3. Natural cause (e.g., , lightning discharges,	Bhutan, Kazakhstan, Mongolia
4. Poor agricultural practices (e.g., open burning for land preparation, agricultural debris burning, etc.)	Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Viet Nam
5. Shifting cultivation or Slash-and Burn	Cambodia, Lao PDR, Myanmar, Viet Nam
6. Arson	Indonesia, Malaysia, Philippines, Thailand
7. Limited capacity on addressing forest fire problems (e.g., human resource, technology, financial, etc.)	Cambodia, Indonesia, Myanmar, Philippines
8. Conflicts (e.g., policy conflict, human-wildlife conflict, etc.)	Bhutan, Philippines, Thailand
9. Fault of population	Kazakhstan, Kyrgyzstan
10. Land conversion for new settlement, agriculture, concession, etc.	Brunei Darussalam, Cambodia, Myanmar
11. Limited awareness and experience on fire prevention	Cambodia, Indonesia, Myanmar
12. Transition of steppe fires	Kazakhstan, Kyrgyzstan
13. Unidentified Causes	Kazakhstan, Kyrgyzstan
14. Land encroachment	Cambodia, Thailand, Myanmar

(Source: Country reports from the Member Countries at the AFoCO Short-Term Training Course on Forest Fire Management Information System, November 1-5, 2021)

## PROBLEM TREE ON FFMIS IN THE AFOCO REGION



(Source: Interventions from 14 Member Countries at the AFOCO Short-Term Training Course on Forest Fire Management)

### 3.4 ADDITIONAL QUESTIONS RELATED TO FFMIS

Q1. DO YOU HAVE THE GOVERNMENT AGENCY OR AGENCIES WHICH DIRECTLY RESPONSIBLE FOR FOREST FIRES CONTROL IN YOUR COUNTRY? IF THERE IS NOT, WHAT AGENCIES ARE CO-RESPONDING TO SUCH TASK AND UNDER WHAT LAWS AND REGULATIONS?	
Bhutan	<ul style="list-style-type: none"> <li>Department of Forest and Park Services (RGoB), Department of Disaster Management, Royal Bhutan Police are all directly involved in controlling forest fires</li> </ul>
Brunei	<ul style="list-style-type: none"> <li>For forest fire specifically, we do not. We have a Fire and Rescue Department who indirectly responsible for forest fire control. For disaster level fire, related agencies responsible may include Forestry Department, National Disaster Management Center, Meteorology Department, and other agencies based on the severity of the fire.</li> </ul>
Cambodia	<ul style="list-style-type: none"> <li>N/A</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>Ministry of Environment and Forestry (MoEF) have one of the directorates that handles land and forest fires is the Directorate General of Climate Change who leads the Directorate of Forest and Land Fire Control.</li> <li>MoEF have an organizational structure up to the site level such as Manggala Agni that routinely patrols.</li> <li>There are MPA/Masyarakat Peduli Api formed by government and cooperate coordination with local government, it is communities group in site/village level in the each prone to fire villages</li> <li>There are local government related disaster management.</li> <li>TNI and Polri in site level, increase the intensity of patrols in the dry seasons</li> </ul>
Kazakhstan	<ul style="list-style-type: none"> <li>According to the order of the Committee for Forestry and Wildlife, the personal responsibility of the first heads of state forest owners was established for untimely detection and extinguishing of forest fires, the transfer of information, as well as for poor performance of measures to prevent the occurrence of forest fires. That is, each forest institution has its own firefighting service, including equipment. But according to the plan between the Ministry of Ecology and Emergencies for the prevention and elimination of forest and steppe fires in the territory of the Republic of Kazakhstan in the event of large forest fires, that is, + 25 hectares, we, according to the plan, involve employees of the fire service of the Ministry of Emergency Situations.</li> <li>All work is carried out in accordance with the Forest Code of the Republic of Kazakhstan, as well as the Joint Order to reduce the risks of occurrence and liquidation of forest and steppe fires between the MEGPR and the Ministry of Emergency Situations.</li> </ul>
Kyrgyzstan	<ul style="list-style-type: none"> <li>The State Forestry Agency, Department of Forest Conservation and Protection, is responsible for fighting forest fires. The Ministry of Emergency Situations jointly helps to extinguish forest fires.</li> </ul>
Lao PDR	<ul style="list-style-type: none"> <li>Ministry of Agriculture and Forestry, as Department of forestry in the National level and Provincial level is mainly responsible for forest fires control cooperation and coordination with district and village level.</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>Fire and Rescue Department of Malaysia (BOMBA)</li> <li>Forestry Department of Peninsular Malaysia</li> <li>Department of Environment Malaysia</li> <li>Ministry of Environment and Water</li> </ul>
Mongolia	<ul style="list-style-type: none"> <li>Yes, they have the directly responsible National Emergency Management Agency</li> </ul>
Myanmar	<ul style="list-style-type: none"> <li>Forest Officers from the Forest Department are mainly responsible for forest fires control in Myanmar without any cooperation with other agencies.</li> </ul>

<b>Philippines</b>	<ul style="list-style-type: none"><li>• Yes, we do. The Bureau of Fire Protection is responsible for the prevention and suppression of all destructive fires on buildings, houses and other structures, forest, land transportation vehicles and equipment, ships or vessels docked at piers or wharves or anchored in major seaports, petroleum industry installations, plane crashes and other similar incidents, as well as the enforcement of the Fire Code and other related laws.</li></ul>
<b>Singapore</b>	<ul style="list-style-type: none"><li>• Yes, we do. We have a Wildfire Task Force led by the Singapore Civil Defense Force (SCDF), with members from across many different government agencies. The aim is to use a Whole-of-Government approach and to have a joint agency response for preventive and mitigation measures against vegetation fires.</li></ul>
<b>Thailand</b>	<ul style="list-style-type: none"><li>• Yes, we do have agencies which directly in charge of forest fires control.</li></ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"><li>• N/A</li></ul>

**Q2. DO YOU HAVE DIRECT FOREST FIRE LAWS AND REGULATIONS OR YOU HAVE ONLY RELATED LAWS AND REGULATIONS TO USE FOR (SECOND PART OF QUESTION #1)?**

<b>Bhutan</b>	<ul style="list-style-type: none"> <li>• Forest fire is covered under Forest and Nature Conservation Act 1995 and Forest and Nature Conservation Rules and Regulations 2017.</li> <li>• Forest Fire Rules and regulation 2012</li> <li>• Forest Fire Management strategy, 2013</li> </ul>
<b>Brunei</b>	<ul style="list-style-type: none"> <li>• We do, under Laws of Brunei, Chapter 46, Forest, section 20; Prohibition as to fire</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>• Department of Fire Police and Rescue under Ministry of Interior is responsibility to prevent and fight fire including wildfire as well. At all levels (arm forces, authorities, public) are obliged to protect and fight forest fire according to forestry and fisheries laws.</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>• Indonesia have Laws Related forest fire and direct forest fire regulations. Basic Law Number 5 of 1990, Law Number 41 of 1999, Presidential Instruction (Inpres) Number 3 of 2020 concerning Management of Forest and Land Fires, Law Number 32 of 2019 concerning Fire Control forest and Land and Others</li> </ul>
<b>Kazakhstan</b>	<ul style="list-style-type: none"> <li>• Rules directly related to forest fires: <ul style="list-style-type: none"> <li>- Fire safety rules in forests, which is developed in accordance with the Forest Code of the Republic of Kazakhstan, which determines the procedure for fire safety in forests.</li> <li>- Rules for accounting, determination and compensation for damage caused by fires on the territory of the forest fund.</li> <li>- Resolution of the Government of the Republic of Kazakhstan "On approval of base rates for calculating the amount of harm caused by violation of the forest legislation of the Republic of Kazakhstan".</li> <li>- Order on the approval of norms and standards for the protection, protection, use of the forest fund, reforestation, and afforestation in the areas of the state forest fund.</li> </ul> </li> </ul>
<b>Kyrgyzstan</b>	<ul style="list-style-type: none"> <li>• The position of the fire safety rule in the forests of the Kyrgyz Republic.</li> </ul>
<b>Lao PDR</b>	<ul style="list-style-type: none"> <li>• Forest Law (2019), National Forest Strategy to 2035 and vision to 2050 and Guidance on Forest Fire Prevention Measurement.</li> <li>• Article 52 Prevention and Control of Forest Fires</li> <li>• Forest fire prevention and control is to protect forests and forest resources from destruction by fire.</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>• National Forestry Act 1984 [Act 313]</li> <li>• Sabah Forest Enactment 1968</li> <li>• Sabah Forest Rules 1969</li> <li>• Sarawak Forest Ordinance 2015 (Chapter 71)</li> <li>• Natural Resources and Environment Ordinance (Fire Danger Rating System) Order, 2004 (Section 18(h)</li> <li>• Environment Quality Act 1974</li> <li>• Akta Pengurusan BOMBA 341</li> <li>• Akta Kualiti Alam Sekeliling 1974</li> <li>• Principle 6: Environmental Impact. Indicator 6.5.5 Fire prevention and control plan to be prepared and implemented for all fire prone forest types. (Malaysian Criteria and Indicators for Sustainable Forest Management)</li> <li>• Pelan Tindakan Pembakaran Terbuka Kebangsaan</li> <li>• Program Mencegah Kebakaran Tanah Gambut Untuk Merentas Jerebu di Malaysia</li> <li>• Clean Air Action Plan</li> </ul>

<b>Mongolia</b>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
<b>Myanmar</b>	<ul style="list-style-type: none"> <li>• In Forest Law (1995,2018), Section 41 states that a person who make fire to destroy the forest must be punished which may extend to 300,000-500,000 MMK or (164 USD \$-273 USD \$) with imprisonment for a term which may extend to 2 years or with both.</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>• We do not have direct forest fire laws, instead forest fire laws in the Philippines are included in general laws such as the Fire Code, Clean Air Act, Revised Forestry Code, Wildlife Act, Tobacco Regulation Act on Smoking Ban and others.</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>• We have general laws of 'No Smoking' in nature reserves and 'No Open fires and no barbecuing' in the nature reserves, national parks, and public parks.</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>• Yes, in the National Reserved Forests Act, B.E. 2514 (1971) Section 14.3 Within the boundary of the national reserved forests, no person may possess for the benefits or reside in the land, construct, reclaim, burn down the forest, log, collect wild matters, or conduct any act that may damage the state of the national reserved forest except the followings: <ul style="list-style-type: none"> <li>- Logging or collecting wild matters under Section 15, entering for utilization, or residing under Section 16, Section 16 bis, or Section 16 ter, any act under Section 17, utilization under Section 18 or any act under Section 19 or Section 20</li> <li>- Logging prohibited wood or collecting prohibited wild matters under the law on forest.</li> </ul> </li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>

**Q3. DO YOUR COUNTRY HAVE A NATIONAL FOREST FIRE PLAN?**

<b>Bhutan</b>	<ul style="list-style-type: none"> <li>We don't have fire plan at the national level as of now. However, we have forest fire management groups and plans developed at District and community level.</li> </ul>
<b>Brunei</b>	<ul style="list-style-type: none"> <li>We have, they are included under Brunei Darussalam National Standard Operating Procedure (NaSOP).</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>We don't have national forest fire plan. However, we have line agency (Forestry Cantonments, local community forestry) to report when forest fire happened in their boundary and sometime based on NASA notification (informal).</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>Yes, we have national strategic plan for 2024 on climate change control</li> </ul>
<b>Kazakhstan</b>	<ul style="list-style-type: none"> <li>The Ministry of Emergency Situations of the Republic of Kazakhstan is developing a national fire safety plan in the country, which provides for points to prevent forest and steppe fires.</li> </ul>
<b>Kyrgyzstan</b>	<ul style="list-style-type: none"> <li>Provision of fire safety rules in the forests of the Kyrgyz Republic.</li> </ul>
<b>Lao PDR</b>	<ul style="list-style-type: none"> <li>We already put in the forest law (2019), forest Strategy, in addition still have notification, order from Ministry of Agriculture and Forestry for fire management.</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>Malaysia does not have any national forest fire plan. However, there are plan prepared dedicated to certain Reserve Forest / forest complex, such as:</li> <li>Forest Fire Management Plan for Kuala Langat North and Kuala Langat South Forest Reserve (2017 – 2021).</li> <li>Cooperative Fire Management Plan for North Selangor Peat Swamp Forest (NSPSF) in Integrated Management Plan for NSPSF 2014-2023.</li> <li>Forest Fire Management Plan for Sugut Conservation Area.</li> </ul>
<b>Mongolia</b>	<ul style="list-style-type: none"> <li>Yes, we have our country forest fire related laws and regulations link to (<a href="https://legalinfo.mn/mn/detail/421">https://legalinfo.mn/mn/detail/421</a>)</li> </ul>
<b>Myanmar</b>	<ul style="list-style-type: none"> <li>Not yet.</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>No, but forest fire is included in the general national forest protection plan.</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>We have an SOP for Wildfire Preventive Measures.</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>Yes, we do have the National Forest Fire Plan which has the Office of the Permanent Secretary, Ministry of Natural Resources and Environment is the main coordinator.</li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

#### Q4. WHAT ARE CAUSES OF FOREST FIRES IN YOUR COUNTRY AND BY WHOM IN WHAT FOREST TYPES AND WHY?

Bhutan	<ul style="list-style-type: none"> <li>Human, electric short circuit and natural. Most of the forest fire occurs in chirpine and bluepine forest of Bhutan since the chirpine and bluepine forests are in the dryer side of the slope and have thicker deposition of needles (fuel) which easily catch fire both from natural and anthropogenic causes. In majority, the causes of forest fires are anthropogenic and man-made.</li> </ul>
Brunei	<ul style="list-style-type: none"> <li>Main causes are anthropogenic and usually during dry season, some bush fires are due to people do open burning, especially for agricultural purposes and fire become uncontrolled and spread to nearby forest. Some case of forest fire also caused by people deliberately burn the bush/forest and other reported case may cause by nature, lightning, reflection from glass.</li> <li>Most fire occurred near urban areas, its tropical Rainforest, but the fire prone areas are mostly covered by grass and invasive fire-resistant acacia tree species</li> </ul>
Cambodia	<ul style="list-style-type: none"> <li>Deciduous Forest type is normally damaged by fire in dry season but green leaf will regrow in wet season because of raining. It was caused by human activities such as land grabbing, burn forest to catch wildlife, resin collection, careless of local people (cooking, smoking, cigarette..., etc.) new settlements in forest area and using fire to clear road and land after harvesting.</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>1. land conversion, which is caused by the activity of preparing (burning) land for agriculture, for example land preparation by the community;</li> <li>2. the use of natural resources, which is caused by activities such as bush burning and cooking activities by illegal loggers or fish hunters in the forest;</li> <li>3. the use of peatlands, which is caused by the activity of making canals or canals without being equipped with adequate control gates of water causing peat to become dry and flammable</li> </ul>
Kazakhstan	<ul style="list-style-type: none"> <li>In 2021, the fires were caused by: <ul style="list-style-type: none"> <li>- From lightning discharges 32.5%.</li> <li>- Transition of steppe fires 15%.</li> <li>- Through the fault of the population 3%.</li> <li>- In the form of other organizations 1%.</li> <li>- From unidentified reasons 48.5%.</li> </ul> </li> <li>In addition, the main reasons for the spread of fires over large areas: <ul style="list-style-type: none"> <li>- Insufficient provision of forestry with machinery and equipment.</li> <li>- Lack of coordination between forestry institutions when extinguishing a fire.</li> <li>- As a result of the transition of steppe fires to the lands of the sff and the human factor.</li> </ul> </li> </ul>
Kyrgyzstan	<ul style="list-style-type: none"> <li>In our country, the causes of forest fires remain largely unknown, the human factor and thunderstorms.</li> </ul>
Lao PDR	<ul style="list-style-type: none"> <li>About 80% of forest fire happen from human activities like agriculture expansion, shifting cultivation, wildlife hunting, infrastructure, mostly forest fire is usually occurred in mixed deciduous forest and dry forest.</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>Anthropogenic factors (traditional agricultural practices, recreational, hunting, fishing), mainly occurred at degraded peatland areas, which neighboring to human activities such as agricultural land for oil palm and cash crops.</li> </ul>
Mongolia	<ul style="list-style-type: none"> <li>Human activities and natural causes are the major source of forest fire in our country.</li> </ul>

<b>Myanmar</b>	<ul style="list-style-type: none"><li>• Forest fires are usually occurred in mixed deciduous forest, dry forest and Deciduous Indaing forest and mainly caused by human activities such as extensive agriculture, shifting cultivation and natural factor such as high temperature.</li></ul>
<b>Philippines</b>	<ul style="list-style-type: none"><li>• Forest fires are usually in grassland and tropical rainforest and mainly caused by anthropogenic factors such as unregulated slash and burn farming, smoking, or natural causes such as extreme heat during the summer.</li></ul>
<b>Singapore</b>	<ul style="list-style-type: none"><li>• Forest Type within Singapore: Tropical Rainforest</li><li>• Possible causes of forest fires within Singapore:<ul style="list-style-type: none"><li>- Smoking / Cigarette butts</li><li>- Public conducting prayers within the forest, placing candles or incense burning</li><li>- Dry leaf litter during dry spells</li></ul></li></ul>
<b>Thailand</b>	<ul style="list-style-type: none"><li>• The activities and behaviors of human have mainly caused the forest fire in Thailand such agricultural burning, land encroachment, carelessness, and lack of caution of fire used.</li></ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"><li>• N/A</li></ul>

<b>Q5. WHICH PARTS OR REGIONS OF YOUR COUNTY HAVE FOREST FIRE OR FIRE PROBLEMS AND IN WHAT PERIODS OF YEAR OR WHAT CONSIDER TO BE A FIRE SEASON IN YOUR COUNTRY? WHAT KIND OF TERRAIN ARE THOSE FIRES OCCUR, FLAT OR MOUNTAINOUS? WHAT KIND OF FOREST FIRE TYPES ARE THOSE, GROUND, SURFACE, OR CROWN FIRES?</b>	
Bhutan	<ul style="list-style-type: none"> <li>In Bhutan, forest fire occurs mostly in the east and western part of the country. It occurs during drier season of the year from October to April. Bhutan is mountainous and fire occurs mostly in mountainous terrain. All forms of forest fire do occur in Bhutan, ground, surface, and crown based on the intensity of the fire, fuel, and the terrain. Ground fires are mostly observed in broad leaved forest. While the crown fires are prevalent in conifers and sloppy areas.</li> </ul>
Brunei	<ul style="list-style-type: none"> <li>Related to question #4, most of the bushfires occurred near urban areas, housing area, highway, etc. These usually intensifies during dry season or in between weather transition period; February - April, June - August. Surface and crown fires occurs at these areas.</li> <li>We used to have severe fire problem annually in peatland areas, but in recent years, it is now very minimal or almost non due to mitigation measures being taken. The area is now being flooded or the water table have risen through canal blocking. Usually ground fire occurred at this area.</li> </ul>
Cambodia	<ul style="list-style-type: none"> <li>Natural Forest and Forest Plantation are always destroyed by fire in dry season starting from December to May every year and mostly happened in north of country.</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>the current condition of the pattern of forest and land fires occurring throughout Indonesia, but with the distribution on peat and non-peatlands. The forest and forest fire season occurs along with the arrival of the dry season and depends on days without rain. Peat fires are the most influential in Sumatra and Kalimantan and some in Sulawesi.</li> <li>The cycle of forest and land fires in Indonesia:</li> <li>Pre-Crisis Phase (January-April) Forest and land fires have just emerged in several areas of Riau and West Kalimantan Provinces This phase is relatively safer. Crisis Phase (June-October) Forest and land fires have emerged in several areas of Sumatra, Kalimantan, Sulawesi, Java, Bali, Nusa Tenggara</li> </ul>
Kazakhstan	<ul style="list-style-type: none"> <li>The Republic of Kazakhstan is administratively divided into 14 regions and 3 cities of republican significance.</li> <li>The fire hazardous season on the territory of the state forest fund is established annually according to the order of the authorized body, in many cases it is from April to November.</li> <li>Large forest fires occur mainly in the forest-steppe zones of the republic. In mountainous areas, due to the humid and cool weather, fires do not spread especially over large areas. But unfortunately, in May of the current month, a large forest fire occurred in the Ridder forestry institution of the East Kazakhstan region, which covered 276.4 hectares of forest plantations.</li> <li>According to the types of fire, these are downstream fugitive, downstream stable, soil (soil-peat) and upstream.</li> </ul>
Kyrgyzstan	<ul style="list-style-type: none"> <li>Forest fires occur in summer and autumn; June, July, August, and September are a fire hazardous season. We have forest fires in remote mountainous regions</li> </ul>
Lao PDR	<ul style="list-style-type: none"> <li>Most of Lao country cover by mountainous about 70%, among that located in the Northern part and mostly fire happen in the mountainous area during Mar-June it's surface fire, the cause from local people activities.</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>Peninsular Malaysia often happened on peatland and degraded peat swamp forest in Selangor, Johor, and Pahang. Normally happened in between May until July, where normally received low precipitation and prolonged hot and dry weather. Type of fire on peatland normally ground and surface fire.</li> <li>State of Sarawak- Northern part where most of agriculture activities conducted by local farmers in between June until September. Most fire occurred in bush and peatland forest normally ground and surface type.</li> <li>Sabah State – Often occurred in West Coast Division, within the period of May until September, consisting mostly of peatland and degraded forests however there are also occasional forest fire in mountainous area. The forest fire types are mostly ground and surface fires.</li> </ul>

<p><b>Mongolia</b></p>	<ul style="list-style-type: none"> <li>• Forest and steppe fires occur in our country Forest fires occur in the central and northern regions of our country Steppe fire occur in the eastern regions of our country Our country has two seasons of forest and steppe fire risk.</li> </ul>
<p><b>Myanmar</b></p>	<ul style="list-style-type: none"> <li>• Around the country, except Ayeyarwaddy and Tanintharyi Regions which are delta regions of Myanmar, have occurred forest fires especially in dry season starting from February to May. At that season, high temperature the range of 30-46 degree Celsius and high air temperature encourage to become fire.</li> </ul>
<p><b>Philippines</b></p>	<ul style="list-style-type: none"> <li>• The Northern Regions of the Philippines usually have the most incidents of forest fires and occurs mostly during the summer season.</li> <li>• Forest fires occur in both flat and mountainous terrain and are usually ground and surface fires.</li> </ul>
<p><b>Singapore</b></p>	<ul style="list-style-type: none"> <li>• Singapore is within a tropical / equatorial climate without clear-cut seasons. However, there are spells of dry weather during the monsoon season, with February usually being the driest month.</li> <li>• Forest fires that occur are usually caused by cigarette butts and incense burning from the public, hence surface fires develop. Quite rarely, crown fires take place as well.</li> </ul>
<p><b>Thailand</b></p>	<ul style="list-style-type: none"> <li>• The major forest fires in Thailand are in the northern region especial in the dry season (November-April).</li> <li>• Most of the forest fires that occur in Thailand are in mountainous areas, which are ground fires.</li> </ul>
<p><b>Viet Nam</b></p>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>

**Q6. DO YOU HAVE FOREST FIRE INFORMATION SYSTEM TO SUPPORT DECISION MAKING IN YOUR COUNTRY? IF YOU HAVE, WHICH AGENCY IS RESPONSIBLE FOR SUCH SYSTEM? IF YOU DO NOT HAVE WHICH FREE FIRE INFORMATION SYSTEMS, ARE YOU USING TO SUPPORT YOUR TASKS SUCH AS NASA-FIRMS OR GWIS?**

<b>Bhutan</b>	<ul style="list-style-type: none"> <li>We don't have forest fire information system of our own. We are very familiar with NASA-FIRMS for detecting forest fires in the locality.</li> </ul>
<b>Brunei</b>	<ul style="list-style-type: none"> <li>No, we do not have information system specifically for forest fire.</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>We don't have forest fire information system. We generated forest fire information through local forestry administration, community forestry and NASA notification.</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>Yes, we have. Directorate General of Climate Change is responsible to develop and manage the system. The sipongi.melhk.go.id system. For official government data sources for satellite data originating from LAPAN and weather data from BMKG with the guardian of hotspot distribution, areas prone to forest and land fires and fire areas at the Directorate of Forest and Land Fire Control</li> </ul>
<b>Kazakhstan</b>	<ul style="list-style-type: none"> <li>In Kazakhstan, there is a Republican Dispatch Center under the Committee for Forestry and Wildlife, which keeps records of forest-steppe fires, receives, and transmits information about the course of extinguishing forest fires, and controls aviation operations in forests. In addition, for all cases of fires (domestic, natural, etc.) there is a Crisis Center under the Ministry of Emergency Situations of the Republic of Kazakhstan.</li> </ul>
<b>Kyrgyzstan</b>	<ul style="list-style-type: none"> <li>there is none, Population, and telephone. We would like to use modern information technologies</li> </ul>
<b>Lao PDR</b>	<ul style="list-style-type: none"> <li>For forest fire control, mostly every year when forest fire period the Ministry of Agriculture and Forestry (MAF) will issue the notification of forest fire, send to Province, District to follow up and also public to socio, particularly local people.</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>Forest Fire Big Data Analytics develop by Minister of Energy and Nature Resources.</li> <li>Department of Environment Malaysia using data derived from ASEAN Specialized Meteorological Centre (ASMC)</li> <li>Forest Fire Information System (ForFIS), responsible agency is MYSA (Malaysian Space Agency)</li> <li>Fire Danger Rating System (FDRS), responsible agency is Meteorological Malaysia (MetMalaysia)</li> </ul>
<b>Mongolia</b>	<ul style="list-style-type: none"> <li>We don't have forest fire information system. We have use to free information systems such as NASA-FIRMS and <a href="http://worldview.earthdata.nasa.gov">worldview.earthdata.nasa.gov</a></li> </ul>
<b>Myanmar</b>	<ul style="list-style-type: none"> <li>Not yet.</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>Currently, the Philippines do not have a forest fire information system, but the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) provides weather and temperature data which usually signals start of the summer season when forest fire are the most frequent.</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>The National Parks Board recently leased a Forest Fire Detection and Monitoring System (FFDMS) to provide 24-hour all-weather monitoring to detect smoke and fire in nature reserves and nature areas. The project for the FFDMS is currently at the procurement stage and the system has yet to go live.</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>Yes, we had decision support system (DSS) for forest fire control. The system is called automatic satellite database for supporting forest fire control mission. Which is a pilot system responsible by Department of National Parks, Wildlife and Plant Conservation (DNP) and data analysis by Bioinformatics and Space Technology Development Agency (GISTDA). Another system is an open fire management decision supporting system (Burn Check). Which is responsible by Pollution Control Department and data analysis by Meteorological Department. And we also use free information systems such as NASA-FIRMS, NOAA, ASMC, etc. In support of forest fire control.</li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

**Q7. DO YOU NEED ANY HELP OR SUPPORT REGARDING FOREST FIRE CONTROL, MANAGEMENT, AND MITIGATION INCLUDING FIRE AND SMOKE HAZE INFORMATION SYSTEM? IF YOU DO, PLEASE KINDLY IDENTIFY THEM POINT BY POINT WITH WHY DO YOU NEED IT?**

<b>Bhutan</b>	<ul style="list-style-type: none"> <li>• Bhutan has not achieved major progress in this field of fire control, management, and mitigation.</li> <li>• Some of the important development we need at this point is forest fire information system and the control center, starting from detection, developing skills for mitigation, and advancing technology.</li> </ul>
<b>Brunei</b>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>• We would like to use modern technology system in order to contribute efficiency forest fire reduction and also promote capacity building of government officials.</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>• Yes. We need support regarding the forest fire information system because our system still can't provide real-time data. This can cause late-response in fire mitigation.</li> </ul>
<b>Kazakhstan</b>	<ul style="list-style-type: none"> <li>• Each fire starts from an insignificant area, the timely detection of smoke affects the reduction of areas and damage to nature. In this regard, we would like support in the installation of an automated fire tower, as well as fire-fighting technicians for modern detection and extinguishing of forest-steppe fires.</li> </ul>
<b>Kyrgyzstan</b>	<ul style="list-style-type: none"> <li>• We would like to use modern information technology for efficiency and reduce the covered area of forest fires to extinguish fires in a timely manner.</li> </ul>
<b>Lao PDR</b>	<ul style="list-style-type: none"> <li>• Yes, we do need support regarding fire management. Forest Department is carrying out more activities on fire prevention than suppression. Therefore, we need to cooperative with another sector include internal/external to support aspects of funding, equipment, technology system.</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>• Support in the aspects of funding, expertise, technology advancement and supply of equipment</li> </ul>
<b>Mongolia</b>	<ul style="list-style-type: none"> <li>• Our country lacks manpower and technology to reduce the risk of forest and steppe fires. that's why we need a forest and steppe fire management system</li> </ul>
<b>Myanmar</b>	<ul style="list-style-type: none"> <li>• Yes, we do need support regarding fire management. Forest Department is carrying out more activities on fire prevention than suppression. Therefore, in my opinion, we need to cooperative such departments under different ministries as Fire Services Department, Environmental Conservation Department, Department of Agriculture, Department of Meteorology and Hydrology. But lack of technology and human resources in fire management is the current situation.</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>• It will be great to understand more on the use of the Forest Fire Danger Rating System to help the Philippines in the early detection and suppression of forest fires</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>• It will be great to understand more about how to detect forest fires more quickly before they reach a large scale, especially within a tropical forest environment.</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>• Of course, we need that support especially in the peat fires in southern part of Thailand. We need the predict and warning systems related to that problem.</li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>

**Q8. DOES YOUR COUNTRY RECOGNIZE FOREST FIRES AS A MAIN PROBLEM OR DISASTER TO SOLVE OR IT IS JUST ANOTHER BUSINESS AS USUAL?**

<b>Bhutan</b>	<ul style="list-style-type: none"> <li>Forest fire is serious problem in Bhutan and there are numerous steps being taken to advocate and control forest fire, however it has been a serious threat to our pristine forest.</li> </ul>
<b>Brunei</b>	<ul style="list-style-type: none"> <li>Forest fire in Brunei Darussalam is seasonal. In general forest fire used to be a major problem due to peat fire. Nowadays, resources are only mobilized if the fire occurs near residential areas, private/public properties, forest reserve or when the fire becomes too uncontrollable which pose risk to the public. Small fires sometime left to exhaust itself but still monitored on-site by the Fire and Rescue Dept.</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>Forest fire is a main problem in Cambodia. It has damaged property, crops welfare, air quality, animals, and biodiversity. It is very complicate whenever forest fire happened because we don't have road access and also modern technology equipment to stop forest fire.</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>Forest fire is one of main problem that happen frequently in Indonesia. It is not only affected our country but also neighbor countries.</li> </ul>
<b>Kazakhstan</b>	<ul style="list-style-type: none"> <li>Yes, we take nature very seriously, and the increase in forest cover is very important to us.</li> </ul>
<b>Kyrgyzstan</b>	<ul style="list-style-type: none"> <li>In the Kyrgyz Republic, forest fires happen every year and we are trying to solve the problem of forest fires in the border areas of neighboring countries to jointly extinguish forest fires, we have a provision for the safety rule of forests in the Kyrgyz Republic.</li> </ul>
<b>Lao PDR</b>	<ul style="list-style-type: none"> <li>It is as usual and happen every year in dry season.</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>Yes, forest fire is main problem to solve in Malaysia. There is a limited forest fire fighting capacity and capability in controlling major fires.</li> </ul>
<b>Mongolia</b>	<ul style="list-style-type: none"> <li>Our country is recognizing forest fires as a main problem or disaster to solve.</li> </ul>
<b>Myanmar</b>	<ul style="list-style-type: none"> <li>It is as usual.</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>The Philippines recognizes forest fire as a main problem considering that it is one of the major causes of forest destruction/loss in the country.</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>The frequency and extent of forest fires in Singapore might not be very high, however, it is still an issue that we face as forest fires (no matter how small) can be of a great impact to our local biodiversity, given the small size of our remaining nature reserves.</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>Thailand recognizes that wildfires are a major problem because wildfires affect the economy, environment, and livelihoods of people in the country.</li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

**Q9. DOES YOUR COUNTRY RECOGNIZE SMOKE HAZE FROM FOREST FIRE WHICH EFFECT PEOPLE HEALTH AS A PROBLEM? IF YOU DO, DO YOU HAVE LAWS AND REGULATIONS TO HANDLE THAT? DO YOU HAVE SUFFICIENT AIR QUALITY MEASUREMENT WMO STANDARDS NETWORK? DO YOU HAVE AN IOT LOW-COST AIR QUALITY MEASUREMENT NETWORK IN YOUR COUNTRY? IF YOU HAVE, BY WHICH GROUP OF PEOPLE FOR BOTH THE STANDARD ONE AND LOW-COST ONE?**

<b>Bhutan</b>	<ul style="list-style-type: none"> <li>• Forest fire is covered under Forest and Nature Conservation Act 1995 and Forest and Nature Conservation Rules and Regulations 2017.</li> <li>• Forest Fire Rules and regulation 2012</li> <li>• Forest Fire Management strategy, 2013</li> </ul>
<b>Brunei</b>	<ul style="list-style-type: none"> <li>• We do, under Laws of Brunei, Chapter 46, Forest, section 20; Prohibition as to fire</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>• Department of Fire Police and Rescue under Ministry of Interior is responsibility to prevent and fight fire including wildfire as well. At all levels (arm forces, authorities, public) are obliged to protect and fight forest fire according to forestry and fisheries laws.</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>• Indonesia have Laws Related forest fire and direct forest fire regulations. Basic Law Number 5 of 1990, Law Number 41 of 1999, Presidential Instruction (Inpres) Number 3 of 2020 concerning Management of Forest and Land Fires, Law Number 32 of 2019 concerning Fire Control forest and Land and Others</li> </ul>
<b>Kazakhstan</b>	<ul style="list-style-type: none"> <li>• Rules directly related to forest fires: <ul style="list-style-type: none"> <li>- Fire safety rules in forests, which is developed in accordance with the Forest Code of the Republic of Kazakhstan, which determines the procedure for fire safety in forests.</li> <li>- Rules for accounting, determination and compensation for damage caused by fires on the territory of the forest fund.</li> <li>- Resolution of the Government of the Republic of Kazakhstan "On approval of base rates for calculating the amount of harm caused by violation of the forest legislation of the Republic of Kazakhstan".</li> <li>- Order on the approval of norms and standards for the protection, protection, use of the forest fund, reforestation, and afforestation in the areas of the state forest fund.</li> </ul> </li> </ul>
<b>Kyrgyzstan</b>	<ul style="list-style-type: none"> <li>• The position of the fire safety rule in the forests of the Kyrgyz Republic.</li> </ul>
<b>Lao PDR</b>	<ul style="list-style-type: none"> <li>• Forest Law (2019), National Forest Strategy to 2035 and vision to 2050 and Guidance on Forest Fire Prevention Measurement.</li> <li>• Article 52 Prevention and Control of Forest Fires</li> <li>• Forest fire prevention and control is to protect forests and forest resources from destruction by fire.</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>• Yes, Malaysia recognizes smoke haze as problem. Malaysia ratify the AATHP. However, Malaysia don't have any transboundary haze pollution act yet. For domestic forest fire, Environment Quality Act 1974 will be enforced to impose fines and legal action on the guilty.</li> <li>• Ministry of Environment and Water and Department of Environment (DOE) are the lead agencies in monitoring air quality throughout Malaysia. The air pollutants concentration is measured by 52 automatic and 14 manual air quality stations.</li> </ul>
<b>Mongolia</b>	<ul style="list-style-type: none"> <li>• Yes, our country is recognizing smoke haze from forest fire which effect people health as a problem. we do not have laws and regulations to handle that.</li> <li>• We do not any sufficient air quality measurement WMO standards network</li> </ul>

<b>Myanmar</b>	<ul style="list-style-type: none"> <li>Ministry of Health and Sport mention that air pollution from any types of fire do effect on people health. We don't have any laws and regulations to handle it and any air quality measurement with WMO standard network.</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>Yes, the DENR's Environmental Management Bureau (EMB) conducts continuous monitoring of air quality parameters affected by the haze. The EMB collaborates with the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) and the Department of Health to ensure consistency of findings and issuance of health bulletins that can be disseminated to the public.</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>Yes, it is considered a problem to the health of the public, and steps to deal with this include provision of early haze warnings, measurement and dissemination of air quality information, and guidelines for dealing with haze-related issues. The National Environment Agency (NEA) works with ASEAN partners to combat haze. PSI and PM2.5 readings are available to the public through websites and the public is advised to check for relevant health advisories that will be issued based on these readings.</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>Thailand is very aware of the problem of smoke haze, especially the problem of pm2.5. For laws and regulations, we also have intensively enforced.</li> <li>Thailand has air quality measurement network all over the country, not only a low cost IoT air quality measurement network but also a powerful measurement tool.</li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

**Q10. DO YOU HAVE SMOKE HAZE TRANSBOUNDARY PROBLEMS?**

<b>Bhutan</b>	<ul style="list-style-type: none"> <li>The smoke haze from India is generally observed in the southern belts of Bhutan.</li> </ul>
<b>Brunei</b>	<ul style="list-style-type: none"> <li>Yes, we do, during dry season we usually experience trans-boundary haze from neighboring countries.</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>No</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>Yes, we have. Some great forest and land fire that caused smoke haze transboundary happen on 1997, 2014, 2015 and 2019</li> </ul>
<b>Kazakhstan</b>	<ul style="list-style-type: none"> <li>Currently, there are no such problems. But neighboring countries have an Agreement on cooperation in the event of a fire, which, one of the important factors, permits free movement between countries when extinguishing forest fires.</li> </ul>
<b>Kyrgyzstan</b>	<ul style="list-style-type: none"> <li>YES.</li> </ul>
<b>Lao PDR</b>	<ul style="list-style-type: none"> <li>Of cause, we have smoke haze from China and Thailand boundary, mostly happened in northern part.</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>Yes, Malaysia has smoke haze transboundary problems. Most of the time, Malaysia air quality get affected by haze from neighboring country especially Indonesia (Sumatera and Kalimantan). However, there are several times that Malaysia was also producing haze which come from peatland fires.</li> </ul>
<b>Mongolia</b>	<ul style="list-style-type: none"> <li>Yes, we have our country smoke haze which transforms from Russia and China.</li> </ul>
<b>Myanmar</b>	<ul style="list-style-type: none"> <li>No.</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>Yes, haze originating from Indonesia have recently reached southern and central Philippines which decreased visibility and disrupted airline flights, business and tourism activities and threatened human health.</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>Yes, sometimes Singapore will experience haze caused by smoke from forest fires in other countries.</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>Yes, Thailand face with smoke haze trans boundary problems.</li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

**Q11. DO YOU HAVE CLIMATE CHANGE DISASTERS RELATED MITIGATION OR RISK REDUCTION PROGRAM IN YOUR COUNTRY?**

<b>Bhutan</b>	<ul style="list-style-type: none"> <li>There are several programs related to climate change mitigation that are looked over by RGoB, NGOs and donor partners.</li> </ul>
<b>Brunei</b>	<ul style="list-style-type: none"> <li>Recently Brunei Darussalam launched a new policy framework called Brunei national Climate Change Policy (BNCCP) which have ten strategies for climate change mitigation.</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>N/A</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>One of the National Development Agenda of Indonesia in 2020-2024 is environmental, disaster and climate change resilience development.</li> </ul>
<b>Kazakhstan</b>	<ul style="list-style-type: none"> <li>Yes.</li> </ul>
<b>Kyrgyzstan</b>	<ul style="list-style-type: none"> <li>UN Paris Agreement on Climate Change.</li> </ul>
<b>Lao PDR</b>	<ul style="list-style-type: none"> <li>Yes. We have climate change disasters related mitigation or risk reduction program, currently we have National reed+ strategy, CLIPAD project and IGFL which implement regard to climate change and Carbon stock.</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>Yes, climate change mitigation action has already been, and is continuing to be, implemented. This includes initiatives to reduce GHG emissions in the energy sector by generating energy from renewable sources, enhancing energy efficiency, using energy-efficient vehicles, increasing waste recycling efforts and reducing carbon emissions from deforestation and forest degradation</li> </ul>
<b>Mongolia</b>	<ul style="list-style-type: none"> <li>We don't have our country Climate Change disasters related mitigation or risk reduction program.</li> </ul>
<b>Myanmar</b>	<ul style="list-style-type: none"> <li>Yes. We have climate change disasters related mitigation or risk reduction program.</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>Yes, the Philippines has adopted a National Climate Change Action Plan which aims to build adoptive capacities of women and men in their communities and increase the resilience of vulnerable sectors and natural ecosystems to climate change. Some of the initiatives and programs under the NCCAP includes the National Greening Program, Solid Waste Management, REDD+ among others.</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>The SOP for wildfire preventive measures that we use is a risk reduction program, as dry spells are monitored closely, and steps are taken to prevent fires from happening when droughts are prolonged.</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>On behalf of the Royal Forest Department, I would like to say that the Royal Forest Department has no such project yet.</li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

(Note: Information excerpted from Country Reports submitted by Participants)

## 3.5 CURRENT ISSUES OF PARTICIPATING COUNTRIES

### 3.5.1 BHUTAN

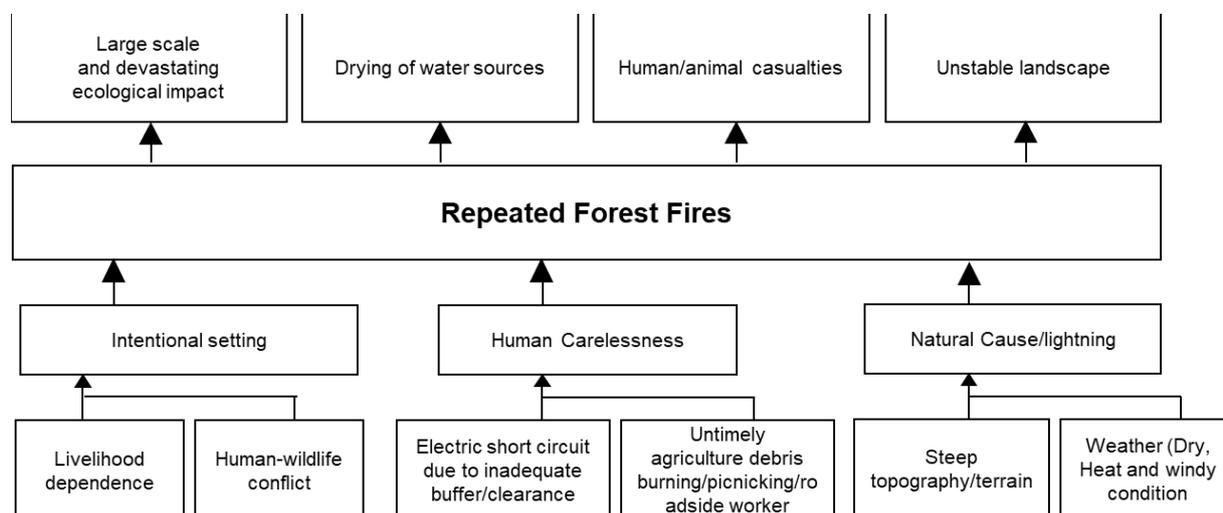


Figure 1. PROBLEM TREE ON FFMIS IN BHUTAN

Table 3. SWOT OF FFMIS IN BHUTAN

Strength	Weakness
<ul style="list-style-type: none"> <li>• Easy to mobilize the fire fighters/volunteers due to small size/population</li> <li>• Forest Act, Rules &amp; regulations, and management guidelines in place</li> <li>• Constitutional mandate of maintaining 60% forest cover for all times</li> <li>• Existing Forest Fire Management groups can be activated</li> </ul>	<ul style="list-style-type: none"> <li>• Geographical Location (steep terrain, strong wind)</li> <li>• Weak coordination amongst stakeholders</li> <li>• Budget Constraints</li> <li>• No professional firefighters</li> <li>• Lack of effective fire equipment and tools</li> <li>• Intentional forest fires (livelihood &amp; Human wildlife conflict)</li> <li>• No proper scientific research carried out on forest fire.</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• Improve forest fire networking system</li> <li>• Improve local capacities through awareness and advocacy programs</li> <li>• Bring together relevant stakeholders through trainings</li> <li>• Procurement of appropriate and site based firefighting tools and equipment</li> <li>• Setting up standard FFMIS</li> <li>• Formation of independent firefighting Agency</li> <li>• Reduction of Forest fire incidences</li> <li>• Research opportunities</li> </ul>	<ul style="list-style-type: none"> <li>• Cooperation and commitment from the stakeholders</li> <li>• Ineffectiveness due to nature of geographical location</li> <li>• No basis of specific previous project on forest fire management at national level to take precautionary steps.</li> </ul>

**TABLE 4. COUNTRY STATUS AND ISSUES ON FFMIS IN BHUTAN**

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• The Constitution of the Kingdom of Bhutan, 2008 under Article 5</li> <li>• National Forest Policy of Bhutan, 2011</li> <li>• The Forest and Nature Conservation Act of Bhutan, 1995 has section on Fire Protection which states</li> <li>• Forest and Nature Conservation Rules and Regulations, 2017</li> <li>• Forest Fire Management Strategy for Bhutan 2013</li> <li>• Incorporated in Local Government Act</li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>• The Department of Forests and Park Services initiates various advocacy programs in fire prone area</li> <li>• Formation of Community Based Forest Fire Management Group initiated at lowest level</li> <li>• Formation of Interagency Fire Fighting Coordination Group and development of Standard Operating Procedure</li> </ul>

### 3.5.2 BRUNEI DARUSSALAM

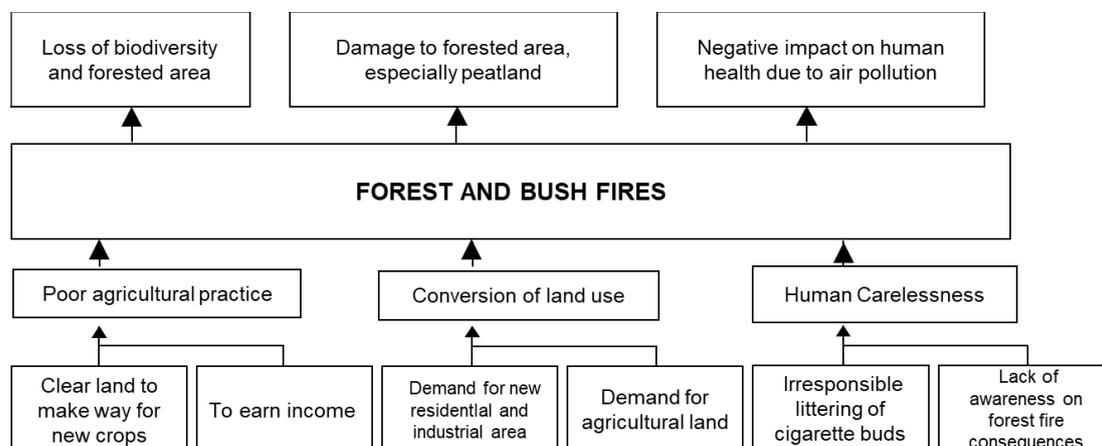


Figure 2. PROBLEM TREE ON FFMIS IN BRUNEI

Table 5. SWOT OF FFMIS IN BRUNEI DARUSSALAM

Strength	Weakness
<ul style="list-style-type: none"> <li>• Increase the efficiency and effectiveness of fire prevention, detection, and suppression.</li> <li>• Able to detect illegal activities such as illegal logging and trespassing when couple with other sensors.</li> <li>• Improvement in surveillance capacity.</li> </ul>	<ul style="list-style-type: none"> <li>• Costly to cover the whole country and wastage if installed at areas that are not prone to fire.</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• Installation in remote areas of borders may also prevent/advert illegal logging activities; may need different sensors i.e., audio sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Land use conversion, especially forest area under state land</li> <li>• Area that was burnt are now covered with fire resistant invasive species, acacia</li> <li>• Overlapping with other agency data may lead to duplication.</li> </ul>

TABLE 6. COUNTRY STATUS AND ISSUES ON FFMIS IN BRUNEI

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• In Brunei Darussalam, the occurrences of forest fires and bushfires are not so severe or widespread.</li> <li>• Wildfires usually occurs whenever there is a long-dry spell. These wildfires are mostly bushfires, rather than forest fires.</li> <li>• Wildfires occurs to the following areas: <ul style="list-style-type: none"> <li>- Recurring in isolated patches along highways and roadsides,</li> <li>- Areas adjacent to rural communities and housing projects,</li> <li>- Agricultural development areas,</li> <li>- Aquaculture development areas,</li> <li>- Conversion projects and industrial development areas.</li> </ul> </li> <li>• Brunei Fire and Rescue Department (BFRD) is the responsible agency in fighting any fire occurrences including the forest and bushfires.</li> <li>• Forestry Department has Task Force on Forest Fires, which detects early prevention of widespread of forest fires occurrences in the forest reserve areas, developed forest plantations and forest recreational parks.</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• Forest Law of 1984, Chapter 46, Brunei Darussalam Laws</li> <li>• Prohibiting slash-burning activities in reserved lands and the penalties involved in such offences.</li> <li>• Chapter 22 Penal Code Section 277A</li> <li>• Public is refrained from conducting any open burning activities.</li> <li>• Offenders will be punishable with a fine, not exceeding BND100,000 (about USD 80,000), where such offences cause pollution to the atmosphere or endanger human life or property, the punishment is a fine of an unlimited amount and/or imprisonment for a term of up to five years.</li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>• N/A</li> </ul>

### 3.5.3 CAMBODIA

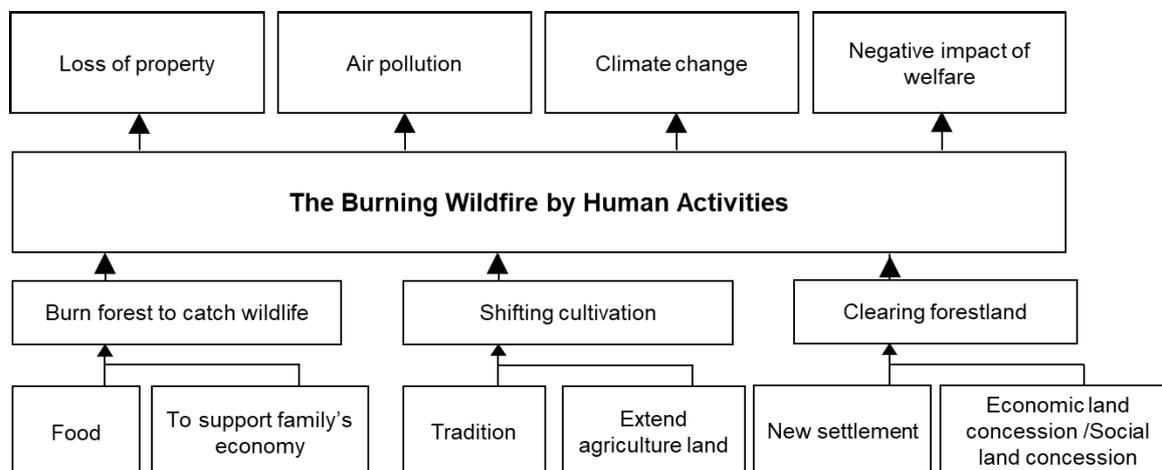


Figure 3. PROBLEM TREE ON FFMIS IN CAMBODIA

Table 7. SWOT OF FFMIS IN CAMBODIA

Strength	Weakness
<ul style="list-style-type: none"> <li>Existing Law on forestry</li> <li>National Forest Program (NFP: 2010-2029)</li> <li>Guidance on Forest Fire Prevention Measurement (MAFF)</li> </ul>	<ul style="list-style-type: none"> <li>Local community has limited knowledge on negative impact of forest fire</li> <li>Poor information and technology on forest fire</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>Local people nearby pilot project site will improve awareness on forest fire suppression</li> <li>Local people will be able to become firefighter to protect their forest resources</li> <li>Local people will change mind set to careless of forest fire</li> </ul>	<ul style="list-style-type: none"> <li>Forest fire will be able to occur via natural disaster</li> <li>Political context could be changed someday without prediction.</li> </ul>

**TABLE 8. COUNTRY STATUS AND ISSUES ON FFMIS IN CAMBODIA**

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• Forestry Administration has been restoring forest resources in Cambodia is not only forest prevention but also replantation. Natural forest and forest plantation are always destroyed by fire every year in dry season starting from December to May. It was caused by human activities such as land grabbing, burn forest to catch wildlife, resin collection, careless of local people (cooking, smoking, cigarette.) new settlements in forest area and using fire to clear road and land after harvesting.</li> <li>• The wildfire had damaged biodiversity, ecological system, welfare, air quality, and loss of property, crops, resources, animals, and people including increase air pollution in atmosphere</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• According to forestry and fisheries laws, the public, armed forces, and authorities at all levels are obliged to maintain and protect forests and prevent fire.</li> <li>• Department of Fire Police and Rescue under Ministry of Interior has responsibility to prevent and fight fire and forest fire.</li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>• General <ul style="list-style-type: none"> <li>- Forest fire information generates from local FA and CF</li> <li>- There is no national system to detect/report the fire</li> <li>- Base on NASA notification (informal)</li> </ul> </li> <li>• Showcases <ul style="list-style-type: none"> <li>- The system detects fire/smoke and make alarm immediately</li> <li>- It covers 15km radius from the tower</li> <li>- Under support of APFNet, two forest watchers and fire controlling system were installed in Tamao Zoo and Wildlife Recue Center, Takeo province and Khun Ream Research station, Siem Reap province.</li> </ul> </li> </ul>

### 3.5.4 INDONESIA

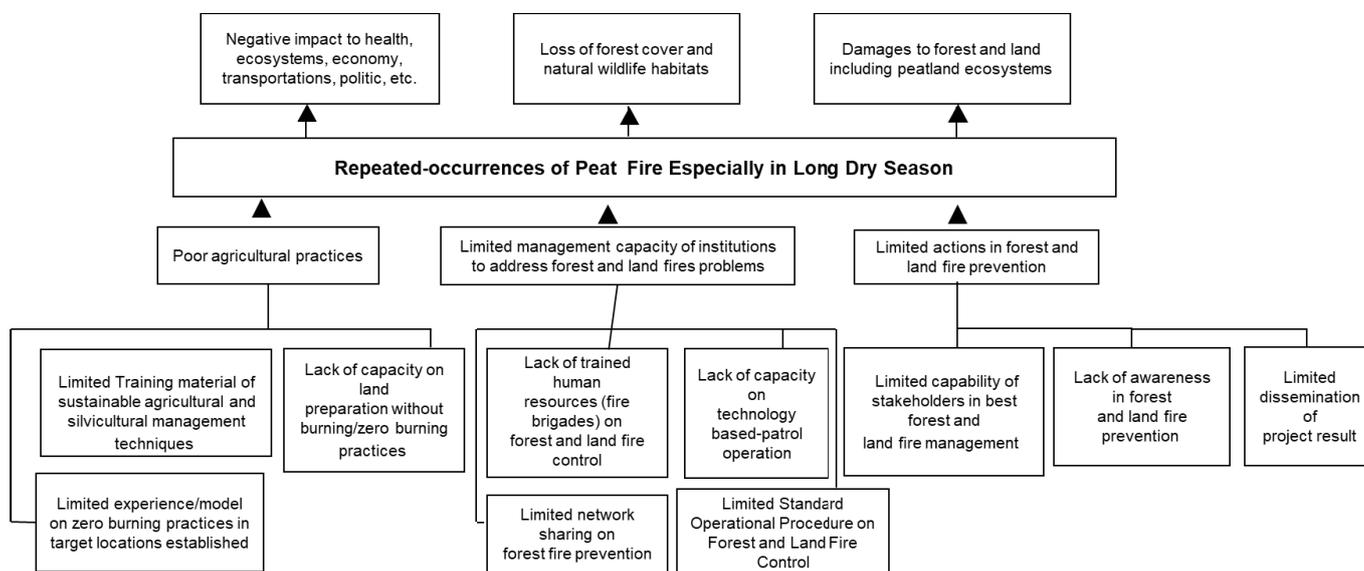


Figure 4. PROBLEM TREE ON FFMIS IN INDONESIA

Table 9. SWOT OF FFMIS IN INDONESIA

Strength	Weakness
<ul style="list-style-type: none"> <li>• There is community forest (HKm) area permit issued in 2021 (935 ha)</li> <li>• There is Farmer group (152 households)</li> <li>• There is Forest Management Unit (FMU)</li> <li>• There is Local NGO (as a community assistant)</li> <li>• There is Community empowerment program from government and NGO</li> <li>• Has anyone succeeded in cultivating stingless bee (kelulut) on peatland</li> </ul>	<ul style="list-style-type: none"> <li>• There is no work plan in community forest (HKm) area yet</li> <li>• The new farmer group is not strong yet. FMU area is very large, and human resources is limited (quantity and capacity)</li> <li>• NGO don't have capital</li> <li>• Programs is not usually match for the needs and abilities/passions of the community</li> <li>• Not all members of farmer groups have the capital and expertise in stingless (kelulut) cultivation</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• High demand for honey (covid-19 pandemic)</li> <li>• There is an ACIAR Project to prevent fires</li> <li>• Good support from Local Government</li> <li>• There is a government program for peat restoration (rewetting, revegetation, revitalization of the community economy)</li> <li>• Kelulut honey is known to the public</li> </ul>	<ul style="list-style-type: none"> <li>• Competition of honey price among farmers</li> </ul>

TABLE 10. COUNTRY STATUS AND ISSUES ON FFMIS IN INDONESIA

<p>Backgrounds and Current Status</p>	<ul style="list-style-type: none"> <li>• Great forest and land fire have occurred since 1982/1983 and happened recently in 2015.</li> <li>• Forest and land fire occurs almost every year, especially in the dry season and mostly happens in peatland.</li> <li>• Early 2021 the area of forest and land fires decreased by 51% from 2020, as well as the number of national hotspots decreased by 12,5%.</li> <li>• Forest and land fires preventive actions by the government, includes Monitoring and early detection, Preventive Patrols, ground suppression, air suppression (waterbombing), rain engineering through Weather Modification Technology (TMC) and law enforcement</li> <li>• The Forest and Land Fire Early Warning and Detection system has been developed and opened to the public (e.g., SIPONGI and FDRS)</li> </ul>
<p>Related National Policy</p>	<ul style="list-style-type: none"> <li>• Law No. 5/1990 on Conservation of Biological Natural Resources and Their Ecosystems</li> <li>• Law No. 41/1999 on Forestry</li> <li>• Law No. 32/2009 on Environmental Protection and Management</li> <li>• Law No. 18/2013 on Prevention and Eradication of Forest Destruction</li> <li>• Law No. 39/2014 on Plantation</li> <li>• Minister of Environment Regulation No. 10/2010</li> <li>• Ministry of Environment and Forestry Regulations No.13/2016</li> <li>• Ministry of Environment and Forestry Regulations No.32/2016</li> <li>• Decree of the Minister of Environment and Forestry No. 282/2017</li> <li>• Ministry of Environment and Forestry Regulations No.47/2017</li> <li>• Ministry of Environment and Forestry Regulations No.8/2018</li> <li>• Ministry of Environment and Forestry Regulations No.9/2018</li> <li>• Presidential Instruction No.3/2020</li> </ul>
<p>Experiences on FFMIS</p>	<ul style="list-style-type: none"> <li>• Indonesia has large peatland areas prone to fire and culture of the community/farmers did shifting cultivation and land-clearance by burn</li> <li>• Long dry seasons and human error are factors to the occurrence of fires</li> <li>• the government issues policies in the form of regulations, law enforcement and technology development to fire prevention</li> <li>• Forest fire and land in 2015, Government did forest fire extinguish by: involving thousands of personnel to extinguish the fire, Water bombing, weather modification, and Used of Calcium Oxide to minimize smoke</li> <li>• Learn from the experience of accident in 2015 that absorbed a lot of costs, the government synergizes with multi-stakeholders and focuses on fire prevention</li> </ul>

### 3.5.5 KAZAKHSTAN

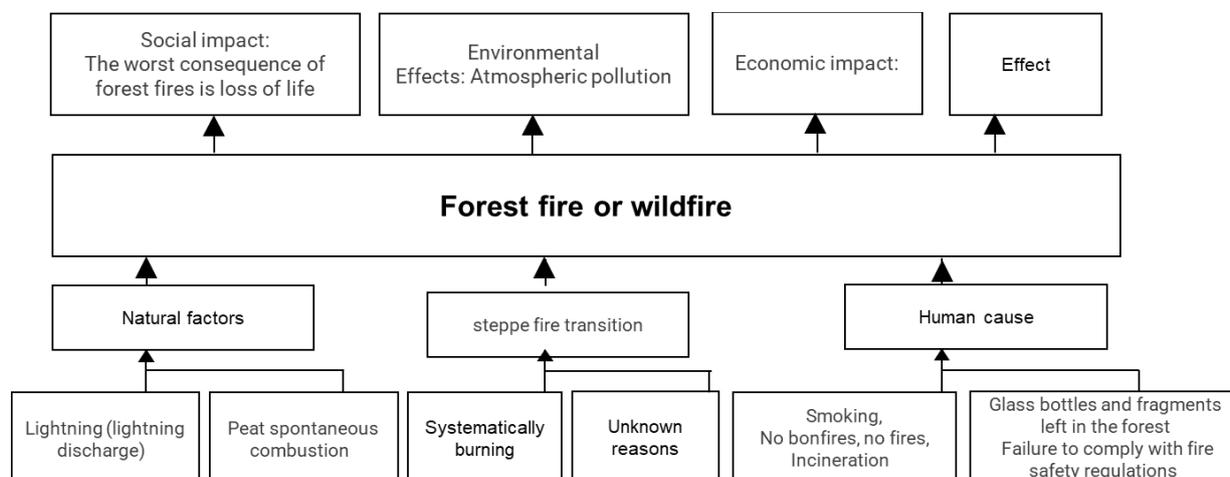


Figure 5. PROBLEM TREE ON FFMIS IN KAZAKHSTAN

Table 11. SWOT OF FFMIS IN KAZAKHSTAN

Strength	Weakness
<ul style="list-style-type: none"> <li>• Availability of the satellite kazeosat-1 kazeosat-2 (Kazakhstan Earth Observation Satellite)</li> <li>• Availability of cartographic database</li> <li>• Government support</li> </ul>	<ul style="list-style-type: none"> <li>• Working with communities</li> <li>• Huge territory</li> <li>• Funding</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• Science and data analysis</li> <li>• Visualization</li> <li>• GIS</li> <li>• Artificial intelligence</li> <li>• Machine learning</li> <li>• Telemetry</li> <li>• Remote sensing</li> <li>• Client-server Internet applications</li> </ul>	<ul style="list-style-type: none"> <li>• Weather conditions</li> <li>• Misreporting a fire</li> <li>• Low environmental culture and environmental education</li> </ul>

**TABLE 12. COUNTRY STATUS AND ISSUES ON FFMIS IN KAZAKHSTAN**

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• Every year, to take the necessary measures to combat forest fires during the fire season, an order is issued by the Committee for Forestry and Wildlife, which states</li> <li>• Joint action plan with the Ministry of Emergencies.</li> <li>• The forest fire services are trained and instructed on the issues of fire-prevention arrangement of the territory and extinguishing forest fires, as well as the procedure for drawing up protocols for violation of the Fire Safety Rules in forests.</li> <li>• Repair of fire-fighting equipment, equipment and observation facilities is in progress</li> <li>• A reserve stock of fuels and lubricants (gasoline and diesel) is being created</li> <li>• Space monitoring of the forest fund areas covered by forest fires is carried out</li> <li>• To timely detect and eliminate forest fires in small areas, air patrols in 8 regions of the republic were carried out by the forces of the Kazavialesoohrana RSE of the Ministry. Every year, work is carried out to create mineralized strips and fire breaks, as well as controlled annealing is carried out in the spring and autumn periods.</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>• N/A</li> </ul>

### 3.5.6 KYRGYZSTAN

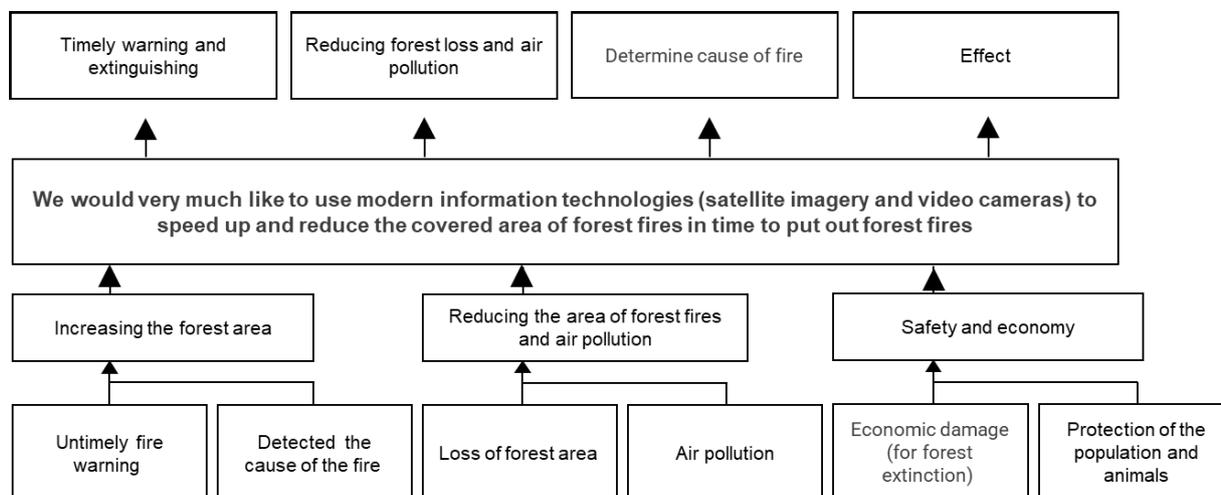


Figure 6. PROBLEM TREE ON FFMIS IN KYRGYZSTAN

Table 13. SWOT OF FFMIS IN KYRGYZSTAN

Strength	Weakness
<ul style="list-style-type: none"> <li>• Timely notification of fire reduction</li> <li>• Reduction of air pollution</li> <li>• Determine the cause of the fire</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• Timely fire extinguishing forest</li> <li>• Reduction covered area from forest fires</li> <li>• Budget savings</li> </ul>	<ul style="list-style-type: none"> <li>• Mountain country</li> <li>• Inaccessibility for installing video cameras</li> <li>• Budget</li> </ul>

TABLE 14. COUNTRY STATUS AND ISSUES ON FFMIS IN KYRGYZSTAN

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• Every year, in order to take the necessary measures to combat forest fires during the fire season, an order is issued by the State Forestry Agency, which states:</li> <li>• Joint action plan with the Ministry of Emergency Situations.</li> <li>• The forest fire teams are trained and instructed on the issues of fire-prevention arrangement of the territory and extinguishing forest fires, as well as the procedure for drawing up protocols for violation of the Fire Safety Rules in forests.</li> <li>• Repair of fire-fighting equipment and equipment is in progress.</li> <li>• A reserve stock of fuels and lubricants (gasoline and diesel) is being created.</li> <li>• Work is carried out annually to create mineralized strips.</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>• N/A</li> </ul>

### 3.5.7 LAO PDR

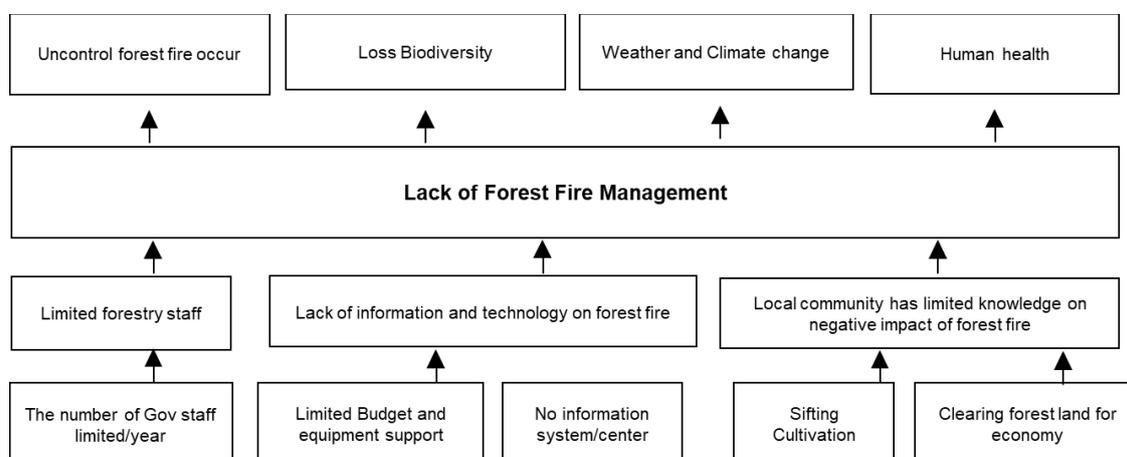


Figure 7. PROBLEM TREE ON FFMS IN LAO PDR

Table 15. SWOT OF FFMS IN LAO PDR

Strength	Weakness
<ul style="list-style-type: none"> <li>Existing Law on forestry</li> <li>National Forest Strategy to 2035 and vision to 2050</li> <li>Guidance on Forest Fire Prevention Measurement</li> </ul>	<ul style="list-style-type: none"> <li>Lack of information and technology on forest fire</li> <li>Limited of local governance staff and</li> <li>Local community has limited knowledge on negative impact of forest fire</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>Local people nearby pilot project site will improve awareness on forest fire suppression and household income are enhanced.</li> <li>Local people will be able to become fire fighter to protect their forest resources.</li> </ul>	<ul style="list-style-type: none"> <li>Forest fire management unsustainable after project duration supported</li> <li>Local livelihood within forest area that cause of Forest fire will be able to occur</li> </ul>

TABLE 16. COUNTRY STATUS AND ISSUES ON FFMS IN LAO PDR

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>Lao PDR is Landlock country, with 236.800 Km<sup>2</sup>, 70% is mountainous. increasing forest cover from 41.5% (9.8 million hectares) in 2002 to 62% (14.7 million hectares) by 2020</li> <li>Forest and forest land in Lao PDR are divided into 3 categories for management, protection, development, and use:                             <ul style="list-style-type: none"> <li>Protection Forest and protection forest land, 139 areas with 7.9 M ha</li> <li>Conservation Forest and forestland area: 139 area with 4.8 M ha</li> <li>Production Forest and production forest land. 51 areas with 3.1 M ha</li> </ul> </li> <li>Forest fires affect large areas of forest. Human activities cause about 80 percent of forest fires, while only lower than 20 percent are due to natural factors.</li> <li>The forests are always destroyed by fire every year during the dry season from February-July.</li> <li>The Ministry of Agriculture and Forestry has the main responsibility for the management of forests.</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>Forestry Law 2021</li> <li>Decree on Protection Forest 2010</li> <li>Decree on Protected area 2015</li> <li>Ministerial Order in Every year on forest fire</li> </ul>
Experiences on FFMS	<ul style="list-style-type: none"> <li>N/A</li> </ul>

### 3.5.8 MALAYSIA

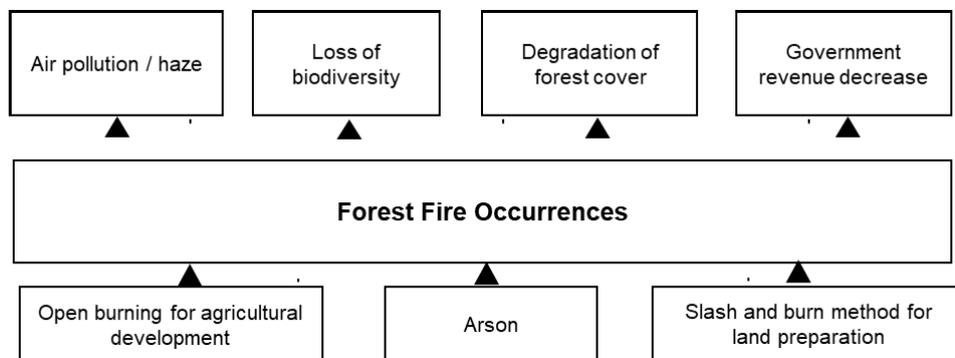


Figure 8. PROBLEM TREE ON FFMIS IN MALAYSIA

Table 17. SWOT OF FFMIS IN MALAYSIA

Strength	Weakness
<ul style="list-style-type: none"> <li>Existing law and regulation</li> <li>Existing monitoring system - Big Data Analytics (BDA), Forest Fire Information System (ForFIS), Fire Danger Rating System (FDRS), Hotspot Distribution Map (from ASMC).</li> <li>Daily information and as well as forecast for weather, extreme weather, and El Nino by MetMalaysia. Apart from that, information on Air Pollutant Index (API) by Department of Environment Malaysia.</li> <li>Cooperation with other agencies (integrated)</li> <li>Existing fire management plan (at some Reserve Forest that prone to fire)</li> </ul>	<ul style="list-style-type: none"> <li>Lack of awareness from local community regarding impact of forest fire.</li> <li>Limited field staff for monitoring and enforcement activity</li> <li>Limited fund and resources</li> <li>Lack of knowledge and experience in suppressing forest fire especially peat fire</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>Early detection and early prevention.</li> <li>ASEAN framework</li> <li>Free fire information systems available (e.g.: NASA FIRMS)</li> <li>Technical expertise from various agency (govt. agencies, RIs, &amp; Universities)</li> <li>International funding (SMPEM, SUPA)</li> </ul>	<ul style="list-style-type: none"> <li>Hot and dry season / climate change</li> <li>Uncontrolled surrounding activities</li> <li>The increased need to fulfill economic needs</li> </ul>

TABLE 18. COUNTRY STATUS AND ISSUES ON FFMIS IN MALAYSIA

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• The worst forest fires experienced by Malaysia were in 1982/83 when almost one million hectares of natural forest burned in Sabah. However, for Malaysia this was the only case where natural forest fires of this magnitude were ever recorded.</li> <li>• Subsequently, forest fires continued to occur in Malaysia, but the extent was less and mainly located in forest plantations and degraded forests (degraded peat swamp forest &amp; logged-over forests).</li> <li>• Forest fires have been reported as early as the 1970s in the pine plantations and the 1980s in the Acacia mangium plantations.</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• Legislations <ul style="list-style-type: none"> <li>- National Forestry Act 1984 [Act 313]</li> <li>- Sabah Forest Enactment 1968</li> <li>- Sabah Forest Rules 1969</li> <li>- Sarawak Forest Ordinance 2015 (Chapter 71)</li> <li>- Natural Resources and Environment Ordinance (Fire Danger Rating System) Order, 2004 (Section 18(h))</li> <li>- Environment Quality Act 1974</li> <li>- Akta Pengurusan BOMBA 341</li> </ul> </li> <li>• Policy on Forestry <ul style="list-style-type: none"> <li>- Forestry Policy of Peninsular Malaysia 2020</li> <li>- Sarawak Forest Policy 2019</li> <li>- Sabah Forest Policy 2018</li> </ul> </li> <li>• Federal Constitution Article 74 (2) <ul style="list-style-type: none"> <li>- Forestry is under the jurisdiction of the state government.</li> <li>- Therefore, each state has the power and freedom to enact laws and manage forestry policies in their respective states.</li> </ul> </li> <li>• National Land Council <ul style="list-style-type: none"> <li>Enable the federal and the state governments to discuss and resolve common problems and issues relating to forestry policy, administration, and management, as well as to enhance cooperation among the federal and state governments.</li> </ul> </li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>• Ministry of Environment &amp; Water</li> <li>• Department of Environment Malaysia (Federal &amp; State)</li> <li>• Department of Irrigation and Drainage (Federal &amp; State)</li> <li>• Malaysian Meteorological Department</li> <li>• Malaysia Civil Defense Force</li> <li>• Sabah Forestry Department</li> <li>• Ministry of Energy &amp; Natural Resources</li> <li>• Forestry Department Peninsular Malaysia / State Forestry Department</li> <li>• Department of Mineral and Geoscience Malaysia</li> <li>• Fire and Rescue Department Malaysia</li> <li>• Malaysian Maritime Enforcement Agency</li> <li>• Forest Department Sarawak</li> <li>• Peatland fire management strategic plan <ul style="list-style-type: none"> <li>- The Prevention Concept of 80:20 refers to a ratio of 80 is for prevention purposes while 20 is only for control and eradication purposes which need to be coordinated in the implementation of peatland management programs by applying the practice of "prevention is better than cure".</li> </ul> </li> <li>• The Peatland Fire Management Cycle <ul style="list-style-type: none"> <li>- The Peatland Fire Management Cycle is structured based on the disaster (emergency) management cycle which is used to plan and respond to the prevention and control of peatland fires locally as well as nationally. This cycle includes four main components namely Prevention, Preparedness, Response and Rehabilitation.</li> </ul> </li> </ul>

### 3.5.9 MONGOLIA

Table 19. SWOT OF FFMIS IN MONGOLIA

Strength	Weakness
• N/A	• N/A
Opportunity	Threat
• N/A	• N/A

TABLE 20. COUNTRY STATUS AND ISSUES ON FFMIS IN MONGOLIA

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• The main reasons of the decreasing forest resources are anthropological activities, forest fire, insects, use of pasture without any control, mining, timber cutting without management plan, illegal cutting of trees for construction and fuel wood, and haying grasses in areas, close to forest areas.</li> <li>• Forest fires affect large areas of forest. Human activities cause about 95 percent of forest fires, while only 5 percent are due to natural factors, mainly lightning (MET, 2017).</li> <li>• The forests are always destroyed by fire every year during the spring and autumn period which are from March to June and Sep to Nov.</li> <li>• The Ministry of Environment and Tourism (MET) has the main responsibility for the management of forests. The National Remote Sensing Center (NRSC) under Information and Research Institute of Meteorology, Hydrology and Environment is responsible for forest fire detection and its prevention.</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• Under the Forest Law of 2015, the National Emergency Management Agency (NEMA) is responsible for: <ul style="list-style-type: none"> <li>- Providing training for NEMA fire fighters.</li> <li>- Dispatching fire fighters to fires.</li> <li>- Providing suppression efforts and tactics for fighting fires.</li> <li>- Assessing damages caused by forest fires.</li> </ul> </li> <li>• In addition, the Fire Safety Law of 2015 allows local citizens to voluntarily fight fires. Funds for these volunteers to obtain equipment and tools come from the state budget, and local governors are responsible for their training.</li> <li>• These volunteers are often the first to detect fires, and they are regularly carrying out the initial attack. If the volunteers are not able to contain or control a fire, NEMA is contacted, and the nearest Fire Suppression Unit is dispatched to assist.</li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>• In any forest type, forest fires present a challenge for forest protection and management, because they have the potential to be at once harmful and beneficial.</li> <li>• According to its Intended Nationally Determined Contributions (INDC), Mongolia proposes to reduce the forest fire affected area by 30 percent to conserve ecosystems and increase carbon sinks. To reach this target will require some modifications in fire management and the consideration of key issues.</li> <li>• Currently, the National Emergency Management Agency (NEMA), coupled with the Ministry of Environment and Tourism, is leading the fire prevention and suppression efforts in Mongolia.</li> </ul>

### 3.5.10 MYANMAR

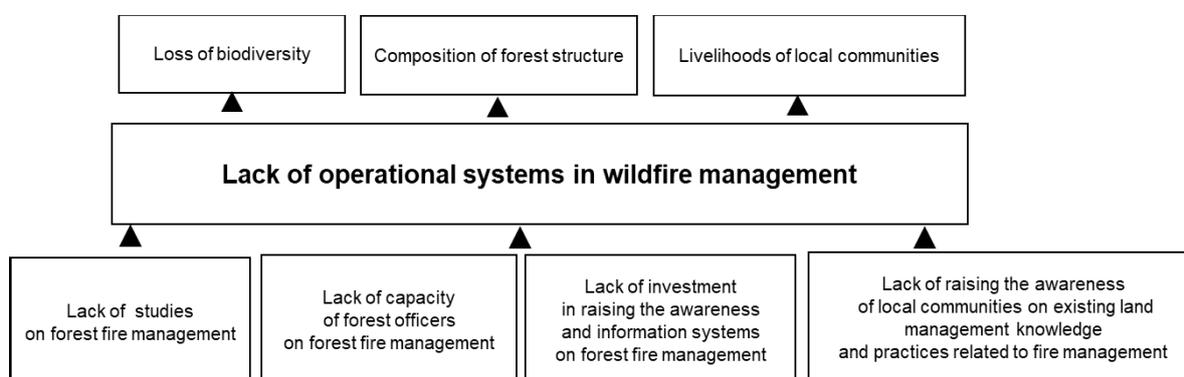


Figure 9. PROBLEM TREE ON FFMS IN MYANMAR

Table 20. SWOT OF FFMS IN MYANMAR

Strength	Weakness
<ul style="list-style-type: none"> <li>Traditional patrolling: watch-out tower, fire line, fireguards</li> </ul>	<ul style="list-style-type: none"> <li>Lack of capacity on fire protection measures</li> <li>Limited to advanced technology such as Drone, RS Data related to forest fire</li> <li>Limited financial resources</li> <li>Insufficient Staff</li> <li>Limited technical research/project</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>Implementation of Demonstration areas related to forest fire management</li> <li>Capacity development of Forest Staffs</li> </ul>	<ul style="list-style-type: none"> <li>High Expenditure on technology</li> <li>Climate Change</li> </ul>

TABLE 21. COUNTRY STATUS AND ISSUES ON FFMS IN MYANMAR

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>According to the Fire Management Global Assessment of FAO, Myanmar has highest burn rate in Southeast Asia and ranks 11th globally in terms of forest fires. Between 2003 and 2012, more than 17,732 million hectares burned in Myanmar</li> <li>Wildfires in dry season due to high temperature on mixed deciduous forest, dry forest and Deciduous Indaing forest.</li> <li>Human activities such as burning forest for hunting &amp; pine collection, poor fire management in shifting cultivation, land clearing for extensive agriculture</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>According to Forest Policy (1995)- It includes protection of soil, water, wildlife, biodiversity, and environment</li> <li>Forest Law (1995, 2018)- Article 41 (d); person who make fire to destroy the forest must be punished which may extend to 300,000-500,000 MMK(164 USD \$-273 USD \$) or with imprisonment for a term which may extend to 2 years or with both</li> <li>30 years National Forest Master Plan (2001-02 to 2030-31)</li> <li>Standard Operation Procedures (Plantations)- Fire protection measures before and after the implementation of departmental forest plantations</li> </ul>
Experiences on FFMS	<ul style="list-style-type: none"> <li>Fire protection measures such as construction fire lines inside and outside the plantation, fire-watchtowers at the first age of plantation</li> <li>Financial support (around 50 USD) monthly to employ a fire-watchman on each plantation for five years after plantation establishment</li> <li>Lack awareness of local people in using fires for production of forest products on forest land</li> <li>Lack of cooperation among the related ministries (only responsible by FD)</li> </ul>

### 3.5.11 PHILIPPINES

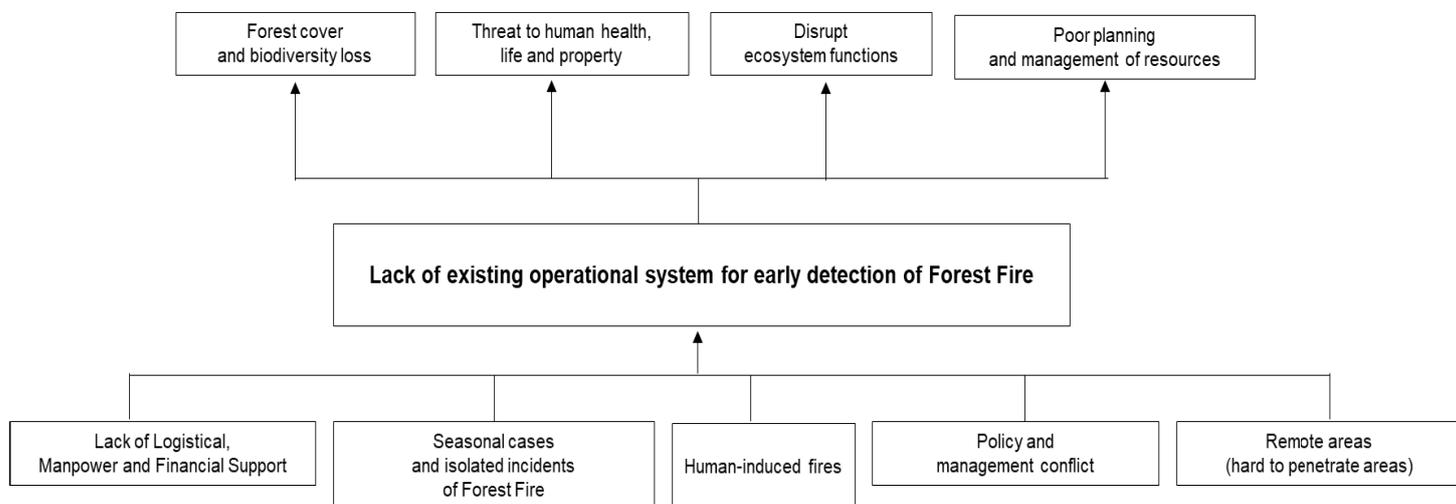


Figure 10. PROBLEM TREE ON FFMIS IN PHILIPPINES

Table 22. SWOT OF FFMIS IN PHILIPPINES

Strength	Weakness
<ul style="list-style-type: none"> <li>• Available FRDS from other country as a guide in the re-calibration of country's FRDS</li> <li>• Pioneering and innovative system</li> <li>• Availability of 10-year historical forest fire data</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of sufficient and sustainable funds</li> <li>• Insufficient spatial data needed</li> <li>• Lack of technical capability in managing forest fire</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• Eligible for funding such as AFoCO, CIFOR, World bank</li> <li>• GIS/RS trained personnel</li> <li>• Holistic approach in developing the system with partners e.g., PAG-ASA and BFP</li> </ul>	<ul style="list-style-type: none"> <li>• Poor internet connectivity in the country</li> <li>• Power interruption</li> <li>• Frequent occurrence of storm/calamities in the country</li> </ul>

**TABLE 23. COUNTRY STATUS AND ISSUES ON FFMIS IN PHILIPPINES**

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• Forestland 15.8 million hectares (52.8%)</li> <li>• Alienable and disposable land 14.2 million hectares (47.8)</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• PREVENTION &amp; SUPPRESSION of all forms of destructive fires in the country is under the jurisdiction of the Department of Interior &amp; Local Government -DILG pursuant to RA No. 6975 of 2010.</li> <li>• Bureau of Fire Protection (BFP) under DILG is the specific agency responsible for the prevention &amp; suppression of ALL DESTRUCTIVE FIRES on building, houses &amp; other structures, FOREST, land, transportation vehicles &amp; equipment, ships or vessels docked at piers or wharves or anchored in major sea ports, petroleum industry installations, plane crashes &amp; other similar incidents. (Sec. 54 of RA No. 6975)</li> <li>• DENR continue to devote &amp; perform substantial efforts including funds to protect the Philippine forests including REHABILITATION OF DAMAGED FOREST AREAS aside from forest fire PREVENTION which the DENR focuses, &amp; SUPPRESSION or fighting forest fire to prevent further spread &amp; cause more damage. In forestry parlance, the prevention, suppression, and rehabilitation of damaged areas caused by forest fires is termed as Forest Fire Management.</li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>• For the last five years (2015-2019), FOREST FIRE MANAGEMENT is included in the DENR's Five-Year National Forest Protection Program /Menu of Options for Effective &amp; Efficient Forest Protection &amp; Law Enforcement (2015-2019).</li> <li>• The DENR's 5-Year National Forest Protection Program (as it commonly known) is translated into a 5-Year Regional Strategic Forest Protection Action Plans by each DENR Regional Office.</li> </ul>

### 3.5.12 SINGAPORE

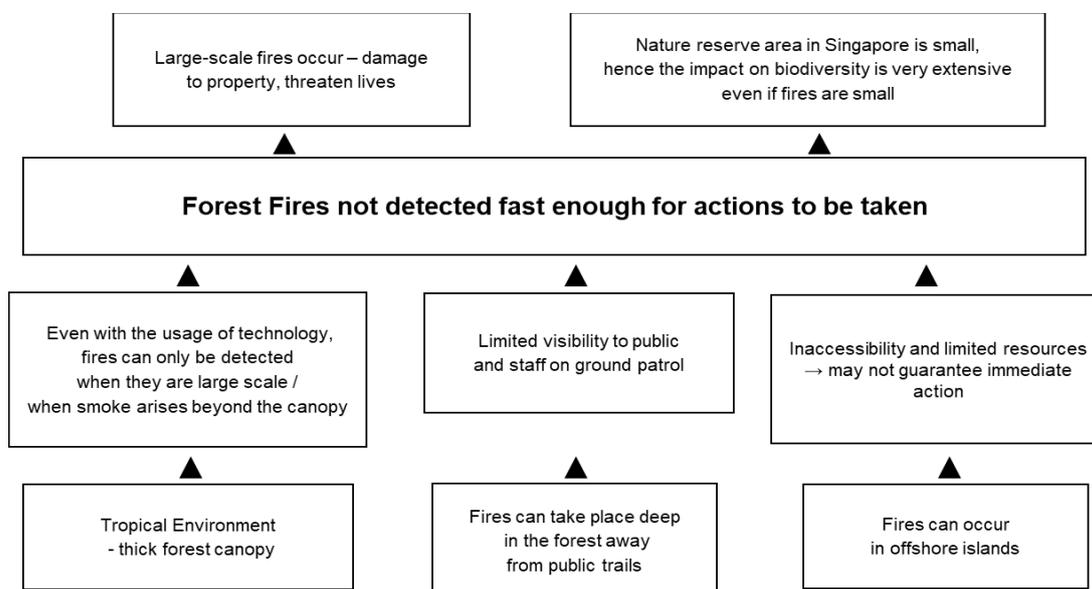


Figure 11. PROBLEM TREE ON FFMIS IN SINGAPORE

Table 24. SWOT OF FFMIS IN SINGAPORE

Strength	Weakness
<ul style="list-style-type: none"> <li>• Effective Mitigation Measures to minimize risk of forest fires (prevention is key)</li> <li>• Whole-of-government approach with clear communication amongst relevant agencies</li> </ul>	<ul style="list-style-type: none"> <li>• Small land area - small fires must be detected early to minimize impact on local biodiversity</li> <li>• Thick canopy layer - Difficult to detect small forest fires</li> <li>• Wildfire management SOP is not as established in offshore islands</li> <li>• Lack of resources on offshore islands</li> <li>• Area is less accessible for SCDF to conduct regular fire drills and training exercises</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• Singapore is striving towards smart solutions</li> <li>• With increasingly advanced technology and funding for technology-related projects, this provides opportunities in developing solutions for forest fire management</li> </ul>	<ul style="list-style-type: none"> <li>• Climate change</li> <li>• Increased visitor ship (due to Covid) with potential trespassers</li> <li>• Illegal immigrants / farmers burning to ward off mosquitoes and public doing prayers</li> <li>• Difficulty to predict certain fires (e.g., those caused by lightning)</li> </ul>

**TABLE 25. COUNTRY STATUS AND ISSUES ON FFMS IN SINGAPORE**

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• Parks &amp; Trees Act (Cap.216)</li> <li>• Use of Remote-controlled Aerial Vehicles (UAV) in Wildfire Surveillance <ul style="list-style-type: none"> <li>- Adopt the use of UAV where applicable in the nature reserves</li> <li>- Continual training of staff on the use of UAV Update of emergency maps</li> <li>- Maps will be updated every alternate year</li> <li>- Familiarization &amp; Simulation Exercises</li> <li>- Between NParks and SCDF</li> </ul> </li> </ul>
Experiences on FFMS	<ul style="list-style-type: none"> <li>• Pulau ubin fire-fighting training road map <ul style="list-style-type: none"> <li>• Training for Staff <ul style="list-style-type: none"> <li>- To enable NParks staff stationed at Pulau Ubin to make better assessment of fire incidences</li> <li>- To attend course on 'Response to Fire Incident in Workplace'</li> </ul> </li> <li>• Outreach to villagers and contractors at Pulau Ubin <ul style="list-style-type: none"> <li>- SCDF to conduct community sessions for villagers and contractors</li> </ul> </li> <li>• Continued joint resourcing and collaboration with SCDF <ul style="list-style-type: none"> <li>- Ongoing discussions with SCDF on the resourcing needs for SCDF for effective deployment and optimal response time</li> </ul> </li> </ul> </li> <li>• Forest fire detection and monitoring system (FFDMS):The FFDMS is a technology-based forest risk management system which would provide 24-hour all-weather monitoring to detect smoke and fire in nature reserves and nature areas</li> </ul>

### 3.5.13 THAILAND

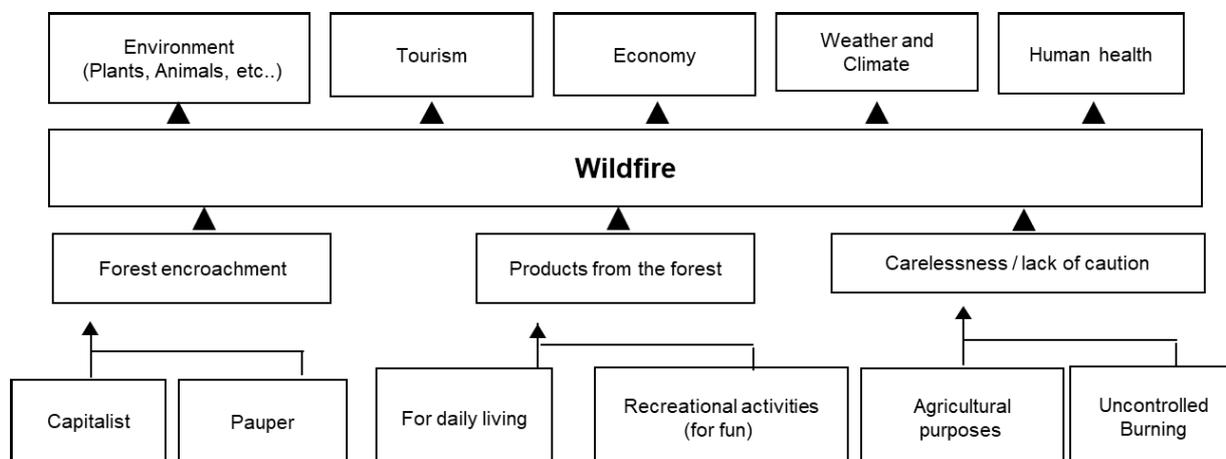


Figure 12. PROBLEM TREE ON FFMIS IN THAILAND

Table 26. SWOT OF FFMIS IN THAILAND

Strength	Weakness
<ul style="list-style-type: none"> <li>Community participation</li> <li>Manage the fire before it spreads</li> </ul>	<ul style="list-style-type: none"> <li>The community or people near the fire area lack knowledge of fire management.</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>Strengthening within community forest</li> <li>Reducing conflict between officials and people</li> <li>Promoting forest sustainability in the community</li> </ul>	<ul style="list-style-type: none"> <li>The environmental condition is prone to wildfires such as extreme drought</li> </ul>

TABLE 27. COUNTRY STATUS AND ISSUES ON FFMIS IN THAILAND

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>The total forest cover in Thailand by 2020 was estimated at 163,800 square kilometers or 31.64 percent of the total country's area. The Royal Forest Department has all areas of responsibility 96,504.75 square kilometers.</li> <li>Forest fire has become a serious problem and caused severe loss to both natural forests and plantations. Forest fires occur throughout the country but mainly in the northern regions. The activities and behaviors of human have mainly caused the problems of forest fire in Thailand such as burning of agricultural waste, land encroachments by capitalist and pauper. The current overview of wildfire situation in year 2021 is significantly reduced compared to the previous year. This is due to the amount of rain during the dry season and the MNRE has launched a project to collect leaves and wood chips from the forest by using the cooperation mechanism of all sectors.</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>1941 Forest Law</li> <li>1961 National Parks Law (amended 2019)</li> <li>1964 National Reserved Forest Law (amended 2016)</li> <li>2019 Thailand Community Forest Act</li> <li>2020 Minister Policy on Preemptive leaves and debris out of the forest area</li> <li>Announcement of the Royal Forest Department Regarding prohibiting any person to do any action in the National Forest Reserve</li> </ul>
Experiences on FFMIS	<ul style="list-style-type: none"> <li>N/A</li> </ul>

### 3.5.14 VIET NAM

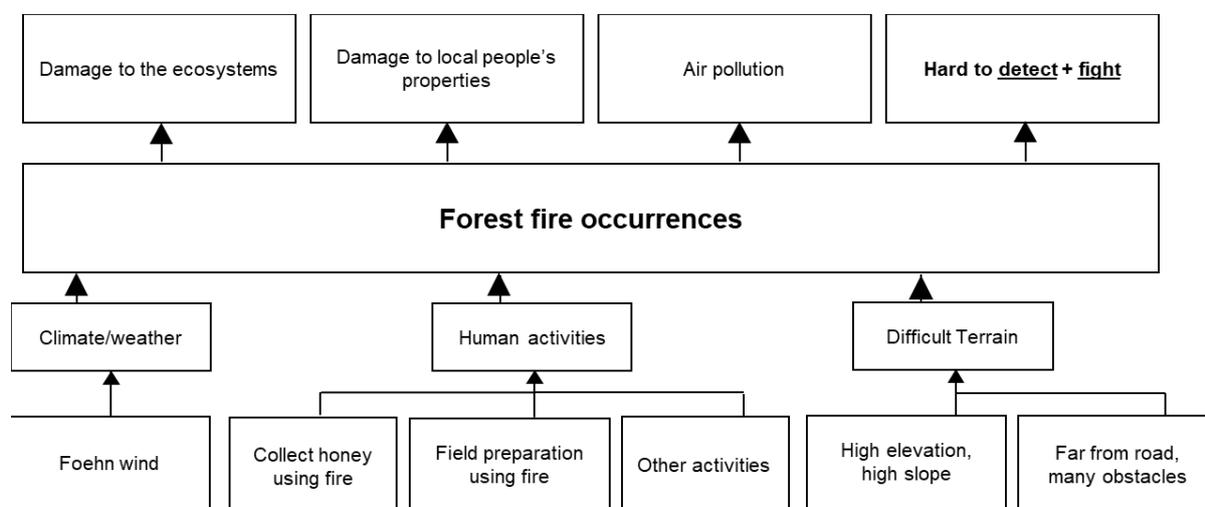


Figure 13. PROBLEM TREE ON FFMS IN VIET NAM

Table 28. SWOT OF FFMS IN VIET NAM

Strength	Weakness
<ul style="list-style-type: none"> <li>• Early detection is very important to control the fire</li> <li>• Applying high technology of thermal cameras ensures the success of the project</li> <li>• Automatic operation</li> <li>• Low demand of human resources</li> </ul>	<ul style="list-style-type: none"> <li>• High cost to install + maintain</li> <li>• Large areas to be monitored → Difficult to widespread over the country</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• High mountains provide broad field of vision for monitoring</li> <li>• Able to focus on high-risk areas of forest fire, in the fire season</li> </ul>	<ul style="list-style-type: none"> <li>• Low capacity of cellular connection in high mountainous areas</li> <li>• The weather (long period of fog, drizzle) may influence the operation of solar panel</li> </ul>

TABLE 29. COUNTRY STATUS AND ISSUES ON FFMS IN VIET NAM

Backgrounds and Current Status	<ul style="list-style-type: none"> <li>• Forest cover &gt;42% (2020).</li> <li>• Diverse natural forest types: Deciduous, bamboo, evergreen.</li> <li>• Mainly plantation forests; low-quality natural forests.</li> <li>• Many endangered plant species.</li> <li>• Serious negative impacts by local people.</li> <li>• Forest protection force too small, each forest ranger responsible a large area of forest.</li> </ul>
Related National Policy	<ul style="list-style-type: none"> <li>• Law on forestry 2017.</li> <li>• Circular 25/2019/TT-BNNPTNT. Specialized regulation on forest fire prevention and extinguishment.</li> </ul>
Experiences on FFMS	<ul style="list-style-type: none"> <li>• Many areas with high risk of forest fire.</li> <li>• Information Systems for forest fire risk classification by Department of Forest Protection.</li> <li>• Fighting forest Fire is the duty of all authority levels, military forces, stakeholders.</li> <li>• In fire season, establish teams of volunteers to patrol every day to detect forest fire if any.</li> </ul>

## 4. TRAINING SCHEDULE (Korea Standard Time, GMT +09)

Day	Time	Activity	Remark
	Self - paced	<b>Pre-Assignments</b> Three (3) E-learning Modules at <a href="https://olc.worldbank.org/">https://olc.worldbank.org/</a> (See the instruction in Attachment-4)	Trainees
<b>30 Oct. (Sat.)</b>	15:00-17:00	Check and confirm Zoom Application connection	The Secretariat
<b>1 Nov. (Mon)</b>	12:00-12:30	Zoom check-in	RETC
	12:30-13:00	Opening Ceremony & Introduction of participants	RETC
	13:00-15:00 (120')	Presentation 1. Country report	Trainees
	15:00-16:00	Break	
	16:00-17:00	Lecture 1.1: Forest Fire Ecology	Dr. Veerachai Tanpipat
	17:00-18:00	Lecture 1.2: International Trends of Forest Fire Management	Dr. Peter Moore
	18:00-18:05	Daily feedback and housekeeping announcement	RETC
<b>2 Nov. (Tues.)</b>	12:30-13:00	Recap on the previous day	Dr. Veerachai Tanpipat/ Trainees
	13:00-15:00	Lecture 2: Introduction to Global and ASEAN Wildfire, Smoke, and Haze Tracking System	Dr. Veerachai Tanpipat
	15:00-16:00	Break	
	16:00-18:00 (120')	Lecture 3: ROK's Forest Fire Information System	Prof. Dr. Park Joowon
	18:00-18:15	Daily feedback	RETC
<b>3 Nov. (Wed.)</b>	12:30-13:00	Recap on the previous day	Dr. Veerachai Tanpipat/ Trainees
	13:00-15:00	Lecture 4: Information Management Platform for Community-based Forest Fire Management and water management	Dr. Veerachai Tanpipat
	15:00-16:00	Break	
	16:00-17:00	Lecture 5: Fire Danger Rating System and Fire Early Warning System	Mr. Hartanto Sanjaya
	17:00-18:00	Lecture 6: Challenges in Regulating Transboundary Haze in Southeast Asia	Dr. Israr Albar
	18:00-18:15	Daily feedback	RETC
<b>4 Nov. (Thur.)</b>	12:30-13:00	Recap on the previous day	Dr. Veerachai Tanpipat/ Trainees
	13:00-14:00	Lecture 7.1: Forest Fire Regime in the Context of Climate Change (Asian View)	Dr. Veerachai Tanpipat
	14:00-15:00	Lecture 7.2: Forest Fire Regime in the Context of Climate Change (Australian View)	Dr. Peter Moore
	15:00-16:00	Break	
	16:00-18:00	Lecture 8: Overview of Wildland Fire Emission Inventory	Dr. Mark Parrington/ Dr. Veerachai Tanpipat
	18:00-18:15	Daily feedback and housekeeping announcement	RETC
<b>5 Nov. (Fri.)</b>	12:30-13:00	Recap on the previous day	Dr. Veerachai Tanpipat/ Trainees
	13:00-16:00 (180')	Presentation 2. Action plan	Dr. Veerachai Tanpipat/ Trainees
	16:00-17:00	Break	
	17:00-17:30	Recap & highlights of the training (inc.evaluation of training)	RETC
	17:30-17:45	Closing Ceremony	RETC

## 5. SESSION SUMMARY & MAIN OUTPUTS

### 5.1

### SESSION 1. FOREST FIRE ECOLOGY AND INTERNATIONAL TRENDS OF FOREST FIRE MANAGEMENT

A. Session Overview	This session introduces the concept of forest fire in the ecosystem. It covers the root causes of a disastrous fire, fire dependence, and adaptation of plants and animals, fire history, and effects on ecosystems.
B. Learning Outcomes	<p>At the end of this session, trainees will be able to understand:</p> <ul style="list-style-type: none"> <li>• Concept and principles of forest fire ecology.</li> <li>• Direct and indirect effects of fire disturbances.</li> <li>• Trends of forest fire management for the decision-making process.</li> </ul>
C. Content	<ol style="list-style-type: none"> <li>(1) Introduction of forest fire's behavior</li> <li>(2) Fire threat to forest ecosystem</li> <li>(3) History of forest fire management and practices</li> </ol>
D. Highlights	<ul style="list-style-type: none"> <li>• Forest fire ecology is the study of the interaction between ecosystem and the wildfires that occur naturally within them.</li> <li>• Forest fire history -Stephen Pyne view consist of three fires progression namely first fire (natural burning), second fire (anthropogenic fire-cultural fire), and third fire (industrialized fire).</li> <li>• Fire environment and behaviors-triangle correlation (weather, fuels, and topography).</li> <li>• Modes of heat transfer conduction, convection, and radiation.</li> <li>• Types of forest fire-ground fire-semi, surface fire, crown fire-semi, zombie fire.</li> <li>• Factors affecting fire behavior of which every fire fighter should be cognizant: fuel characteristics, fuel moisture, air temperature, topography (terrain), wind, atmospheric stability, relative humidity, and fire behavior.</li> <li>• Forest fire effect-deforestation &amp; Degradation-&gt;Climate change speed up.</li> </ul>
E. Interventions	<ul style="list-style-type: none"> <li>• Most dominant forest fire is the surface fire according to damage per hectare. However, peat fire contributes more emission in the atmosphere.</li> <li>• Fighting fire with fire or prescribed burning is the best approach in the larger landscape given the right time and location.</li> <li>• Forest Fire environment and behavior are most important aspects to consider as a forest fire commanders and fighters.</li> <li>• Precise anticipation of fire environment (8 factors) is key to firefighting success and avoid casualties/fatalities.</li> <li>• Firefighter safety should be the priority.</li> <li>• Fire can be a great servant but a bad master.</li> <li>• Guide on peatland fire management – Prof. Bambang Hero Saharjo.</li> </ul>

## 5.2

### SESSION 2. INTRODUCTION TO GLOBAL AND ASEAN WILDFIRE, SMOKE, AND HAZE TRACKING SYSTEM

F. Session Overview	This session introduces a series of information systems globally used in tracking the real-time information of wildfire, smoke, and haze. It also provides how to build up the wildfire database to analyze fire regimes, behavior, and their impact.
G. Learning Outcomes	At the end of this session, trainees will be able to: <ul style="list-style-type: none"> <li>Identify the open-access information system and tools for forest fire management</li> <li>Explore factors and requirements for the analysis.</li> </ul>
H. Content	(1) The steps of fire and smoke haze information system. (2) Forest fire and smoke haze decision supporting and management system.
I. Highlights	<ul style="list-style-type: none"> <li>Possible today to access large computing power, geoinformatics, cloud system and IoT.</li> <li>7 Steps of Fire &amp; Smoke Informatics consists of: <ul style="list-style-type: none"> <li>Prevention.</li> <li>Monitoring.</li> <li>Prediction and forecasting.</li> <li>Warning.</li> <li>Response.</li> <li>Recovery &amp; mitigation.</li> <li>After action review</li> </ul> </li> <li>Human monitoring increasingly replaced by Thermal &amp; Visible CCTV cameras and UAV/drones.</li> <li>Satellite monitoring systems e.g., NASA FIRMS, Sentinel-hub able to perform - active fire detection, burn severity, fire radiative power and fire emissions.</li> <li>However, different platforms rely on different databases and information still requires field validation.</li> <li>Monitoring of carbon emissions month by month by CAMS.</li> <li>Forecasting tools e.g., Copernicus, Windy, Nullschool, Google Earth Engine.</li> <li>Burn areas detection using Burn Severity Index (BSI).</li> <li>Prediction using Burned Areas Frequency by Google Earth Engine.</li> <li>Fire movement projection service e.g., Prometheus.</li> <li>Fire prevention is the most important and need to understand behavior of the locals.</li> <li>In fighting fires, smoke movement is key and fast information delivery.</li> </ul>
J. Interventions	<ul style="list-style-type: none"> <li>How quick is FIRMS able to detect a forest fire from the point the fire starts? <ul style="list-style-type: none"> <li>Used to be at least 3 hours due to processing time. Lately, processing time has reduced.</li> </ul> </li> <li>How large does the fire need to be to get detected by satellite systems? <ul style="list-style-type: none"> <li>25 square meters and depending on the heat (experience in Thailand).</li> </ul> </li> <li>Can satellite systems detect fires if cloud/fog/tree canopies are blocking the view? <ul style="list-style-type: none"> <li>Yes, blending different tools.</li> </ul> </li> <li>How to differentiate between organized burning activities and natural fire? <ul style="list-style-type: none"> <li>All prescribed burnings must be reported. Plus, information from the field to validate.</li> </ul> </li> <li>Free online training on early warning systems and fire monitoring: <ul style="list-style-type: none"> <li>NASA Applied Remote Sensing Training (ARSET) (<a href="https://appliedsciences.nasa.gov/what-we-do/capacity-building/arset/about-arset">https://appliedsciences.nasa.gov/what-we-do/capacity-building/arset/about-arset</a>)</li> </ul> </li> </ul>

### 5.3

#### SESSION 3. ROK'S FOREST FIRE INFORMATION SYSTEM

K. Session Overview	This session provides how to design a forest fire surveillance system and its implementation. It introduces forest fire management and information system in the Republic of Korea.
L. Learning Outcomes	At the end of this session, trainees will be able to understand: <ul style="list-style-type: none"> <li>• Designing and implementation of a fire information system.</li> <li>• A network approach to predict forest fire.</li> </ul>
M. Content	(1) Forest Disaster Management Platform (2) Conceptual Model (3) Disaster Response System.
N. Highlights	N/A
O. Interventions	<ul style="list-style-type: none"> <li>• Participants gained the knowledge about the usefulness of the system and how the system works.</li> <li>• How do other countries get this system and apply it into practice is a difficult question?</li> </ul>

### 5.4

#### SESSION 4. INFORMATION MANAGEMENT PLATFORM FOR COMMUNITY-BASED FOREST FIRE MANAGEMENT AND WATER MANAGEMENT

P. Session Overview	This session introduces a community-based forest fire information system and cooperation and engagements among different stakeholders. It covers the models and tools used for community-based forest fire management examples from Thailand.
Q. Learning Outcomes	At the end of this session, trainees will be able to: <ul style="list-style-type: none"> <li>• Identify potential resources and online tools for their country-specific fire management information system.</li> <li>• Explore the real-time information through open-access techniques.</li> </ul>
R. Content	(1) Case study of community-based forest fire management.
S. Highlights	<ul style="list-style-type: none"> <li>• Land utilization to create a sustainable approach, Land manager, Agroforestry, Sufficiency Economy.</li> <li>• Information Management Platform is a holistic approach.</li> <li>• Utilization of Science and Technology with Water Resource Information. Projects under the Hydro Informatics Institute.</li> <li>• Local community involvement is the key towards successful implementation of the projects with the leaders being the champions of the projects.</li> <li>• The core model of the projects is based on sufficiency economy which is based on sustainable development.</li> </ul>
T. Interventions	<ul style="list-style-type: none"> <li>• Do the funds received for violations of fire safety rules go to forestry enterprises? <ul style="list-style-type: none"> <li>- The funds are received directly by the local community.</li> </ul> </li> <li>• Is there a levy imposed on community who use water for household and power supply? <ul style="list-style-type: none"> <li>- Depends on support of the local community.</li> </ul> </li> </ul>

## 5.5

### SESSION 5. FIRE DANGER RATING SYSTEM OR FIRE EARLY WARNING SYSTEM

U. Session Overview	This session introduces the essential tool of warning extreme fire danger conditions to mitigate the disaster fire problems.
V. Learning Outcomes	<p>At the end of this session, trainees will be able to:</p> <ul style="list-style-type: none"> <li>• Explore long-term fire danger predictions based on advanced numerical weather conditions.</li> <li>• Understand the application of fire danger and early warning information systems and their advantages.</li> </ul>
W. Content	<p>(1) History of global fire danger rating system or fire early warning system.                  (2) Operational stages of the fire danger rating system.</p>
X. Highlights	<ul style="list-style-type: none"> <li>• The lecture focused on Ina-FDRS – peatland, which consists of 5 main components. Throughout the lecture session, anthropogenic factor was deeply discussed as statistics showed that human activities are the main driver of forest fire occurrences.</li> <li>• Ogan Komering Ilir, Sumatera Selatan was selected as a study area for the lecture and agriculture land clearing known as sonor was stressed as one of the causes of forest fire.</li> <li>• One of the setbacks in forest fire suppression identified was the lack of equipment.</li> <li>• Suffice to say that every technology ever existed has its own pros and cons, and this does not exclude FDRS. Hence, a myriad of system was introduced i.e., ERA5, NOAA, JAXA.</li> </ul>
Y. Interventions	<ul style="list-style-type: none"> <li>• From the trend of forest fire occurrences, it is suggested that:                         <ul style="list-style-type: none"> <li>- More awareness programs and forest fire training to be conducted in the fire-prone settlements.</li> <li>- Establishment of forest rangers among the forest communities to facilitate and assisting government officials in enforcement activities.</li> </ul> </li> </ul>

## 5.6

## SESSION 6. CHALLENGES IN REGULATING TRANS-BOUNDARY HAZE IN SOUTHEAST ASIA

Z. Session Overview	This session explores some of the constraints and barriers in the process of transboundary haze regulation. Likewise, the laws and regulations currently in use of the Southeast Asian countries can also be considered for collaborative action of transboundary haze problems.
AA. Learning Outcomes	At the end of this session, trainees will be able to: <ul style="list-style-type: none"> <li>• Identify the main constraints and barriers of transboundary haze solutions.</li> <li>• Identify constraints and opportunities of existing laws, rules, and regulations of SEA countries.</li> </ul>
BB. Content	(1) Identification of constraints and opportunities in regulating transboundary haze. (2) Identification of existing laws, rules, and regulations of regional countries.
CC. Highlights	<ul style="list-style-type: none"> <li>• ASEAN Birth in 1967.</li> <li>• The purpose of ASEAN Charter: A firm foundation in achieving the ASEAN community by providing legal status and institutional framework for ASEAN.</li> <li>• There are 4 councils under ASEAN and, AATHP is under ASEAN Socio-Cultural Community Council (ASCCC) with many meetings and COPs, especially COP to AATHP.</li> <li>• Institutional arrangement: COP of ministers level; Committee under COP; MSC and MSC Mekong; ASEAN Haze fund and ACC.</li> <li>• Peatland management with aims of monitoring and supporting APMS and funded by many organizations around the world, in particular APSMPE SUPAS for Sustainable Management and Peatland Ecosystems in ASEAN that reduce wildfire and haze.</li> <li>• The program of MAHFSA supported efforts to reduce transboundary haze pollution and its impact in Southeast Asia and support implementation roadmap ASEAN transboundary haze pollution control.</li> <li>• From 2016 to 2020, ASEAN member countries organized many meetings and workshop on EA of ACCTHP.</li> </ul>
DD. Interventions	<ul style="list-style-type: none"> <li>• I could broaden my horizons in terms of AATHP Institutional Framework and Arrangement as well as operation.</li> <li>• Latest technologies (FDRS) could reduce wildfire and haze, in particular Fire Early Warning System.</li> <li>• I hope that ASEAN member countries and nations across the globe could cooperate and exchange more model technologies and experts in detection and prevention Forest Fire.</li> <li>• To monitor cross-border fires Indonesia have thermal camera/CCTV especially in area prone to fire and there is satellite to see transboundary haze.</li> <li>• Related slash and burn, other country ASEAN Member mostly have similar culture for land preparing with simple and easy technique with burn.</li> </ul>

## 5.7

### SESSION 7. FOREST FIRE REGIME IN THE CONTEXT OF CLIMATE CHANGE

EE. Session Overview	This session explores the frequency and intensity of fire occurrence, how each country implements climate change mitigation activities in Nationally Determined Contributions (NDCs), and risk and enabling conditions that link to climate change.
FF. Learning Outcomes	<p>At the end of this session, trainees will be able to:</p> <ul style="list-style-type: none"> <li>• Understand the influences of forest fire regime.</li> <li>• Analyze the factors and interactions linking to climate change.</li> </ul>
GG. Content	<p>(1) Concept of forest fire regime and changes over time. (2) Measures to fire and climate change mitigation.</p>
HH. Highlights	<ul style="list-style-type: none"> <li>• Asian View <ul style="list-style-type: none"> <li>- Disaster-Climate Change.</li> <li>- Fire regime in Asia might be changing as the permafrost is melting more due to the temperature increasing in the northern Russia.</li> <li>- Climate Change for Primary rainforest destruction increased 12% from 2019-2020.</li> <li>- How Covid-19 affects the world's forest that increased illegal harvesting in the protected areas and top 10 countries with forest loss in 2020.</li> <li>- Showed the past and current Fire Regime and Top of CO<sub>2</sub> Emission in ASEAN country.</li> <li>- Cause of fire in each ASEAN country (previous training).</li> <li>- From 2003 through active forest fire, fire emission detected by satellite.</li> </ul> </li> <li>• Australian View <ul style="list-style-type: none"> <li>- The lecture mainly focused on the influence of "Climate Change" as an alarming indicator of emerging forest fires globally (based on IUFRO 2018) and then concentrate the discussion on the Australia's experience and current situations.</li> <li>- Emphasized that the fire activity in Australia is strongly affected by higher inter-annual climate variability and extremes. (i.e., 2019/2020 Black Summer Bushfire in Southeast Australia).</li> <li>- In the case of Australia, the frequency of major forest fire years (&gt;1M hectares burnt) has markedly increased since 2000.</li> <li>- The mean number of years since the last fire has decreased in each of the past four decades.</li> <li>- The recent trend is that increase in forest fire burnt area is consistent with increasingly more dangerous fire.</li> <li>- The future fire regimes are expected to be temperature driven and will influence fuels.</li> </ul> </li> </ul>
II. Interventions	<ul style="list-style-type: none"> <li>• Do the cooperation project of Forest fire management in ASEAN country?</li> <li>• We all must learn to live with fire.</li> <li>• Improve the planning and enhance technical capabilities to improve fire management situations.</li> <li>• Climate change is a very big topic globally and we should take it seriously.</li> <li>• Different localities have different parameters to be calibrated when using fire danger rating system.</li> </ul>

5.8

**SESSION 8. OVERVIEW OF WILDLAND FIRE EMISSION INVENTORY**

JJ. Session Overview	This session introduces the emissions inventory methods for wildland fire and particulate matter concentrations of fire emission.
KK. Learning Outcomes	<p>At the end of this session, trainees will be able to:</p> <ul style="list-style-type: none"> <li>• Access emission estimation tools.</li> <li>• Identify the strengths and weaknesses of the emission inventory methods.</li> </ul>
LL. Content	<p>(1) Available methodologies for estimating fire emissions.                  (2) Fire emission factors.                  (3) Free forest fire information and system.</p>
MM. Highlights	<ul style="list-style-type: none"> <li>• We learnt on Fire Emission and its variable due area, fuel, combustion, weather, and many other factors.</li> <li>• Consequently, there are various methods in inventory of fire emissions for wildland fire which look into very detail factors of fire emission and interpolate it into available technologies to get better data or output.</li> <li>• There are few available methodologies for estimating fire emissions such as FiNN, GFAS, GFED &amp; QFED which differs in spatial resolutions, highest temporal frequency, emission factors and data availability.</li> <li>• We also learnt to use free forest fire information and system such as Fire Cam Online tool using five database or methodologies.</li> <li>• Besides, haze monitoring as important as forest fire monitoring and listed many links to be accessed.</li> </ul>
NN. Interventions	<ul style="list-style-type: none"> <li>• We have been able to access emission estimation tools and choose the best for our use.</li> <li>• We must admit there are strengths and weaknesses on each emission inventory methods.</li> <li>• But the important is how to benefit from it and assisting us on our objectives.</li> <li>• It is learnt that good systems or tool only can be completed with full verification on the ground.</li> </ul>

## 6. ACTION PLANS OF PARTICIPATING COUNTRIES

### 6.1 BHUTAN

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>• Name: Department of Forests &amp; Park Services</li> <li>• Nature or type: Government Agency</li> <li>• Major functions/duties: To conserve and manage Bhutan's forest resources, biodiversity to ensure social, economic and environmental well-being and maintain a minimum of 60% of the land under forest cover for all times to come.</li> </ul>
Project Duration	January 2023 – January 2028
Est. Budget	USD\$ 200,000
Main Objectives	<ul style="list-style-type: none"> <li>• To reduce forest fire incidences and protect life and properties from forest fire.</li> <li>• To review legal framework, develop action plan and strategies that are practical, achievable, and reliable for the fire prevention, preparedness, response, and recovery.</li> <li>• Build and share knowledge among stakeholders to come to a common understanding of local forest fire risk, impacts and come out with appropriate management options.</li> <li>• To build a strong and reliable forest fire information system in place through adoption of state-of-the-art system and technologies. Institute strong forest fire data base for future interventions and planning.</li> </ul>
Benefactors	AFoCO, BFL
Potential environmental and social risk	Challenging topography and difficult to convince local communities on the conservation benefits.
Project Details	<ul style="list-style-type: none"> <li>• Improved SRF through use of fire management tools (prescribed burning)-to manage fuel.</li> <li>• Develop a communication network for incident reporting and coordinating suppression.</li> <li>• Institute technology for fire detection and monitoring.</li> <li>• Develop Forest fire prone area map.</li> <li>• Develop post fire assessment framework and valuation parameter.</li> <li>• Develop and implement regional and district fire management plan with SOPs.</li> <li>• Develop information, education, and communication materials.</li> <li>• Procure tools and equipment.</li> <li>• Review Policy, Law and rules and identify gaps.</li> <li>• Institute Forest Fire control Centre with the assistance of regional partners.</li> </ul>
Expected Results	<ul style="list-style-type: none"> <li>• Economic Effects: <ul style="list-style-type: none"> <li>- Improved revenue through increased timber productions.</li> <li>- Reduced fire mitigation cost.</li> <li>- Protect commercial timbers.</li> <li>- Increase Hydropower generation through watershed protection/fire incidences reduction.</li> </ul> </li> <li>• Technical Effects: <ul style="list-style-type: none"> <li>- Professional fire fighters in place.</li> <li>- Effective and efficient firefighting mechanism developed.</li> <li>- Comprehensive scientific research on mountainous forest fire behavior conducted.</li> <li>- Ensure mainstreaming or linking of disaster risk reduction with national level development plan, policy, program, and project.</li> <li>- Ensure compliance of the approved hazard zone and vulnerability map.</li> <li>- Strong data base in place for fire forecasting and management.</li> </ul> </li> </ul>

Item	Details
Expected Results	<ul style="list-style-type: none"> <li>• Social and Environmental Impacts               <ul style="list-style-type: none"> <li>- Harmonize social networking for firefighting.</li> <li>- Educate local folks on forest fire impacts and improve local understanding of fire hazards.</li> <li>- Enhances the fire management capacity of local communities and shoulder social responsibilities.</li> <li>- Improve watershed area and engage community in management of watershed areas.</li> <li>- Maintained 60% of forest cover for all time.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>• Policy provisions in favor of FFMS               <ul style="list-style-type: none"> <li>- FNCRR, 2017.</li> <li>- Constitution of Kingdom of Bhutan.</li> <li>- Forest Fire strategy, 2013.</li> <li>- National Forest Policy.</li> <li>- Local Government Act.</li> </ul> </li> <li>• Gaps and challenges of implementing in FFMS               <ul style="list-style-type: none"> <li>- Hesitation from local community to participate.</li> <li>- Weak coordination amongst stakeholders.</li> <li>- Imminent Human Wildlife Conflict.</li> <li>- Risking ones lives in challenging geographical terrain.</li> <li>- Lack of monitoring and poor information sharing on forest fire.</li> <li>- lack of modern safety equipment.</li> <li>- Budgetary provision</li> </ul> </li> <li>• Solutions               <ul style="list-style-type: none"> <li>- Formation of community-based forest fire management.</li> <li>- Formation of Community Networking systems.</li> <li>- Provide sufficient incentives for community for the prevention of forest fire.</li> <li>- Provide user friendly and handy firefighting tools.</li> <li>- Allocate annual budget for training, advocacy, and purchase of materials.</li> <li>- Improve Forest fire data base at all levels and conduct research to address problems and challenges.</li> <li>- Local incentives and compensation for foregoing livelihood opportunities.</li> </ul> </li> </ul>

## 6.2 BRUNEI DARUSSALAM

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>Name: Forestry Department</li> <li>Nature or type: Government department</li> <li>Major functions/duties : Parks and Recreation, Sustainable Forest Management</li> </ul>
Project Duration	March 2022 – March 2023
Est. Budget	USD\$ 1.5M
Main Objectives	To develop forest fire early warning system
Benefactors	National Disaster Management Centre, Rescue and Fire Department, Meteorology Department, Local institutions
Potential environmental and social risk	Minimal as installation of sensors are located within state land and Forestry Department jurisdiction.
Project Details	To develop, install and operation for early forest fire detection system with the use of a modular system (can use different sensor; hot-swappable) at areas that are prone to fire. Capacity building equipment usage and operation.
Expected Results	<ul style="list-style-type: none"> <li>Economic Effects: <ul style="list-style-type: none"> <li>Reduce the cost of fire suppression.</li> <li>Reduce the cost of damage to properties.</li> <li>Reduce the cost of forest rehabilitation.</li> </ul> </li> <li>Technical Effects: <ul style="list-style-type: none"> <li>Allow firefighters to implement fire prevention, detection, and pre-suppression plan</li> <li>Allow firefighters to mobilize faster before fire spread more.</li> <li>Increase in expertise for the operation of the system.</li> </ul> </li> <li>Social and Environmental Impacts: <ul style="list-style-type: none"> <li>Reduce loss of forested area.</li> <li>Reduce loss of forest biodiversity.</li> <li>Reduce cost of human lives and property.</li> <li>Provide livelihood for local community.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>Policy provisions in favor of FFMIS <ul style="list-style-type: none"> <li>Forest Act, Chapter 46, Laws of Brunei.</li> <li>National Forestry Policy, 1989.</li> <li>Sustainable Forest Management.</li> <li>Forestry Strategic Plan 2020 – 2022.</li> </ul> </li> <li>Gaps and challenges of implementing in FFMIS <ul style="list-style-type: none"> <li>Acceptance and cooperation with other agencies.</li> <li>Technical skills for installation and monitoring of system.</li> </ul> </li> <li>Solutions <ul style="list-style-type: none"> <li>Active collaboration and knowledge sharing.</li> <li>'Whole of Nation' approach.</li> <li>Create more awareness on the importance of having an early detection system.</li> </ul> </li> </ul>

## 6.3 CAMBODIA

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>Name: Forestry Administration</li> <li>Nature or type: Government Agency</li> <li>Major functions/duties : Department of Forestry and Community Forestry</li> </ul>
Project Duration	March 2022 – February 2027
Est. Budget	USD\$ 300,000
Main Objectives	<ul style="list-style-type: none"> <li>Wildfire behavior will be mainstreamed within local community.</li> <li>Afforestation will be implemented to contribute climate change reduction via forest fire suppression.</li> </ul>
Benefactors	Proposal request to donors.
Potential environmental and social risk	Wildfire could be occurred without pre prediction.
Project Details	The project will be studied on forest rehabilitation as well as dissemination on negative impact of wildfire to environment and social to contribute the climate change reduction. All of level stakeholders, authorities, and local communities could participate the afforestation in community forestry via supporting by Forestry Administration under Ministry of Agriculture, Forestry and Fisheries that provides technical framework.
Expected Results	<ul style="list-style-type: none"> <li>Economic Effects: <ul style="list-style-type: none"> <li>Local community will improve livelihood via proceed and utilize NTFP in community Forest plus get a new job in pilot project.</li> <li>Tourist service will be installed to contribute supporting income in local community Forest after project well done.</li> </ul> </li> <li>Technical Effects: <ul style="list-style-type: none"> <li>Local community will have real firefighter to forest fire suppression.</li> <li>Local community will receive knowledge about tree plantation technique.</li> </ul> </li> <li>Social and Environmental Impacts: <ul style="list-style-type: none"> <li>This pilot project will be able to contribute climate change reduction.</li> <li>This on site will become model of green zone in Cambodia.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>Policy provisions in favor of FFMS <ul style="list-style-type: none"> <li>Existing Law on Forestry.</li> <li>National Forest Program (2010-2029).</li> <li>Guidance on Forest Fire Prevention Measurement.</li> </ul> </li> <li>Gaps and challenges of implementing in FFMS <ul style="list-style-type: none"> <li>The project implementation could be stuck because of political changing.</li> <li>Natural disaster could be occurred without prediction to the project.</li> </ul> </li> <li>Solutions <ul style="list-style-type: none"> <li>Preparing strategy plans on afforestation and forest fire suppression.</li> <li>Close collaboration between stakeholders and at all levels.</li> <li>Benefit sharing and motivation into the project.</li> <li>Dissemination and education on negative impact of wildfire.</li> </ul> </li> </ul>

## 6.4 INDONESIA

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>Name: Center for Standardization of Disaster and Climate Change Instruments (BSI-MoEF), Forest Manajemen Unit (FMU), and Local NGO</li> <li>Nature or type: Non timber forest product, Agroforestry System and zero burning agricultural practices on peatland</li> <li>Major functions/duties : sustainable income for peat fire prevention</li> </ul>
Project Duration	Jan 2022 – Dec 2023
Est. Budget	USD\$ 155,000
Main Objectives	Improved community income through/stinglesh/honeybee cultivation and development of sustainable agroforestry system in peatland
Benefactors	Local Community and Forest Management Unit
Potential environmental and social risk	<ul style="list-style-type: none"> <li>Environmental risk: Peat fire if community continues agricultural land preparation by burning.</li> <li>Social risk: Market Competition if community do not form farmer group.</li> </ul>
Project Details	<ul style="list-style-type: none"> <li>Facilitate the development of business plan.</li> <li>Development of agroforestry on peatland/ paludicultura: Provision of seedlings and agricultural inputs.</li> <li>Stingless honeybee cultivation.</li> <li>Capacity building (FMU, Farmer group): Strengthening farmer group, training for honeybee cultivation, post-harvest technology, marketing management.</li> <li>Farmer group assistance (By NGO).</li> <li>Provision of facilities for Trigona/stinglesh bee cultivation: provision of honeybee nets, provision of dehumidifier for honeybee, equipment for harvesting.</li> <li>Facilitate Marketing of stingless honeybee (by FMU).</li> </ul>
Expected Results	<ul style="list-style-type: none"> <li>Economic Effects: <ul style="list-style-type: none"> <li>Increased farmer's income from best practices of agroforestry.</li> <li>Increased FMU earning (from benefit sharing of honeybee business).</li> </ul> </li> <li>Technical Effects: <ul style="list-style-type: none"> <li>Sustainable honeybee production technique.</li> <li>Stinglesh bee quality improvement technique.</li> </ul> </li> <li>Social and Environmental Impacts: <ul style="list-style-type: none"> <li>Farmer's group: Strengthened, improve network increases, improve skill and knowledge.</li> <li>Increased public awareness on environmental protection, Less peatland fire.</li> <li>Increasing of environmental quality (better forest quality/land cover, optimalization land used.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>Policy provisions in favor of FFMIS <ul style="list-style-type: none"> <li>Zero burning policies.</li> <li>Peat water table policy for cultivation.</li> <li>Classification of peatland for conservation and cultivation.</li> <li>Availability of early warning system.</li> </ul> </li> <li>Gaps and challenges of implementing in FFMIS <ul style="list-style-type: none"> <li>Zero burning technique is expensive, more time needed, not yet mastered by community.</li> <li>Community awareness on the dangers of smoke haze is low.</li> <li>Community knowledge on burning peat will fertilize soil.</li> <li>More commodities on drained peatland, and drained peatlands are more prone to fire.</li> </ul> </li> <li>Solutions <ul style="list-style-type: none"> <li>The use of peatland without burning.</li> <li>Paludiculture system.</li> <li>Stingless bee cultivation.</li> <li>Community investigation on peatland.</li> </ul> </li> </ul>

## 6.5 KAZAKHSTAN

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>• Name: N/A</li> <li>• Nature or type : N/A</li> <li>• Major functions/duties : N/A</li> </ul>
Project Duration	01.02.2022 – 01.02.2024
Est. Budget	USD\$ 1180,000
Main Objectives	Early detection of forest and steppe fires and training the population on fire safety and awareness raising.
Benefactors	N/A
Potential environmental and social risk	N/A
Project Details	The early detection system for forest fires consists of two parts: hardware and software. The hardware part is a network of controlled surveillance sensors (video cameras, thermal imaging sensors, infrared cameras). The software part is a special software (software), with the help of which it monitors forests in real time and determines the coordinates of fires. The system uses the existing infrastructure of mobile operators (cell towers, communication equipment and service teams). Because the system is easily scalable and expandable, it is suitable for forest fire detection.
Expected Results	<ul style="list-style-type: none"> <li>• Economic Effects: <ul style="list-style-type: none"> <li>- Saving money on constant patrolling.</li> <li>- Reducing the cost of extinguishing fires and reforestation.</li> <li>- Minimize the risks of loss of profit from crops.</li> </ul> </li> <li>• Technical Effects: <ul style="list-style-type: none"> <li>- Early detection of forest and steppe fires.</li> <li>- Quick response to fires.</li> <li>- Minimize area on fire.</li> </ul> </li> <li>• Social and Environmental Impacts: <ul style="list-style-type: none"> <li>- Reduction of forest fires.</li> <li>- Reduction of air pollution.</li> <li>- Ecosystem conservation.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>• Policy provisions in favor of FFMS <ul style="list-style-type: none"> <li>- Early detection of forest and steppe fires.</li> </ul> </li> <li>• Gaps and challenges of implementing in FFMS <ul style="list-style-type: none"> <li>- Lack of new technology and equipment for FFMS.</li> <li>- Lack of state information systems and centralized forest fire management.</li> <li>- Low level of environmental culture and environmental education.</li> </ul> </li> <li>• Solutions <ul style="list-style-type: none"> <li>- Development of an integrated firefighting system.</li> </ul> </li> </ul>

## 6.6 KYRGYZSTAN

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>• Name: N/A</li> <li>• Nature or type: N/A</li> <li>• Major functions/duties: N/A</li> </ul>
Project Duration	01.02.2022 - 01.02.2026
Est. Budget	For installation of video cameras 2,000,000 USD \$ approximately
Main Objectives	We would very much like to use modern information technologies (satellite images and video cameras) for efficiency and reduce the covered area of forest fires in a timely manner to extinguish forest fires and reduce forest fires, air pollution.
Benefactors	AFOCO
Potential environmental and social risk	Forest fires
Project Details	Modern information technologies (video cameras and satellite images).
Expected Results	<ul style="list-style-type: none"> <li>• Economic Effects: <ul style="list-style-type: none"> <li>- Budget savings.</li> </ul> </li> <li>• Technical Effects: N/A</li> <li>• Social and Environmental Impacts: <ul style="list-style-type: none"> <li>- Air pollution.</li> <li>- Increase of forest covered area.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>• Policy provisions in favor of FFMIS <ul style="list-style-type: none"> <li>- Reduction of air pollution.</li> <li>- Reduction of forest loss covered area.</li> <li>- Budget savings.</li> </ul> </li> <li>• Gaps and challenges of implementing in FFMIS <ul style="list-style-type: none"> <li>- Timely extinguishing forest fires.</li> <li>- Timely notification/warning.</li> </ul> </li> <li>• Solutions <ul style="list-style-type: none"> <li>- Modern information technologies (satellite images and video cameras) for efficiency and reduction of the covered area of forest fires timely extinguish forest fires and reduce forest fires, air pollution.</li> </ul> </li> </ul>

## 6.7 LAO PDR

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>Name: Department of Forestry</li> <li>Nature or type: Ministry of Agriculture and Forestry</li> <li>Major functions/duties : National and Provincial Department of Forestry</li> </ul>
Project Duration	<March 2022> – <February 2027>
Est. Budget	1,000,000 USD\$
Main Objectives	<ul style="list-style-type: none"> <li>Develop an integrated fire management system through the introduction of early detection and monitoring systems, provision of fire suppression equipment and involvement of local communities along with restoration of forest land disturbed by fire.</li> <li>Strengthen institutional and technical capacities for the integrated management of forest fires through training programs and public awareness raising activities.</li> </ul>
Benefactors	Proposal request to donors.
Potential environmental and social risk	Forest fire could be occurred without management system.
Project Details	The project will be conducted on forest rehabilitation as well as dissemination on negative impact of Forest fire to environment and social in order to contribute the Sustainable Forest management. All National and local stakeholders, authorities could participate the afforestation in community forestry via supporting by Ministry of Agriculture and Forestry.
Expected Results	<ul style="list-style-type: none"> <li>Economic Effects: <ul style="list-style-type: none"> <li>Local community will improve livelihood via maintenance of plantation area.</li> </ul> </li> <li>Technical Effects: <ul style="list-style-type: none"> <li>Institutional and governmental will receive technical training guidelines on Forest fire.</li> <li>Local community will receive knowledge about tree plantation technique and forest fire management.</li> </ul> </li> <li>Social and Environmental Impacts: <ul style="list-style-type: none"> <li>This pilot project will be sustainable forest management.</li> <li>This on site will become model of forest fire management.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>Policy provisions in favor of FFMS: N/A Gaps and challenges of implementing in FFMS: System control, equipment, information.</li> <li>Solutions <ul style="list-style-type: none"> <li>Extending an existing Law on forestry.</li> <li>Preparing master plans on forest fire managements.</li> <li>Close collaboration between stakeholders and at central and local level.</li> <li>Dissemination and education on negative impact of Forest fire for relevant authorities.</li> </ul> </li> </ul>

## 6.8 MALAYSIA

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>• Name: Ministry of Energy and Natural Resources</li> <li>• Nature or type: Ministry</li> <li>• Major functions/duties : To spearhead the natural resources governance for the wellbeing of the nation</li> </ul>
Project Duration	2022 - 2027
Est. Budget	USD\$ 10,000,000.00
Main Objectives	To sustainably manage peatlands in Malaysia to conserve resources, prevent degradation and generate benefit for the communities
Benefactors	Government funding – under 12th Malaysia Plan (RMK-12) & Co-funding from international projects.
Potential environmental and social risk	<p>Effective cooperation from multi-stakeholders.</p> <ul style="list-style-type: none"> <li>• Sustainability of peatland management and development.</li> </ul>
Project Details	<p>search on understanding peatlands characteristics. ordination from multi stakeholders and communities.</p> <ul style="list-style-type: none"> <li>• Strengthening the methodologies of fire suppression and prevention.</li> </ul>
Expected Results	<ul style="list-style-type: none"> <li>• Economic Effects: <ul style="list-style-type: none"> <li>- Reduce the risk to loss of valuable forest produce.</li> </ul> </li> <li>• Technical Effects: <ul style="list-style-type: none"> <li>- The effectiveness of early detection of fire incidents can help in reducing forest fire incidence statistics.</li> <li>- Updated management plan with holistic integrated measures.</li> <li>- Updated data on peatland inventories.</li> </ul> </li> <li>• Social and Environmental Impacts: <ul style="list-style-type: none"> <li>- Biodiversity and local community livelihood can be protected.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>• Policy provisions in favor of FFMIS <ul style="list-style-type: none"> <li>- There is a need to review and update existing policy to strengthen sustainability efforts.</li> <li>- Strengthen enforcement of laws and regulations.</li> </ul> </li> <li>• Gaps and challenges of implementing in FFMIS <ul style="list-style-type: none"> <li>- Limited fund and resources.</li> <li>- knowledge gaps in implementing FFMIS based on local needs.</li> </ul> </li> <li>• Solutions <ul style="list-style-type: none"> <li>- Technical training / capacity building for staff on FFMIS.</li> <li>- Look for international and as well local fund for funding on FFMIS development and enhancement.</li> <li>- Get support from private company which can provide technical support.</li> </ul> </li> </ul>

## 6.9 MONGOLIA

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>• Name: N/A</li> <li>• Nature or type N/A</li> <li>• Major functions/duties : N/A</li> </ul>
Project Duration	N/A
Est. Budget	N/A
Main Objectives	N/A
Benefactors	N/A
Potential environmental and social risk	N/A
Project Details	N/A
Expected Results	<ol style="list-style-type: none"> <li>1. Economic Effects: N/A</li> <li>2. Technical Effects: N/A</li> <li>3. Social and Environmental Impacts : N/A</li> </ol>
Challenges and Solutions	<ol style="list-style-type: none"> <li>1. Policy provisions in favor of FFMIS: N/A</li> <li>2. Gaps and challenges of implementing in FFMIS: N/A</li> <li>3. Solutions : N/A</li> </ol>

## 6.10 MYANMAR

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>Name: Forest Department</li> <li>Nature or type: Government Organization</li> <li>Major functions/duties : Conservation and Sustainable management of forest and ecosystem</li> </ul>
Project Duration	2022 - 2024
Est. Budget	USD\$ 600,000
Main Objectives	To implement forest fire management systems in areas that have high potential to occur forest fires by promoting the capacity of all relevant stakeholders on wildfire management
Benefactors	Forest Staffs, Resident people in project area.
Potential environmental and social risk	Interest of resident people.
Project Details	<ul style="list-style-type: none"> <li>To find out areas that have highest potential to occur wildfires through satellite datasets (GEE, NASA, NOVA).</li> <li>To build up the capacity on Remote Sensing methods to all forest staffs in terms of forest fire information systems.</li> <li>To promote the awareness of local people in the selected project area in terms of the causes and effects of forest fires.</li> <li>To develop the demonstration plot for forest fire protection and monitoring systems on the selected project area.</li> </ul>
Expected Results	<ul style="list-style-type: none"> <li>Economic Effects: <ul style="list-style-type: none"> <li>It can quickly detect the fire burning area and prevent by fire break activities.</li> <li>It can provide job opportunities to resident people as for fireguard vacancy.</li> <li>Improvement of biodiversity condition.</li> </ul> </li> <li>Technical Effects: <ul style="list-style-type: none"> <li>Conduct of Mapping and Planning related to forest fire Management.</li> <li>Increasing the number of technicians.</li> <li>Access technical database for future studies and plans.</li> </ul> </li> <li>Social and Environmental Impacts: <ul style="list-style-type: none"> <li>Protect the Forest Ecosystem from the risk of forest fire.</li> <li>Reduce environmental problems from forest fires.</li> <li>Reduced incidences of human disturbance.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>Policy provisions in favor of FFMIS <ul style="list-style-type: none"> <li>Forest Department (1995, 2018)- Article 41, sub article (d).</li> <li>Forest Policy (1995).</li> <li>30 years National Forest Master Plan (2001-02 to 2030-31).</li> </ul> </li> <li>Gaps and challenges of implementing in FFMIS <ul style="list-style-type: none"> <li>Human disturbance.</li> <li>High Expenditure.</li> </ul> </li> <li>Solutions <ul style="list-style-type: none"> <li>Developing the technical systems in the existing fire protection measures.</li> <li>Capacity development at all levels.</li> <li>Protection of forest fires on the departmental forest plantations and natural forests at the project area.</li> <li>Protection the property of local people in the project area.</li> <li>Protection of illegal logging by the use of forest-fighting base camps on the project area.</li> </ul> </li> </ul>

## 6.11 PHILIPPINES

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>Name: DENR</li> <li>Nature or type: Environment</li> <li>Major functions/duties : N/A</li> </ul>
Project Duration	2022 - 2023
Est. Budget	USD\$ 200k
Main Objectives	To develop and adopt a Forest Fire Danger Rating System.
Benefactors	DENR/BFP/PAG-ASA/LGUs
Potential environmental and social risk	N/A
Project Details	The FDRS will monitor forest / vegetation fires risk, predict fire behavior and supply information which will support forest fire management in the country. It can be used as a guide to policymakers in developing actions to protect life, property, and the environment.
Expected Results	<ul style="list-style-type: none"> <li>Economic Effects: <ul style="list-style-type: none"> <li>Decreased loss on property and natural resources caused by fire</li> <li>Informed management decisions on fire prone areas (improved resource allocations)</li> </ul> </li> <li>Technical Effects: <ul style="list-style-type: none"> <li>Improved understanding of fire behavior</li> <li>Improved capability to produce fire hotspots shapefiles/maps</li> </ul> </li> <li>Social and Environmental Impacts: <ul style="list-style-type: none"> <li>Halting continued deforestation due to forest fires thereby conserving existing natural and plantation forests</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>Policy provisions in favor of FFMS <ul style="list-style-type: none"> <li>No specific policy provisions on the use FFMS in the Philippines.</li> </ul> </li> <li>Gaps and challenges of implementing in FFMS <ul style="list-style-type: none"> <li>Provision of budget for the implementation of the system, particularly on infrastructure and logistical support.</li> <li>Technical capacity of the field officers/benefactors to implement the system.</li> <li>Coordination with other agencies and stakeholders for the implementation of the system.</li> </ul> </li> <li>Solutions <ul style="list-style-type: none"> <li>Inclusion of budget for the implementation of the system in the agencies' Annual Budget Allotment.</li> <li>Conduct of consultation meetings with concerned agencies and other stakeholders.</li> <li>Conduct of capacity building activities on the implementation of the system for concerned field officers and agencies.</li> <li>Conduct of intensive communication campaigns for concerned communities.</li> </ul> </li> </ul>

## 6.12 SINGAPORE

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>• Name: National Parks Board</li> <li>• Nature or type: Environment</li> <li>• Major functions/duties : Forestry, parks management, consultant agency</li> </ul>
Project Duration	2022 - 2025
Est. Budget	USD\$700,000
Main Objectives	<ul style="list-style-type: none"> <li>• Improve wildfire management procedures in offshore islands.</li> <li>• Increase digitization of operational processes.</li> </ul>
Benefactors	Singapore Government
Potential environmental and social risk	Disruption of sensitive ecological food web / disturbance to local biodiversity.
Project Details	<ul style="list-style-type: none"> <li>• Improve wildfire management procedures in offshore islands <ul style="list-style-type: none"> <li>• Collaboration with SCDF for: <ul style="list-style-type: none"> <li>- Site familiarization and Tabletop exercises to address case scenarios within the islands, as well as determining resource needs.</li> <li>- Staff training for better assessment of fire incidences (~USD\$700).</li> </ul> </li> </ul> </li> <li>• Increase digitization of operational processes (within mainland and offshore islands) <ul style="list-style-type: none"> <li>• Monitoring of potential sources of fuel using LIDAR scans of dead/decayed trees and wood (Research and Development ~USD\$300,000(?)) <ul style="list-style-type: none"> <li>- Information and location to be shared on the cloud for site managers to make decision on the removal</li> <li>- To ensure forests are healthy, reducing risk of spontaneous forest fire.</li> </ul> </li> <li>• Usage of Tethered Drones for firefighting (USD\$300,000) <ul style="list-style-type: none"> <li>- Incorporating the use of tethered drones in fire-fighting procedures (stated budget allocated for approx. 3 tethered drones).</li> <li>- Upon receiving alerts from staff/public/CCTV on detection of forest fire or smoke, deploy charged tethered drone to determine location of fire.</li> <li>- For larger forest fires, drones can transport water / extinguishing liquids to put out fires.</li> </ul> </li> <li>• Deployment of affordable air quality sensors within the forest for early detection of forest fires (~USD\$30,000) <ul style="list-style-type: none"> <li>- Determine hotspots / areas with higher frequency or risk of forest fires and deploy sensors at these locations (stated budget allocates for approx. 10 sensors).</li> <li>- Sensors to send alerts to staff when PM2.5 exceeds normal levels.</li> </ul> </li> </ul> </li> </ul>
Expected Results	<ul style="list-style-type: none"> <li>• Economic Effects: <ul style="list-style-type: none"> <li>- Reduce economic losses from spontaneous forest fires.</li> <li>- Reduce the number and frequency of manpower needed to monitor and respond to fire events.</li> <li>- Preserve forest health, saving costs of forest restoration caused by damages from fire.</li> </ul> </li> <li>• Technical Effects: <ul style="list-style-type: none"> <li>- Use of technology that updates information efficiently.</li> <li>- More trained personnel to operate the technology and analyses the data.</li> <li>- When a new site is assessed for fire safety planning, developed SOPs and technology can be used.</li> </ul> </li> <li>• Social and Environmental Impacts: <ul style="list-style-type: none"> <li>- Keeps the site safe for visitors.</li> <li>- Keeps the site safe for people working on site.</li> <li>- Reduce the risk of forest fires.</li> <li>- Reduce environmental damage from forest fires.</li> </ul> </li> </ul>

Item	Details
<p>Challenges and Solutions</p>	<ul style="list-style-type: none"> <li>• Policy provisions in favor of FFMIS               <ul style="list-style-type: none"> <li>- Workplace Safety and Health Act [Act 7 of 2006].</li> <li>- Fire Safety Act - Fire Safety (Petroleum and Flammable Materials) Regulations 2005 (Amended Sept 2013).</li> <li>- Environmental Protection and Management (Prohibition on The Use of Open Fires) Order.</li> <li>- Parks and Trees Regulations.                   <ul style="list-style-type: none"> <li>• Smoking in Nature Reserves is prohibited.</li> <li>• Discharge of any dangerous fireworks, explosives or weapons is not allowed within any national park, nature reserve or public park.</li> <li>• No Camping and Barbecues.</li> </ul> </li> <li>- Causing or contributing to risk of dangerous fire Penal Code (Chapter 14 Section 285)</li> </ul> </li> <li>• Gaps and challenges of implementing in FFMIS               <ul style="list-style-type: none"> <li>- Usage of tethered drones.                   <ul style="list-style-type: none"> <li>• Sound of drones can disturb local biodiversity.</li> <li>• Restrictions by Aviation authorities.</li> </ul> </li> <li>- Site challenges of offshore islands.                   <ul style="list-style-type: none"> <li>• Due to distance of offshore islands from mainland, SCDF's response time might be long - staff will need to be equipped with training and resources to fight fires while awaiting arrival of SCDF team.</li> </ul> </li> <li>- Air quality sensors within forests.                   <ul style="list-style-type: none"> <li>• Fires can take place anywhere, difficult to determine locations of where to deploy these sensors.</li> </ul> </li> </ul> </li> <li>• Solutions               <ul style="list-style-type: none"> <li>- Usage of tethered drones - to research further into the risk management of drones and ensure risk of drone failure is kept as low as possible.</li> <li>- Site challenges of offshore islands.                   <ul style="list-style-type: none"> <li>• National Parks Board officers schedule tabletop familiarization exercises to prepare for fire emergencies.</li> <li>• Yearly forest fires data made available - allowing site managers to be aware of months with higher risk of forest fires.</li> </ul> </li> <li>- Air quality sensors within forests - study trends of hotspots and use these locations as trial sites, sensors can be deployed at other locations within the forest if they are effective.</li> </ul> </li> </ul>

## 6.13 THAILAND

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>Name: Royal Forest Department</li> <li>Nature or type: Government Agency</li> <li>Major functions/duties : conservation, protection, maintenance, and management for the utilization and , study, research</li> </ul>
Project Duration	About 7 months from January to July (before wildfire season)
Est. Budget	USD 3,125 (~100,000 THB)/ Community Forest
Main Objectives	Reduce the occurrence of forest fire in the community and enhance the community forest
Benefactors	Royal Forest Department
Potential environmental and social risk	Unpredictable environment
Project Details	Involve communities in forest fire management before it spreads to other area.
Expected Results	<ul style="list-style-type: none"> <li>Economic Effects: <ul style="list-style-type: none"> <li>Reduce the expenses to fire management.</li> <li>The area has been restored.</li> <li>People in the community forest earns more income from the fertile forest.</li> </ul> </li> <li>Technical Effects: <ul style="list-style-type: none"> <li>Establish a mechanism for cooperation from all sectors.</li> <li>People in the forest community can take preliminary action to extinguish forest fires.</li> </ul> </li> <li>Social and Environmental Impacts: <ul style="list-style-type: none"> <li>Reduce the spread.</li> <li>Reduced smoke.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>Policy provisions in favor of FFMIS <ul style="list-style-type: none"> <li>A pilot project to coordinate cooperation among community forest networks in the region.</li> <li>Be applied and transferred to improve both forest fire and community forest management.</li> </ul> </li> <li>Gaps and challenges of implementing in FFMIS <ul style="list-style-type: none"> <li>Lack of continuity of integration.</li> <li>The budget to support is insufficient.</li> <li>Cooperation of ASEAN countries.</li> <li>Fully Support from the Royal Forest Department.</li> </ul> </li> <li>Solutions <ul style="list-style-type: none"> <li>Intensive cooperation both within the organization and international cooperation.</li> <li>To promote forest fire management and community forest network.</li> </ul> </li> </ul>

## 6.14 VIETNAM

Item	Details
Implementing Organization	<ul style="list-style-type: none"> <li>• Name: Administration of Forestry</li> <li>• Nature or type: Governmental Agency</li> <li>• Major functions/duties : Forest management</li> </ul>
Project Duration	2022 - 2025
Est. Budget	USD\$ 700,000
Main Objectives	Installing and operating the Forest Fire Early Detecting systems for 06 National Parks in Vietnam
Benefactors	Ministry of Agriculture and Rural Development, Local Authorities
Potential environmental and social risk	None
Project Details	<ul style="list-style-type: none"> <li>• Designing specified administration software + mobile application</li> <li>• Field survey for location selection</li> <li>• Establishing concrete base</li> <li>• System installation in monitoring station: <ul style="list-style-type: none"> <li>• + Datalogger open source Mhaster</li> <li>• + Transmission system: 4/5G</li> <li>• + Server on host-computers</li> <li>• + Sensor: Thermal camera IR &amp; Video recorder (NVR)</li> <li>• + Solar panel</li> </ul> </li> <li>• System operation testing</li> </ul>
Expected Results	<ul style="list-style-type: none"> <li>• Economic Effects <ul style="list-style-type: none"> <li>- Reduce loss by forest fires.</li> <li>- Reduce human resources for fire monitoring.</li> </ul> </li> <li>• Technical Effects <ul style="list-style-type: none"> <li>- Early detection.</li> <li>- Quick + Automatic respond.</li> </ul> </li> <li>• Social and Environmental Impacts <ul style="list-style-type: none"> <li>- Improving forest resources management :Biodiversity, Landscape, Human properties.</li> </ul> </li> </ul>
Challenges and Solutions	<ul style="list-style-type: none"> <li>• Policy provisions in favor of FFMS <ul style="list-style-type: none"> <li>- Regulations on the management of activities within National Park by each provincial authority.</li> <li>- Law on Forestry (2017) and Law on Biodiversity (2018).</li> </ul> </li> <li>• Gaps and challenges of implementing in FFMS <ul style="list-style-type: none"> <li>- High budget requirement.</li> <li>- Continuous funding for maintenance.</li> <li>- Technical knowledge.</li> </ul> </li> <li>• Solutions <ul style="list-style-type: none"> <li>- Workshop + training for technicians and administrators.</li> <li>- Ask for donation to raise budget for maintaining the systems.</li> </ul> </li> </ul>

## 7. SURVEY RESULTS

After completing all sessions of the training, the participants filled out the questionnaire composed of the organization and preparation of the training course, subjects, training design, comparisons with other training courses, and opinions for the training course.

### 7.1 Organization and Preparation

Based on the results of the questionnaire (**Table 1**), 41.7% of the participants strongly agreed that the organization of the course was appropriate, and 50% of them agreed to the same survey item. 44.4% of the participants strongly agreed that they were well-informed and kept updated before the training course, while 36.1% of them agreed to the same statement. Regarding satisfaction with the pre-arrangement of the organization, 52.8% of the participants strongly agreed and 36.1% of them agreed to the same statement.

Table 1. Organization and Preparation

Variable	Percentage (%)	
	Strongly Agree	Agree
• The organization of the course was appropriate	41.7	50.0
• I was well informed and kept updated before the training course	44.4	36.1
• I was satisfied with the pre-arrangement of the organization	52.8	36.1

### 7.2 Educational Environment

Based on the results of the questionnaire (**Table 2**), 50% of the participants very satisfied that the Zoom setting, and 44.4% of them Satisfied to the same statement. 77.8% of the participants very satisfied that the hospitality of the RETC staff, and 19.4% of them satisfied to the same statement.

Table 2. Educational Environment

Variable	Percentage (%)	
	Very Satisfied	Satisfied
• Zoom Setting	50.0	44.4
• Hospitality of the RETC staff	77.8	19.4

### 7.3 Comparison with other training courses

Relative to other training courses taken by the participants (**Table 3**), 91.4% of the participant answered the overall quality of this training course was "high or much higher", followed by 8.3% who said it was "similar". 72.2% of the participants said that the level of intellectual challenge presented and the participants who said "similar" was 27.8%. 38.9% of the participant answered the level of involvement/participation in this course was "high or much higher", followed by 55.6% who said it was "similar". 72.2% of the participants said that the amount of effort participants put into this course was "high or much higher", followed by 27.8% who said it was "similar". 88.9% of the participant answered the amount of knowledge/information gained through this course was "high or much higher", followed by 11.1% who said it was "similar".

Table 3. Relative to other training courses taken by the participants

Variable	Frequency (%)		
	Much higher	High	Similar
• The overall quality of this training course	25.0	66.7	8.3
• The level of intellectual challenge presented	19.4	52.8	27.8
• The amount of effort participants put into this course	11.1	61.1	27.8
• The level of involvement/participation in this course	16.7	22.2	55.6
• The amount of knowledge/information gained through this course	22.2	66.7	11.1

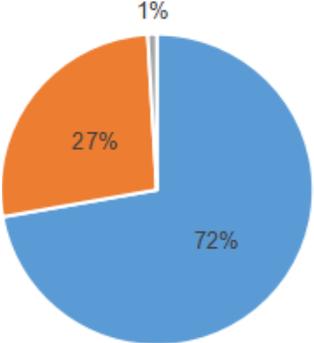
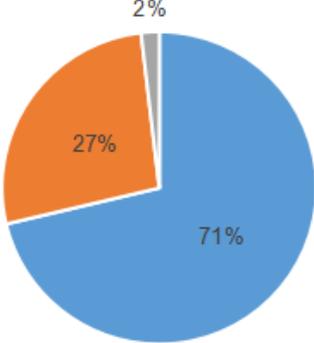
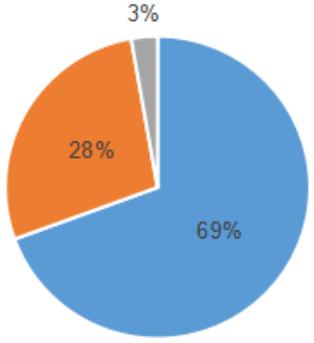
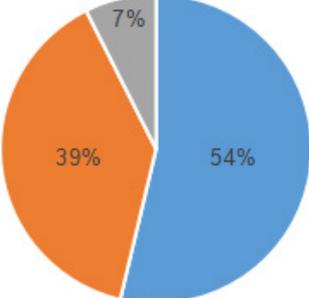
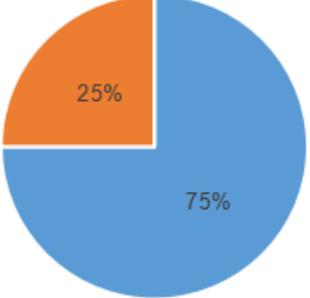
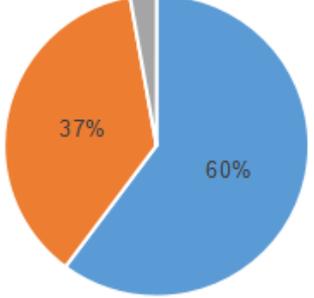
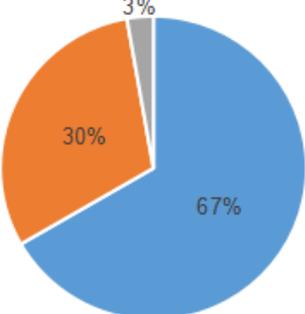
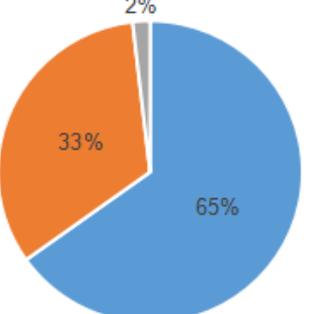
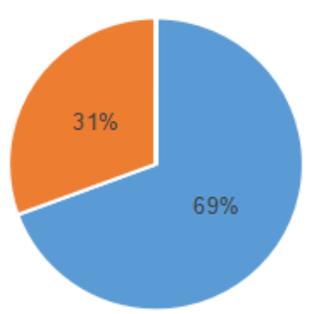
## 7.4 Lecturer Evaluation

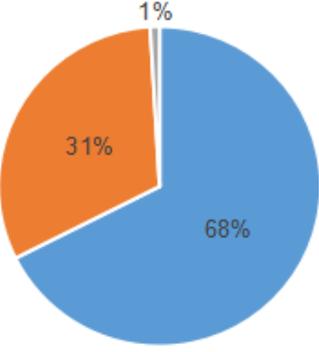
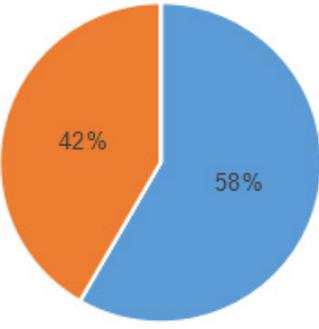
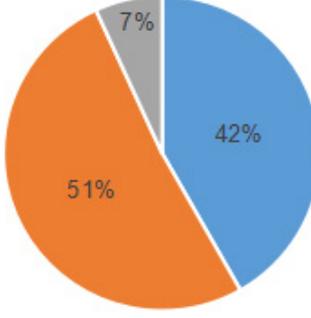
### I. Lecturer Evaluation Elements

- A. Helpful for work and self- improvement
- B. Professionalism of Lecturer
- C. Performance and attitude of Lecturer

### II. LECTURERS LIST

No.	Lecturer Name	Lecture
1	Dr. Veerachai Tanpipat	Lecture 11 Forest Fire Ecology
2	Dr. Peter Moore	Lecture 12 International Trends of Forest Fire Management
3	Dr. Veerachai Tanpipat	Lecture 2: Introduction to Global and ASEAN Wildfire, Smoke, and Haze Tracking System
4	Prof.Dr. Park Joowon	Lecture 3: ROK's Forest Fire Information System
5	Dr. Veerachai Tanpipat	Lecture 4: Information Management Platform for Community-based Forest Fire Management and Water Management
6	Mr. Hartanto Sanjaya	Lecture 5: Fire Danger Rating System and Fire Early Warning System
7	Dr. Israr Albar	Lecture 6: Challenges in Regulating Transboundary Haze in Southeast Asia
8	Dr. Veerachai Tanpipat	Lecture 7.1: Forest Fire Regime in the Context of Climate Change- Asian View
9	Dr. Peter Moore	Lecture 7.2: Forest Fire Regime in the Context of Climate Change- Australian View
10	Dr. Veerachai Tanpipat	Lecture 8: Overview of Wildland Fire Emission Inventory

<p><b>LECTURE 1.1 FOREST FIRE ECOLOGY</b></p>	<p><b>LECTURE 1.2 INTERNATIONAL TRENDS OF FOREST FIRE MANAGEMENT</b></p>	<p><b>LECTURE 2: INTRODUCTION TO GLOBAL AND ASEAN WILDFIRE, SMOKE, AND HAZE TRACKING SYSTEM</b></p>
 <p>1% 27% 72%</p> <p>■ Very good ■ Good ■ Average</p>	 <p>2% 27% 71%</p> <p>■ Very good ■ Good ■ Average</p>	 <p>3% 28% 69%</p> <p>■ Very good ■ Good ■ Average</p>
<p><b>LECTURE 3: ROK'S FOREST FIRE INFORMATION SYSTEM</b></p>	<p><b>LECTURE 4: INFORMATION MANAGEMENT PLATFORM FOR COMMUNITY-BASED FOREST FIRE MANAGEMENT AND WATER MANAGEMENT</b></p>	<p><b>LECTURE 5: FIRE DANGER RATING SYSTEM AND FIRE EARLY WARNING SYSTEM</b></p>
 <p>7% 39% 54%</p> <p>■ Very good ■ Good ■ Average</p>	 <p>25% 75%</p> <p>■ Very good ■ Good ■ Average</p>	 <p>3% 37% 60%</p> <p>■ Very good ■ Good ■ Average</p>
<p><b>LECTURE 6: CHALLENGES IN REGULATING TRANSBOUNDARY HAZE IN SOUTHEAST ASIA</b></p>	<p><b>LECTURE 7.1: FOREST FIRE REGIME IN THE CONTEXT OF CLIMATE CHANGE- ASIAN VIEW</b></p>	<p><b>LECTURE 7.2: FOREST FIRE REGIME IN THE CONTEXT OF CLIMATE CHANGE- AUSTRALIAN VIEW</b></p>
 <p>3% 30% 67%</p> <p>■ Very good ■ Good ■ Average</p>	 <p>2% 33% 65%</p> <p>■ Very good ■ Good ■ Average</p>	 <p>31% 69%</p> <p>■ Very good ■ Good ■ Average</p>

LECTURE 8: OVERVIEW OF WILDLAND FIRE EMISSION INVENTORY	WAS THE OVERALL TRAINING GOOD/ USEFUL?	TOTAL RESULT																								
 <p>■ Very good ■ Good ■ Average</p> <table border="1"><thead><tr><th>Category</th><th>Percentage</th></tr></thead><tbody><tr><td>Very good</td><td>68%</td></tr><tr><td>Good</td><td>31%</td></tr><tr><td>Average</td><td>1%</td></tr></tbody></table>	Category	Percentage	Very good	68%	Good	31%	Average	1%	 <p>■ Very good ■ Good ■ Average</p> <table border="1"><thead><tr><th>Category</th><th>Percentage</th></tr></thead><tbody><tr><td>Very good</td><td>58%</td></tr><tr><td>Good</td><td>42%</td></tr><tr><td>Average</td><td>0%</td></tr></tbody></table>	Category	Percentage	Very good	58%	Good	42%	Average	0%	 <p>■ Very good ■ Good ■ Average</p> <table border="1"><thead><tr><th>Category</th><th>Percentage</th></tr></thead><tbody><tr><td>Very good</td><td>42%</td></tr><tr><td>Good</td><td>51%</td></tr><tr><td>Average</td><td>7%</td></tr></tbody></table>	Category	Percentage	Very good	42%	Good	51%	Average	7%
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Average	7%																									

## 8. RECOMMENDATIONS FROM PARTICIPANTS

### Thank you notes:

- The training is very effective and beautiful. Due to the mountainous terrain in our area, there is a lack of quick detection and access equipment in the event of a fire, which can be very time consuming and increase the spread of fires. therefore, there is a need to increase the number of advanced equipment and prepare people to work on it.
- It was a very useful good training; I would like to thank all the participants and organizers.
- Thank you very much for adding a translator.
- I think this online training course may not be as successful as it should be due to the language barrier and telecommunication unstable facto (esp. in my office). Moreover, since I must come to my office every day and attend the course. Sometimes I couldn't catch the lessons or important issues. However, I am very determined to study and take this good opportunity from AFoCO team. Thank you.
- First, I want to thank the organizers, as well as the teachers for raising a serious issue for the atmosphere, nature and, of course, humanity. I wish you all good health and family happiness. Thank you very much.

### Next training may be operated considering...

- We were a little bit behind the schedule and could not participate in the active discussion.
- The participant still not too much involved and active in the training since it is an on-line course.
- Quite difficult to keep all participant turn on the camera. Perhaps later AFoCO can make a rule from the start. That at least first 5 minutes of lecture, all the participants must turn on their camera. Hopefully with this effort, the participant can know each other and be more active.
- Let the host call somebody from the group and encourage to ask questions, also a way to check if they are eager to listen and or listening all through-out. Since it is virtual training the attention span of participants are very short.
- The lecture must be short and comprehensive 1-2 hours' lecture is too long for a virtual participant).
- The organizer must present a "HOUSE RULES" before the start of the lecture proper.
- The rightful way of how to raise a question, unmuting the microphone when not talking etc. it should be in a presentation (ppt) format, so that, everyone can see it visually.
- The training time was too tight. maybe can organize two sessions, including hands-on session.
- The training was more of awareness on different systems, it would be nice to see some practical analysis of the subjects adding few more days to the training.
- Wish to participate in person to get some knowledge in a handling different assessment system and understand what can be done for Bhutan. Thank you for the wonderful presentation and organizers.
- Training duration should be extended

### Next training topic on FFMS may include...

- Practical data analysis
- Hands-on session
- Integrated Forest Fire Management Project in the global level
- How to build Information System for Forest Fire Management

## 9. LIST OF PARTICIPANTS

NO.	COUNTRY	NAME	POSITION	AFFILIATION
1	BHUTAN	Mr. Sonam Tobgay	Forestry Officer	Trashigang Forest Division
2		Mr. Dhan Bahadur Gurung		Mongar Forest Division
3	BRUNEI DARUSSALAM	Mr. Ak Haji Mohd Fayyadh Zaidani bin Pg Haji Mohd Ali	Forestry Officer	Forestry Department, Ministry of Primary Resources and Tourism
4		Mr. Muhd Arif bin Haji Selamat	Assistant Forestry Officer	
5	CAMBODIA	Mr. Ork Sithsambo	Vice Chief of Forestry Management Office	Forestry Administration
6		Mr. Khin Sokimon	Technical Staff	
7	INDONESIA	Ms. Ramawati, S.Hut, M.Sc	Center for Standardization and Instruments of Disaster Resilience and Climate Change, Researcher	Ministry of Environment and Forestry
8		Mr. Mohamad Iqbal S.Hut, M.Sc	Center for Standardization of Disaster and Climate Change Instruments, Researcher	
9		Ms. Ike Mediawati	Researcher	Research institute of conservation technology
10		Ms. Ninik Damiyati, S.Hut, M. Env	Officer	Regional Environment and Forestry Agency, Center Java Province
11		Mr. Nur Syamsi Muhammad		Regional Environment and Forestry Education and Training Centre (BDLHK) Samarinda
12		Mr. Radian Bagiyono	deputy director for forest and land fires control	Directorate of forest and land fires management, Climate Change Directorate, MOEF
13		Ms. Eva Famurianty	Head of Warning and Early Detection System	Directorate of forest and land fires management Directorate of forest and land fires management
14		Mr. Eny Haryati, S. Hut, M.Sc	Head Section of Evaluation on Forest and Land Fire Management	
15		Mr. Nugraha M. Malau, S.Hut	Extention officer/ Sekretary MA Daops Sumatera IX	Balai PPIKHL Wilayah Sumatera, Forest Ranger (PEH)/
16		Ms. Putri Laila Komari, S.Hut	staff Officer at section land and forest fire	
17	Mr. Chaerul Parsaulian Ginting S, S.Hut	Chief of DAOPS PKU		
18	Mr. Deki Andika Purbaya	Chief of Manggala Agni Sumatera X/ Muara Bulian		
19	KAZAKHSTAN	Mr. Baizakhov Abzal	Specialist	Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan
20		Mr. Niyaz Zholbarys	Specialist of the Forestry and Wildlife Committee	
21	KYRGYZSTAN	Mr. Ernist Toktonazarov	Head of the Department	Department of Forest Protection and Conservation of the State Agency
22		Mr. Taalaibek Azhygulov	Specialist	
23	LAO PDR	Mr. Khamla Sinthavong	Technical officer	Department of Forestry (DOF), Lao PDR
24		Mr. Chanthakhad Souphida		
25	MALAYSIA	Ms. Farrah Salvena Savaln	Assistant Forest Conservator	Forestry Department of Peninsular Malaysia
26		Mr. Mohd. Reydzuan Bin Yong	Assistant Director (Protection)	
27		Ms. Atifa Maryam binti Norbanan	Assistant Secretary	Forestry Management Division, Ministry of Energy and Natural Resources
28		Mr. Mostafa Kamal Bin Mohamad Fauzi	Research Officer	Forest Department Sarawak
29		Mr. Hyrul Izwan bin Mohd Husin	Research Officer	Forest Research Institute, Malaysia
30	MONGOLIA	Mr. Amanjol Bulkhbai	Remote Sensing Engineer (responsible for Wildfire Risk Assessment and Monitoring)	Information and Research Institute of Meteorology, Hydrology, and Environment, Ministry of Environment and Tourism, Mongolia
31		Ms. Buyandelger Naranbaatar	Forest Engineer (responsible for Forest Resource including Forest Fire Management)	Yeruu Inter-Soum Forest Unit, Environment and Tourism Department of Selenge Province, Mongolia

32	MYANMAR	Ms. Ei Sandar Myint	Staff Officer	Forest Department
33		Mr. Lynn Htet Aung	Range Officer	
34	PHILIPPINES	Mr. Jhun Barit	Senior Forest Management Specialist	Forest Management Bureau
35		Ms. Cathy Pauig		
36		Mr. Hubert Dale Riña	Forest Management Specialist II	
37		Mr. Angelo R. Marquez	Forest Management Specialist I	
38		Ms. Angie Lee Grace C. Joarque	Forest Management Specialist I	
39		Mr. Jayson A. Guevarra	Information Systems Analyst II	
40	SINGAPORE	Ms. Shirlene Goh	Manager/ Projects (Conservation)	National Parks Board
41		Ms. Kelly Tan Siang Ting	Manager/Marine Park	
42	THAILAND	Mr. Wirawut Buaroy	Forestry Technical Officer, Professional Level	Royal Forest Department
43		Ms. Warangkana Suwannarat	Forestry Technical Officer	Community Forest Management Office
44	VIET NAM	Mr. Thai Son Le	Lecturer	Forest Resources & Environmental Management Faculty, VNUF
45		Mr. Bui Xuan Truong		
46		Ms. Kieu Thi Duong		
47		Mr. Vu Van Truong		
48	LECTURERS AND FACILITATORS	Dr. Veerachai Tanpipat	Senior Expert	Faculty of Forestry, Kasetsart University
49		Dr. Peter Moore	Fire Management Consultant	Food and Agriculture Organisation of the UN
50		Mr. Hartanto Sanjaya	Specialist Engineer	National Research and Innovation Agency, President Office, Indonesia
51		Dr. Israr Albar	Deputy Director	Planning, Directorate of Forest and Land Fire Management, Ministry of Environment and Forestry, Indonesia
52		Dr. Park Joowon	Assistant Professor	Lab. of Forest Management & Geographic Information System, Dept. of Forestry, College of Agriculture & Life Sciences, Kyungpook National University
53		Dr. Yeongjoo Lee	Director	AFoCO Secretariat
54		Ms. Zhaniyat	Interpreter	
55		Ms. Su Yi Hnin	Staff Officer	
56		Ms. Soozin Ryang	Program Officer	
57		Ms. Kay Khine	Fellowship official	

### **Asian Forest Cooperation Organization (AFoCO)**

AFoCO is a treaty-based intergovernmental organization that is committed to strengthening forest cooperation and taking concrete actions to promote sustainable forest management and address the impacts of climate change.

### **AFoCO Regional Education and Training Center (RETC)**

AFoCO RETC was established as a subsidiary organ of AFoCO to develop the capacities of member countries in dealing with forestry and related environmental issues. The RETC provides practical and problem-solving oriented training programs, training courses, and workshops to enhance the knowledge and skills of diverse participants including government officials from member countries, researchers, university students, and members of local communities, among others.

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*AFoCO's Training Reports aim to highlight the findings of training activities and provide up-to-date knowledge and information on the topics discussed by participating Member Countries. The views expressed in this report do not necessarily reflect the views of the decision-making bodies of AFoCO or its Member Countries.*

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