

# Capacity Development Need and Gap Analysis (CDNGA): Summary Brief

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## EXECUTIVE SUMMARY

The Capacity Development Need and Gap Analysis (CDNGA) is an activity undertaken under Component 1 of regional programme "Measurable Action for Haze-Free Sustainable Land Management in Southeast Asia (MAHFSA)". The Programme is funded by International Fund for Agricultural Development (IFAD) and implemented by ASEAN Secretariat (ASEC), with its co-implementing partners i.e. Center for International Forestry Research (CIFOR) and Global Environment Centre (GEC).

The CDNGA was undertaken to assess the capacity of ASEAN region and its member states in implementing the ASEAN Peatland Management Strategy (APMS, 2006-2020) and the first Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation (also known as ASEAN Haze-Free Roadmap 2016-2020) as well as the use of available information and results management system for monitoring and reducing transboundary haze pollution in the region. Findings from the CDNGA are used to support the capacity development needs within the region and guide the options to enhance data, information and results management systems for sustainable peatland management and haze control. The CDNGA process is shown in Figure 1.

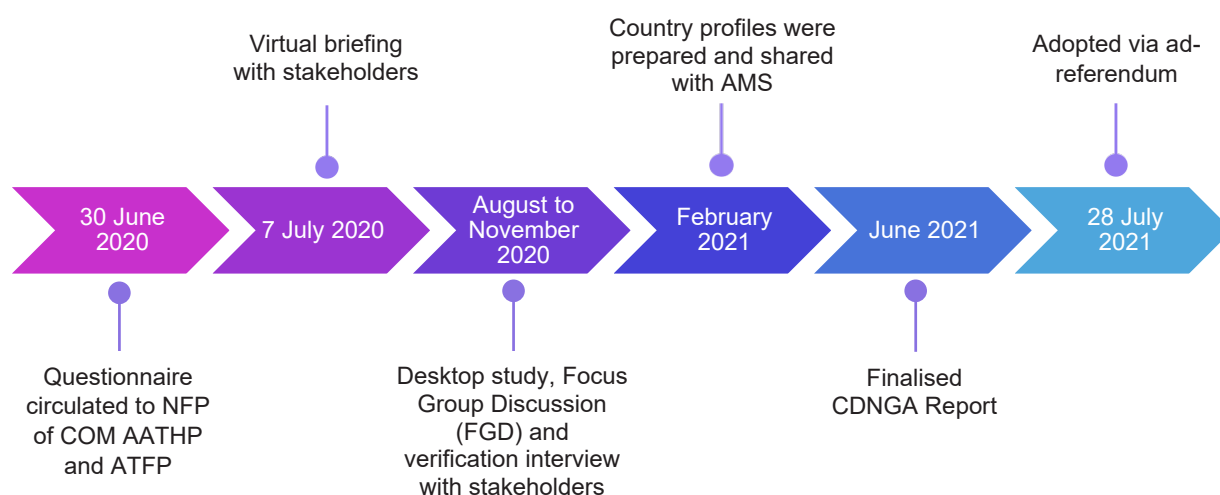


Figure 1: Timeline of CDNGA process

This Summary Brief contains findings from the CDNGA activity as follows:

- 1) Findings on regional monitoring and early warning systems
- 2) Overall overview of AMS priorities for peatland and fire management
- 3) Priority needs
- 4) Capacity development packages for regional and national levels
- 5) Enhancing regional data collection and result management
- 6) Conclusions
- 7) Recommendations

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### 1) Findings on regional monitoring and early warning systems

Several monitoring systems have been developed in the region to provide information such as hotspot, weather forecast and fire risk. The systems that provide regional early warning information are ASMC<sup>1</sup>, BMKG SPARTAN<sup>2</sup>, LAPAN<sup>3</sup>, DNP<sup>4</sup>, GISTDA<sup>5</sup> and MET Malaysia<sup>6</sup>.

Table 1: Systems that provide regional early warning information in ASEAN region

	Website	Hotspot	FDRS	Data Coverage
ASMC	<a href="http://asmc.asean.org/home/">http://asmc.asean.org/home/</a>	✓	✓	ASEAN
BMKG SPARTAN	<a href="https://spartan.bmkg.go.id/peta-interactive/">https://spartan.bmkg.go.id/peta-interactive/</a>	✓	✓	ASEAN
BRIN	<a href="https://hotspot.brin.go.id/">https://hotspot.brin.go.id/</a>	✓	✗	Indonesia
DNP	<a href="http://www2.dnp.go.th/gis/FDRS/FDRS.php">http://www2.dnp.go.th/gis/FDRS/FDRS.php</a>	✗	✓	Northern ASEAN
GISTDA	<a href="https://fire.gistda.or.th/">https://fire.gistda.or.th/</a>	✓	✗	Northern ASEAN
MET Malaysia	<a href="https://myclimate.met.gov.my/fdrsWmsObsAseanMetPortal">https://myclimate.met.gov.my/fdrsWmsObsAseanMetPortal</a> <a href="https://myclimate.met.gov.my/fdrsWmsNwpAseanMetPortal">https://myclimate.met.gov.my/fdrsWmsNwpAseanMetPortal</a>	✗	✓	ASEAN

<sup>1</sup> ASEAN Specialised Meteorological Centre (ASMC)

<sup>2</sup> Badan Meteorologi, Klimatologi, dan Geofisika (BMKG), Sistem Peringatan Dini Kebakaran Hutan dan Lahan (SPARTAN), Indonesia

<sup>3</sup> Badan Riset dan Inovasi Nasional (BRIN), Indonesia

<sup>4</sup> Department of National Parks, Wildlife and Plant Conservation (DNP), Thailand

<sup>5</sup> Geo-Informatics and Space Technology Development Agency (GISTDA), Thailand

<sup>6</sup> Malaysian Meteorological Department (MET Malaysia)

## 2) Overall overview of AMS priorities for peatland and fire management

The priorities for peatland and fire management in the ASEAN region have been set by the AMS in the framework from two sets of documents:

### 2.1. APMS and the associated ASEAN Programme on Sustainable Management of Peatland Ecosystems 2014–2020 (APSMPE)

As part of the APMS Review Analysis, AMS provided input on potential national level goals in relation to the 25 APMS operational objectives that could be included in future APMS. From the 25 operational objectives, the top priorities based on numbers of AMS are summarised in Figure 2.

Further action to determine the exact extent and current status of peatlands at national level	Public and stakeholder awareness and participation	Peatland fire prevention	Development of policies and regulations for peatland management	Biodiversity Conservation
<b>9 AMS</b>	<b>8 AMS</b>	<b>7 AMS</b>	<b>7 AMS</b>	<b>6 AMS</b>
Integrated management of peatlands	Peatland restoration	Regional Cooperation	Best management practices	Financing the Action
<b>6 AMS</b>	<b>6 AMS</b>	<b>5 AMS</b>	<b>5 AMS</b>	<b>5 AMS</b>

Figure 2: AMS priorities in peatland management for the period 2021 to 2030.

## 2.2. Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation (Haze-Free Roadmap) 2016 - 2020

The ASEAN Haze-Free Roadmap serves as a strategic framework for implementation of collaborative actions to control transboundary haze pollution in the region. The overall goal of the Roadmap is to eliminate regional transboundary haze pollution through intensifying collective actions to prevent and control forest and/or land fires. The Roadmap was reviewed in 2021, of which a set of monitoring and evaluation guidelines and indicators will be developed based on consultation with AMS, the ASEAN Socio-Cultural Community (ASCC) Blueprint 2025, and overall conclusion on implementation of the Roadmap, as well as recommendation for a revised or renewed Roadmap for the region. From the 8 strategies, the top priorities based on numbers of AMS are summarised in Figure 3.

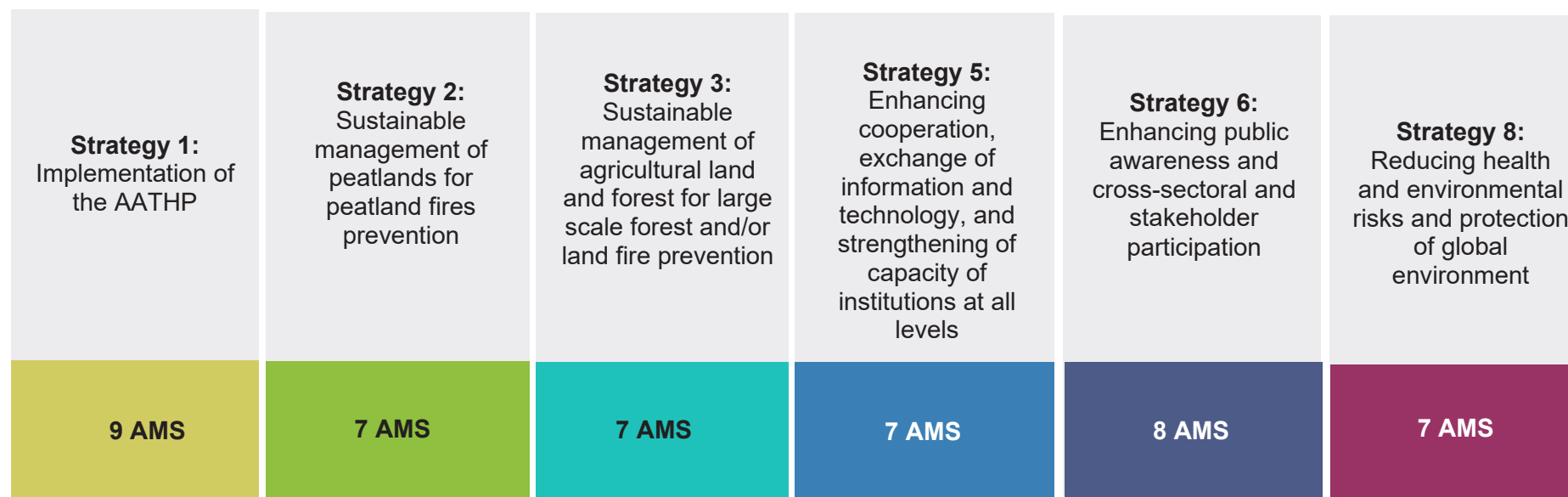


Figure 3: AMS have prioritised six out of eight strategies from ASEAN Haze-Free Roadmap as top priorities

## 2.3 National Focal Points (NFP) for Related ASEAN Processes

All AMS have signed and ratified the AATHP and subsequently have established the Conference of the Parties to the AATHP (COP), respective national institutional setting for air quality monitoring to represent at Committee Meeting (COM) of AATHP and nominated key agencies who are handling peatland management to represent at ASEAN Task Force on Peatlands (ATFP). The NFPs of the ATFP oversee and coordinate implementation of the APMS. Peatland management has never been a stand-alone responsibility of any one government agency, there have been many ministries and agencies sharing the responsibility and playing respective roles to manage the peatlands sustainably within the country. All AMS have established National Monitoring Centre (NMC) as the national institutional arrangement to undertake appropriate measures to monitor all fire-prone areas, all land and/or forest fires, the environmental conditions and haze pollution arising from such fires. Below is the list of agencies nominated to represent each AMS for COM AATHP, ATFP and NMC for the AATHP.

Table 2. List of NFP for Committee to AATHP and ATFP, and NMC of the AMS

NFP of COM AATHP	NFP of ATFP	NMC
<b>Brunei Darussalam</b>		
Ministry of Development	Department of Environment, Parks and Recreation, Ministry of Development	Department of Environment, Parks and Recreation, Ministry of Development
<b>Cambodia</b>		
General Directorate of Natural Protected Area, Ministry of Environment	General Directorate of Natural Protected Area, Ministry of Environment	Ministry of Water Resources and Meteorology
<b>Indonesia</b>		
Directorate General of Climate Change, Ministry of the Environment and Forestry (MOEF)	Directorate of Peatland Degradation Control, Ministry of the Environment and Forestry (MOEF)	Directorate of Forest and Land Fire Management (DFLFM), Ministry of the Environment and Forestry (MOEF)
<b>Lao PDR</b>		
Natural Resources and Environmental Research Institute (NRERI), Ministry of Natural Resources and Environment (MONRE)	Department of Water Resources, Ministry of Natural Resources and Environment (MONRE)	Meteorology and Hydrology Department, Climate Division, Ministry of Natural Resources and Environment (MONRE)
<b>Malaysia</b>		
Department of Environment, Ministry of Natural Resources, and Environment Sustainability (NRES)	Ministry of Natural Resources and Environmental Sustainability (NRES)	Department of Environment, Ministry of Natural Resources and Environmental Sustainability (NRES)

NFP of COM AATHP	NFP of ATFP	NMC
<b>Myanmar</b>		
Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC)	Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC)	Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC)
<b>Philippines</b>		
Department of Environment and Natural Resources (DENR)	Biodiversity Management Bureau (BMB), Department of Environment and Natural Resources (DENR)	Forest Management Bureau, Department of Environment and Natural Resources (DENR)
<b>Singapore</b>		
Ministry of Sustainability and the Environment (MSE)	National Environment Agency (NEA)	Meteorological Service Singapore, National Environment Agency
<b>Thailand</b>		
Pollution Control Department (PCD), Ministry of Natural Resources and Environment (MNRE)	Department of National Park, Wildlife and Plant Conservation (DNP), Ministry of Natural Resources and Environment (MNRE)	Department of National Park, Wildlife and Plant Conservation (DNP), Ministry of Natural Resources and Environment (MNRE)
<b>Viet Nam</b>		
Forest Protection Department, Ministry of Agriculture and Rural Development (MARD)	Forest Protection Department, Ministry of Agriculture and Rural Development (MARD)	Centre for Environmental Monitoring, Ministry of Natural Resources and Environment (MONRE)



### 3) Priority needs on Peatland Management

Drawing insights from the CDNGA, Figure 4 highlights various priorities in peatland, fire, and haze management in the region. These identified priority needs serve as the primary guide for identifying and tailoring capacity development support for the AMS.

#### Priority Needs on Peatland Management

Peatland Assessment Methodology	All AMS have indicated high priority to undertake further inventory to identify peatland. Peatland mapping using GIS and remote sensing will help to pre-analyse and interpret possible peatland areas prior to field assessment for ground-truthing, as well as fine-tuning the potential peatland map after the ground checks. Aerial survey (using drone or small unmanned aerial vehicle (UAV)) may help to identify general management issues such as canal systems, land-use change, fire scar, and possible connectivity to good vegetation or forested areas.
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#### Priority Needs for Fire and Haze Management

Fire prevention	Prevention is more important than impacts mitigation. ASEAN Guidelines for Peatland Fire Management recommend 70% prevention, 10% each for preparedness, response, and recovery. Major progress by Indonesia: peatlands rewetting, enhanced water management and monitoring, implementation of national regulation
Recovery from post-fire	Important to support ecological recovery to reduce future fire risks. Encourage rehabilitation activities that include restoring hydrological function, replanting of fast-growing indigenous tree species, and fire patrolling, engagement with local communities. Burn scar monitoring has received low attention by AMS. Free accessible burn scar information is available at <a href="https://firms.modaps.eosdis.nasa.gov/map/">https://firms.modaps.eosdis.nasa.gov/map/</a> .

Figure 4: Identified priority needs on peatland, fire and haze management

#### 4) National Capacity Development Packages

Based on the priority needs in peatland, fire, and haze management in CDNGA, several capacity development topics have been identified for each AMS. This feedback is summarised in Table 3.

Table 3: Summary of the capacity development priorities for AMS

Total		BD	CA	ID	LA	MY	MM	PH	TH	VN
<b>Focus 1: Peatland inventory, mapping, assessment of degradation status, Monitoring (APSMPE T1)</b>										
6	Peatland assessment and mapping		✓		✓	✓	✓	✓		✓
<b>Focus 2: Peatland Fire Prevention Measures (APSMPE T2/Roadmap S2)</b>										
9	Training on fire risk warning (including Fire Danger Rating System operation and promotion) and fire prevention	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Technology transfer in fire prevention and rehabilitation effort including using of satellite	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Training for rangers and forest fire-fighter team on fire prevention and management		✓	✓	✓	✓	✓	✓	✓	✓
2	Ground water level monitoring in peatland areas			✓		✓				
<b>Focus 3: Peatland Fire and Haze Occurrence (APSMPE T2/Roadmap S2)</b>										
5	Monitoring and reporting of peatland fire and haze occurrence (Result Management System)	✓		✓		✓		✓	✓	
1	Establishment of monitoring base camp			✓						

Total		BD	CA	ID	LA	MY	MM	PH	TH	VN
<b>Focus 4: Resources allocate and generated for peatland management and fire prevention</b>										
5	Explore collaboration on peatland management and fire prevention	✓		✓		✓		✓	✓	
2	Procurement and operate of tools and equipment for combating of fire			✓	✓					
9	Awareness raising on peatland value, sustainable use and ecosystem services to communities and public	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Focus 5: Implementation of NAPPs, APMS, Roadmap</b>										
9	Capacity development in rehabilitation and conservation	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Awareness enhancement and peer learning from regional BMPs for community activities	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Knowledge exchange to enhance peatland governance and policies	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Peatland and climate change	✓	✓	✓	✓	✓	✓	✓	✓	
2	Procurement and operate of tools and equipment for combating of fire (not peatland)				✓			✓		
1	Awareness raising on peatland value, sustainable use and ecosystem services to communities and public						✓			

BD: Brunei Darussalam  
MM: Myanmar

CA: Cambodia  
PH: Philippines

ID: Indonesia  
TH: Thailand

LA: Lao PDR  
VN: Vietnam

MY: Malaysia

## 5) Regional Capacity Development Package

Given the vast scale of the capacity development needs and gaps in the ASEAN region in relation to peatland and fire management, coupled with relatively limited scale and scope of support available under the MAHFSA Component 1, several actions have been chosen for support by the programme, include – verification through discussions with the respective AMS on the national priorities. To ensure this verification process, a virtual regional workshop was organised on 16 March 2021 with relevant stakeholders from the region to validate the findings of the CDNGA, particularly focusing on the proposed capacity building recommendations. From the workshop, six (6) capacity development packages were prioritised by AMS for regional level implementation (Table 4). The packages fall within the scope of five (5) different focus. The table also indicates the suggested institution or personnel to be trained, varying from national experts, relevant agencies, field patrollers and community. The table also suggests the possible trainers for each package.

Table 4: Top six capacity development packages for regional level prioritised by the AMS, with regards to the focus areas

Focus 1: Peatland inventory, mapping, assessment of degradation status, Monitoring (APSMPE T1)	
Capacity development	<i>Peatland assessment and mapping (for northern ASEAN region)</i>
Possible trainers	GEC, IUCN, SUPA 1
Institution/ people to be trained	Agencies, national experts/partners in Northern ASEAN sub-region
Focus 2: Training on fire risk warning (including Fire Danger Rating System operation and promotion) and fire prevention	
Capacity development	<i>Training on fire risk warning (including Fire Danger Rating System operation and promotion) and fire prevention</i>
Possible trainers	Agencies operating FDRS (i.e. DNP Thailand, MET Malaysia and BMKG Indonesia), GEC, CIFOR
Institution/ people to be trained	National Focal Points   National Monitoring Centres   Relevant provincial agencies   Field patrollers
Capacity development	<i>Peatland fire prevention measures at site and community level</i>
Possible trainers	GEC, CIFOR, Wetlands International   MOEF and BRGM, Indonesia   NRECC Malaysia
Institution/ people to be trained	National Focal Points   Supporting agencies   Field patrollers   Stakeholders   Community

Focus 3: Peatland Fire and Haze Occurrence (APSMPE T2/Roadmap S2)	
Capacity development	<i>Monitoring and reporting of peatland fire and haze occurrence (Result Management System)</i>
Possible trainers	ACC THPC (or Interim), ASMC, GEC
Institution/ people to be trained	National Focal Points   National Monitoring Centres   Relevant provincial agencies   Field patrollers
Focus 4: Resources allocate and generated for peatland management and fire prevention	
Capacity development	<i>Awareness raising on peatland values, sustainable use and ecosystem services to communities and public</i>
Possible trainers	GEC, CIFOR, RECOFTC, IUCN, Wetlands International, SUPA 2
Institution/ people to be trained	Supporting agencies   Stakeholders   Community
Focus 5: Implementation of NAPPs, APMS, Roadmap	
Capacity development	<i>Best Management Practices for sustainable community land management and public</i>
Possible trainers	GEC, CIFOR, RECOFTC, SUPA 2   MOEF, Indonesia
Institution/ people to be trained	Supporting agencies   Stakeholders   Community

### Enhancing regional data collection and result management

A key element of the support under the MAHFSA programme is to assist AMS in improving data collection and better results management. From the gaps found during CDNGA, several options have been identified to improve this, with options covering regional and national issues. These options can be undertaken simultaneously or sequentially and summarised in Table 5.

Table 5: Several options identified to improve data collection and better results management

<b>Utilisation of dissemination tools</b>	<b>01</b>	<ul style="list-style-type: none"> <li>• Mobile phone applications offer boundless geographical limits with optimum audience reach</li> <li>• Facilitates data collection and dissemination process with higher efficiency</li> <li>• Mobile application (e.g. ASEAN Fire Alert PhoneApp Tool) provide hotspot and FDRS info</li> </ul>
<b>Strengthen capacity of NFP and NMC for COM AATHP at national level</b>	<b>02</b>	<ul style="list-style-type: none"> <li>• The capabilities of NFP and NMC at national level must be strengthened and it is a priority to establish proper dissemination information system</li> <li>• Each designated agency must be fully understood of their responsibilities, to bridge the communication gaps between the agencies and enable clear information provision</li> </ul>
<b>Develop national mechanisms to utilise the existing FDRS</b>	<b>03</b>	<ul style="list-style-type: none"> <li>• There is low utilisation of FDRS information in ASEAN. FDRS is an indicator to monitor fire risk</li> <li>• Important to strengthen capacity of FDRS application at national level and to communicate the fire risk danger to local/public</li> <li>• Encourage multi-language option to be enabled for wider audience reach</li> </ul>
<b>SOP for local action for fire prevention</b>	<b>04</b>	<ul style="list-style-type: none"> <li>• Suitable SOP to practice fire prevention measures should be developed tailored according to local requirements</li> <li>• Activity under suggested SOP should include installing FDRS signboard, designing patrolling path, measuring ground water level, verifying hotspot, disseminate fire risk level</li> </ul>
<b>Strengthening the communication between NMC and local level</b>	<b>05</b>	<ul style="list-style-type: none"> <li>• To communicate monitored data and prevention strategies to local level including ground patrollers</li> <li>• Encourage proper platforms to disseminate information to ensure information reach to local level</li> <li>• To enable two-way interaction via feedbacks</li> </ul>
<b>Accessing fire and haze related information through a centralised website</b>	<b>06</b>	<ul style="list-style-type: none"> <li>• To develop a centralised website where all fire prevention information from other websites can be accessed</li> <li>• Inputs taken and compiled from ASMC, BMKG, MET Malaysia, DNP/GISTDA websites</li> <li>• As an archive database of forest fire information to support projections and research</li> </ul>

## 6) Conclusions

20 conclusions extracted from five themes in the CDNGA and summarized as below:

Conclusions	Regional	National
<b>Sustainable Peatland Management (SPM)</b>		
1. SPM is a priority and is relevant to many ASEAN targets and frameworks	SPM is in line with other key policies and plans of ASEAN has been highlighted in the COM/COP meetings of the AATHP as well as ASEAN Working Groups on Nature Conservation and Climate Change. The recently adopted Final Review of the APMS has also emphasized the ongoing relevance and importance of sustainable peatland management and the APMS.	AMS have recognised the importance of sustainable management of peatlands. Through the adoption of the ASEAN Peatland Management Strategy 2006-2020 (APMS), AMS have shown their collective commitment to sustainable management of peatlands and their associated biodiversity as well as preventing peatland degradation, fires and haze. The AMS have also worked to facilitate the implementation of the APMS at national level to develop national and/or provincial/state/local level strategies or action plans for sustainable peatland management.
2. The final review of the APMS has recommended a second Phase of the APMS for 2021-2030 be developed to address a broad range of priorities	<p>Top priorities for the next 10 years of AMS for peatlands include:</p> <ul style="list-style-type: none"> <li>a. Peatland assessment activity include identification of upland peat, detail assessment on landscape or peatland hydrological unit.</li> <li>b. Multi-stakeholder awareness and participation including regional knowledge exchange and experience sharing.</li> <li>c. Development and strengthen of national peatland related policies and regulations</li> <li>d. Integrated management and use of peatlands through best management practices, rehabilitation and restoration, paludiculture, community livelihood.</li> <li>e. Biodiversity conservation will enrich endemic flora and fauna to provide multitude benefit through ecosystem services</li> </ul>	<p>The top priorities verified by AMS through the Final Review of the APMS Implementation, based on the number of countries selecting them as priority are:</p> <ul style="list-style-type: none"> <li>a. Further action to determine the exact extent and current status of peatlands at national level (9 AMS)</li> <li>b. Public and stakeholder awareness and participation (8 AMS)</li> <li>c. Peatland fire prevention (7 AMS)</li> <li>d. Development of policies and regulations for peatland management (7 AMS)</li> <li>e. Biodiversity Conservation (6 AMS)</li> <li>f. Integrated management of peatlands (6 AMS)</li> <li>g. Peatland restoration (6 AMS)</li> <li>h. Regional Cooperation (5 AMS)</li> <li>i. Best management practices (5 AMS)</li> <li>j. Financing the Action (5 AMS)</li> </ul>
3. Significant Capacity Gaps are present among AMS in relation	<p>Key Capacity Gaps include:</p> <ul style="list-style-type: none"> <li>a. inadequate institutional framework and capacity at regional level to support APMS implementation</li> </ul>	<p>Key Capacity Gaps identified include</p> <ul style="list-style-type: none"> <li>a. Peatland identification, delineation and assessment</li> <li>b. Assessment and conservation of peatland biodiversity</li> </ul>

Conclusions	Regional	National
to sustainable peatland management	<ul style="list-style-type: none"> <li>b. Lack of overview of status and importance of key peatlands to support regional programmatic planning and information sharing</li> <li>c. Lack of resources for regional training and exchange on best management practices for peatlands include restoration, hydrological monitoring, peatland assessment, and community livelihoods</li> </ul>	<ul style="list-style-type: none"> <li>c. Understanding and managing peatland hydrology</li> <li>d. Peatland restoration approaches</li> <li>e. Delineation and management of upland or mountain peatlands</li> <li>f. Sustainable community livelihoods in relation to peatlands</li> </ul>
<b>Fire and Haze Prevention</b>		
4. Prevention of land fires, forest fires and haze is a top priority of all AMS and is relevant to many ASEAN targets and frameworks	Fire and haze prevention strategy in AMS is guided by the AATHP and the sub-regional frameworks for Southern and Northern ASEAN.	<ul style="list-style-type: none"> <li>a. Fire prevention needs to be promoted further through national Standard Operating Procedures (SOPs) and strategies by integrating action from all relevant agencies as well as private sector and communities.</li> <li>b. Investment, incentives, capacity development and multi-stakeholder partnerships must be put in place to encourage smallholders and local community to effectively prevent fires and implement sustainable land management approaches.</li> </ul>
5. A broad range of actions are needed to prevent and manage fire and haze in the ASEAN region over the next 10 years	<p>Top priorities for the next 10 years for fire and haze prevention are:</p> <ul style="list-style-type: none"> <li>a. Implementation of the ASEAN Agreement on Transboundary Haze Pollution (AATHP) and establish ACC,</li> <li>b. Promotion of the ASEAN Guidelines on Peatland Fire Management and the ASEAN SOP</li> <li>c. Promotion of sustainable management for peatland fire prevention</li> <li>d. Promotion of sustainable management of agricultural land and forest to prevent large scale forest and/or land fires</li> <li>e. Enhancing cooperation, exchange of information and technology, and strengthening of capacity of institutions at regional and international levels to</li> </ul>	<p>Top priorities for the next 10 years for fire and haze prevention are:</p> <ul style="list-style-type: none"> <li>a. Fire prevention through rewetting (for peatlands), multi-stakeholder partnership with reference to PPRR concept, and national/sub-national multi-agency fire patrol and prevention arrangements</li> <li>b. Alternative community land development strategies through zero-burning practices for peatlands, and controlled burning for non-peat area.</li> <li>c. Implementation of local and national plans that support environmental protection and conservation, such as National Biodiversity Strategy and Action Plan (NBSAP), National Action Plan on Peatlands (NAPP), and others.</li> </ul>



Conclusions	Regional	National
	<ul style="list-style-type: none"> <li>replicate best practices with support from solid scientific research</li> <li>f. Enhancing public awareness and cross-sectoral and stakeholders participation at regional level</li> <li>g. Reducing health and environmental risks and protection of regional and global environment</li> </ul>	<ul style="list-style-type: none"> <li>d. Implement existing national/sub-national guidelines on management practices for sustainable management of peatland fire prevention</li> <li>e. Sustainable management of agricultural land and forest to prevent large scale forest and/or land fires</li> <li>f. Enhancing cooperation, exchange of information and technology, and strengthening of capacity of institutions at all levels from local to national to replicate best practices with support from solid scientific research</li> <li>g. Enhancing public awareness and cross-sectoral and stakeholder participation at local, sub-national and national levels</li> <li>h. Reducing health and environmental risks and protection of local environment</li> </ul>
<p>6. The most important aspect of fire management is fire prevention rather than fire fighting</p>	<ul style="list-style-type: none"> <li>a. Action is needed at the regional level to document and share effective approaches for fire prevention for both peatlands and mineral soil areas.</li> <li>b. Monitoring and reporting of progress in fire prevention needs to be enhanced at regional levels</li> </ul>	<ul style="list-style-type: none"> <li>a. 70% of resources need to be allocated to fire prevention (currently the majority of resources and capacity in most AMS are still mainly allocated for response to fire rather than prevention).</li> <li>b. Enhancement is needed in mitigation, preparedness, human resource development, providing scientific input and awareness creation.</li> </ul>
<p>7. Inadequate preparation prior to dry season leads to ineffective fire control</p>	<p>There is currently inadequate utilisation of regional early warning system such as short to medium term forecasts and FDRS in the preparation and strategy for fire prevention.</p>	<ul style="list-style-type: none"> <li>a. Lack of preventive and preparedness measures to ensure better response. Prevention measures in peatlands include rewetting, enhancing water storage and management</li> <li>b. Preparedness activities for control of land fires such as mobilising stakeholders, as well as preparation for all types of fire such as enhancing frequency of patrols, making the equipment ready to use, rehearsal and drill practices, reuniting fire protection committees are very essential to prevent and prepare for any forest fire incident.</li> </ul>

Conclusions	Regional	National
<b>Fire and Haze Prediction, Warning and Monitoring Systems</b>		
8. There are a growing number of effective tools in ASEAN for fire prediction and early warning	There are several platforms available to provide information regarding hotspot and fire risk at regional level. The platforms are operated by ASMC, BMKG, DNP and MET Malaysia. Each system has unique advantages and features especially in the algorithm used, spatial resolution, temporal resolution and geographical focus. The systems are accessible by the public and should compliments each other.	There are several platforms available to provide information regarding hotspot and fire risk at national levels. The platforms are MSS, BMKG, DNP, FireWatchVN, GISTDA, FORFIS and MET Malaysia. Each system has unique advantages and features.
9. There is inadequate utilisation of FDRS and warning systems at local level in most AMS	The system for disseminating FDRS information from service providers to AMS needs to be enhanced and made proactive rather than assuming all stakeholders will access the information on the websites directly	There is relatively low utilisation of the FDRS information at national and local levels which reflect to the low understanding and knowledge of the fire risk system. The understanding of the warning system needs to be enhanced to sustain support and coordination between relevant agencies.
10. The coverage and utilisation of air quality monitoring systems in ASEAN is insufficient	Air quality information is among the elements to be monitored following guidance by ASEAN SOP. However, the capacity to track air quality information is low in several countries in the region. There is no standard air quality measurement applicable in the region as there are various indices being used in measurement with different classification categories.	Each AMS may have customised air quality information. Some AMS do not have sufficient air quality monitoring stations/sensors to monitor situation. Some other challenges include: lack of capacity; lack of technology support in particular Northern ASEAN (i.e. Cambodia, Lao PDR, Myanmar and Viet Nam)
11. Hotspot monitoring is not the best tool to determine progress in preventing fire and haze	Hotspot is only an indicator of the presence of fires and sometimes lead to false positives. Further refinements are needed to enhance the use of hotspots in tracking fire extent and severity. Currently minimum attention has been given to burn scar monitoring which is a more accurate measure of the extent of fires compared to the hotspots.	Burn scar monitoring has received low attention by AMS due to lack of capacity and understanding of the importance of this information.
<b>Institutional framework</b>		
12. The delay in the establishment of the ACC has impacted the	Absence of a fully established ACC has led to delays in establishment of necessary communication and coordination mechanisms to stimulate action to prevent and control fires and haze.	-

Conclusions	Regional	National
implementation of the AATHP		
13. The Capacity and functioning of the NMCs in relation to tracking of the Roadmap indicators needs further enhancement	-	The designated NMCs in some AMS lack the required budget, personnel, equipment or training to undertake some of their functions. In addition, communication between NMC with the relevant departments/agencies in the national and local level offices also poor in some cases, which prevents their valuable support in predicting, preventing, detecting and managing land and forest fire and its suppression. There are also gaps in communication between NMC and NFP in some countries.
14. The current reporting and information sharing by NMCs and its subsequent use and analysis is insufficient to fully track fires and haze and determine the effectiveness on management measures	The sharing of information by NMC to the regional level is limited and does not yet meet the requirements under the SOP under the AATHP. There is lack of proper communication between NMC, NFP, regional service providers and ASEC. Communication issue from NMC to ACC/ASEC has caused gaps in information sharing and using knowledge available for better forest and land fire management planning. At the regional level, there is not yet enough capacity to synthesise and guide necessary action.	<ul style="list-style-type: none"> <li>a. Different level of verification at the local level to national level and thus limiting reporting process from national to regional levels.</li> <li>b. Need to simplify reporting mechanism including to overcome language barrier and too technical content</li> </ul>
<b>Sub-Regional and country variations</b>		
15. The capacity and level of support needed varies between AMS	Coordination at regional level through AATP and COM to AATHP has been ongoing and AMS have been reporting on country progress on APMS and Roadmap Implementation. However, follow up on capacity and support needed maybe limited after the meetings and could possibly base on existing regional programmes or bilateral projects being supported by International Development/Dialogue Partners.	<p>Several countries such as Cambodia, Lao PDR, Myanmar, Philippines and Viet Nam need support in the peatland assessment.</p> <p>Cambodia, Lao PDR and Myanmar have lower resources and capacity in fire prevention. Further enhancements are necessary in to build capacity and technical knowledge and secure resource for action.</p>
16. There is a significant difference between Northern and Southern	The nature, root causes and drivers of land and forest fires vary significantly between Southern and Northern ASEAN with several factors such as timing of forest fire	-

Conclusions	Regional	National
ASEAN in both land and forest fires and peatland management	season with corresponding of the dry season, common land management approaches and crop types and type of fuel varying significantly.	
17. There is significant expertise and experience in some AMS that could be deployed to enhance capacity in other AMS	Some AMS such as Indonesia, Malaysia and Thailand have moderate to high capacity in peatland management and fire prevention and control which could be shared to support other AMS with less experience and capacity.	
18. Conflicts between activities and approaches by different sectors enhance the risks for land degradation and fires	-	There is insufficient coordination of inter-sectoral engagement and partnership for fire/haze as well as peatland management. While there is a growing trend of engagement for fire/haze and peatland management issues by range of government agencies from different sectors (e.g. forestry, agriculture, environment, water management, and community development), private sector (plantation, forestry and tourism sectors), academia/research, Civil Society Organisations (CSOs) and communities. However, the engagement needs to be enhanced for a greater impact and significant result.
19. There is growing potential for support to address land and forest fires in the region through multi-agency support	Several programmes are undertaken by different organisation such as IFAD, GEF, EU and FAO. SUPA programme supports regional capacity building through several dialogue activities and peatland assessment. Mekong Peatlands Project supports peatland assessment and develop NAPP in Cambodia, Lao PDR and Myanmar.	Multi-agency support by different organisation to strengthen the capacity and framework of AMS to fight against forest fire and haze issue in the region.
20. More effective engagement of local communities is needed to transform agriculture and land management practices to prevent fires and haze	-	Enforcement measures alone are not effective to prevent large scale land clearing with fire especially by local communities. It is critical to complement this with measures to find economically viable alternatives for land management for communities that eliminates or minimises the use of fire.

## 7) Recommendations

20 recommendations observed from the 5 themes of the CDNGA are summarized as below:

Recommendations	Regional	National
<b>Institutional framework</b>		
1. The establishment of ACC must be expedited	The AATHP specifies for the establishment of the ASEAN Coordinating Centre on Transboundary Haze Pollution Control (ACC) to facilitate the structures and actions under the AATHP. The ACC was expected to be established soon after the entry into force of the AATHP in 2003, but it was delayed for the ratification of Indonesia in 2014. Unfortunately, six years later, discussions for the establishment of the ACC are still ongoing. The delay in establishing the ACC has necessarily affected the level of progress with the AATHP and the Roadmap.	-
2. Enhance the function of NMC at national level and for regional reporting and communication	The ASEC/ACC should enhance communication and establish stronger linkages with the NMCs to share the required information at agreed regular intervals	NMC should enhance national monitoring measures. It is acknowledged that several AMS have limited capacity in information assessment at national level especially information related to air quality. However, every AMS has the capacity to provide daily weather information which is very critical during dry season. Sharing information practices and communication between NMC, NFP and other relevant agencies are missing in many cases and need to be enhanced.
3. The Institutional framework for the implementation of the APMS should be further strengthened	The ASEAN Task Force on Peatlands (ATFP) has endorsed the development of a Phase 2 of the APMS for the period 2021-2030. Measures need to be put in place to strengthen the implementation framework including the ATFP, ATFP National Focal Points and other important institutions and stakeholders involved in the strategy implementation. The details of action needed can be elaborated during the process of formulation of the Phase 2 of APMS in 2021.	-

Recommendations	Regional	National
<b>Sustainable peatland management</b>		
<p>4. Action should be taken to address the Significant Capacity Gaps in AMS in relation to sustainable peatland management</p>	<p>APMS Implementation needs to be enhanced for the following priorities identified through APMS Final Review:</p> <ul style="list-style-type: none"> <li>a. Further action to determine the exact extent and current status of peatlands at national level (9 AMS)</li> <li>b. Public and stakeholder awareness and participation (8 AMS)</li> <li>c. Peatland fire prevention (7 AMS)</li> <li>d. Development of policies and regulations for peatland management (7 AMS)</li> <li>e. Biodiversity Conservation (6 AMS)</li> <li>f. Integrated management of peatlands (6 AMS)</li> <li>g. Peatland restoration (6 AMS)</li> <li>h. Regional Cooperation (5 AMS)</li> <li>i. Best management practices (5 AMS)</li> <li>j. Financing the Action (5 AMS)</li> </ul>	<p>Action should be taken to address key capacity gaps identified through the APMS review including</p> <ul style="list-style-type: none"> <li>a. Peatland identification, delineation and assessment especially in AMS in the northern ASEAN region</li> <li>b. Assessment and conservation of peatland biodiversity</li> <li>c. Understanding and managing peatland hydrology</li> <li>d. Peatland restoration approaches</li> <li>e. Delineation and management of upland or mountain peatlands</li> <li>f. Sustainable community livelihoods in relation to peatlands</li> </ul>
<b>Fire and Haze Prevention</b>		
<p>6. Enhanced action should be taken to implement the Roadmap for a Haze-Free ASEAN and improve capacity for prevention of land and forest fires, and haze</p>	<p>Prioritise the ASEAN Haze-Free Roadmap Implementation:</p> <p>Strategy 1: Implementation of the AATHP (9 AMS)</p> <ul style="list-style-type: none"> <li>a. Strategy 2: Sustainable management of peatlands for peatland fires prevention (7 AMS)</li> <li>b. Strategy 3: Sustainable management of agricultural land and forest for large scale forest and/or land fire prevention (7 AMS)</li> <li>c. Strategy 5: Enhancing cooperation, exchange of information and technology, and strengthening of capacity of institutions at all levels (7 AMS)</li> <li>d. Strategy 6: Enhancing public awareness and cross-sectoral and stakeholder participation (8 AMS)</li> </ul>	<p>Much more effort needs to be put on fire prevention rather than fire response in AMS. This should be supported through assigning clear institutional responsibilities and resources for prevention as well as implementation of training programmes on fire prevention, linked to enhanced policies and regulations.</p>

Recommendations	Regional	National
	e. Strategy 8: Reducing health and environmental risks and protection of global environment (7 AMS)	
7. The ASEAN Guidelines on Peatland Fire Management should be actively promoted and implemented	The ASEAN Guidelines on Peatland Fire Management were adopted in 2015 and a regional Training of Trainers (TOT) was conducted in 2016, however, implementation of the Guidelines needs to be enhanced and promoted further.	National training and training of training programmes on peatland fire management need to be developed and implemented
<b>Fire and Haze Prediction, Warning and Monitoring Systems (Results management and warning system)</b>		
8. Fire prediction and early warning tools should be enhanced and promoted in ASEAN	<p>Closer links and exchange should be undertaken between various platforms for fire prediction, warning and monitoring to enhance the effectiveness of the tools and improve the dissemination and use by end users.</p> <p>Top priorities for the next 10 years for results management and warning systems are:</p> <ol style="list-style-type: none"> <li>a. Effective and timely fire prediction and warning to reach the regional and national levels by optimize the utilisation of existing results information from service providers e.g. ASMC, MET Malaysia, BMKG, DNP, NASA, etc.</li> <li>b. Enhance implementation of the ASEAN SOP</li> <li>c. Transparent on information sharing on national and regional effort in tracking hotspot and smoke haze occurrence</li> <li>d. Provide update at regional level on land and forest fires (including peat fires) and smoke haze based on agreed targets</li> </ol>	<p>Closer links and exchange should be undertaken between various platforms for fire prediction, warning and monitoring to enhance the effectiveness of the tools and improve the dissemination and use by end users.</p> <p>Top priorities for the next 10 years for results management and warning systems are:</p> <ol style="list-style-type: none"> <li>a. Effective and timely fire prediction and warning to reach the subnational and local levels by optimize the utilisation of existing results information from service providers e.g. ASMC, MET Malaysia, BMKG, DNP, NASA, etc.</li> <li>b. Strengthen internal institutional framework to enhance information sharing and monitoring mechanisms at national, sub-national and local levels</li> </ol>
9. Capacity should be enhanced to access and use FDRS and fire warning	While a range of FDRS results are available on a daily basis in the ASEAN region, the use of these key products for prevention and preparedness for fire management is limited due to limited capacity and	Capacity needs to be enhanced at the local level to use this information in a proactive manner to support fire prevention and control.

Recommendations	Regional	National
systems at local level in most AMS	lack of user-friendly tools or information in local language.	
10. Expand the coverage and dissemination of information related to air quality monitoring systems in ASEAN	Air quality information is among the element to be monitored following guidance by ASEAN SOP. However, the capacity to track air quality information is low in many AMS. Standardisation or harmonisation of air quality parameters between AMS would enhance information exchange and overall analysis.	Many systems are not equipped with PM2.5 monitoring capacity yet. Work is needed to expand the coverage including the provision of low-cost or cost-effective air quality monitoring devices for local level monitoring by community and other stakeholders.
11. Develop and promote use of alternate systems to hotspot monitoring to track and determine success of fire prevention measures in ASEAN	-	A broader range of parameters need to be determined and systematically used to track and determine the success of fire prevention measures including tracking of burn scars differentiated by land type (e.g. forest, agricultural land and peatlands). In addition, the scale of efforts for fire prevention such as zero burning agriculture, peatland rewetting etc. should also be monitored and reported.
12. A sub-regional capacity development programme should be initiated in Northern ASEAN (Mekong region and Philippines)	The nature and root causes of fire is different in Northern and Southern ASEAN. While there is significant capacity for fire management in the Southern ASEAN region, there are significant gaps in the north that could be addressed by a dedicated programme to build capacity in the sub-region. There are similarities in the situation in these countries.	
<b>Capacity Building and Exchange</b>		
13. A regional exchange programme on peatland and fire management should be developed to enhance exchange and skills in ASEAN	Knowledge of peatland and fire management especially from country with established system and success stories must be exchanged throughout the region and global level to enhance the coordination and cooperation in peatland and fire management.	-
14. Best management practices should be compiled and disseminated and a	Documented BMPs to be promoted at regional level.	Many best management practices (BMPs) have been developed in different AMS but are poorly documented and not disseminated. BMPs should be



Recommendations	Regional	National
network of BMP sites should be established to support peer to peer learning		collated and used to develop manuals, training and outreach materials. BMP demonstration sites are very key to help facilitate rapid and practical learning by local and national stakeholders.
15. Existing national and regional training centres or programmes should be enhanced through provision of new training modules and Training of Trainers (TOT) Programmes Online and video-based training should be expanded to enable rapid outreach even during periods of travel restrictions	There are a variety on national and regional training programmes and centres in the ASEAN region. Training modules on peatland and fire management should be developed jointly to expand the delivery partners for training in the region. A key lesson learned from the COVID-19 pandemic is that online and video-based training is cost effective and can significantly expand the reach and effectiveness on training programmes	There are a variety on national and regional training programmes and centres in the ASEAN region. Video based materials can be easily adapted to local language versions.
16. Strengthen capacity and exchange through effective knowledge management systems and enhance the synergy and avoid duplication between multiple initiatives for capacity building in the region	There is a rapidly growing number of knowledge products in ASEAN with more than 1,600 publications on peatlands and more than 1,000 on fire. These knowledge products need to be properly curated and disseminated to avoid duplication and enhance capacity.	There is a need at national level to compile relevant publications and journal of which useful to be referenced domestically to improve local knowledge using existing case studies. Numerous supports from various organisation needs to be undertaken by harmonising the effort to avoid redundancy and maximise the benefit to AMS.
17. Outreach and media engagement needs to be enhanced on fire and haze prevention and peatland management in ASEAN	A regional communication strategy and communication materials should be developed to support outreach and stakeholder engagement.	In order to spread the message and maximise the engagement of different stakeholders, it is important to use outreach programmes and engage the media to disseminate messages of peatland and fire management
18. Targeted capacity building initiatives are needed for local government and communities to enhance capability for sustainable land management	-	Local communities and local government are at the front line of peatland and forest management and their actions are critical to prevent land and forest fires. Capacity building programmes need to be developed to target these key groups.





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