Report

Community-based fire management

Trends, needs and next steps for capacities, technologies, gender equality and social inclusion

Community-based Fire Management Project
In partnership with the United States Department of Agriculture Forest Service
In four countries in Southeast Asia

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Abbreviations and acronyms

AFFIRM	Assuring the Future of Forests with Integrated Risk Management
ASEAN	Association of Southeast Asian Nations
CBFiM	community-based fire management
GIS	geographic information systems
REDD+	reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
UAV	unmanned aerial vehicle
UNESCO	United Nations Educational, Scientific and Cultural Organization

Executive summary

Forest fires continue to significantly impact the environment, economies and communities worldwide in direct and indirect ways. Environmental harm caused by forest fires disturbs ecosystems, alters land use and induces massive waves of greenhouse gases. Climate change affects each passing fire season, intensifying the severity of smoke and haze by increasing the frequency, intensity and duration of fires. These smoke particulates generate a transboundary haze that is afflicting the whole Association of Southeast Asian Nations (ASEAN) region at a worsening rate, thereby increasing the threats to public and environmental health. The transdisciplinary scale and transboundary impact of wildfires requires a collective and proactive approach that is inclusive of diverse perspectives.

Studies across Southeast Asia indicate that people cause most fires, either accidentally or intentionally (in cases of agriculture burning or land clearing). In October 2022, RECOFTC and the United States Department of Agriculture's Forest Service initiated a five-year regional project across four lower Mekong countries—Cambodia, Lao People's Democratic Republic, Thailand and Viet Nam—aimed at advocating for community-centered landscape governance and integrated natural resource management to improve fire management practices and policies.

Target sites in the four countries were selected on a range of factors, including but not limited to burn-scare proximity, hotspot density, land use and transboundary relevance. This community-based fire management (CBFiM) project was formed on the belief that community and landscape perspectives should be prioritized in the design and implementation of forest fire management.

Ganz, Fisher and Moore (2003) defined community-based fire management as a form of land and forest management, wherein a local community, with or without collaboration from other stakeholders, take on a significant role in determining the objectives and practices related to preventing, controlling or utilizing fires. A proactive and community-centered approach benefits ecosystem health and biodiversity while strengthening landscape connectivity and the sustainability of community livelihoods. By nurturing trust and applying adaptive management strategies that draw on social, economic, cultural and ecological conditions, the RECOFTC project seeks to facilitate the cross-stakeholder and cross-sector approach needed to build up resiliency in fire-threatened landscapes. The involvement of regional stakeholders and opportunities for knowledge-sharing throughout the project is expected to counter the challenge of transboundary haze from the root of the problem: irregular and unpredictable burning in the region.

The foundation for CBFiM is an integrated fire management framework. This holistic framework applies systems thinking to manage forest fire issues. It also recognizes the potential positive role that fire can have within a landscape. The framework centers on five elements, often referred to as the 5Rs: review, risk reduction, readiness, response and recovery.

Using the integrated fire management framework, RECOFTC conducted a four-component needs assessment, which also included a situation analysis. The objective was to determine gaps in the capacities, technologies and practices of gender equality and social inclusion (GESI) across stakeholders within the CBFiM Project's landscapes and determine its next steps. The needs assessments findings led to the formation of a regional capacity-development plan that the project sites can use to customize a similar plan for their context.

This report features the findings on those gaps, challenges and opportunities as they relate to the capacities, technologies and GESI practices required for stronger CBFiM. The intended audience of this report are policy-makers, international and regional practitioners, donors and fire management decision-makers.

Data for the assessment were compiled through a desk review of literature, stakeholder consultations, group discussions and informant interviews. Semi-structured interviews and snowballing techniques were used throughout the assessment period. A full range of stakeholders, from government agencies, academic and research institutions to civil society organizations, private sector entities and individual community members at the national, provincial and local levels provided valuable inputs and informed the assessment.

The capacity development needs assessment findings indicate that each country prioritizes different aspects of the 5Rs in integrated fire management. Thailand emphasizes review, Lao PDR focuses on risk reduction and readiness, Cambodia prioritizes response and Viet Nam concentrates on recovery. The assessment reveals diverse approaches across the countries, with no community meeting more than 25% of the 5Rs criteria. These results highlight significant gaps in CBFiM capabilities, underscoring the need for targeted improvements across all five areas.

The assessment arrived at the following six capacity-building priorities in the project's four countries:

- Enhancing knowledge and skills in adopting and adapting technologies and innovations for fire management, with emphasis on early detection and rapid response.
- Developing robust methodology and tools for data collection and analysis of fire causes and impacts.
- Facilitating the effective use of communication platforms for information-sharing and awareness-raising at the community and interagency levels.
- Building up practical skills and confidence in combating high fire risk situations and fire incidents.
- Strengthening platforms that integrate traditional fire knowledge into fire management.
- Addressing the barriers preventing women, youth, Indigenous Peoples and local communities and other minority groups from participating in decision-making processes and fire management activities.

Recommendations

Based on the analysis and findings, the following recommendations on capacity-development interventions address the gaps and challenges toward effective CBFiM in Cambodia, Lao PDR, Thailand and Viet Nam. Capacities that are addressed by these recommendations focus on the priorities to enhance knowledge and skills in technologies and innovations in fire management. This is to build practical skills in combating high fire risk situations, effectively use communication tools and raise awareness at the community and interagency levels. These recommendations target needs at the district, commune and other local levels.

1. Conduct training of trainers to expand the community of experienced instructors with specific scope and context to their area.
2. Establish a mechanism for a cascade approach in coaching and training with the training of trainers program. This will ensure that the knowledge and skills are delivered through layers and reach the final target group at the local level.
3. Build GESI practice into CBFiM through training, mentorship and a support network
4. Develop technical skills through field practicum.
5. Support cross-learning in the field and on site to share lessons learned and insights on overcoming challenges at the community level.
6. Foster a community of practice that inspires, supports and encourages innovation and skills through regular learning labs and events that bring practitioners together.

The following recommendations for scaling up community-based fire management should be targeted at the regional and national levels:

1. Design and develop effective tools to replicate implementation of effective CBFiM every year and in new sites. Select different geographic zones or ecosystems so that CBFiM can be tailored to different parts of the country and region. Tools should include offline and online materials for landscape-relevant awareness-raising, guidelines, e-learning courses, training manuals, short films and protocols.
2. Decentralize responsibilities for year-round fire management activities to the provincial and community levels.
3. Establish enabling policies and regulations for effective fire management with clear guidelines on roles and responsibilities for interagency coordination.
4. Establish enabling policies for the protection of the health and safety of at-risk fire communities and for fire preparation, forest patrols and fire response teams.

Introduction

RECOFTC, in collaboration with the United States Department of Agriculture's Forest Service, RECOFTC, in collaboration with the United States Department of Agriculture's Forest Service, is spearheading a regional project on community-based fire management (CBFiM) The central purpose of this cross-landscape project is to advocate for and support community-centered governance and integrated natural resource management regarding fire practice, forest fires and wildfires. CBFiM's research and activities have revolved—and will continue to do so—around gap analysis on fire management tools and systems and then using the generated knowledge and evidence to improve policies and practice.

The five-year project, which began in October 2022, covers four lower Mekong countries: Cambodia, Lao PDR, Thailand and Viet Nam. It is targeting the root causes of forest fires and their socioecological consequences in specific landscapes in the four countries. Complementing previous work by RECOFTC, the Forest Service and other organizations in the region, project activities directly relate to CBFiM and are designed to respond to the unique needs and challenges of the countries, provinces and communities where the target sites are located.

Targeted beneficiaries are communities in the project landscapes. Given the regional nature of smoke and haze generation and movement, secondary beneficiaries are the millions of people also living in the region. An integrated strategic communication and knowledge management approach, coordinated closely with the Forest Service and other partners, connects stakeholders, activities and geographies to ensure that lessons learned benefit as many people as possible in fire-susceptible areas.

The project seeks to reduce forest fire frequency and intensity specifically and generally increase regional resilience to climate change impacts. Activities have started and will continue to work toward the following outcomes:

Outcome 1: CBFiM policy, planning and practice are strengthened and well-integrated among local, provincial and national government structures.

Outcome 2: Technologies are shaped by the needs and experiences of communities and are widely used to support forest fire management and control.

Outcome 3: Knowledge on forest fire management is shared among and between stakeholders at the local, national and regional levels, resulting in improved policies and practices.

One of the project's first activities entailed a needs assessment to understand each country context and the role of fire in the four targeted landscapes, the results of which are presented in this report. The overall assessment looked at needs in terms of capacity development, technology, and gender equality and social inclusion as

they relate to CBFiM. The competency level of stakeholders affects their proficiency in executing specific tasks, considering the minimal requirements of knowledge, skills and prior experience essential for those tasks.

The evaluation of competency levels, encompassing knowledge, skills and attitude, serves as a gauge for task performance effectiveness in achieving predefined objectives and results. Should the assessed competency level fall short of the specified standards, it implies a deficiency in ability or a gap in capacity to execute tasks and attain desired outcomes. The overall assessment consisted of four components:

- Situation analysis and capacity-development needs assessment (CDNA)
- Technology needs assessment
- Gender equality and social inclusion gaps assessment
- Analysis of findings for recommendations and determining next steps

The situation analysis looked at the presence or lack of enabling conditions supporting CBFiM in the project sites. The capacity (or competency) gaps, including technology and GESI, were assessed in relation to the findings from the desk review and other data collection.

The needs assessment revolved around an integrated fire management framework (figure 1) and the integrated fire management competencies required for an inclusive and transdisciplinary CBFiM approach.[1]

The integrated fire management framework guided the crafting of questions for each of the three assessment components:

- What capacities, competencies and enablers need to be increased to help communities become more effective or actively participate in fire management?
- What capacities need to be increased to enable national authorities and other relevant actors (civil society, community groups and universities) to be more effective in fire management?
- What technologies are currently used in these landscapes, and what technology gaps exist?
- What barriers exist that impede the participation of women and other disadvantaged groups in fire management? What opportunities, challenges and resources are available to promote GESI in landscape fire management?

As this report reflects, the overall needs assessment has been critical for:

- Identifying existing and expected competencies of participants from communities, government entities and relevant stakeholders within the project region to engage in CBFiM planning.

- Providing recommendations on capacity-development strategies and interventions for designing management plans and programs (including training and workshops) that tackle the capacity gaps and needs among targeted stakeholders.

To contextualize the project and its goals, the next section of this report describes the integrated fire management framework and the ambitions of CBFiM. After explaining the dynamics of the data collection and how the needs assessment evolved from capacities to additional assessments looking specifically at technology and GESI, the report turns to the findings. The third and fourth sections give a glimpse of each country's fire management context, highlighting the situation in the target sites (presence or lack of enabling conditions supporting CBFiM). Section 5 goes through the findings on capacity development development needs, technology-related needs and the gaps relating to GESI. The final section explains the recommended activities for the RECOFTC project and other partners working on CBFiM and then highlights the next steps the CBFiM Project has planned.

Integrated fire management

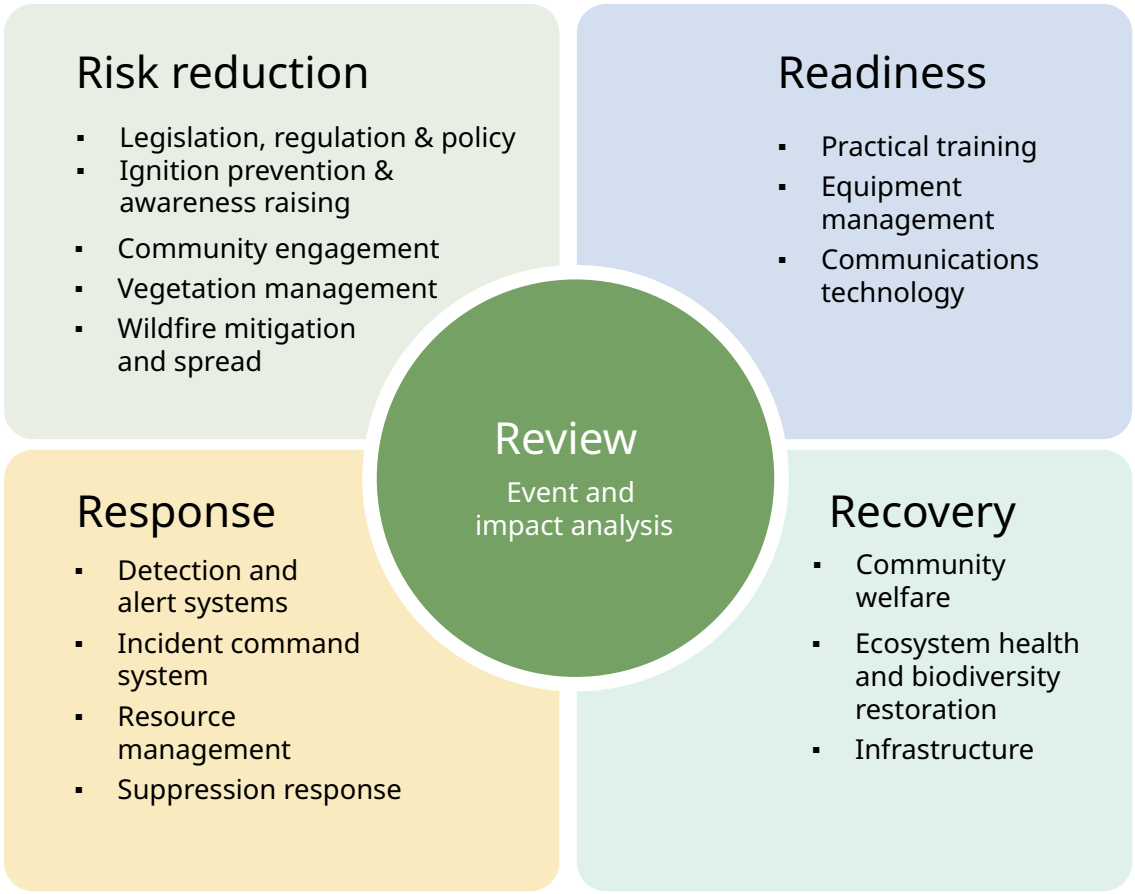
Integrated fire management framework

Integrated fire management is a comprehensive approach that combines various strategies and techniques to reduce the risk and impact of fires on both ecosystems and communities. The framework recognizes that fires are a natural part of many ecosystems and aims to find a balance between suppressing fires when necessary and allowing them to fulfill their ecological role. The three main components of integrated fire management are (a) fire management—prevention, response and fire use; (b) fire ecology—ecological attributes of fire and (c) fire culture—socioeconomic necessities and impacts.[2]

The integrated fire management framework is important for CBFiM because it provides a holistic and collaborative approach to the complexities of fires and involves communities in the process to promote sustainable and resilient landscapes. The integrated fire management framework (figure 1) centers on five pillars: review, risk reduction, readiness, response and recovery (presented as the 5Rs in this report).[3]

1. **Review (and analysis):** Data collection and analysis in the context of fire occurrence and historical and existing fire regimes. This includes studying fuels, weather, fire behavior, ecological response, fire management response, the general public response, post-fire recovery processes and the relationships between all these factors.
2. **Risk reduction:** Reduction of the probability, severity and impact of wildfires. This includes community engagement, participatory mapping and risk assessments and CBFiM plans.
3. **Readiness:** Preparation for uncontrolled fire events by communities and relevant government and emergency response agencies. This includes evacuation and shelter-in-place plans, emergency response training and sufficient communication plans as well as checking up on firefighting, personal safety and communications equipment.
4. **Response:** Management of fires when they occur. This includes allocation of rapid response resources (personnel and equipment), communication systems (alerts and status updates) and evacuations.
5. **Recovery:** Remediation of human and ecological values after fires occur. This includes restoring infrastructure and ecosystems and providing welfare resources and insurance for loss and damage.

Figure 1. Integrated fire management's 5Rs



Community-based fire management

Regional work on community-based fire management

In 1998, a paper on the role of indigenous use of fire in forest management was presented at an international workshop that RECOFTC organized. The authors found that high-quality information on community involvement in fire management was scarce. Additionally, many of the workshop's participants believed that communities adversely contributed to—rather than properly managed—forest fires.

In response, Project FireFight South East Asia[4] and RECOFTC initiated efforts to gather information and assess interest in CBFiM. They began with a regional workshop in Bangkok in December 2000, which garnered significant interest and led to a larger conference on Communities in Flames. That conference, attended by more than 120 people from 21 countries, emphasized the vital role that communities must have in fire management.

Despite these efforts, CBFiM struggled with a lack of clarity and institutional support. Over time, organizations like the World Bank, Tropenbos International and the International Tropical Timber Organization began to support related initiatives

under various labels, such as community-led climate resilience. Although CBFiM links to broader areas, such as community-based natural resource management and disaster risk reduction, it has been uniquely emphasized by persons studying indigenous fire practices. However, there is concern that fire management issues could fragment the already diverse community-based natural resource management field.

From the start, CBFiM was intended to be integrated into overall land-use planning and natural resource management—not as a separate identity but as part of community capacity-building. Similarly, within the fire management community, CBFiM is considered a critical component of integrated fire management.

RECOFTC has extensive experience leading and participating in projects related to CBFiM and advocating for the adoption of CBFiM plans and practices.[5] This includes establishing firebreaks, implementing weeding practices, conducting silviculture, promoting forest restoration and supporting assisted natural regeneration efforts.

RECOFTC's FLOURISH Project (2018–2022), which supported community-based enterprise strengthening in Lao PDR, Thailand and Viet Nam, included a component on fire management. Through that project, RECOFTC integrated fire management into community forest agreements; delivered capacity-building training related to fire prevention, firefighting and control; and supported national dialogues on forest fire management. Additionally, Union-funded Our Tonle Sap Project in Cambodia, RECOFTC is supporting the development of CBFiM. This approach is already integrated into most new community forestry and fishery management plans in Cambodia.

The current four-country CBFiM Project continues RECOFTC's emphasis on CBFiM as well as the interest of many other partners. For instance, the project aligns closely with the demand of international actors to establish the Global Fire Management Hub through the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Program, which was officially launched in May 2023. That initiative is responsible for the recent publication of the second edition of the *Integrated Fire Management Voluntary Guidelines*.[6]

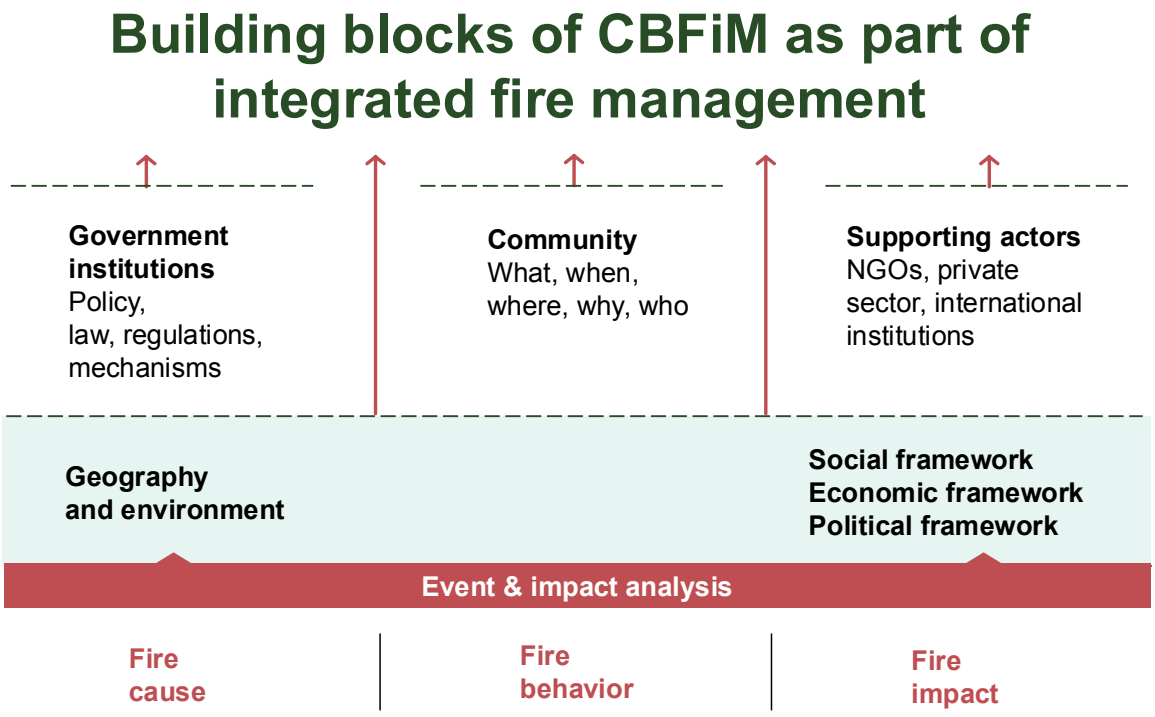
The Global Fire Management Hub coordinates and unifies partnerships in building capacities on integrated fire management to reduce the negative impacts of wildfires on livelihoods, landscapes and global climate stability while maintaining the important ecological and cultural role of fire in its traditional uses. This hub integrates 25 years of experiences and insights from the Global Fire Monitoring Center and the Global Wildland Fire Network. FAO's Asia-Pacific office is contributing toward the Assuring the Future of Forests with an Integrated Risk Management (AFFIRM) mechanism to overcome gaps in data needs, inform forest-related risks and foster an integrated approach to risk management. With leadership from the FAO headquarters in Rome and regional guidance from FAO's Asia-Pacific office in Bangkok, RECOFTC is contributing community-level perspectives from its work on the CBFiM approach.

The community-based fire management approach

The CBFiM approach, with its integrated and participatory methods, offers an effective solution for addressing various challenges in developing countries, especially in the tropics where the main trigger of fires is from people. Ganz, Fisher and Moore (2003) defined CBFiM as a form of land and forest management wherein a local community, with or without collaboration from other stakeholders, have a significant role in determining the objectives and practices related to preventing, controlling or utilizing fires.[7] This approach emphasizes community involvement in decision-making processes, contributing to more sustainable and locally tailored solutions for fire management.

CBFiM, as a component of integrated fire management and a form of disaster risk reduction (figure 2), acknowledges traditional or existing fire practices within communities.[8] It emphasizes participatory involvement in designing fire management objectives and plans. This approach involves communities living in and near forests in decision-making, draws on their local knowledge and equips them to prevent, control and utilize fires safely. By preparing communities to manage fire risks, CBFiM helps balance ecological impacts and livelihood interests.

Figure 2. Building blocks of community-based fire management



These community-focused approaches are increasingly emphasized in fire management initiatives. FAO, for instance, found considerable value in the integration of participatory rural appraisals into fire management planning. Ganz, Fisher and Moore (2003) also developed participatory rapid assessments for evaluating different types of CBFiM approaches. Ideally, CBFiM provides a role in stewardship alongside fire practitioners and community representatives to ensure that results are adaptive, sustainable and effective.[9] CBFiM serves as a holistic framework by applying systems thinking to forest fire issues and incorporating ecology and the environment alongside socioeconomic and political ambitions. CBFiM also recognizes the potential positive role that fire may have within a landscape, which thus requires ensuring that voices are heard from Indigenous Peoples and local communities. Local knowledge holders have crucial information regarding fire and sustainable land management but may include persons who do not self-identify as Indigenous or are not legally recognized. Forest governance is also considered by including government and institutional representatives in the development of CBFiM plans.

Needs assessment methodology

The needs assessment applied the integrated fire management framework to define the gaps, challenges and opportunities across the national, provincial and community contexts for an inclusive, transdisciplinary approach. The enabling factors that contribute to strong CBFiM were evaluated through the lens of the 5Rs; situation and context; capacity development; and competencies in technology accessibility and availability, and gender equality and social inclusion practices (figure 3).

Figure 3. Components of CBFiM in the needs assessment

The findings of the situation analysis as well as the three assessments (capacity-development needs, technology and gender equality and social inclusion) created a picture of the level of competencies and gaps among stakeholders primarily in the project sites. Those findings became the basis for the design of a general capacity-development plan that will be implemented by RECOFTC regionally to help achieve the project's objectives and, hopefully, will be used by other regional partners (because resources are limited). Additionally, it will guide each project site to arrive at its own context-specific capacity-development plan.

Components of the situation analysis (section 4):

- Identification and analysis of the drivers contributing to fire occurrences and fire risks in the landscapes.
- Examination of relevant policy, regulatory frameworks and global commitments related to fire management.
- Understanding the landscape of national and local institutions and stakeholders involved in fire management.

- Understanding how communities (including men, women and other civil society groups) are involved in forest management and their needs.

A variety of research methods were employed for the situation analysis, including a literature review, survey, interviews and data analysis, to arrive at a comprehensive understanding of the context in the project sites.

The three assessments relied on workshop consultations, group discussions and surveys, as well as informant interviews, to determine the gaps in knowledge and resources related to fire management. This qualitative approach was supplemented by quantitative analysis to validate the findings (see appendix A for the guiding questions per each "R" of the integrated fire management framework).

The situation analysis and the three assessments adhered to the principles of integrated fire management, which emphasize collaboration, interdisciplinary approaches and cross-boundary cooperation.

Data collection

RECOFTC country teams (who conducted the workshops and collected data) oriented themselves with the data collection guidelines that RECOFTC's main office staff had drafted. Stakeholders who were consulted or interviewed shared insights into gaps they had experienced in their formal institutional roles as well as those of colleagues, partners and other specialists they work with. This highlighted the overlapping competency gaps among all relevant stakeholders in the project context and provided valuable information to shape the project's capacity-development plan.

Table 1. Data collection according to objective

Category of need or gap	Factors to assess (based on the integrated fire management's 5Rs framework)	Approach
Situation analysis	▪ Drivers of fire occurrences and fire risks ▪ Policy and regulatory frameworks ▪ Landscape of institutions and stakeholders ▪ Existing fire and forest fire management practices	Desk research

Capacity development (and competencies)	▪ Social and cultural dynamics ▪ Economic dynamics ▪ Environmental and ecological dynamics ▪ Institutional dynamics ▪ Collaboration ▪ Communication	In-person workshops (group discussions, stakeholder consultations) and informant interviews
Technology	▪ Geospatial data ▪ Early warning and risk management ▪ Data and knowledge management and sharing ▪ Mechanical and hand tools	In-person workshops (group discussions, stakeholder consultations), informant interviews, online survey (where possible) and snowball sampling
Gender equality and social inclusion	▪ Policy, governance and institutions ▪ Social and cultural norms and beliefs ▪ Family and personal perceptions ▪ Gendered access to and control over the resources (forest, information, fire control, finances) ▪ Gender roles and responsibilities, participation, benefits and opportunities for sharing decision-making	In-person workshops (group discussions, stakeholder consultations), informant interviews, online survey (where possible)

More than nine workshops were conducted to assess the existing capacities, gaps and needs within communities and with at least 405 stakeholder participants regarding fire management. These workshops also gathered diverse perspectives and fostered collaboration among all involved parties to develop effective, inclusive and sustainable strategies for fire management.

Using participatory approaches, the workshops engaged local community members, representatives from various groups (youth, women, underrepresented groups), relevant landowners and government agencies (forestry, fishery, forest protection) (table 2). Facilitators were experienced RECOFTC staff. Sessions included small group discussions, presentations, participant engagement and, if useful, surveys. Because mutual respect and understanding helps to bridge cultural divides and facilitate meaningful dialogue for positive outcomes,[10] this process encouraged proactive and creative responses to navigate intercultural tensions and conflicts. A respectful attitude toward diverse entities helped identify common ground and address historical disagreements among stakeholders. This approach fostered adaptive, sustainable, inclusive and socially just solutions.

When it became clear in the first few workshops on general capacity-development needs that not enough information was on hand regarding technologies and the practices of gender equality and social inclusion, additional workshops were organized to focus solely on those issues.

Table 2. Data collection approaches

Country	Interviews and consultation workshops	Approaches
Cambodia	▪ Ou Tabrouk Community Fishery ▪ Tram Paer Community Fishery ▪ Koh Praek Raing Til Community Fishery	▪ Combined capacity-development needs assessment workshop, 24 August 2023 in comprehensive workshop ▪ Online communication platform (Telegram) workshop on 23 November 2023 and reflection workshop, 23 May 2024
Lao PDR	▪ Bokeo Province ▪ Xayaboury Province ▪ District Agriculture and Forestry Offices ▪ Provincial Agriculture and Forestry Offices ▪ Department of Forestry	▪ Capacity-development needs assessment workshop, 27 March 2023 in Bokeo Province ▪ Capacity-development needs assessment workshop, 3 April 2023 in Xayaboury Province ▪ Technology and gender equality and social inclusion workshop, 10 May 2024 in Vientiane, Lao PDR
Thailand	▪ Manee Pruek Village ▪ Rat-rat Pattana Village ▪ Sawang Village ▪ Kiew Nam Village	▪ Capacity-development needs assessment workshop, 9 September 2023 ▪ Capacity-development needs assessment workshop, 10 September 2023 ▪ Capacity-development needs assessment workshop, 11 September 2023 ▪ Capacity-development needs assessment workshop, 23 September 2023 ▪ Technology and gender equality and social inclusion workshop, 5 March 2025 in Nan City
Viet Nam	▪ Ma Bo and Cho Rung and Da Quyn villages, Duc Trong Commune ▪ Tan Ha, Toa Cat, Da Quyn commune, Duc Trong District ▪ Provincial-level consultation in Dalat City	▪ Capacity-development needs assessment validation workshop, 20–23 December onsite at respective locations ▪ Gender equality and social inclusion baseline workshop, 22–26 January 2025 ▪ Technology workshop, 11–12 March 2024
Main office RECOFTC	▪ Provide guidelines and coaching ▪ Conducted learning lab on CBFiM to familiarize staff and partners on the conceptual framework for the capacity-development needs assessment	▪ Learning lab conducted, 17–20 October 2023 ▪ Provide support and resources on integrated fire management and 5Rs ▪ Regular communication

Needs assessment challenges

The capacity-development needs assessment experienced several challenges in its implementation process. The capacity-development needs assessment results should be considered with the situation analysis, while the technical and gender equality and social inclusion components should be evaluated as starting points for further in-depth investigation.

- Staff recruitment for the CBFiM Project was delayed and thus the capacity-development needs assessment process started late and was rushed to finish before the fire season began. Despite the late start (October 2022), each country was required to complete its capacity-development needs assessment before November or December 2023 to have sufficient time to prepare CBFiM planning workshops before fire season in the early year (January–March 2023). Due to the lack of time before fire season and the need to prioritize the CBFiM capacity development, the technology needs assessment was conducted separately toward the end of fire season.
- The timing and resources of the assessments differed in the four countries. Lao PDR, Thailand and Viet Nam benefited from results of the FLOURISH Project, which provided a basic understanding of integrated fire management and fire context at the national level. Lao PDR and Thailand used the same provincial site as in the FLOURISH Project, while Viet Nam moved to a new project site, in Lam Dong Province. The Cambodia project team benefited from fire experiences and knowledge from the Our Tonle Sap Project in Siem Reap Province, and this allowed for scaling up that approach to Pursat Province. These variations in CBFiM practices and the level of RECOFTC's engagement with target communities required the CBFiM management team to adapt our approach accordingly. This presented a challenge as it necessitated tailoring strategies to varying levels of existing knowledge and engagement, ensuring that each site could effectively progress despite differences in baseline capacity.
- Although gender-disaggregated data were collected during the capacity-development needs assessment workshops, there was a lack of GESI dimensions assessed due to a lack of resources and guidance. A separate assessment was deemed necessary, but it was conducted differently in each country due to funding available. Viet Nam mobilized additional funding and staff expertise to spearhead GESI analysis in fire management. Separate workshops were conducted alongside the technology workshop in Lao PDR and Thailand, with expertise from GESI specialists in each country. In Cambodia, the assessment was supplemented by work conducted by an intern who focused on GESI dimensions in Pursat Province.
- One limitation of this exercise is its generalized perspective on competency needs and gaps among stakeholders. This stems from the data collection process and data analysis and thematic coding. This constraint was due to how much time and resources the project could allocate for this process, given the other

activities and deliverables that needed to be addressed. Consequently, the capacity-development needs assessment findings provide overarching insights into capacities and competencies but may lack specificity for target groups. For example, while the data indicate a shared need for enhanced knowledge and skills in adopting new technologies for fire management across all four countries, they do not precisely inform the extent of local authorities' and communities' experience in utilizing these technologies or their current efficiency in doing so. This underscores the need for additional context-specific assessments for a more nuanced understanding of capacity requirements.

- The capacity-development needs assessment results primarily reflected insights from community and provincial assessments, along with secondary data, offering a somewhat limited perspective on existing competencies. To develop more robust and well-rounded recommendations, it is crucial to integrate external information and data from other development agencies and national government assessments into the analysis.

Despite these issues, the rapid assessment provided valuable insights into current trends and gaps in CBFiM and provided the basis for the CBFiM Project's next steps on capacity development. Ongoing monitoring, evaluation and follow-up assessments will be crucial in refining these findings and understanding the impact of tailored interventions. As CBFiM gains visibility at the international and national levels, continued investment will enhance climate and fire resilience and capability for communities and the environment. Additionally, a learning lab was conducted once in October 2023 but should be conducted regularly to ensure diverse perspectives and changing dynamics across the region and fire seasons.

Situation analysis results

The situation analysis results offer a comprehensive overview of the fire management context and the characteristics of fire-prone landscapes across the four countries covered by the CBFiM Project. This analysis utilized a range of methods and tools to assess the current state of these sites, considering factors such as landscape and land-use characteristics, socioeconomic influences, fire frequency and ignition sources and the impact on public and environmental health. The analysis provides findings at both regional and country levels, offering a nuanced understanding of the situation across different scales.

It delved into the elements that drive fire occurrences, evaluated existing policy and regulatory frameworks and explored the roles of national and local institutions in fire management in the project sites. The project data profiles in appendix B provide a detailed look at the areas chosen to pilot project activities, with direct beneficiaries including local villagers, community members and their surrounding landscapes.

Regional situation

The Southeast Asian region (and its governance through ASEAN) is experiencing rapid and profound changes in social, institutional and economic systems. Persistent poverty in large parts of the population, growing disparities within and between nations and rapid globalization—driven by advancements in information technology, transport and trade—are all evident.

In many ASEAN countries, there is a trend toward decentralizing fire management responsibilities from national to subnational authorities. Additionally, transnational corporations and international environmental organizations are taking on a larger role in land stewardship and policy development, with a shift toward integrated environmental policies and management practices. Governments are increasingly willing to cooperate on fire management at a regional level, as seen from the multitudes of ASEAN functioning bodies in the past four decades, such as the ASEAN Regional Haze Action Plan and the Regional Haze Action Plan Coordination and Support Unit. However, a challenge remains in translating this willingness into concrete and effective actions, particularly when local stakeholders lack adequate empowerment.

Transboundary smoke and haze have been a priority issue for ASEAN member states for at least the past 25 years, with hundreds of billions of dollars of economic damage from social and environmental impacts.[11] In response, policy-makers have initiated numerous plans and mechanisms, including the ASEAN Agreement on Transboundary Haze Pollution, the ASEAN Peatland Management Strategy (2023–2030), the ASEAN Investment Framework for Haze-Free Sustainable Land

Management and the ASEAN Haze-Free Roadmap (2023–2030).[12] These regional mechanisms aim for an integrated approach to build multistakeholder partnerships and enhance the availability of resources to stop the large-scale burning of forests, peatland and agricultural residue through a variety of innovative strategies.

Each fire season continues to intensify, with increasing severity of smoke and haze due to more frequent, severe and prolonged fires. Climate change is clearly exacerbating the situation. This smoke creates transboundary haze, which is worsening annually across the ASEAN region and threatening public and environmental health. Forest fires continue to significantly impact the environment, economy and communities around the world in direct and indirect ways. They have serious consequences for many households in the ASEAN region, including proximate impacts, such as loss of life, livestock and property, and longer-term impacts, such as degradation of natural resources and increasing rates of respiratory illness and natural disasters.[13] Research shows that 30 percent of South and Southeast Asia experiences recurrent fires annually, especially in Cambodia, Lao PDR, Myanmar and Thailand.[14]

To further understand the impacts of fire in Southeast Asia, RECOFTC collaborated with the Yale University-hosted The Forests Dialogue (February to April 2022; made possible through the German-funded FLOURISH Project) to facilitate a series of national and subnational roundtable discussions. These dialogues brought together diverse stakeholders to share ideas and perspectives on the challenges, strategies and needs related to forests and fires in Thailand, Lao PDR and Viet Nam. The discussions were designed around core questions to determine challenges and good practices related to forest fire management and to develop a better understanding of the links between climate change and forest fire, with the following conclusions:

- Fire, smoke and haze patterns and their impacts often cross borders, requiring international coordination
- Fire management should shift from short-term, reactive suppression to long-term, integrated planning that involving diverse stakeholders and efforts at multiple levels
- Indigenous Peoples and local communities are disproportionately impacted by forest fires but are often underrepresented in designing and implementing effective forest fire management strategies
- Engaging Indigenous Peoples and local communities in fire management requires a long-term commitment to building trust and achieving better integration in planning, preparedness and response
- At the community level, common needs include capacity development for planning, implementation and monitoring, as well as access to firefighting equipment

State of community fire in Southeast Asia

Nearly all fires in Southeast Asia have human-induced origins. Therefore, addressing fires in this region requires a landscape-level approach based on an in-depth understanding of socioeconomic, governance, gender and cultural dimensions, as well as scientific factors such as ecology, vegetation, fuels and fire behavior.[15] Indigenous Peoples and local communities have developed traditional fire knowledge, encompassing ecological insights, beliefs and practices for better resource and landscape management.[16]

In Southeast Asia, fire has been used for multiple purposes, such as promoting new grass growth for livestock and new shoots and leaves for food, controlling pests and diseases, collecting non-timber forest products and hunting wildlife, shifting cultivation and clearing vegetation for agriculture.[17] Fires are also triggered unintentionally due to cigarette smoking, careless cooking activities, resin extraction, honey collection and wildlife hunting.[18]

Policies and legal frameworks supporting land management, including fire management, are limited and often not specific to land cover types across the lower Mekong region. Fire management policies are typically integrated into existing land management structures, but there is a lack of interagency coordination when rural fire incidents occur across different land governances and cover types.

Overall, effective forest fire management in Southeast Asia requires collaborative efforts involving diverse stakeholders, sustained engagement with local communities and tailored approaches that consider regional contexts and challenges. Legislation and policies must align with local practices and needs to ensure successful implementation of fire management initiatives and safeguard ecosystems and livelihoods in the region.

Fire management in CBFiM Project sites

Cambodia – Tonle Sap Biosphere Reserve in Pursat Province

The fire situation in Cambodia is multifaceted, involving ecological, agricultural and policy dimensions. Cambodia has one of the highest fire frequencies in Asia, with 8.7 million fires recorded from 2001 to 2020, impacting 41.6 percent of the land. Fires are often linked to agricultural practices, such as controlled burns for land management and crop production, though they are less common in tree-based systems like rubber and oil palm. These fires contribute to forest degradation, particularly in dry regions, and are often set intentionally for activities like grazing or mushroom cultivation, or accidentally from managed lands. Economic land concessions for industrial agriculture can help prevent and inadvertently increase fires, particularly where safeguards are weak. Fires are more prevalent in unmanaged lands and often spread from agricultural areas into protected forests, posing significant risks to biodiversity and ecosystems.[19] This situation underscores the challenges in enforcing fire management laws and the need for improved strategies to prevent uncontrolled fires, which pose significant threats to Cambodia's biodiversity and ecosystems. Strengthening fire policy enforcement, particularly in the economic land concessions, and developing integrated management strategies are crucial to balancing agricultural needs with environmental conservation.

The Ministry of Agriculture's Department of Forestry and Department of Fisheries support community forestry fishery and management plans, which may include provisions for fire management but are not mandatory. The Ministry of Environment manages biosphere reserves and community-protected areas, involving village chiefs and community leaders in forest fire-related work. The Fisheries Administration is responsible for managing the commercial fishing areas and aquatic habitat from open water, flooded forests, rice fields, grasslands and small water bodies.

Project sites

The CBFiM Project targets four communities in the Tonle Sap Biosphere Reserve in Pursat Province. The Tonle Sap Lake, the largest freshwater lake in Southeast Asia, boasts a diverse array of interconnected ecoregions with a high degree of biodiversity, earning it the status of a biodiversity hotspot. The lake is a significant cornerstone for livelihoods, well-being and cultural practices for many communities. It was designated as the first UNESCO Biosphere Reserve in Cambodia in 1997, covering an area of 14,812.6 square kilometres and divided into three zones—core, buffer and transition areas. The Tonle Sap Authority is responsible for managing the Tonle Sap Lake, including those three zones within the flooded areas.

The flooded forest around the lake is the largest seasonally flooded freshwater swamp forest habitat or inundated forest in Southeast Asia, characterized by dynamic water levels that rise dramatically during the rainy season due to the

Mekong River's overflow. This unique ecosystem supports over 300 species of fish, as well as various mammals and birds, some of which are endangered, all adapted to the fluctuating water levels.

The Tonle Sap Biosphere Reserve is home to an estimated 1.4 million people of many ethnic origins, including Cham, Vietnamese and predominantly Khmer individuals, who engage in natural resource management in community fisheries, community-protected areas and community forestry projects.

Despite its ecological importance, the Tonle Sap Biosphere Reserve faces threats to its sustainability. Climate change, upstream damming and diversion of tributaries for agricultural irrigation are contributing to the lake's rapid shrinkage. In 2019 and 2020, the delayed and shortened annual flood pulses disrupted fish spawning and growth. The reduction in the lake's size during the wet season has led to increased agricultural expansion, often involving land clearing through burning, which has escalated the incidence of forest fires within the Reserve. During the dry season, the seasonally flooded areas dry out and are used for grazing, farming and other sustenance activities, making them increasingly susceptible to fires. These fires pose a growing threat to both the local population and the Reserve's biodiversity. The rapid landscape changes, reduced flooding periods and altered water volumes have intensified the severity of these fires, further endangering the ecosystem.

Other human activities, like burning flooded forest to capture wildlife or harvest honey from wild honeybees as well as clearing land for cropping, considerably contribute to forest fires in the Reserve. In some grassland areas near the flooded forest zones, fires are used to maintain grass for livestock grazing. Reducing these multifaceted challenges is crucial to safeguarding the ecological integrity and socioeconomic well-being of the Reserve and its surrounding communities.

In Cambodia, land management is complex, with overlapping governance responsibilities divided across the Ministry of Agriculture and the Ministry of Environment. The Ministry of Agriculture's departments, including forestry and fisheries, support community fishery and forestry management plans, which may include provisions for fire management but are not mandatory. The Ministry of Environment manages biosphere reserves and community-protected areas, involving village chiefs and community leaders in forest fire-related work.

In the Tonle Sap Biosphere Reserve, community fisheries directly engage with the work on CBFiM. Although various institutions are involved in fire management within the Reserve, challenges remain in implementing CBFiM plans due to a lack of permanent structures and funding. Collaborative efforts between project teams and local stakeholders are essential to address these challenges and promote sustainable fire management practices.

Since its launch in late 2022, the CBFiM Project team has coordinated with the community fisheries under the supervision of community fisheries management committees to establish CBFiM plans and patrol teams. When a village is engaged in any work regarding forest fires, the head of commune, the village chief and other

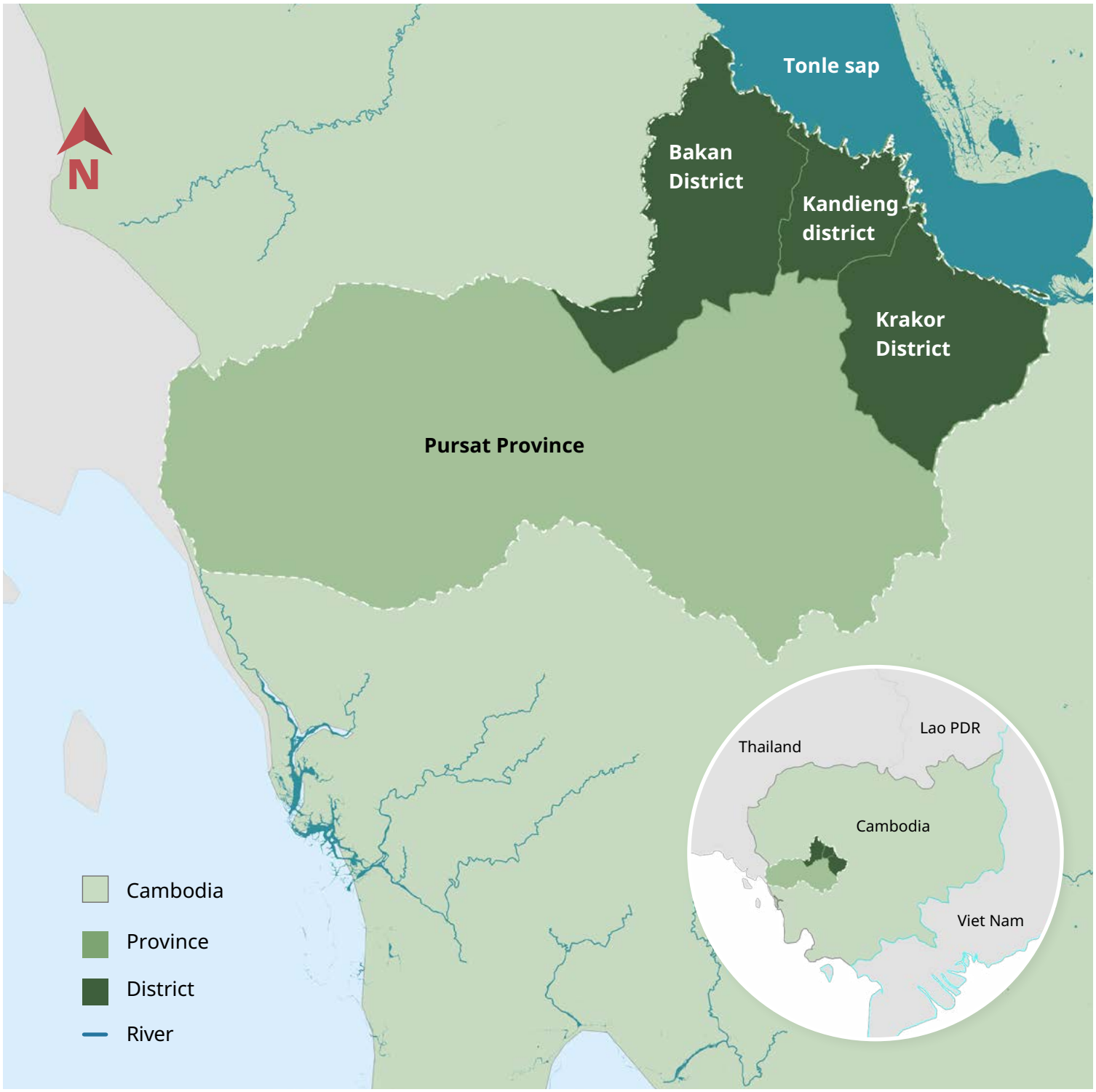
community leaders are involved. These teams receive official recognition from the commune chiefs of the associated community fisheries. This process is informally recognized, and there is no regulation that enforces or supports the development of a CBFiM plan. Without a permanent structure, the communities lack funding to effectively implement their fire management plan, including any risk reduction, readiness and response activities.

In the Ou Tabrouk Community Fishery in Ou Sandan Commune of Krakor District, the historical and current fire regime within the flooded forest occurs in the dry season, from March to June. Most community-flooded area wildfires are caused by humans, such as discarded cigarette butts and cooking by ranchers, fishermen or hunters.

In Koh Praek Raing Til community fishery located in Raing Til Commune of Kandieng District and Tram Pear Community Fishery located in Meteuk Commune of Bakan District, wildfires are often attributed to individuals from outside the village engaging in cattle grazing, fishing and improper cooking techniques. Additionally, fires can spread from the southern part of the community, where rice farmers practice crop residue burning. In 2018, Koh Praek Raing Til experienced significant burning, particularly in grassland areas, causing severe damage to the forests. Approximately 20 hectares of forests needed restoration efforts to mitigate the fire's impact.

The sensitive zone around the villages in Koh Praek Raing Til and Tram Pear undergoes annual burning in small sections during the dry season, affecting the grazing fields and lakes. Reports of cases indicated that individuals resorted to burning the forests to capture wild animals. These practices pose tremendous risks to the local ecosystem and highlight the need for sustainable fire management strategies and community-awareness initiatives to prevent further damage and promote responsible land-use practices.

To ensure accountability and sustainability, the CBFiM Project team, in collaboration with the Fishery Administration Cantonment, developed terms of reference. The document outlines the roles and responsibilities, an accountability framework, leadership roles and cooperation with relevant stakeholders at the subnational level for the CBFiM planning and community-based fire patrol teams.



Cambodia project sites

Ou Tabrok

Ou Tabrok and Chong Klong village, Ou Sandan commune, Krakor District, Pursat Province

1,559 people

Area (ha) **2,951**

Koh Raing Til

Raing Til, Koh Keo, Praek villages, Kosh Prek Raing Til commune, Kandieng district, Pursat Province

3,373 people

Area (ha) **15,250**

Tram Pear

Trampear village, Smam Preah commune, Bakan District, Pursat Province

1,170 people

Area (ha) **3,418**

Lao PDR – Bokeo and Xayaboury provinces

In Lao PDR, forest fires are prevalent during the dry season (late October to early May) in the upland areas of the north, primarily attributed to shifting agriculture practices. Recognizing the need for forest fire management, the government initiated activities to raise awareness about preventing forest fires, supported by technical guidelines developed by RECOFTC and the Department of Forests. However, there is a lack of clear management structures and financial systems for forest fire management at the national and subnational levels, highlighting the need for greater policy development and capacity-building.

The primary cause of forest fires is anthropogenic activities. Shifting agriculture, a practice where farmers cut down vegetation, dry it and then burn it to ashes to prepare the land for agricultural planting, is often seen as a cause. Many cases occur in the northern provinces, including Oudomxay, Luang Namtha, Bokeo, Luang Prabang and Xayaboury. Historically, there have been numerous instances of uncontrolled or escaped burning, leading to severe wildfires. This was mainly due to a lack of fire prevention or protection measures in place. Additionally, organizing a task force or firefighting team to quickly respond to forest fires was challenging.

The Lao government lacks a specific policy related to forest fire management. However, forest fire management, with a focus on prevention and combating, is delineated in both the Lao Forestry Law and the Environmental Law. The adverse effects of forest fires on sustainable forest management and biodiversity protection are detailed in policy documents, such as Forest Strategy 2020 and National REDD+ Strategy 2025. The Forestry Law, amended in 2019, specifically in article 52, provides a comprehensive framework for forest fire prevention and control, encompassing four pivotal steps and activities. The Law on Environmental Protection, amended in 2013, addresses forest fire prevention in article 20. The PM 11 directive (21 July 2023) on attention to management, prevention and use of forest, forest land, prevention of destroying forest, forest land and forest fire provides a comprehensive framework for forest fire prevention and control.

In alignment with the Forestry Strategy Plan until 2035 and in response to the Provincial Department of Agriculture and Forestry's directive, it has become imperative to act on forest fire management. To mitigate the damage caused by forest fires, an activity plan was devised, focusing on "providing forest fire prevention information in target villages in 2023". The core of this initiative involves disseminating information about the Forestry Law and raising awareness about the detrimental effects of forest fires among the public. The aim is to curb forest fires, especially during the production season, from February to April—a period when such incidents are more prevalent due to land clearing and forest burning for agriculture. These proactive measures are essential to prevent and cope with the challenges posed by forest fires in the region.

The Forestry Law acknowledges the importance of detailed measures and regulations to implement government policies and action plans for effective forest fire prevention and readiness. This is particularly crucial for Provincial Agriculture

and Forestry Offices and District Agriculture and Forestry Offices because they lead and coordinate efforts with other relevant authorities and agencies to manage forest fires on the ground.

Annually, the Ministry of Agriculture and Forestry issues the Forest Fire Prevention Instruction Letter, known as Chang Kan, which is signed by the Minister before the onset of the dry season. This directive mandates the respective departments and agencies within the forestry sector, both at the central and subnational levels, to prepare and be proactive in forest fire prevention and combating fires when they occur. The Chang Kan emphasizes the importance of awareness-raising at the village level, cautioning local communities practicing agriculture to be vigilant about forest fire incidents.

While the responsibility for local awareness-raising rests with the government at all levels, it is typically spearheaded by local district forestry staff. Despite the awareness-raising efforts and sending directives from the national to the subnational level and from subnational to local communities to enhance readiness for fire prevention and response, the provincial and district authorities, including the Provincial Agriculture and Forestry Offices and District Agriculture and Forestry Offices, do not regularly engage in activities aimed at preparing for and preventing fires. However, when fires occur, they encourage residents, including soldiers, to combat them.

Forest patrolling is primarily carried out by local communities, with occasional support from the Provincial and District Agriculture and Forestry Offices, depending on their budget allocations from the national level. Neither the national nor subnational level has allocated any budget specifically for forest fire management.

Project sites

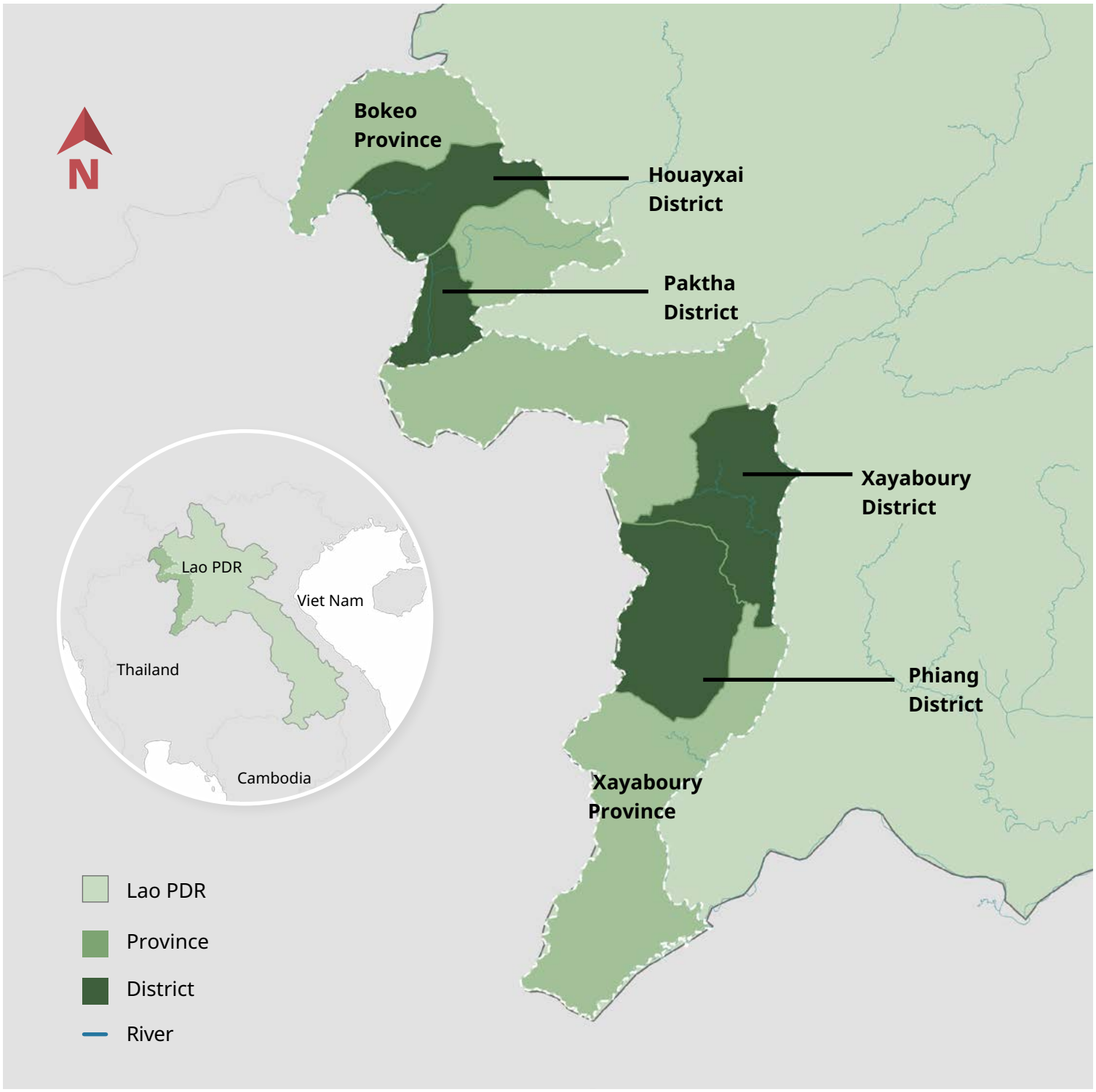
The CBFiM Project has identified gaps in review and risk reduction and has advocated for and supported the Lao government in developing provincial forest management plans as well as CBFiM plans at the community level. This has included constructing forest firebreaks and establishing forest fire committees at the provincial, district and community levels to garner more support and engagement from the government toward forest fire management.

As an early activity of the project, RECOFTC worked with the Department of Forests, specifically the Forest Intervention and Planning Division, to develop technical guidelines for forest fire prevention and response. A committee has reviewed and revised these guidelines. They are now awaiting approval from the Director General of the Department of Forests. Once approved, the guidelines will be officially issued in 2024.

Twenty-five targeted villages are actively engaged in the CBFiM Project: Ten in Houayxai District and five in Paktha District (Bokeo Province) and five in Xayaboury District and five in Phiang District (Xayaboury Province). These villages have participated in community forest fire management training, contributed to planning

efforts and successfully established their own CBFiM plans. Each village has formed a forest fire management committee comprising three units: a forest fire patrolling and communication unit; a supporting unit responsible for preparing food, water and fundraising; and a firefighting team.

Local communities have constructed firebreaks in high-risk areas within their forest territories. Additionally, some communities situated along the border with Thailand have collaborated with Thai counterparts, exemplified by the joint efforts in the Houaythong Village area. In addition to the targeted communities, staff from the Provincial and District Agriculture and Forestry Offices who received the training of trainers (ToT) training are now applying CBFiM principles in other villages and districts. This dissemination of knowledge ensures the sustainability and expansion of CBFiM practices beyond the project's initial scope.



Project sites in Lao PDR

Xayaboury District and Phiang District, Xayaboury Province

10 villages in Xayaboury district

11,374 people

Area (ha) **35,357**

Houayxai District and Paktha District, Bokeo Province

10 villages in Houayxai district, 5 villages in Paktha district

8,491 people

Area (ha) **36,112**

Thailand – Nan Province

Despite establishing the Forest Fire Control Section in 1976 and subsequent fire prevention and suppression campaigns, including the use of hotspot data, people in remote areas of Thailand have continued to use fire illegally for non-timber forest products and agricultural purposes.[20]

In 2021, the Cabinet recognized the Special Action Plan on PM 2.5 pollution and established nine policies and programs. These focused on preventing fires to reduce PM 2.5, especially in forest areas and implementing fire-control measures. They initiated fire management campaigns, established a community monitoring network at the provincial level using satellite technology and began researching alternative fuel management methods with a new technology tool, the FireD mobile application piloted in Chiang Mai.

In 2022, responsibility for minimizing smog and dust pollution was assigned to 11 ministries. Each ministry issued directives and emphasized empowering local communities. Local administrations were instructed to oversee and implement the action plan. A campaign for fire safety and fuel management was launched, allowing controlled burning in agricultural areas, subject to approval via the FireD or Burn Check applications and under the oversight of Provincial Working Groups and Provincial Single Command Centers.

By 2023, using three guiding principles—proactive communication, increased operations and enhanced participation—a distinct approach and seven rules were implemented. The focus remained on fuel management and fire safety; a fire danger rating system was introduced to predict wildfire severity and risk. These initiatives remain ongoing and continue to build on progress from previous years.

While attitudes towards forest fires in Thailand have strongly emphasized against any fire activity since the 1970s,[21] a No Burn Policy, enacted in 2017 by the Ministry of Natural Resources and Environment, further restricts open burning to reduce PM 2.5 severity in northern Thailand. This policy targets agricultural residue burning during the fire season by setting a fixed time frame for the burning prohibition. Each northern province sets a different time frame for no burning. Government agencies use hotspot data from satellite imagery as key performance indicators, with a hierarchy from central to regional to local levels. The Geo-Informatics and Space Technology Development Agency manages satellite data (MODIS and VIIRS) made available from the US National Aeronautics and Space Administration.[22]

Challenges persist due to mismatches between policy regulations, interagency coordination and agricultural practices. Community-specific fire histories and cultural uses of fire further complicate fire management efforts, underscoring the importance of tailored approaches and community engagement.

Project sites

RECOFTC launched the CBFiM Project in Nan Province, collaborating with local communities to address forest fire risks. RECOFTC has a substantial presence

and relationships with the Nan provincial government. The selected villages were chosen based on forest fire risk, density of hotspots and potential for interagency collaboration. The targeted villages have experienced varying degrees of forest fire severity at different times due to a variety of factors, including topography, the agricultural products produced and cultivation time slots that depend on burning, and time slots where burning is prohibited per provincial government regulations. Their approaches to fighting fire also vary based on circumstances, available tools, level of expertise and other uncontrollable elements, such as natural disasters. The selected villages are Manee Phruek in Thung Chang District, Rat-rat Pattana in Santisuk District, Sawang and Kio Nam in Mae Charim District. These communities include more than 50 percent forest cover, with livelihoods relying on various agricultural products such as upland rice, ginger, maize and other vegetables.

The burning prohibition period for Nan Province as regulated by the government was 75 days, from 15 February to 30 April 2023, and was reduced in 2024 to 46 days, from 15 March to 30 April. This regulation applies to all villages in Nan Province.

The following section details the history and role of fire in each village participating in the CBFiM Project.

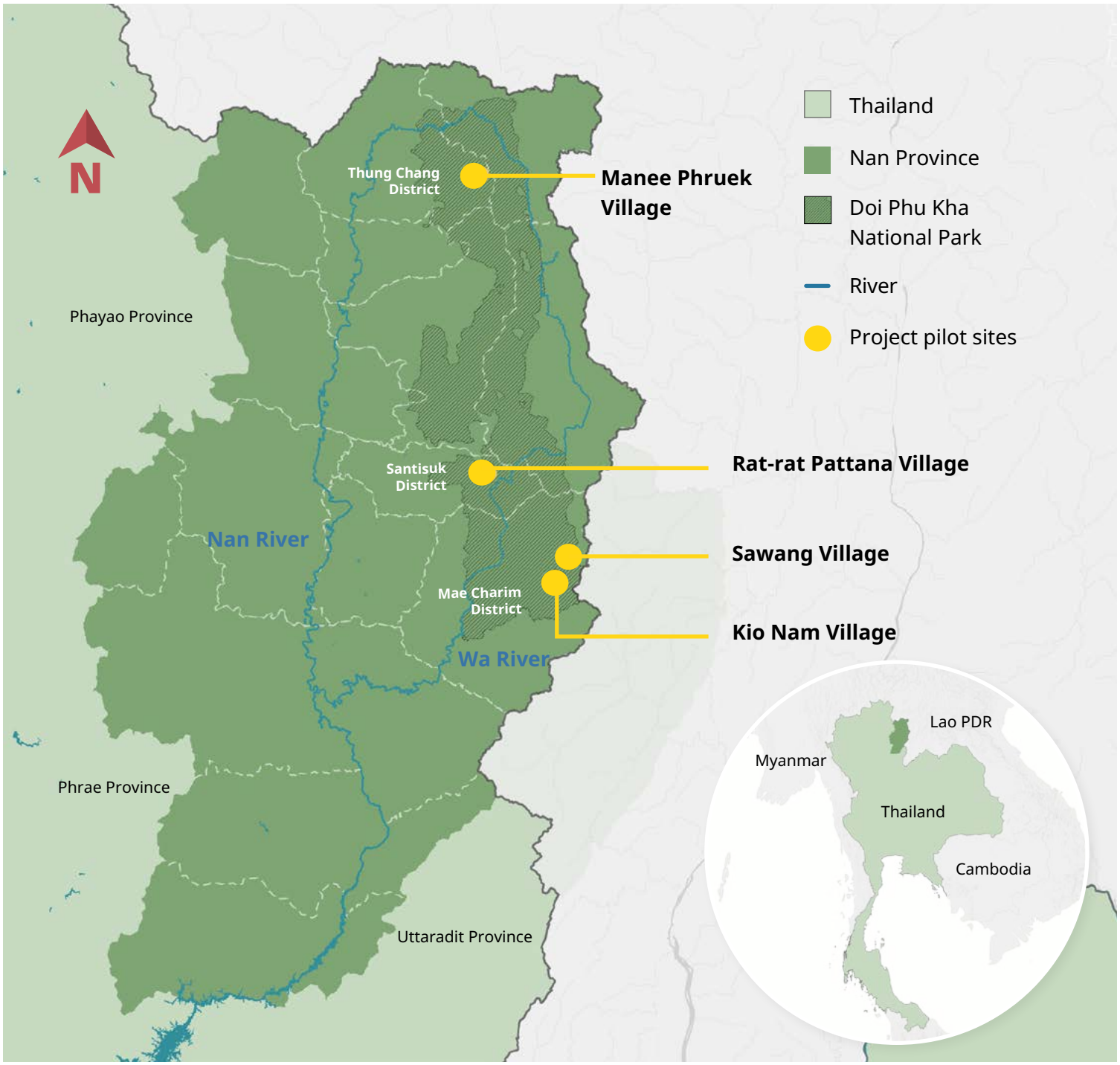
Manee Phruek Village: The most severe fire incidents occurred in 2002, 2022 and 2023. In 2002, a fire impacted community forestry and agricultural areas, resulting in a reduction of tree and forest products, including bananas and bamboo shoots. The 2023 fires in Manee Phruek Village were particularly serious, affecting nearly the entire agricultural landscape. Potential factors included El Niño seasonality and fuel accumulation due to government-imposed burning restrictions. The No Burn Policy did not align with agricultural practices and seasonal needs. This extensive fire caused significant smoke and haze, adversely affecting the health and vision of the community, especially children and older people.

Rat-rat Pattana Village: Significant fire incidents occurred in 2017, 2018 and 2023. In 2017, a fire engulfed approximately 160 hectares in agricultural zones and Phu Dam Mountain, taking until the next morning to control. In April 2018, a smaller fire, covering about 64 hectares, extended from Phu Dam Mountain and Phu Laem Thong Mountain, possibly caused by hunting and gathering. In 2023, the most severe wildfire occurred in a previously burned area, covering 1,600 hectares. Villagers attributed it to hunting and gathering in the nearby national park, aggravated by the El Niño conditions. Beyond the health impacts and smoke, the fire resulted in degraded water quality, severe air pollution and substantial losses in agricultural products and income.

Sawang Village: The most severe fire cases occurred in 2000 and 2021. In April 2000, a wildfire swept through all forest areas, including community forestry, with drought and accumulated fuel as the assumed causes. No firebreaks were present, and villagers did not attempt to halt the fire. These fires covered 80–160 hectares, and took three days to control. Villagers attributed the causes to agricultural activities, livestock raising and hunting. The repercussions included material and agricultural product losses, as well as degraded water and air quality, leading to health issues. In 2021, fires originated in agricultural zones in the neighboring village of Kio Nam, spreading into Doi Phu Kha National Park. Small, manageable fires occurred in 2023.

Kio Nam Village: The significant years for fire incidents in Kio Nam Village were 2021 and 2023. In late April 2021, a fire covering 272 hectares impacted the forest areas in Huai Tad and Huai Ja Rui districts. It took about a week to control, with assumptions that the fire originated from outside or near the forest. The aftermath included water quality degradation and a subsequent decrease in water levels in 2022. In April 2023, another fire occurred, spreading from forest areas to rotational farming and a forest restoration area under a Royal initiative. Approximately 8 hectares were burned and 32 hectares were affected by smoke and heat. Villagers believed it resulted from illegal forest burning, driven by dissatisfaction with the government-imposed burning prohibition time slots. This incident led to the loss of watershed forests, scrub forests and rotational farming areas.

The cultural use of fire within these communities is primarily linked to their agricultural practices. Agricultural waste from rice, maize and other crops is most often burned at the end of harvest season. Other uses of fire include burning household waste and using smoke or fire for collecting non-timber forest products.

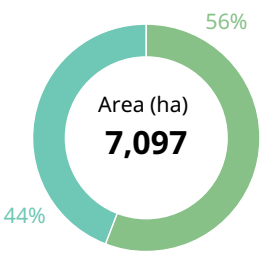


Project sites in Thailand

Forested area | Agricultural land | Community forest

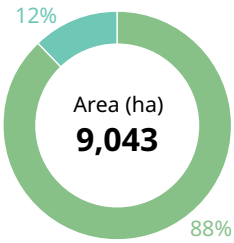
Manee Phruek Village

2,346 people



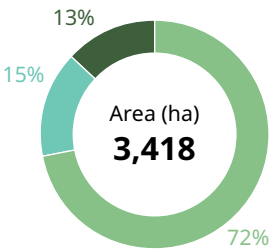
Rat-rat Pattana Village

893 people



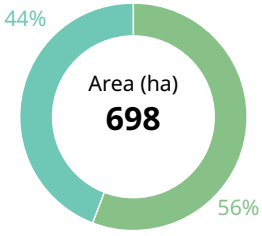
Sawang Village

367 people



Kio Nam Village

340 people



Viet Nam – Lam Dong Province

Between 2015 and 2020, there were 1,928 reported cases of fire in Viet Nam, affecting 8,631 hectares and leading to deforestation, degradation, climate change and environmental pollution. Around 6 million hectares across 48 provinces are identified as hotspots at risk. The most impacted forests include pine, eucalyptus, acacia, melaleuca, bamboo and natural and restored young forests.

The challenges in managing forest fires are compounded by the fact that natural forest areas are often situated far from residential zones, characterized by rugged terrain that complicates the organization of protection patrols and firefighting efforts during emergencies. In areas where planted forests adjoin residential zones, there is a lack of awareness among residents living in proximity to the forests and forest edges. These communities are susceptible to activities that can trigger forest fires, further emphasizing the need for heightened awareness and preventive measures. Such activities include:

- Using fire for site preparation for cultivation and burning grasslands.
- Clearing vegetation, cleaning gardens and using fire carelessly in forests.
- Cooking, coal burning, grass burning and heating.
- Beehive and honey collecting and hunting wild animals.
- Ecotourism activities using fire.
- Intentional burning due to personal conflicts.

There is currently no formal forest fire management plan at the community level specifically for the CBFiM modality. However, regulations regarding forest fire prevention and firefighting require that all citizens participate in these efforts. As a result, community management groups take on a leadership role, coordinating and guiding collective actions for forest fire prevention and firefighting within the community.

Legislation on forest fire in Viet Nam includes the Law on Fire Prevention and Firefighting 2001, the Law on Forestry 2017 and the Law on Public Investment 2019. In 2013, the Law on Forest Fire Prevention and Response was amended with a supplemental article on natural disaster prevention and control.

Project sites

The CBFiM Project has targeted Da Quyn Commune in Duc Trong District, Lam Dong Province, which is located within the Central Highlands. The province's population exceeds 1.2 million people, including 43 ethnic groups. Approximately 65% of the total population works in agriculture, forestry or fishery sectors, leading to high demand for land. The terrain is mainly plateaus, high mountains and slopes forming river valleys.

Forest fires pose significant threats in Lam Dong Province. According to the Lam Dong Forest Protection Department, from 2010 to 2022, the province experienced

189 forest fires, with an average burned forest area of 474.6 hectares. On average, there are 16 forest fires each year, mostly occurring in the dry season (December to April) in pine and plantation forests. During this period, rainfall accounts for only 10–15 percent of the total annual rainfall.

In Viet Nam, the CBFiM Project implementation began with needs assessments, by building on an application developed for community forest monitoring by Vietnam National University of Forestry. The project is now developing a new iteration of this mobile application to include enhanced forest fire monitoring and reporting functions. In addition, the CBFiM Project has included an in-depth GESI baseline assessment and capacity development activities throughout.

Cultural uses of fire exist in Lam Dong Province in areas with extensive grasses in the understory of the forested areas. In some cases, these grasses are maintained through a fire management regime to support cattle grazing.

The province faces challenges in early detection and prevention of forest fires, exacerbated by limited capabilities in science and technology transfer at national, provincial and community levels. Long-term plans and strategies for forest fire management are integrated into national target programs, but there is a need for community-level structures and regulations to enhance local fire management efforts.

Da Quyn Commune has a population of 5,453 with primary livelihoods in agriculture from rice and perennial tree crops, animal husbandry and forest protection. The forest area in Da Quyn Commune belongs to the Ta Nang Forest Protection Management Board, which contracts individual households for forest protection and fire prevention and control activities. The contracted households are organized into patrolling groups; however, there is a limited quota for the number of households receiving contracts. There are no village-level regulations on forest management.

With large areas of coniferous forest, the forests managed by the villages are at high risk of fire in the dry season. In pine forests, the main burning materials are pine leaves and branches, along with ground grass. High fire risks also occur in bamboo forests with fuel loads from leaves, branches, broken and old bamboo stems in clumps and bamboo shoot peels left on the ground after harvesting.

Despite initial efforts in forecasting, warning of forest fire risks and the early detection of fire points, there are notable limitations in Lam Dong Province. The province faces constraints in research, application and transfer of science and technology related to forecasting and preventing forest fires. The current capabilities for early detection of forest fires are restricted, leading to a lack of seriousness in proactively deploying disaster-prevention plans promptly. Addressing these limitations is crucial to enhancing the province’s preparedness and

response to forest fire threats through more advanced technologies and effective implementation of prevention strategies.

Regarding long-term plans and strategies, Lam Dong Province has detailed plans and activities on prevention and control of forest fires integrated into national target programs. These include an action plan from the Viet Nam Forestry Development Strategy in Lam Dong Province for 2021–2030, the Lam Dong Provincial REDD+ Action Plan and the Strengthening Capacity of Forest Fire Prevention and Response in Lam Dong Province 2022–2030 Project.

Project sites in Viet Nam

Da Quyn Commune, Duc Trong District, Lam Dong Province

Includes Ma Bo, Cho Dung, Cho Re, Toa Cat communities

5,453
people

1,320
households

Area (ha)
17,153,000

68%
forest cover

Needs assessments findings

This section covers the results of the three needs (or gaps) assessments that were conducted relating to the capacity-development, technologies and gender equality and social inclusion practices required for stronger CBFiM.

Capacity-development needs assessment

The capacity-development needs assessment questions were strategically designed to align with the integrated fire management framework, ensuring a comprehensive exploration of essential components for CBFiM. A rigorous review by experts in capacity-development needs assessment and fire management ensured clarity and alignment with the conceptual understanding of the integrated fire management's 5R framework.

Each component from the integrated fire management framework (review, risk reduction, readiness, response and recovery) was associated with six to ten criterion that were discussed during the assessment workshops. The responses and discussions from the workshops were summarized into themes, noting the existing fire management structure. When compiled, the results referenced the presence or absence of the criteria, as reported in the workshops and informant interviews. Any uncertainties in the findings were clarified through follow-up calls and desk reviews to ensure data consistency.

Assessment results

Table 3 summarizes the capacity needs for each 5R component, categorized by country. The "X" indicates a competency gap. For instance, stakeholders in Cambodia, Lao PDR and Thailand expressed a gap in collecting and analyzing data related to historical fire incidents, weather patterns and vegetation types in communities under the review component. In most cases, the assessment analyzed the results from the workshops by differentiating between government agencies and community groups. This allowed for a better understanding of the gaps, if any, across stakeholders.

All country participants in the workshops cited factors influencing fire behavior and spread within their landscapes. In Cambodia, knowledge of the flooded forest landscape enables the community to conduct appropriate patrols during fire season and identify causes of fire quickly and confidently. However, there remains a lack of comprehensive capacity to address fire through the integrated fire management framework. In Lao PDR, patrolling is conducted by the community within the Village Agriculture and Forest Subunit, and they prepare firebreaks and use traditional methods to reduce the risk of fire.

Two of the four countries assess specific risks associated with diverse types of agricultural and topographical features in their areas. They also incorporate traditional knowledge and practices into fire response strategies, considering community culture. In Thailand community leaders coordinate and approve the creation of firebreaks within their village areas. In Viet Nam, forest rangers understand forest status, topography and other general data but have limited ability to conduct risk assessments using the fire weather risk index. Specific technical officers perform that level of risk assessment, but this skill has not been effectively translated to other groups.

Officials in three of the four countries (Lao PDR, Thailand and Viet Nam) reported that they systematically identify and assess potential fire risks within their communities and meaningfully engage community members in readiness efforts.

These competency results highlight that, regionally, there is some depth of fire understanding and community-level efforts are being made. However, there are still gaps in specific technical skills and their dissemination across different stakeholder groups.

Table 3. Summary of the capacity needs assessment, based on the 5R components, by country

Framework categories	Capacity needs	Cambodia	Lao PDR	Thailand	Viet Nam
Review	Identify factors influencing fire behavior and spread in area.				
	Assess the specific risks associated with diverse types of agricultural activities and topography in the area.		X		X
	Collect and analyze data related to historical fire incidents, weather patterns and vegetation types in a community.	X	X	X	
	Use data to identify trends and patterns that may inform future fire management strategies.	X	X	X	X
	Engage with local stakeholders, including community members, government agencies and non-profit organizations, to gather information about the fire situation.	X	X	X	X
	Use risk mapping and modeling techniques to visualize and communicate potential fire risks to community members.	X	X	X	X
	Communicate complex fire management data and findings to community members with varying levels of understanding.	X	X	X	X

Framework categories	Capacity needs	Cambodia	Lao PDR	Thailand	Viet Nam
Risk reduction	Systematically identify and assess potential fire risks within the community.	X			
	Involve communities in the identification and prioritization of fire risks.		X		X
	Effectively manage the identified fire risk.	X	X	X	X
	Integrate landscape management to reduce fire risks in a community.	X	X	X	X
	Effectively collaborate with local authorities to enhance the capacity for risk reduction.	X	X	X	X
	Adequate education and training programs contributing to reducing fire risk that respond to the local needs.	X	X	X	X
	Monitor the effectiveness of risk reduction measures over time.	X	X	X	X
	Integrate traditional knowledge and practices into risk reduction strategies, considering the cultural context of the community.	X	X	X	X
	Manage budget and resources that contribute to successful risk reduction initiatives effectively.	X	X	X	X
	Adapt risk-reduction strategies in response to changing environmental conditions or emerging challenges.	X	X	X	X

Framework categories	Capacity needs	Cambodia	Lao PDR	Thailand	Viet Nam
Readiness	Assess the training needs of community members regarding fire preparedness and response.	X	X	X	X
	Allocate and mobilize resources, including personnel and equipment, in anticipation of fire events.	X	X	X	X
	Develop and implement communication strategies to ensure timely and accurate information dissemination during fire events.	X	X	X	X
	Meaningfully collaborate with related authorities to enhance community readiness for fires.	X	X	X	X
	Adequate drills and exercises to test a community's readiness for fire events.	X	X	X	X
	Meaningfully engage community members in readiness efforts, ensuring their active participation and ownership of preparedness measures.				X
	Conduct post-event reviews to assess the effectiveness of readiness measures and identify areas for improvement.	X	X	X	X
Response	Effectively apply the incident command system to manage people and resources during fire incidents.	X	X	X	X
	Effectively and clearly communicate and disseminate information in a timely manner.	X	X	X	X
	Adapt and make informed decisions in dynamic and rapidly changing fire situations.	X	X	X	X
	Effectively cross-collaborate with related government agencies for emergency support for the enhanced response effort.	X	X	X	X
	Incorporate traditional knowledge and practices into fire response strategies, considering the cultural context of the community.			X	X
	Effectively use firebreaks and containment strategies to control the spread of fires.	X	X	X	
	Effectively assess and review the post-response lesson learned for improvement.	X	X	X	X

Framework categories	Capacity needs	Cambodia	Lao PDR	Thailand	Viet Nam
Recovery	Meaningfully involve community members in the recovery process following a fire.	X	X	X	X
	Effectively assess the damage caused by a fire and identify a community's immediate and long-term needs.	X	X	X	
	Effectively manage resources for recovery efforts, including financial, human and material resources.	X	X	X	X
	Effectively coordinate with external agencies and NGOs to enhance recovery efforts in a community.	X	X	X	X
	Include infrastructure and habitat restoration in the recovery plan.	X	X	X	X
	Include economic recovery and livelihood support in the recovery plan.	X	X	X	X
	Include community resilience-building in the recovery plan.	X	X	X	
	Effectively monitor the effectiveness of recovery measures over time.	X	X	X	X
	Effectively communicate the progress and support of the recovery process with a community and ensure transparency throughout the process.	X	X	X	X

Figure 4 illustrates how the four countries prioritize activities related to the 5Rs according to the capacity-development needs assessment findings. None of the communities where an assessment workshop was conducted met more than 25 percent of all the criteria for the 5Rs. Viet Nam met 22 percent of the criteria specifically for recovery, while the other three countries did not meet any criteria for this component. This suggests gaps in meeting the overall criteria for effective fire management across the assessed communities, highlighting the need for targeted improvements in all five areas.

Review

- Thailand had the highest percentage of activities dedicated to review, making up nearly 30 percent of its total activities.
- Cambodia and Lao PDR also prioritize review, although to a slightly lesser extent.
- Viet Nam allocates a moderate percentage to review, less than Thailand but more than Cambodia.

Risk reduction

- Risk reduction is most emphasized in Lao PDR, where it accounts for around 20 percent of activities.
- Cambodia and Thailand also focus on risk reduction, with similar percentages.
- Viet Nam has the lowest emphasis on risk reduction in comparison with the other countries.

Readiness

- Readiness activities are most prominent in Lao PDR, similar to their focus on risk reduction.
- Cambodia and Thailand allocate a similar, slightly lower percentage to readiness.
- Viet Nam has the lowest percentage of readiness activities.

Response

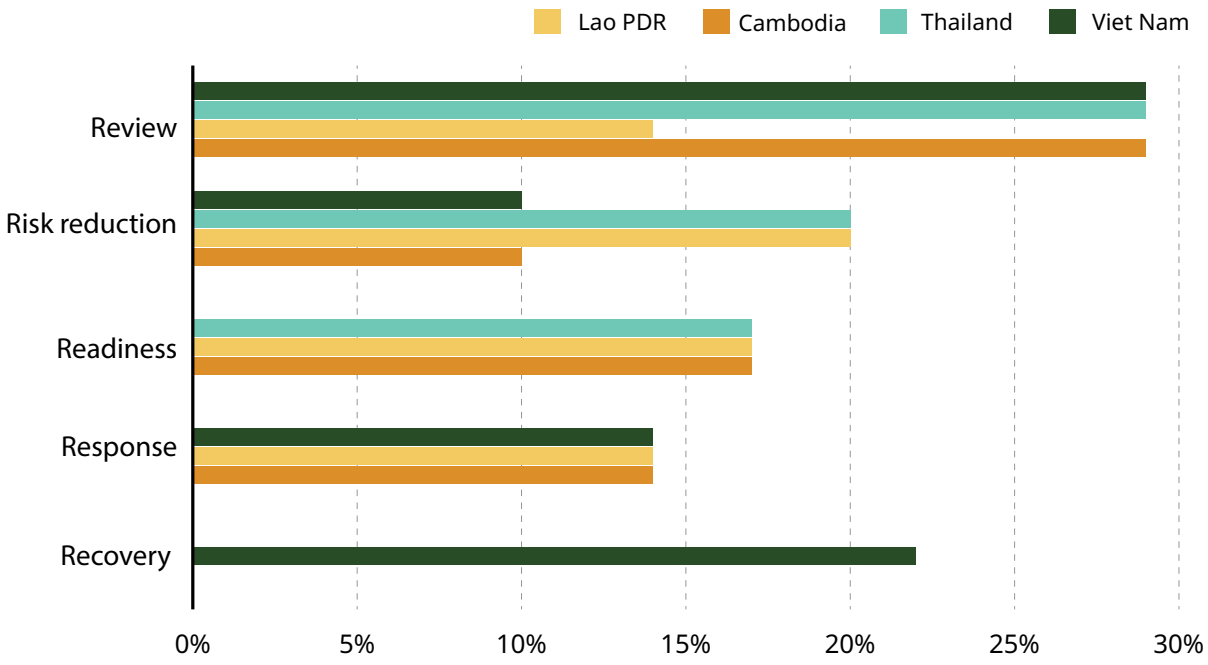
- Response activities are notably emphasized in Cambodia, making up a significant portion of their activities.
- Viet Nam follows with a moderate percentage, while Lao PDR and Thailand have relatively low percentages dedicated to response.

Recovery

- Viet Nam places the most emphasis on recovery activities, accounting for a significant portion of its total activities.
- Cambodia and Lao PDR also dedicate a fair amount of their efforts to recovery.
- Thailand allocates the least emphasis to recovery among the four countries.

In summary, the results show that each country prioritizes different aspects of the 5Rs. Thailand focuses heavily on review, Lao PDR emphasizes risk reduction and readiness, Cambodia prioritizes response and Viet Nam concentrates on recovery. The CDNA distribution suggests differing approaches to fire management and disaster preparedness across the four countries.

Figure 4. Capacities reported for each of the 5Rs, by country



Technology needs assessment

This part of the assessment generated information on currently used fire management-related technologies and related capacities and needs to inform CBFiM in the Mekong and broader region. Technologies and associated capacities were assessed within four themes:

- Geospatial data
- Early warning and risk management
- Data and knowledge management and sharing
- Mechanical and hand tools

The fire management technologies of interest—many interlinked—covered geospatial data, fire danger rating systems, data sharing and communication platforms, and mechanical tools and applied techniques for integrated fire management. Specific technology topics evaluated included the use of geographic information systems (GIS), early warning systems, aerial surveillance, data analytics and predictive modeling, community alerts, incident and fire risk communication platforms, remote sensing systems, real-time monitoring systems, mobile applications, simulation and training technologies and integration of new tools and techniques.[23]

Existing technology and capacities of the local stakeholders were assessed, and potential technologies for the local context were discussed regarding the needs, operations and resources. Although the CBFiM Project does not seek to fulfill all the technological needs of local communities, this assessment will help RECOFTC and

associated partners take necessary steps regarding the gaps. Partners' projects, such as the NASA and USAID's SERVIR Southeast Asia, the Asian Forest Cooperation Organization's fire-related initiatives and FAO's AFFIRM mechanism may be better positioned to collaborate with national governments and support CBFiM through centralized approaches. RECOFTC's CBFiM Project's goal is to clarify the technical needs of stakeholders in the pilot landscapes to ensure coordination between communities and local governments.

The initial capacity-development needs assessment workshops assessed technology competencies across the four countries, revealing significant gaps in all discussed parameters (table 4). Specific dialogues on technology and tools were organized in separate workshops and engagements with communities and stakeholders. Given the country and project implementation context, these technology assessments were carried out through group discussions, sometimes supplemented with an online survey during the workshops. However, the online surveys were not well distributed and did not comprehensively represent the entire stakeholder group.

Assessment results

The capacity-development needs assessment process incorporated questions on current and potential new technology, addressing observed gaps in the five categories within integrated fire management. These questions explored the fire management context and development at multiple levels, focusing on the international, regional and national, and looking at the role of technology in reducing, addressing and mitigating forest fires.

In Cambodia, the primary technology gap identified was in data and knowledge management, leading to a focus on establishing clear communication channels among stakeholder groups. The CBFiM Project conducted workshops to build capacity in this area and assess stakeholders' competencies with accessible technology. During these workshops, many representatives faced challenges in understanding basic mobile applications, highlighting the need for support and training sessions.

Participants, including government officers from district and commune levels, community representatives and police authorities, noted a lack of geospatial data usage for early warning, despite common practices such as patrolling and setting up fire-lookout points. The use of signboards and firebreaks was prevalent but required improvement and regular maintenance. A significant gap cited was the need for enhanced interagency and community communication and alerts, particularly integrating geospatial data to improve fire management strategies.

In Lao PDR, gaps in fire management technology were evident, especially at the ground level, with significant differences in technological capacity across different levels. Participants in the technology workshop, mainly government officers and civil society representatives, indicated that geospatial data and mechanical tools (like firebreaks and water storage) are equally used in fire management. However,

there is limited use of mobile applications, software tools or web browsers for monitoring weather and hotspot data. Regular dry season activities include patrolling forests, setting up fire-lookout points and building firebreaks, but villages lack adequate extinguishing tools. Workshop participants reported maintaining updated records of burned areas, land cover, fire frequency and severity annually, using GPS and databases for data storage. However, they are limited in human resources and capacity to adapt and effectively use technology. One participant highlighted that communication from central agencies to local areas is often delayed, suggesting the need for an improved alert system to inform the public of fire incidents promptly.

In Thailand, a technology consultation workshop involving government officers and community members focused on determining tools needed to support an early warning system for fire management. The workshop revealed that firebreaks and mechanical techniques are more commonly used than geospatial data, although some participants reported using satellite data. Regular activities for fuel reduction are well-attended. Some participants reported using mobile applications, software tools or web browsers to monitor weather and hotspot data for early warning purposes. Records on burned areas and fire frequency and severity are maintained regularly by some participants but inconsistently by others. A significant gap noted among participants was the need for improved data collection and better access to useful data in the field.

In Viet Nam, gaps in access to simple and scalable technology in fire management were cited during the technical assessment workshops. These workshops included government officers from provincial, commune and district levels as well as community and union representatives. Geospatial data was the most used technology, followed closely by firebreaks, prescribed burning and aerial surveillance (drones and cameras). Predictive modeling and data analytics were also noted for their use in fire management. Regular fuel reduction activities are conducted, while only a few participants reported using mobile applications, software tools or web browsers for early warning purposes. Common dry season activities include patrolling forest areas and setting up fire-lookout points. Participants confidently maintain yearly records of burned areas, land cover and fire frequency and severity, storing this data using software databases. A common gap noted by the participants is the need for more training and materials for specialized tools and equipment.

Table 4. Technology competencies assessed during the needs assessment workshops

Capacity needs	Cambodia	Lao PDR	Thailand	Viet Nam
Effectively integrate the new technologies in fire management.	X	X	X	X
Effectively utilize GIS and mapping technologies to analyze and visualize fire risks within a community.	X	X	X	X
Effectively utilize remote sensing technologies, such as satellite imagery, for monitoring vegetation health and identifying potential fire risks.	X	X	X	X
Effectively implement early warning systems for fires in a community.	X	X	X	X
Leverage community alert apps and communication platforms to disseminate critical information to residents during fire events.	X	X	X	X
Utilize mobile applications to engage with and educate community members on fire risks and preparedness measures.	X	X	X	X
Effectively integrate drones and aerial surveillance technologies into fire monitoring and response efforts.	X	X	X	X
Effectively utilize data analytics and predictive modeling to assess and predict fire behavior in a community.	X	X	X	X
Effectively utilize real-time monitoring systems for tracking fire incidents.	X	X	X	X
Organize simulations and provide training technologies for preparing communities and responders for fire events.	X	X	X	X

Gender equality and social inclusion gaps assessment

At the onset of the CBFiM Project implementation in 2022, the initial consultations and workshops did not prioritize GESI mainstreaming due to time and resource constraints. As the project progressed, this gap became evident, with most meetings having less than 30 percent women's participation (table 5). This was a concerning reality, especially considering the proportion of women within the targeted population. While a high participation rate of women is not the sole measure of success, their underrepresentation risks widening gendered gaps, particularly in the division of labor and their recognition in fire management. Success can be measured by the value of women's contributions, their attainment of leadership roles and the subsequent increased opportunities and activities that follow. Mainstreaming GESI thus responds to existing barriers and creates enabling environments for the CBFiM approach to thrive, ultimately leading to wildfire-resilient communities and landscapes.

Table 5. Percentage of women participating in needs assessment workshops

Country (% of women in project sites)	Capacity-development needs assessment workshops	Technology workshops	CBFiM planning workshops
Cambodia (48%) (community fishery members)	17%	10%	12%
Lao PDR (56%)	8%	33%	17%
Thailand (50%)	40%	28%	28%
Viet Nam (48%)	17%	17%	32%

The GESI assessment sought to identify gaps at the national, provincial and community levels. These gaps could serve as entry points to build capacities in wildfire resiliency and to integrate GESI practices into CBFiM. This assessment provides a baseline of the socioeconomic contexts and cultural and societal norms in the project areas related to CBFiM. This assessment establishes a baseline understanding of the socioeconomic contexts and cultural norms in the project areas related to CBFiM. Due to the limited scope of the assessment, the findings are considered preliminary and serve as an initial baseline for future, more comprehensive studies.

The assessment had six objectives:

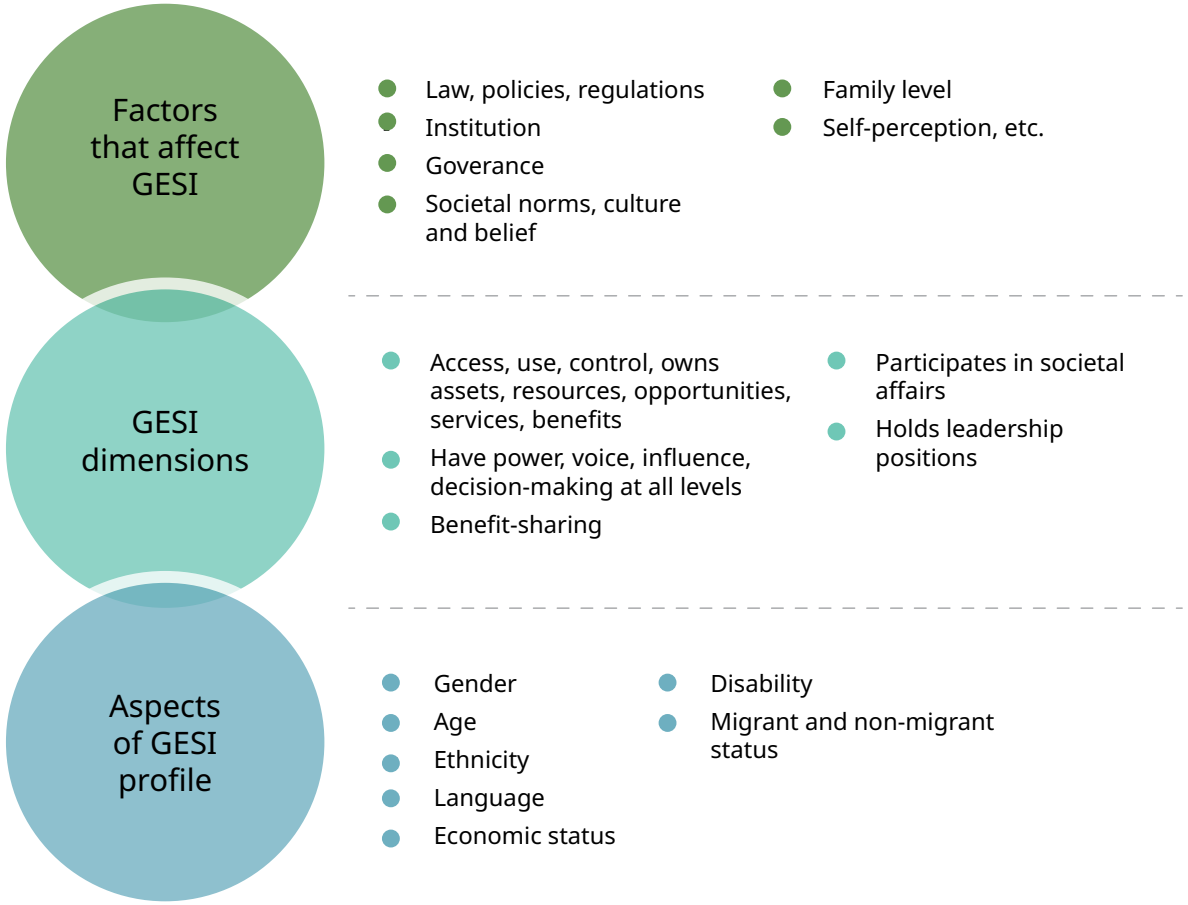
- Analyze women's and men's participation in integrated fire management across national, provincial and community levels. Evaluate the benefits and impacts for different groups. Examine power dynamics within CBFiM initiatives.
- Assess the status of women's access to and control over forest resources and decision-making processes.
- Understand gender roles and responsibilities in family and community spheres.
- Determine the barriers to the participation of women and other disadvantaged groups in fire management activities.
- Identify advantages, opportunities, resources, difficulties and challenges in promoting GESI in fire management.
- Propose activities and recommendations to bridge GESI-related gaps and identify entry points for mainstreaming these practices into project activities.

The assessment focused on vulnerable and disadvantaged groups, including women, youth, elderly persons, Indigenous People, people with disabilities and health issues, migrants and/or persons residing in remote areas. The gender equality and social inclusion assessment examined the socioeconomic context and cultural norms of vulnerable and marginalized groups. This approach was guided by two principles: the Universal Declaration of Human Rights, which guarantees the rights to life, liberty and security, and the United Nations Declaration on the Rights of Indigenous Peoples, which affirms their rights to self-determination, territories and resources.[24]

Mainstreaming gender equality and social inclusion into the CBFiM approach addresses a significant gap in applying theory to practice. Understanding that people from different backgrounds, cultures and genders respond differently to wildfire risk will enable improved capacity-building strategies and tailored engagement.[25]

Figure 5 illustrates the significance of certain factors that influence the dimensions of gender equality and social inclusion. These factors should be considered when aiming to mainstream these practices into project implementation.

Figure 5. Mapping gender equality and social inclusion-related gaps



Source: RECOFTC (2024). "Viet Nam GESI Gap Analysis: Methodology and Plan" (unpublished); and USAID, and RTI (2022). *USAID Reducing Demand for Wildlife: Gender Equality and Social Inclusion Analysis*.

Assessment results

The depth of assessment varies by country due to project resources and timelines. However, the preliminary work provides a sufficient foundation for integrating GESI into CBFiM plans.

The GESI baseline for the CBFiM Project starts with the participation rate of women in the needs assessment workshops conducted thus far. The ensuing capacity-development plans should incorporate diverse perspectives from stakeholder groups and community members. In addition to gender, the baseline study and capacity-development needs assessment considered the inclusion of underrepresented groups, youth, elderly, ethnic groups and migrants. Generally, participants engaged in the capacity-development needs assessment and planning workshops were aged 36–60 years, with a minority aged 19–35 years. The current datasets, however, were limited in their collection of age data, gathering information based on broad age ranges. This limitation hinders a more nuanced

understanding of how different age groups contribute to and are affected by fire management practices. Moving forward, it will be essential to capture more detailed age demographics. This will allow for a deeper analysis of the specific needs, perspectives and capacities of different age cohorts. Engaging a more diverse age range, especially younger community members, is vital for fostering inclusive and sustainable fire management practices.

Survey responses from the workshops provided the following insights regarding women's participation in CBFiM activities. Cambodia did not conduct the survey due to time and resource constraints.

- **Viet Nam and Lao PDR:** Women are most actively involved in collecting non-timber forest products.
- **Lao PDR:** Women are more active in building firebreaks and responding to fire incidents than collecting non-timber forest products but participate in all activities.
- **Viet Nam:** Women additionally have a role in maintaining records and information and may be involved in patrolling forest areas.
- **Thailand:** Women are most active in building firebreaks and in maintaining records and information.

In Pursat Province, Cambodia, disaggregated data were collected on women, youth, heads of households and and disabilities to better understand community dynamics. Beyond this, the GESI assessment in project sites was limited. Although women are represented in several community patrol teams, their numbers are usually low, ranging from one to three among the 15–25 members in a group. Traditional roles in fire and fishery management are typically limited, with men primarily responsible for patrolling, fishing, hunting and livestock grazing. Restoration activities and management of savings groups are well-supported and, in some cases, led by women (women's savings group). The project area includes both Buddhism and Islam, so religious diversity and social norms must be considered. There is a gap in understanding how these social differences may affect communication and the identification of targeted solutions in CBFiM.

In Xayaboury and Bokeo provinces, Lao PDR, traditional roles in the forestry sector are distinctly gendered. Men typically engage in logging, timber processing and forest management, while women are primarily involved in collecting non-timber forest products, such as firewood, wild foods, herbs and medicinal plants. Due to limited experience with fire-related activities, women are generally excluded from participation in fire management. Additionally, women often lack opportunities to build their skills in forestry and fire management because they are primarily responsible for housework and motherhood, which restricts their ability to engage in fire rapid response and fighting (because these tasks can span multiple days). Although fire causes in the community are often linked to activities performed by men, the impact of fires disproportionately affects women. Discussions with CBFiM Project stakeholders revealed that both men and women play significant

roles in building and maintaining firebreaks. Despite their active involvement, women have received less training compared to their male counterparts. Many young women participate in fire-control activities with minimal training. Although they are included as members of the forest fire committee, their efforts are often underrecognized. Consequently, they frequently lack opportunities for capacity-building or advancement within the committee structure. This lack of recognition and training hinders their ability to contribute effectively to other tasks and participate in decision-making processes within fire management. These roles are influenced by geographic location, ethnic group and socioeconomic status, which ultimately shape their benefits from and impacts on the forest. Marginalized groups, including ethnic minorities, poor households and people with disabilities, frequently face exclusion from decision-making processes and benefit-sharing mechanisms, further exacerbating social inequities in the forestry sector.

In Nan Province, Thailand, women and men share similar responsibilities in rapid response activities, such as carrying water and fighting fires. However, responses from the Hmong ethnic minority group indicated that men are more often assigned to survey teams due to safety concerns for women. In contrast, the Lua ethnic minority group noted that food preparation before and during fire incidents is a shared responsibility between men and women. Observations from the capacity-development needs assessment workshops also revealed that women in the Hmong community spoke significantly less than men during discussions, highlighting a potential issue with gendered participation and representation in community conversations.

In Lam Dong Province, Viet Nam, a comprehensive baseline assessment highlighted significant barriers to integrating GESI into existing forest fire management plans and their implementation. The assessment revealed limited policies specifically addressing GESI in forest fire prevention programs. The Vietnam Women's Union has conducted minimal activities aimed at promoting and raising awareness of women's roles in forestry and fire protection. The forestry sector is largely male dominated, with women making up only 22 percent of the workforce within the Lam Dong Forest Protection Department. With this small proportion of women staff and women in leadership roles in the forestry sector, there are also no staff with GESI-related capacities, no GESI focal point and limited awareness among local governments.

There is a lack of cooperation among local organizations to promote gender equality and social inclusion in forest management. This gender imbalance is reflected in the general perception that men are more suited for forestry-related tasks, such as patrolling, night duty, fire prevention, clearing vegetation and digging. Consequently, women are often excluded from planning meetings and the communication process related to fire protection.

At the community level in Lam Dong Province, women are not considered for forest patrolling due to limited quotas and cultural norms. Women and youth have limited skills and experience in fire prevention and response, and women have limited access to information due to their absence in fire management meetings.

Women also have fewer opportunities in forest and forest fire management and rarely participate in decision-making related to forest management. This lack of participation affects their livelihoods and opportunities. Another major barrier is the lack of disaggregated data on gender, age and ethnicity in management reports, which further impedes efforts to address and integrate GESI considerations effectively.

Analysis of the findings per country

The findings across the four project countries point to a notable gap in taking a holistic approach to fire management. This deficiency is attributed to challenges in administrative structures, budget constraints, resource shortages and an overemphasis on firefighting. Insights from the literature review, country coordinators and stakeholder interviews collectively support this observation. Consequently, essential components seem to be lacking in CBFiM strategies, notably within the recovery aspect of the 5R framework and the integration of specific technologies for effective fire management, both generally and in community-driven initiatives.

Several significant gaps emerged in the analysis of the combined findings from the three assessment that align with the 5R framework, which encompasses the following areas.

Cambodia

Stakeholders cited the following capacity gaps and needs:

1. Improve ability to analyze root causes beyond immediate human actions.
2. Enhance information-sharing on fire causes and impacts with affected communities.
3. Develop comprehensive, year-round risk-reduction plans at the provincial and commune levels with community involvement.
4. Provide continuous training for patrolling teams and support to access necessary resources.
5. Enhance knowledge of local authorities and communities in adopting new fire management technologies, including early detection and rapid response tools.
6. Improve capacity for using basic communication technologies at the local level.
7. Understand how social differences impact communication and engagement.

Lao PDR

Stakeholders cited the following capacity gaps and needs:

1. Address limited training and opportunities that restrict women's effective participation in fire management decision-making.
2. Address the significant disparities in technological capacities between villages and districts.
3. Enhance knowledge and skills among local authorities and communities for collecting and analyzing data on past, present and potential future fires.
4. Strengthen processes for sharing information about fire causes and impacts with affected communities.
5. Improve coordination of patrolling activities, particularly among affected villages and surrounding areas.
6. Develop skills to engage local communities in planning and preparing for fire response.
7. Strengthen advocacy skills for developing comprehensive post-fire recovery plans that address socioeconomic and environmental factors.
8. Enhance local authorities and communities' knowledge of new fire management technologies, including early detection and rapid response tools.
9. Improve communication channels to eliminate delays in information flow from central to local levels.

Thailand

Stakeholders cited the following capacity gaps and needs:

1. Develop skills to identify root causes of fire-related conflicts and use this knowledge to foster collaboration between communities and authorities on beneficial fire use in agriculture.
2. Improve capacity to adapt risk-reduction strategies to align with local agricultural practices and national policies.
3. Strengthen collaboration and information exchange among district-level department to enhance fire monitoring and patrolling effectiveness.
4. Limited knowledge on the effective use of fire readiness equipment for local authorities and communities.
5. Establish robust protocols for communication and information dissemination to ensure timely reporting and coordination during fire incidents.

6. Establish structured mechanisms to compensate individuals and communities for losses incurred during fire response efforts.
7. Enhance knowledge and skills in adopting new fire management technologies, including early detection and rapid response tools.
8. Address gender disparities in customs that affect participation and decision-making in meetings and activities. Recognize and respond to gender role differences to avoid gender blindness.
9. Improve data collection methods and increase access to relevant field data.

Viet Nam

Stakeholders cited the following capacity gaps and needs:

1. Develop skills in designing methodologies and using tools for effective fire data collection and analysis.
2. Establish mechanisms to incorporate local traditional fire knowledge, assess fire risks and foster collaboration for effective fire management.
3. Improve ability to create and implement year-round risk reduction and fire preparedness plans, including landscape assessments and resource mapping.
4. Enhance capacity to support policies that assess the socioeconomic impacts of fires.
5. Provide sufficient training and materials for using specialized tools and equipment.
6. Address barriers for women and youth in fire management, including limited skills, experience and participation in decision-making.
7. Develop strategies to support local community recovery from the socioeconomic and environmental impacts of fires.
8. Enhance knowledge and skills for adopting new technologies for early detection and rapid response in fire management.

Regional

The findings led to several assumptions regarding the capacity gaps and needs across all four assessed countries. While there were some differences, the common capacity requirements include:

- **Enhanced data and analysis skills:** Stakeholders must enhance their capacity to create and implement year-round risk-reduction strategies at provincial and district levels. This includes conducting thorough landscape assessments to ensure resource availability during fire incidents.
- **Improved information-sharing**: Stakeholders need to build their capacities to set up platforms and processes for disseminating information and creating

awareness about policies, financial support, preventive measures and fire trends. This will enhance inter-agency communication and collaboration to mitigate fire impacts.

- **Capacity-building for community involvement in preparation:** Ensure that stakeholders are creating and implementing landscape-specific strategies and plans for all five stages of CBFiM, integrating these into existing and future forest and landscape management plans.
- **Incorporating traditional knowledge:** Strengthen platforms that integrate local community knowledge into fire management. This involves collaborative fire risk assessment and mainstreaming community involvement in developing and implementing fire response plans.
- **Enhancement of technology adoption:** Increase knowledge and skills in adopting and adapting new fire management technologies, including suppression and early detection tools. Improve methodologies and tools for collecting and analyzing data on fire causes, ecological and economic impacts and stakeholder effects, especially within local communities.
- **Training and resource support:** Develop practical skills and experience in using specific equipment and tools for more effective fire readiness and response. Design tools and materials for replicating successful CBFiM implementations, including offline and online resources, such as awareness materials, guidelines, e-learning courses, training manuals, short films and protocols.
- **Improved communication and coordination:** Strengthen platforms and processes for disseminating information across stakeholder groups to enhance awareness of incidents, risk factors, weather alerts and fire trends. This will facilitate interagency communication and collaboration.
- **Improved gender equality and social inclusion:** Address barriers preventing women, youth and minority groups from participating in decision-making processes and fire management activities. Implement gender-sensitization programs to improve understanding and inclusivity within the forest and fire management.

Higher-level recommendations:

- Support the **decentralization of roles and responsibilities** for year-round fire management activities from national-level administration to the provincial and community-level decision-making and planning.
- Encourage the development of **enabling policies and regulations** for effective fire management, with clear guidelines on roles and responsibilities for **interagency coordination**. Platforms should include information on policy changes, financial support, preventive measures and fire trends.
- Emphasize **enabling policies for protecting of the health and safety** of at-risk fire communities and fire preparation, forest patrol and fire response teams.

Recommendations and next steps

Although the capacity-development and other needs assessments identified gaps within CBFiM in the four project landscapes, the analysis offers feasible entry points and suggests priorities to improve fire management for all four countries. Certain vital components are absent from CBFiM strategies, particularly evident in aspects like the recovery component of the 5R framework and the incorporation of tools and technologies into CBFiM initiatives. The lack of tools and technologies may be attributed to limited access to funds and awareness. Ideally, the formation of a community of practice and opportunities for cross-learning will broaden the reach and application of more efficient tools and technology.

From a regional perspective, CBFiM addresses fire, smoke and haze from a point source and reduces its often-detrimental downstream impact. Transboundary smoke and haze are high priorities for regional policy-makers who are looking for integrated management approaches that include community consensus at conception and facilitate interagency coordination throughout.

Recommendations

The following recommendations are intended for project designers, practitioners and land managers to address the capacity gaps within the four project countries but may be further explored to apply to the lower Mekong region. The first six recommendations aim to strengthen provincial and local capacities:

1. Conduct training of trainers to expand the community of experienced potential instructors with specific scope and context to their area.
2. Establish a mechanism for a cascade approach in coaching and training with the training of trainers program. This will ensure that the knowledge and skills are delivered through layers and reaches the final target group at the local level.
3. Enhance gender equality and social inclusion in CBFiM through training, mentorship and building a support network.
4. Develop technical skills through field practicum.
5. Support cross-learning in the field and onsite to share lessons learned and insights on overcoming challenges at the community level.
6. Foster a community of practice that inspires, supports and encourages innovation and skills through regular learning labs and events that bring practitioners together.

The following recommendations should be targeted at the regional and national

levels:

1. Design and develop effective tools to replicate successful CBFiM implementation annually and in new sites. This includes creating offline and online materials for landscape-relevant awareness-raising, guidelines, e-learning courses, training manuals, short films and protocols.
2. Decentralize responsibilities for year-round fire management activities to the provincial and community levels.
3. Develop enabling policies and regulations for effective fire management with clear guidelines on roles and responsibilities for interagency coordination.
4. Establish policies to protect the health and safety of at-risk fire communities and fire preparation, forest patrol and fire response teams.

Next steps

The CBFiM approach and project implementation should be accompanied by targeted interventions that enhance the capacities of community-level, district-level, and provincial-level stakeholders. The next steps of the project will prioritize building up these capacities while advancing the development of accessible GESI-responsive technologies that empower communities to effectively manage fire risks.

A priority in the upcoming phase will be the enhancement of fire management information systems, with emphasis on making them more accessible and user-friendly for communities. The project will also work on integrating the CBFiM approach into existing platforms, such as the SMART conservation tool (Spatial Monitoring and Reporting Tool), to ensure that CBFiM practices are seamlessly incorporated into broader conservation efforts.

Following the assessment workshops, CBFiM plans were developed before the fire season, including an annual calendar of activities aligned with the 5Rs (review, risk reduction, readiness, response, recovery). The integrated fire management framework guided the design of these plans, ensuring that fire-related activities were scheduled for each month of the year as needed. For instance, the plan includes specific planting seasons, allowing the community and other stakeholders to identify windows for risk-reduction activities, such as building firebreaks and collecting vegetation residue. During the wet season, the CBFiM plans also include periods for recovery (assessing burn area and planting) and review, facilitating annual reflection and adaptation to maintain the sustainability of the plans. These CBFiM plans, developed with community input, aim to be incorporated into existing government-approved land management plans, as aligned with the project outcome. This integration is crucial for ensuring the sustainability and long-term effectiveness of community-based fire management strategies while aligning them with official land management policies and frameworks. To further support these

goals, the CBFiM Project will focus on fostering stronger collaborations between communities, local authorities and national agencies. This will involve continuous monitoring, feedback loops and iterative improvements to the tools and strategies.

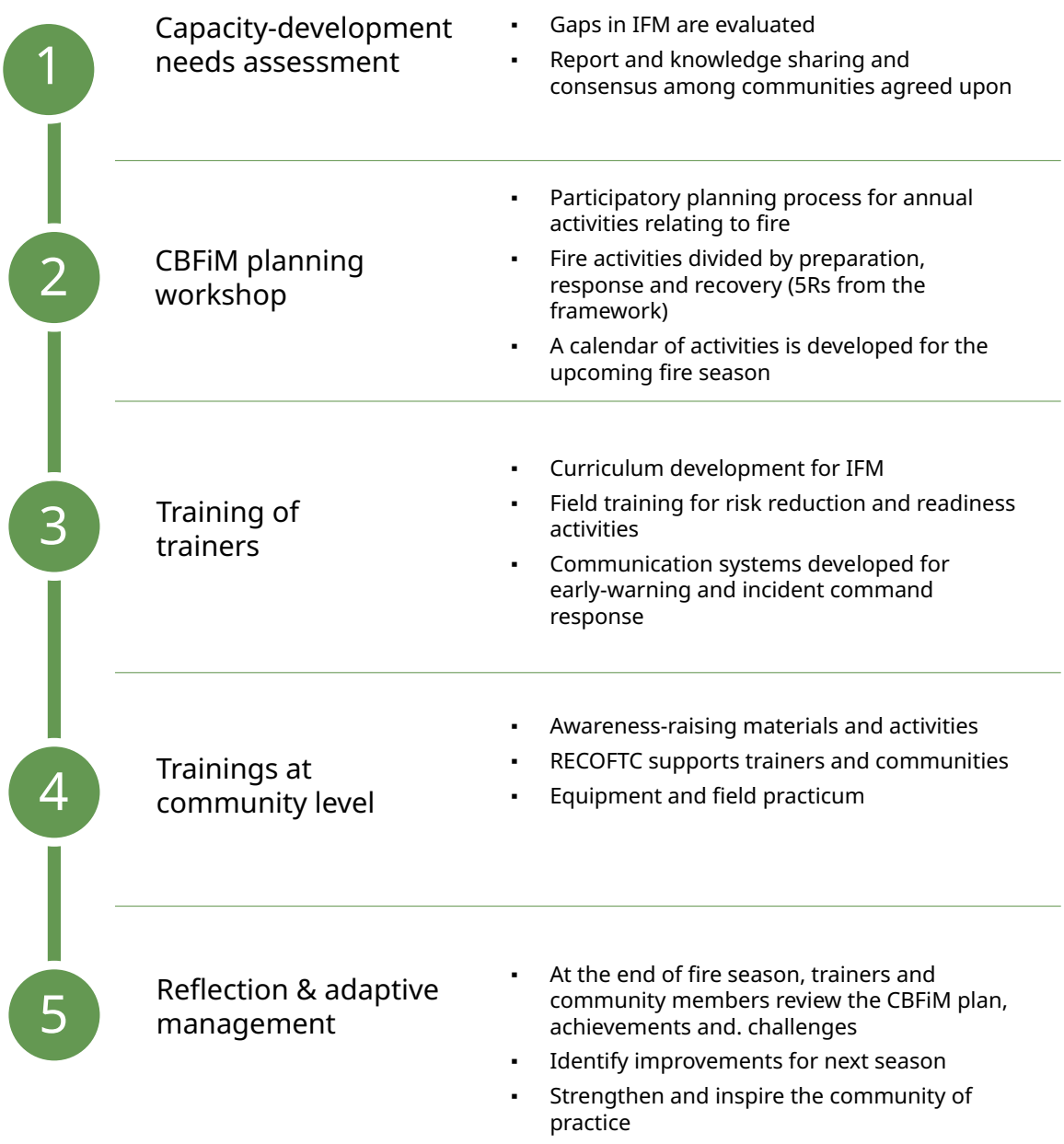
By building on the successes of the initial phase and addressing the assessed capacity gaps, RECOFTC's CBFiM Project is working to create a more resilient and responsive fire management system. This will not only protect vulnerable communities and ecosystems from the increasing threat of wildfires but also contribute to the broader climate adaptation and sustainable development goals in the region.

Capacity-development plans

The overall needs assessment (and situation analysis) has clarified the generalized categories of interventions required to strengthen CBFiM. In the context of project implementation, RECOFTC has created a general capacity-development plan to guide the next steps of the CBFiM Project. From this, the country teams have designed country-specific capacity-development plans using the findings from the needs assessment workshops.

The general capacity-development plan (Appendices D and E) outlines the curriculum that is most relevant and needed for the four-country local context, with project landscapes and stakeholders as the primary beneficiaries. It entails competency areas and topics (knowledge, skills and attitudes), targeted audiences and the criteria for choosing the target groups, timing and resources (funds and expertise).

Figure 6. RECOFTC CBFiM Project's capacity-development plan



This structured flow represents the stages involved in capacity development, from assessing needs to reflecting on and adapting management practices.

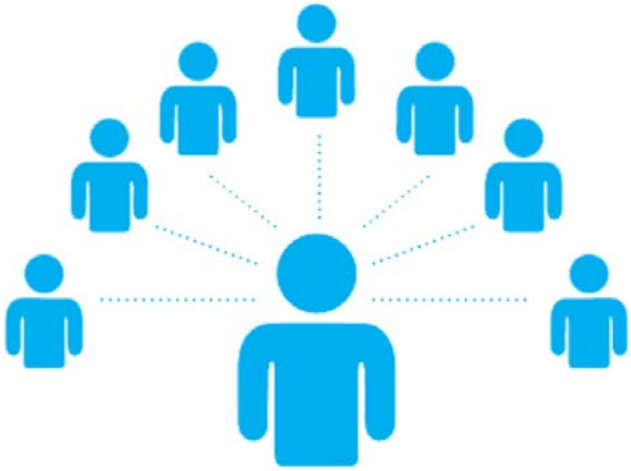
Proposed capacity-development interventions

Capacity-development interventions could be similar at each level but the objectives, target audience, scope of content and competency, learning methodology and duration will differ. The CBFiM Project will need to consider the design, planning and implementation of activities that can be executed in a way that ensures the most effective mobilization of resources based on the regional and national contexts.

RECOFTC recommends the capacity-development interventions to be delivered under the CBFiM Project cover training, technical skills development through practicum, field visits to case studies of effective CBFiM, learning labs to foster a community of practice and general capacity-building-related interventions.

Training programs

The training of trainers is a model used to prepare potential instructors or less experienced instructors on the best ways to deliver training materials to others.



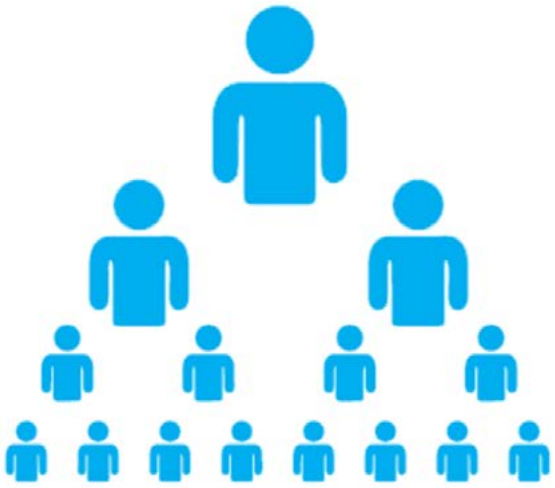
Instructors should include project country coordinators and partners or collaborators (NGOs and government officers) who have committed to being part of the capacity-development strategy development, planning and implementation.

Training sessions need to incorporate conceptual knowledge, skills development and facilitation and training skills related to CBFiM. In this project, this includes four important elements:

- Provide a solid understanding of integrated fire management and the 5R competencies.
- Focus on enhancing 5R-related skills that need to be imparted to local target audiences.

- Develop capacity to deliver and facilitate learning processes and methodologies, including setting objectives, developing training sessions, delivering content effectively, monitoring progress and evaluating learning outcomes.
- Incorporate hands-on experiential learning processes to practice new competencies and strengthen existing ones related to CBFiM.

Cascade approach training to local level authorities and grass-roots communities



The training of trainers should be followed by a cascade model, which involves delivering training through layers of trainers (from the training) until it reaches the final target group, which in this project refers to the local level stakeholders.

The CBFiM Project's target audience includes relevant local authorities working on forest or landscape management and fire management activities such as forest rangers and governmental fire rangers, relevant NGO grass-roots facilitators and local community representatives. When designing and delivering training for these target groups, trainers will need to consider several factors:

- Adapting abstract or complex theoretical concepts to suit the target group's level of understanding.
- Developing guidelines and materials that are simple, short and easily digestible.
- Setting up modular programs instead of long training workshops to accommodate the target group's work schedules and livelihood responsibilities.

- Incorporating hands-on experiential learning processes to practice new competencies and reinforce existing skills related to CBFiM.

Gender equality and social inclusion mentorship program

To enhance gender equality and social inclusion integration in CBFiM, it is crucial to develop local champions who advocate for these principles within their communities. These champions should be provided with comprehensive training opportunities covering GESI sensitization, fire management, health and safety measures, leadership skills, CBFiM strategies and landscape management, as well as tools and technologies to support their work. Additionally, establishing a mentorship program where experienced technical experts and leaders offer guidance and support can significantly bolster the capacity of these local champions. The focus should be on empowering youth and women to take on leadership roles, fostering their abilities to innovate and integrate GESI into CBFiM effectively. By nurturing these leaders and promoting innovative solutions, communities can better address barriers and strengthen environments conducive to inclusive decision-making and fire management practices. Creating a network of support and a community of practice on gender equality and social inclusion in CBFiM will provide ongoing collaboration, learning and resource-sharing opportunities, which are essential for sustaining efforts and achieving meaningful outcomes in promoting inclusive fire management initiatives.

Technical skills development through practicum

Prioritizing hands-on practice and technical skills development for fire management across the 5R components is crucial. To ensure practical training, the capacity-development events require fire management experts. Initiating a database of potential trainers and facilitators from relevant organizations with targeted invitations will ensure the delivery of impactful and practical training sessions.

Immersion through regional and cross-learning site visits

To maximize learning, study visits to successful fire management sites in the region will be essential. Participants, including country coordinators and local leaders, can gain inspiration and motivation from good practices and firsthand experiences. The effectiveness of this capacity-development intervention relies on identifying suitable sites and stakeholders, implementing a well-designed learning flow and incorporating reflection sessions. Ensuring the application of acquired knowledge in participants' own contexts through a defined plan of action with specific timelines is crucial. The caveats to make this capacity-development intervention effective are:

- Identify the most suitable sites and stakeholders to engage with during the visit.
- Design and implement a learning flow that reinforces competencies (knowledge, skills, experience and attitudes) acquired in other capacity-development interventions (cascade training, practicum, learning lab, etc.).
- Include sessions for reflection and internalization of lessons learned, followed by discussions on how to apply these insights to participants' own contexts.
- Develop a specific, time-bound action plan for incorporating learnings from the field visits into participants' own work environments.

Learning labs to foster community of practice and knowledge exchange

A "learning lab" facilitates interactive cross-learning and the sharing of lessons, good practices and innovations through discussions and dialogues. It nurtures a culture of continuous learning and implementation, fostering communities of practice for ongoing support, advice and mentoring at the regional and national levels. A learning lab differs from a workshop in that it emphasizes creating an equal space for all participants, with less focus on a single primary expert. Unlike traditional workshops, where an expert typically leads the session, learning labs encourage interactive cross-learning, where everyone contributes and learns from each other. It sustains capacity-building efforts beyond one-off interventions, promoting better communication and understanding among stakeholders. The targeted participants, including country coordinators, local leaders and international experts, contribute to the formation of communities of practice. Insights from these learning labs inform policies and practices at national and regional levels, enhancing the ability to address specific situations or adapt policies accordingly.

In October 2023, the CBFiM Project hosted its first learning lab in Chiang Mai, Thailand. The event gathered RECOFTC staff, government partners and regional fire experts to share knowledge and tools on CBFiM and integrated fire management. Participants from the four project countries engaged in thought-provoking discussions and exchanged insights on fire management across diverse landscapes. The learning lab included field visits to observe local communities' fire management efforts firsthand. There is a need to inspire, encourage and support local leaders to be mobilized for more effective fire management. Fostering a community of practice will help identify, inspire and support actors in the landscape and hopefully address fire management challenges unique to each country.

Knowledge management and sharing

In addition to the capacity-development interventions outlined above, broader efforts are needed to address the capacity gaps. These involve creating comprehensive guidelines, awareness materials, demonstration videos and protocols to enhance the knowledge and skills of the target groups. Allocating communication resources for the development of these materials would greatly benefit the project.

Appendix D provides the learning objectives that can be included in any of the recommended capacity-development interventions. It offers guidelines based on each of the components of the 5R framework and indicates the national-level focus or priority. This appendix can serve as a guiding reference for a project team and trainers in shaping their capacity-development initiatives at the national and grass-roots levels. It is tailored to specific priorities relevant to CBFiM, with a unique focus on each country's distinct needs.

Table 6. Summary of methodology and target groups for capacity-development interventions for all four project countries

Level of capacity-development intervention	Methodology or approach	Target audience
Regional	Training of trainers	Country coordinators, regional and national partners
	Study visits and familiarization trips	
	Learning lab	
	GESI mentorship	
National	Cascade approach training	Relevant local authorities, grass-roots communities
	Study visits and familiarization trips	Country coordinators, national partners, local authorities, grass-roots communities
	GESI mentorship	
	Learning lab	Country coordinators and national partners
Local, grass-roots communities	Cascade approach training	Relevant local authorities, grass-roots communities
	Technical skills development through practicum	
	GESI mentorship	
	Study visits and familiarization trips	
	Relevant CBFiM guidelines and awareness material	

Proposed country-specific and regional interventions

Specific capacity-development interventions are needed for each project site:

Cambodia

- Conduct a workshop to build a charter and ensure appropriate moderation for the CBFiM communication channel using the Telegram app.
- Strengthen skills in report writing, conducting and recording meetings and financial management.
- Organize a Tonle Sap Biosphere Reserve knowledge-sharing event on CBFiM.

Lao PDR

- Organize awareness-raising campaigns using offline posters and radio announcements.
- Provide financial accounting training.
- Promote cross-learning between the two project provinces including site visits and exchanges.

Thailand

- Promote cross-learning and knowledge sharing within the Doi Phu Kha National Park.
- Provide financial accounting training.
- Attend national policy events on fire management to gain insights and share experiences.
- Organize study visits to other provinces to observe and learn from successful CBFiM implementations.
- Organize transboundary exchange workshops.

Viet Nam

- Conduct GESI trainings integrated with CBFiM.
- Provide financial accounting training.
- Promote cross-learning across provinces.
- Develop skills and data collection methods for assessing forest plots to measure the impact of burning biomass on carbon emissions.

RECOFTC regional engagement in CBFiM

- Coordinate with regional actors, particularly the Asian Forest Cooperation Organization, on CBFiM and training of trainers delivery.
- Collaborate closely with the FAO Global Fire Management Hub to harmonize technical training and capacity-building with focus on community roles and traditional fire knowledge across the region.
- Lead the development of a Green Climate Fund proposal focused on capacity-building, exploring collaboration with ProGreen and the World Bank and engaging with the Asian Development Bank on planned technical assistance for Southeast Asia.
- Enhance knowledge management between projects, with a focus on capacity-building.

Limitations of capacity development

An important consideration for the project is to recognize that not all gaps identified in the assessments can be addressed by capacity development alone. Some gaps require other forms of interventions, such as reviewing relevant policies, guidelines and protocols to strengthen relevant institutional structures and processes, enhancing relevant and more efficient infrastructure, advancing technology and mainstreaming gender and social inclusion for better fire management, especially at the local level.

Appendix A. Guiding questions for capacity-development needs assessment

Guiding questions based on the integrated fire management framework

Categories	Objectives and questions
1. Review of fire problems	**Objectives**
	▪ To assess knowledge, skill and ability to analyze and understand fire dynamics. ▪ To evaluate proficiency in gathering, analyzing and communicating information critical to the development of effective CBFiM strategies.
	Questions
	Fire behavior understanding: ▪ Can you explain the key factors influencing fire behavior and spread in your area? ▪ How do you assess the specific risks associated with diverse types of agricultural activities and topography in your area?
	Data collection and analysis: ▪ Describe your approach to collecting and analyzing data related to historical fire incidents, weather patterns and vegetation types in a community. ▪ How do you use data to identify trends and patterns that may inform future fire management strategies?
	Stakeholder engagement: ▪ Explain how you engage with local stakeholders, including community members, government agencies and non-profit organizations, to gather information about the fire situation. ▪ Give an example of a situation where effective stakeholder engagement led to valuable insights into the community's fire management needs.
	Risk mapping and analysis: ▪ How do you use risk mapping and modeling techniques to visualize and communicate potential fire risks to community members? ▪ Can you provide an example of a successful application of risk mapping in a CBFiM context?
	Communication of findings: ▪ How do you communicate complex fire management data and findings to community members with varying levels of understanding? ▪ Provide an example of a situation where effective communication of research findings led to positive community engagement and action.

Categories	Objectives and questions
2. Risks reduction	**Objectives**
	To assess the ability to identify, prioritize and implement strategies to mitigate the risks associated with fires.
	Questions
	Risk identification: ▪ How do you systematically identify and assess potential fire risks within your community? ▪ Can you provide an example of a situation where you successfully identified previously unrecognized fire risks?
	Community engagement for risk reduction: ▪ How are community members involved in the identification and prioritization of fire risks? Provide examples of successful community engagement initiatives. ▪ Describe a situation where community input significantly influenced your risk reduction strategies.
	Risk management: ▪ Provide examples of risk management strategies you have implemented to address high-priority fire risks.
	Land management and planning: ▪ How do you use the results from the fire analysis to reduce fires in land management? ▪ Can you provide examples of successful projects where infrastructure modifications contributed to effective risk reduction?
	Collaboration with related authorities: ▪ How do you collaborate with local authorities to enhance the capacity for risk reduction during fire events? ▪ Describe a situation where effective collaboration with emergency services resulted in successful risk reduction.
	Education and training programs: ▪ What role do education and training programs play in your risk reduction strategies? How do you tailor these programs to the specific needs of the community? ▪ Provide examples of successful educational initiatives that contributed to reducing fire risks.
	Monitoring and evaluation of risk-reduction measures: ▪ How do you monitor the effectiveness of risk-reduction measures over time? ▪ Describe a situation where the results of monitoring and evaluation led to adjustments in risk-reduction strategies.

Categories	Objectives and questions
	Integration of traditional knowledge: ▪ How do you integrate traditional knowledge and practices into risk-reduction strategies, considering the cultural context of the community? ▪ Provide examples of situations where traditional knowledge contributed to effective fire risk reduction.
	Resource allocation and budget management: ▪ How do you prioritize and allocate resources for implementing risk-reduction measures within your community? ▪ Describe a situation where effective budget management contributed to successful risk-reduction initiatives.
	Adaptability and continuous improvement: ▪ How do you adapt risk-reduction strategies in response to changing environmental conditions or emerging challenges?
3. Readiness	**Objectives**
	To assess the preparedness, planning and organizational skills for effective readiness in CBFiM
	Questions
	Community training and capacity-building: ▪ How do you assess the training needs of community members regarding fire preparedness and response? ▪ Can you share examples of successful community training programs that enhance readiness for fires?
	Resource allocation and mobilization: ▪ Describe your approach to allocating and mobilizing resources, including personnel and equipment, in anticipation of fire events. ▪ Provide examples of situations where effective resource allocation contributed to improved readiness.
	Communication strategies: ▪ How do you develop and implement communication strategies to ensure timely and accurate information dissemination during fire event and for all year? ▪ Describe a situation where effective communication strategies enhanced community readiness and response.
	Collaboration with authorities: ▪ How do you collaborate with authorities to enhance community readiness for fires? ▪ Provide examples of successful partnerships with emergency services that improved overall readiness levels.
	Community drills and exercises: ▪ How do you organize and conduct drills and exercises to test the community's readiness for fire events? ▪ Describe a specific drill or exercise that exposed areas for improvement in community readiness.

Categories	Objectives and questions
	Community involvement in readiness efforts: ▪ How do you engage community members in readiness efforts, ensuring their active participation and ownership of preparedness measures? ▪ Describe a situation where community involvement significantly improved readiness levels. Review and continuous improvement: ▪ How do you conduct post-event reviews to assess the effectiveness of readiness measures and identify areas for improvement? ▪ Provide examples of changes implemented because of post-event reviews.
4. Response	**Objectives**
	To assess the ability to coordinate and execute effective responses during fire events
	Questions
	Incident command and coordination: ▪ Describe your experience in incident command during a fire response. What strategies do you employ to coordinate resources and personnel effectively?
	Community communication during emergencies: ▪ How do you communicate with the fire response team during a fire emergency? What methods do you use to ensure clear and timely information dissemination? ▪ Can you share examples of effective community communication strategies implemented during past fire responses?
	Resource allocation and deployment: ▪ How do you prioritize and deploy resources, including firefighting teams and equipment, during a fire response? ▪ Describe a situation where strategic resource allocation contributed to the effective containment of a fire.
	Collaboration with emergency services: ▪ How do you collaborate with governmental agencies for emergency support, neighboring communities or external agencies during a fire response? ▪ Share examples of successful partnerships with emergency services that enhanced the overall response effort.
	Adaptability in dynamic situations: ▪ Describe your ability to adapt and make informed decisions in dynamic and rapidly changing fire situations. ▪ Provide examples of situations where your adaptability contributed to effective response outcomes.
	Inclusion of traditional knowledge: ▪ How do you incorporate traditional knowledge and practices into fire response strategies, considering the cultural context of the community? ▪ Provide examples of situations where traditional knowledge influenced response actions positively.

Categories	Objectives and questions
	Effective use of firebreaks and containment strategies: ▪ Describe your approach to using firebreaks and containment strategies to control the spread of fires. ▪ Provide examples of successful containment efforts you have been involved in.
	Debriefing and learning from response efforts: ▪ How do you conduct debriefings after a fire response to assess what worked well and areas for improvement? ▪ Provide examples of changes implemented because of post-response debriefings.
5. Recovery	**Objectives**
	To assess an ability to lead and contribute to the post-fire recovery efforts.
	Questions
	Community engagement in recovery: ▪ How do you involve community members in the recovery process following a fire? What strategies do you use to ensure their active participation? ▪ Provide examples of successful community engagement initiatives during post-fire recovery.
	Assessment of damage and needs: ▪ Explain your approach to assessing the damage caused by a fire and identifying the immediate and long-term needs of the community. ▪ Provide examples of situations where a thorough needs assessment informed successful recovery strategies.
	Resource mobilization and allocation: ▪ How do you mobilize and allocate resources for recovery efforts, including financial, human and material resources? ▪ Describe a situation where effective resource mobilization contributed to the success of recovery initiatives.
	Coordination with external agencies and organizations: ▪ How do you coordinate with external agencies and non-governmental organizations to enhance recovery efforts in the community? ▪ Share examples of successful collaborations with external partners during post-fire recovery.
	Infrastructure and habitat restoration: ▪ Describe your strategy for restoring damaged infrastructure and rehabilitating natural habitats after a fire. ▪ Provide examples of successful projects where infrastructure and habitat restoration efforts positively impacted the community.

Categories	Objectives and questions
	Economic recovery and livelihood support: ▪ How do you support the economic recovery of the community, including the restoration of livelihoods affected by the fire? ▪ Share examples of initiatives that have effectively supported the economic recovery of communities after a fire event.
	Community resilience-building: ▪ How do you contribute to building community resilience during the recovery phase? What specific strategies do you employ? ▪ Provide examples of situations where community resilience was strengthened through recovery efforts.
	Monitoring and evaluation of recovery measures: ▪ How do you monitor the effectiveness of recovery measures over time? What indicators do you use to assess the success of recovery initiatives? ▪ Provide examples of changes implemented based on the evaluation of recovery efforts.
	Communication of progress and support: ▪ How do you communicate the progress of recovery efforts to the community? What strategies do you use to maintain transparency and foster community support? ▪ Describe a situation where effective communication positively influenced community support for recovery initiatives.
6. Technology	**Objectives**
	To assess proficiency in leveraging technology to enhance various stages of fire management.
	Questions
	Use of GIS and mapping technologies: ▪ How do you utilize GIS and mapping technologies to analyze and visualize fire risks within a community? ▪ Provide examples of specific projects where GIS mapping significantly contributed to effective fire management.
	Early Warning Systems: ▪ Describe your experience in implementing early warning systems for fires in a community. What technologies do you incorporate, and how do they enhance early detection and communication? ▪ Provide examples of situations where early warning systems played a crucial role in CBFiM.
	Drones and aerial surveillance: ▪ How do you integrate drones and aerial surveillance technologies into fire monitoring and response efforts? ▪ Share examples of instances where drone technology provided valuable insights during fire management activities.

Categories	Objectives and questions
	Data analytics and predictive modeling: ▪ Explain your approach to using data analytics and predictive modeling to assess and predict fire behavior in a community. ▪ Provide examples of successful applications of data analytics in fire management.
	Community alert apps and communication platforms: ▪ How do you leverage community alert apps and communication platforms to disseminate critical information to residents during fire events? ▪ Describe a situation where these technologies facilitated effective communication with the community.
	Remote sensing technologies: ▪ How do you utilize remote sensing technologies, such as satellite imagery, for monitoring vegetation health and identifying potential fire risks? ▪ Provide examples of successful applications of remote sensing technologies in CBFiM.
	Real-time monitoring systems: ▪ Explain your experience with real-time monitoring systems for tracking fire incidents. How do these systems enhance situational awareness and response efforts? ▪ Share examples of situations where real-time monitoring systems positively impacted fire management.
	Mobile applications for community engagement: ▪ How do you use mobile applications to engage with and educate community members on fire risks and preparedness measures? ▪ Provide examples of successful mobile application initiatives that contributed to community involvement.
	Simulation and training technologies: Describe your use of simulation and training technologies for preparing communities and responders for fire events. How do these technologies enhance readiness? ▪ Provide examples of training programs that effectively utilize simulation technologies.
	Integration of new technologies: ▪ How do you stay abreast of emerging technologies in fire management, and how do you assess their potential for integration into CBFiM? ▪ Provide examples of situations where the adoption of modern technologies positively impacted fire management strategies.

Appendix B. Country project data profiles

Cambodia			
Project site name	**Ou Tabrouk**	**Koh Raing Til**	**Tram Pear**
Location	Ou Tabrouk and Chong Klong village, Ou Sandan commune, Krakor District, Pursat Province	Raing Til, Koh Keo, Praek villages, Koh Praek Raing Til commune, Kandieng district, Pursat Province	Tram Pear village, Smam Preah commune, Bakan District, Pursat Province
Focal point in community	Sa Ya, Chief of Community Fishery	Sok Sitha, Chief of Community Fishery	Luon Thieng, Chief of Community Fishery
Key stakeholder group	Community Fishery Management Committee (CFiMC)	CFiMCs, CBFiM and patrol teams	CFiMCs, CBFiM and patrol teams
Area of site in hectares	2,951	15,250	3,017
Community population	1,559 population of two villages, 526 CFi members	3,373 population of three villages, 1,221 CFi members	1,170 population, 580 CFi members
Household number	507 families of two villages	650 families of three villages	254 families
Number of women	277 women of CFi members (53% women)	645 women of CFi members (53% women)	220 women of CFi members (37% women)
Livelihood	85% farmers of dry rice farmers, 15% fishers	90% fishers	85% farmers of dry rice farmers, 15% fishers
Land use	20% on dryland and 80% flooded forest in the TSBR	Flooded forest area	Flooded forest area
Land cover	Flooded Forest	100% flooded forest cover	100% flooded forest cover

Lao PDR		
Project site name	**Xayaboury District and Phiang District, Xayaboury Province**	**Houayxai District and Paktha District, Bokeo Province**
Location	10 villages in Xayaboury district	10 villages in Houayxai district, 5 villages in Paktha district
Focal point in community	Village head person and District Agriculture and Forestry Office (DAFO) official	Village headperson and DAFO official
Key stakeholder group	▪ National level: Department of Forestry ▪ Provincial level: Agriculture and Forestry (Provincial Agriculture and Forestry Office, PAFO) ▪ Office and district level: Agriculture and Forestry office (DAFO) ▪ Military & Youth Union ▪ Provincial Women Advancement/Lao Women Union	▪ National level: Department of Forestry ▪ Provincial level: Agriculture and Forestry (PAFO) ▪ Office and district level: Agriculture and Forestry office (DAFO) ▪ Military & Youth Union ▪ Provincial Women Advancement/Lao Women Union
Area of site (ha.)	35,356. 97	36,111.90
Community population	11,374 people	8,491 people
Household number	2,128 in 10 villages	2,739 in 15 villages
Number of women	5,534 women (48% women)	5,515 women (64%)
Livelihood	85% farmers (paddy rice, cassava) 10% small retailor or trader, 5% fishing	90% farmers (paddy rice, rubber) 10% small retailor or trader
Land use	Forest land, Agriculture land, Cultural land (cemetery, temple), building land, Industry land, Infrastructure land and wetland (river, steam and reserved riverbank)	Forest land, Agriculture land, Cultural land (cemetery, temple), building land, Industry land, Infrastructure land and wetland (river, steam and reserved riverbank)
Land cover	Agriculture land 50%, Forest land 30%, other infrastructure 20%	Agriculture land 50%, Forest land 30%, other infrastructure 20%

Thailand				
Project site name	**Manee Phruek**	**Rat-rat Pattana**	**Sawang**	**Kio Nam**
Location	Thung Chang District, Nan Province	Santisuk District, Nan Province	Mae Charim District, Nan Province	Mae Charim District, Nan Province
Focal point in community	Vichit Kiritheerakul (Village headman)	Nark Boon-in (Village headman)	Samak Yod-on (Village headman)	Suriya Pongsawipawat (Village headman)
Key stakeholder group	Doi Phu Kha National Park, Development Project for Security in Nan watershed under the royal initiative.	Doi Phu Kha National Park, Development Project for Security in Nan watershed under the royal initiative.	Doi Phu Kha National Park, Development Project for Security in Nan watershed under the royal initiative, HRDI	Doi Phu Kha National Park, Development Project for Security in Nan watershed under the royal initiative.
Area of site in hectare (ha\.)	6,980.48	868.48	886.56 (excluded Conservation and utilization forest within Doi Phu Kha National Park)	697.49
Community population	2,346	893	367	340
Household number	419	227	76	57
Number of women	1,204 (51% women)	435 (49% women)	178 (48% women)	169 (50% women)
Livelihood	Agriculture (upland rice for household consumption, ginger, maize, cabbage)	Agriculture (upland rice for household consumption, maize)	Agriculture (upland rice for household consumption, maize, ginger, vegetable under supported by HRDI-Highland Research and Development Institute)	Agriculture (upland rice for household consumption, ginger) and livestock raising (cow, buffalo, goat)
Land use	▪ Settlement 448 ha ▪ Agriculture 3,732.48 ha ▪ Forest 2,800 ha	▪ Settlement 20.8 ha ▪ Agriculture 480 ha ▪ Forest 367.68 ha	▪ Settlement 16 ha ▪ Agriculture 445.12 ha ▪ Community forest 425.44 ha	▪ Settlement 10.4 ha. ▪ Agriculture 234.08 ha ▪ Conservation Forest 274.08 ha ▪ Utilization Forest 176.16 ha ▪ Restoration area 2.72 ha
Land cover	Forest cover 40% Settlement and agriculture 60%	Forest cover 42% Settlement and agriculture 58%	Forest cover 84% Settlement and agriculture 15%	Forest cover 65 % Settlement and agriculture 35%

Viet Nam				
Project site name	**Cho Rung**	**Ma Bo**	**Tan Ha**	**Toa Cat**
Location	Da Quyn Commune, Duc Trong District, Lam Dong Province			
Village area (ha)	2,208	5,058.5	1,324	1,800
Area of site (ha)	2,046.34	1,974.19	761.47	1,433.96
Community population	584	1,886	619	1,026
Household number	156	348	129	283
Number of women	257		332	
Key stakeholder groups	Provincial level: ▪ Department of Agriculture and Rural Development ▪ Department of Forest Protection ▪ Forest Protection and Development Fund ▪ Women's Union District level ▪ Department of Forest Protection ▪ Women's Union Commune level ▪ Ta Nang Protection Management Board ▪ Da Quyn Commune People's Committee ▪ Women's Union ▪ Farmer's Union ▪ Youth's Union Village level ▪ Women's Union ▪ Farmer's Union ▪ Youth's Union			
Livelihood	Coffee farming (main), forest protection, working as hired labour, cattle raising, vegetable farming			
Land use	▪ Agriculture: coffee, rice, vegetable ▪ Forestry: Plantation and natural pine forests			
Land cover	Forest covers 68.47% of the commune area (highest in the Duc Trong district)			

Appendix C. Situation and context analyzed by 5Rs of the integrated fire management framework

Cambodia

Review

1. While the authorities can apply tools (such as participatory tools–PRA (Participatory Rural Appraisal), group discussion, and questionnaire) to research on the fire situation and the causes of fire have been identified as human-caused: Reckless smoking, unattended cooking and hunting. However, the underlining root causes that explain why and how these are the cause are not yet analyzed.
2. Information on causes and impact of the flooded fire exists, however, is not disseminated properly and widely to the affected communities.

Risk reduction

1. There are policies and regulations on fire prevention and control measurement at the national level. However, the year-round risk-reduction plan or strategies in the provincial and commune with contribution or involvement of the local community that respond to the root causes of the flooded fire are still missing.
2. The patrol team is the only function used to monitor and reduce the risk of fire in the respective area. Consequently, from the above, without clear strategies from the provincial and local authorities, the fire patrolling team does not receive adequate financial and equipment supports which makes the patrol team lack of incentives and does not continuously and effectively execute the work.

Readiness

1. The involvement of the local community with local knowledge and familiarity with the area is still underestimated. This is for example that the community does not involve in planning to prepare to fight the fire.
2. The patrol team in the front row in fighting the fire does not receive regular practice or training provided by the provincial and commune authorities. The training is sometimes provided by external organizations without continuous support.

Response

1. There are response plans and strategies that are designed to fight fire. However, the plan does not properly involve the local community. It was designed and executed by the governmental authorities.

2. Even though there are fire response plans, the authorities are not able to disseminate and communicate the plan with the related agencies to ensure the plan is effectively conformed.

Recovery

1. The only activity to recover from the fire is replanting
2. The policy and regulations and procedure to assess the fire's loss and provide support after the fire do not exist

Technologies

Technology possible to support the fire management in the area is drones. However, the local communities cannot use it while the governmental authorities do not support them.

Lao PDR

Review

1. In Lao PDR, the root causes of the fire are identified as human-caused: Slash and burn for land preparation, hunting without control. However, the underlining root causes that explain why and how these are the cause are not yet analyzed while the community members and authorities lack knowledges on data collecting and analyzing tools and lack of experiences in applying these tools to analyze root causes of fire.
2. Even though there is some information on the causes and impact of the fire in the area, it still lacks communication mechanisms to effectively disseminate to the communities. The current approach of communicating relies on official letters and local coordination in each village.

Risk reduction

1. Even though there are activities to promote fire prevention and fire use awareness, it still lacks communication mechanisms to effectively raise awareness with the communities. The current approach to communicating relies on official letters and local communication in each village.
2. Firebreak and patrolling are tools used to monitor and reduce risk of fire in Lao PDR. Each village has its own patrol team without coordination mechanisms between each village. This creates challenges and gaps when the fire occurs near the village border line.
3. The patrol team is the key function to monitor and reduce the risk of fire in the area. However, they lack incentives and do not receive adequate financial and equipment support which makes the patrol team does not continuously and effectively function.

Readiness

1. The community plays a key role in preparing and getting ready to fight fire using local practices. However, they do not receive support in developing a clear readiness plan to prepare and practice related persons ready when the fire occurs. The current approach is from the adapted practice based on experience.
2. The current method the community used to suppress fire is dry branches with other local tools. Lack of continuous support on budget and equipment to fight the fire. Sometimes, the community receives training on fire suppression techniques from non-governmental organizations, but it is inconsistent.
3. Gaps in budget allocation policy prevent continuous support on practical equipment to fight fire. In Lao PDR, there is no budget allocation for fire management. Each organization, including the local community, must use their own budget.

Response

1. There are local practices and strategies the community and authorities used to fight fire. As this is not an official response plan that is collectively designed and clearly implemented between the governmental authorities and the local community, it is challenging to prepare, practice and train the related persons to be ready and familiar with the plan.
2. When the fire is reported by the patrol team, one community team will reach the fire site while another team will standby for coordination in case the back-up support is needed. However, without a rapid communication mechanism, it is challenging to provide information at the front row real-time when the situation changes.
3. The communication flow for commanding resource allocation is not effective. Provincial Agriculture and Forestry Office/DAFO is clearly leading the processes of coordination, communication, assessing and monitoring the situation; however, they need to consult with district/provincial governor for decision-making.

Recovery

There is no plan, policy or activities to recover after the fire to ensure the recovery on socioeconomic and environmental aspects.

Technologies

The communities and authorities do not have knowledge of technology that can be beneficial and able to be applied to support the fire management in the area.

Thailand

Review

1. Based on observation and experiences, the community and local authorities also have information of the specific types of agriculture that require fire usage and

topography that influences the spread of fire. A calendar of fire use in preparing the agricultural land was also aware among the community leaders and local authorities. However, there are still conflicts of understanding on the positive use of fire in agricultural activities between the communities and authorities.

2. The community and related stakeholders affected by the fire situation discussed and collected data on the fire situation separately. Communication on the analysis of the root cause of the situation is top to down, from the governmental authorities to community via announcement on regulations and rules.
3. Neither communities nor authorities are aware of risk mapping and modeling.

Risk reduction

1. Even though there are strategies and plans aiming to reduce fire risk, the plan and strategies do not respond to the local way of living.
2. There are laws and regulations aiming to reduce the risk of fires, however, it does not match with the local context. This is for example the Zero Burn policy.
3. The authorities such as local administrative organization that are newly responsible to support the fire management in the community and mobilize the related resources cannot perform their duties which prevents the effective allocation of resources such as budget, equipment and techniques for fire risk reduction activities.
4. The community and authorities can identify potential fire risks. They recognized the water management system and growing optional species of agricultural crops can reduce the risk of fire in the area. However, they lack competency to collaborate with authorities and related stakeholders to plan and support risk-reduction activities in the long-term such as water planning management, marketing, optional agricultural species that do not rely on fire use.

Readiness

1. The current state of fire management reveals a notable deficiency in cross-district collaboration concerning monitoring and patrolling activities. Districts operate in relative isolation, with limited exchange of information and resources, hindering the collective ability to effectively monitor and patrol areas susceptible to fires. This lack of collaboration undermines the overall efficiency and responsiveness of the fire management system.
2. The effectiveness of fire management in protected areas is impeded by significant challenges in interagency coordination and budget allocation. The local administrative organization is assigned and allocated budget for fire management. However, the use of money for operations in protected areas is prohibited. The lack of seamless collaboration among agencies involved in fire management poses a substantial obstacle to cohesive and well-coordinated efforts. Additionally, the inadequacies in budget allocation further exacerbate these challenges, limiting the resources available for critical fire prevention, monitoring and suppression activities within protected areas. Addressing these

interagency and budgetary constraints is essential to enhance the overall effectiveness of fire management initiatives in safeguarding protected areas.

3. There is deficiency in both knowledge and essential equipment necessary for adequate preparation for firefighting. Insufficient understanding of effective fire management strategies coupled with a lack of the requisite equipment compromises the ability to proactively address and mitigate potential fire incidents while there is none of continuous comprehensive training programs and equip relevant personnel with the necessary tools to enhance the preparedness and response capabilities in the face of fire-related challenges.

Response

4. In Thailand, there is an absence of collaborative fire management plans that is essential for effective fire response. The lack of crucial input and coordination from diverse stakeholders and relevant agencies and the absence of clearly defined roles in these plans compounds the challenge, hindering the effective fire response.
5. The current challenges in fire response in Thailand also include a deficiency in both knowledge and support for the development of transportation routes, hindering quick access to fire-affected areas. Additionally, there is a lack of robust communication mechanisms, impeding the timely reporting of incidents. The task team relies only on the use of mobile phones for communicating the fire situation under the uncertain function of the connection during the fire incident. The absence of efficient transportation infrastructure and effective communication protocols jeopardizes the speed and effectiveness of response efforts.
6. There is a shortfall in support for essential safety equipment and tools required for effective fire suppression. The community still lacks appropriate materials and equipment necessary to extinguish fires, such as blowers and safety equipment. It is common for the team to use fresh branches to extinguish the fire which stimulates the widespread spread of the fire. The absence of adequate resources poses a significant challenge to the safety and efficiency of fire response teams.
7. The capacity-development needs assessment result also highlights a significant gap in knowledge and competency related to the safe suppression of fires and the performance of first aid activities. There is a pressing need for enhanced training and skill development among relevant personnel to ensure a proficient and secure response to fire incidents.
8. There is no effective cross-district collaboration, particularly when fires extend from neighboring areas. It is challenging to control the fire when it spreads from neighboring districts leading to uncontrollable fire. The absence of coordinated efforts and information-sharing between districts undermines the collective ability to effectively respond to and manage fires that transcend administrative boundaries.

9. Volunteer firefighters play a crucial role in firefighting services, yet the absence of monetary rewards poses a barrier to recruitment and sustained volunteer commitment.

Recovery

1. There exists a critical gap in the ability to comprehensively assess the impact of fires, impeding the development of targeted recovery strategies. The plan, policy or activities to recover after the fire to ensure the recovery on socioeconomic and environmental aspects do not exist.
2. The community and fire response team are not provided any compensation for damage incurred to agricultural products, property and injuries resulting from fire extinguishing efforts. The lack of a structured mechanism to address and redress these losses poses a significant challenge to affected individuals and communities.

Technologies

1. The communities and authorities do not have knowledge and skills of technology that can be beneficial and able to be applied to assess areas with fire susceptibility.
2. The authorities are competent in using the satellite for hotspot alert. However, they lack knowledge and skill on advanced technologies that could be used for planning fire response such as using the satellite to track hotspots through application to see the frequency of fires.

Viet Nam

Review

1. Critical lack of detailed methodology data collection, analysis on fire problem, especially the updated and relevant data such as weather, changes in wind direction, temperature, updates on changes in land-use types.
2. Lack of independent research capabilities and tools of in-depth analysis, mapping software. The relevant information is mainly general information for the whole region. However, the data source related that can provide for a specific area at commune level is not available, so this is also a gap.

Risk reduction

1. There is no weather index, rainfall, humidity, hazard level to forecast data for the small scale such as district or commune level. Such data area is available at provincial level. The function of forest ranger at provincial and district, commune level is to follow their own Forest Fire Management Plan and based on the information of access the remote sensing forest fire detection warning national systems (The system is referred to as FireWatch Viet Nam). Regional forest fire danger rating system of center level to readiness and response to forest prevention and control, especially on dry season.

2. The survey results indicated that the people have no ability to understand and skills on forest fire risk assessment the risk level of forest fire have been noticed to community from the forest ranger and forest owners.
3. Lack of competency to cooperate and incorporate the local knowledge do fire risk assessment. There are no available mechanisms for the community's contribution to traditional knowledge of fire risk assessment.
4. Incompetency on techniques or methodology to mitigate the spread of the fire (firebreaks, buildings design, agricultural burns, prescribed burning).
5. Lack of community collaboration in the Forest Fire Management Plan. The system is not open to local people to assess local people are limited in participating in the development process of the Forest Fire Management Plan at the district level.
6. Lack of understanding on policy, regulation and guidelines to facilitate compliance and inform decision-making.

Readiness

1. There is no strategy or plan that is used to prepare ready for the fire. This includes practices and drills on firefighting and fire evacuation.
2. They failed to allocate available resources for infrastructure and equipment maintenance. This results in ineffective tools, vehicles and roads approaching the fire scene in a timely manner.
3. Serious shortage of equipment to quickly response to the fire especially transportation and firefighting equipment.

Response

1. There is a Forest Fire Management Plan used as procedures to response to fire incidents. However, the community does not have a key role in engaging with the plan development and suppressing the fire. The local people almost have not participated in the Detect Forest fire system and fire response. This is because of the lack of mechanism and tools for them to participate.
2. All residents and organizations must participate in forest fire suppression. The procedure of the forest fighting following the regulations of the government that developed in detail in the Forest Fire Management Plan of forest owner and fit with local condition of the forest areas. The task force of forest fire must be aware of the procedure that is written in the Forest Fire Management Plan. There is a coordination procedure to contact and communicate with the related agencies when forest fire occurs. The leader will manage the coordination and situation in the event of fire. The Forest Fire Management Plan has response tactics when forest fire gets worse that can inform to communicate with the community members who might be prone or affected to the fire and in the event.

3. To forecasts of unexpected situations such as wind change or other affecting weather changes to the firefighting team or volunteers is based on experiences without any strategies, plan, method and tools.
4. There is a critical lack of equipment and vehicles to response to forest fire. Road condition and terrain condition led to difficulty approaching the scene.

Recovery

There is an effort to assess and analyze the impact after the fire incident using GPS, tape to measure calculate the damage and design a plan to recover. However, community engagement is presented to be least involved in the process.

Relevant fire management technologies

1. Forest rangers in the landscape must deal with many challenges in early detection fires. The tool currently in use is Moderate Resolution Imaging Spectroradiometer (MODIS), and it is not time sensitive as it can only detect fires that have occurred.
2. The firefighting team does not have knowledge of technologies and tools that can help assess unexpected incidents during the fire incident such as assessing the wind changes and weather forecasting etc.

Appendix D. Objectives of capacity-development interventions

Proposed intervention (based on 5R)	Objectives	Priority (identified per country)	Target stakeholders
Review			
Root causes review and analysis through stakeholder engagement and community involvement	1. To identify the underlying factors contributing to fires. 2. To foster collaboration skills among stakeholders, encouraging effective communication and joint problem-solving. 3. To empower community members with root cause analysis skills in identifying and addressing fire-related issues	Cambodia, Lao PDR, Thailand, Viet Nam	Community, forest ranger, government agencies
Risk mapping and modeling	1. To identify vulnerable areas such as geospatial risk maps that help identify areas prone to fires based on historical data, vegetation types, weather patterns and topography 2. To develop models that can simulate potential fire scenarios, considering factors like wind speed, terrain and fuel load, which helps predict the likelihood of fires and identify vulnerable zones.	Cambodia, Lao PDR, Thailand, Viet Nam	Forest ranger, government agencies
Communication of findings	1. To provide a clear and accessible means of communication to convey complex risk information to the public and enhance public awareness, fostering a deeper understanding of the potential consequences of fires	Cambodia, Lao PDR, Thailand, Viet Nam	Forest ranger, government agencies

Proposed intervention (based on 5R)	Objectives	Priority (identified per country)	Target stakeholders
Risk reduction			
Landscape and land-use planning	To understand the role of land-use planning in mitigating fire risks. To integrate fire risk considerations into land-use plans and zoning regulations.	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Collective fire risk management plan and strategy respond to the identified root causes and risk	1. To develop fire risk management plan and strategy that responds to the identified root causes and risk by ensuring community involvement and related stakeholder engagement 2. To assess the effectiveness of risk-reduction measures by implementing systems to monitor and evaluate risk-reduction initiatives and making data-driven adjustments.	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Fuel management techniques	1. To understand different vegetation types, fuel characteristics and how they contribute to fire behavior. 2. To implement fuel management strategies such as controlled burns, vegetation clearing and creating firebreaks. 3. To analyze fuel management options for economic market opportunity.	Cambodia, Lao PDR, Thailand	Community
Readiness			
Collective emergency response	1. To understand the basics of emergency response procedures, including evacuation protocols, communication plans and first aid. 2. To enhance the capacity in emergency response techniques, including firefighting, search and rescue and first aid. Understanding basic firefighting techniques and equipment	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies

Proposed intervention (based on 5R)	Objectives	Priority (identified per country)	Target stakeholders
Community engagement and collaboration with local authorities	1. To understand the roles and responsibilities of local authorities in emergency response. 2. To establish partnerships with local fire departments, law enforcement, and other relevant agencies for coordinated response efforts such as conducting community drills, organizing awareness campaigns and fostering a sense of shared responsibility for emergency preparedness	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Community systems and crisis communication plan	1. To understand effective crisis communication principles during emergencies. 2. To establish and maintain communication systems, including two-way radios, community alerts and coordination with local authorities. 3. To develop communication plans and strategies for different phases of an emergency, including messaging, media relations and community updates	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Resource management	1. To manage and allocate resources during an emergency. 2. To develop resource management plans, including the deployment of firefighting equipment, water sources and other essential resources. 3. To establish maintenance schedules, conduct equipment checks and ensure the availability of operational tools.	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Response			
Collective fire response plans and strategy	1. To develop fire response strategy collectively with community involvement and related agencies	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Firefighting techniques	1. To effectively and safely use of the firefighting tools and method.	Cambodia, Lao PDR, Viet Nam	Community, government agencies

Proposed intervention (based on 5R)	Objectives	Priority (identified per country)	Target stakeholders
Communication systems and incident command system	1. To ensure proficiency in communication systems, including radios, alarms and other means of alerting and coordinating responders to ensure the fire response in a timely manner. 2. To develop and implement the incident command system structures, roles and responsibilities to ensure a coordinated and organized response	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Community engagement in response and cross collaboration with external agencies	1. To enhance community members' capacity and raise awareness to act as first responders, participate in community patrols and assist in evacuation efforts. 2. To understand the roles and responsibilities of external agencies in fire response. 3. To establish and maintain effective partnerships with local fire departments, law enforcement and other relevant agencies both within and cross administrative areas	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Resources management and mobilization	1. To understand how to coordinate and allocate resources during a fire response. 2. To develop resource coordination plans, including the deployment of personnel, equipment and other essential resources including logistics of transporting personnel, equipment to ensure timely and efficient support during a response	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Recovery			
Post-fire impact assessment	1. To understand methods for assessing the socioeconomic, environmental and infrastructural impacts of fires. 2. To conduct comprehensive assessments to inform recovery planning	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Community needs assessment	1. To understand how to assess the immediate and long-term needs of community members affected by fires. 2. To develop the capacity to conduct community needs assessments to identify priorities for recovery efforts	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies

Proposed intervention (based on 5R)	Objectives	Priority (identified per country)	Target stakeholders
Recovery planning	1. To enhance knowledge on the principles of recovery planning, including goal setting, resource allocation and stakeholder engagement. 2. To develop and implement recovery plans.	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies
Community engagement in recovery	1. To ensure the involvement of the community in the recovery process. 2. To enhance the capacity of the community in recovery efforts, providing feedback and contributing to decision-making	Lao PDR, Thailand, Viet Nam	Community, government agencies
Coordination with external agencies	1. To Establish and maintain effective partnerships with organizations involved in recovery efforts	Lao PDR, Thailand, Viet Nam	Community, government agencies
Technologies			
The possible technology available to support the fire management in the area	1. To review the possible technology available to support fire management in the area. 2. To enhance the capacity to apply technologies in fire management	Cambodia, Lao PDR, Thailand, Viet Nam	Community, government agencies

Appendix E. Intervention work plans by country

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Lao PDR	CBFiM training and develop CBFiM Planning at community level	Participatory approach, field practicum	Local people received forest fire knowledge, CBFiM plan that approved by village authority and will be approved DAFO in the step	**Knowledge**: 5Rs knowledge. Integrated and participatory approach on CBFiM. - Preparation process, steps of CBFiM plan development - Participatory fire prevention plan -Firebreaks	Village members include village committee, women union, youth, village agriculture and forestry subunit, grass-roots officers	Jan to Feb 2024	Key partner: Provincial of Agriculture and Forestry office, District of Agriculture and Forestry	**Trainers:** RECOFTC, PAFO, DAFO, military, youth union, women's union **Materials**: Posters, flipchart projector, PTT

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Viet Nam	Develop CBFiM plan at community level	Participation approach. In class training and site visiting	CBFiM Plan Framework - CBFiM Plan Framework development process CBFiM local facilitators - Summary poster of CBFiM Plan	Knowledge: 5R knowledge. Integrated and participatory approach on CBFiM. - Preparation process, steps of CBFiM plan development - Participatory fire prevention plan framework - agree on PS by all parties Skills: - Skills that promote working with the community of local officials; - Integrating gender;	Core group of farmers from villages participating in the project (10 people/ village, including village heads, secretaries, women officials, youth, 30% women) - Commune forestry officers, local forest rangers, forest owner officers	Jan to April 2024	RECOFTC/ FPD, forest owners, local authorities	Training materials for RECOFTC, village level forest protection plan, sustainable forest management, FLOURSH project

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Viet Nam	CBFiM Forest Fire monitoring Mobile Application	Participation approach. In class training and site visiting	local community and forestry staff can use CBFiM Forest fire monitoring Mobile Application local CBFiM Forest fire - local facilitators	Knowledge: Using application software for mobile phones to monitor forest fires. Skills: Skills to install and use software, enter information, manage and report information related to forest fires, - Change in approach: Participatory approach and role of community; PEFS integration	Core group of farmers from villages participating in the project (10 people/ village, including village heads, secretaries, women officials, youth, 30% women) - Commune forestry officers, local forest rangers, forest owner officers	May-24	RECOFTC/ FPD, forest owners, local authorities	Smartphone application software for forest fire monitoring and forest management of the pilot FLOURISH Project in Nghe An 2021–2022

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Regional	Building networks	Active participation in national and regional level related working groups and conventions Attending regular FAO/ AFFIRM meetings	Engagement and understanding of fire management context at national, regional and international level. CBFiM Project is well known to partners and stakeholders	Knowledge of CBFiM approach in Lower Mekong region Case studies from the field Opportunities, challenges and lessons learned are conveyed across partners for future collaboration	Project team engages with partners at local, national, regional, international level	Throughout project	Asia-Pacific forestry congress, COP28, IUFRO, AFFIRM, FAO, AFOCO, CI, WCS	PPT, T&L
Regional	Cross-learning	Selected representatives from each community or project site visits adjacent site	Workshop with representatives share lessons learned, challenges, and present new ideas	To share lessons learned and present new innovative ideas for adaptive management	community representatives	April-August 2024	communities (Lao-Lao, Lao-Thai, Cambodia-Cambodia)	PPT, facilitators, T&L

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Regional	Needs assessment	Conduct needs assessment through participatory approach, desk research, focus group discussions using quantitative and qualitative methods	Needs assessment report - Gaps in technology, Capacity, National Institutional, Policy, GESI	To analyze and understand current gaps in technology, capacity, institutional, policy, and GESI in fire management in the four project countries	Main Office with support country coordinators and technical consultant	March, April 2024	FAO	FAO, T&L, Goal 2
Regional	Dissemination and discussion forums	Regional dialogue on CBFiM	Exchange lessons learned and success stories as well as challenges and next steps for tacking transboundary issues and integrating GESI into CBFiM	To share lessons learned and disseminate CBFiM Needs Assessment, CBFiM Manual designed for the regional (four countries) context, GESI integration manual	partners, relevant stakeholders, community representatives	May-Aug 2024	FAO, AFOCO, Governments,	T&L

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Thailand	Develop CBFiM plan at community level	Participatory approach. In class training	CBFiM Plan Framework - CBFiM Plan Framework development process	Knowledge: 5R knowledge. Integrated and participatory approach on CBFiM. - Preparation process, steps of CBFiM plan development Skills: - Skills that promote working with the community of local officials; - Integrating gender;	Core group of farmers from four pilot villages including village heads - National Park staffs, The Royal Project Initiative staffs	Oct-23	RECOFTC, Forest Fire Control Station, local authorities	Training materials for RECOFTC
Thailand	CBFiM fire management support by unmanned aerial vehicle (UAV)	Participation approach. In class training and field exercise	Local community and National Park staff can use UAV for CBFiM	Knowledge: Using UAV to patrol/monitor fires. Skills: Skills to use UAV, collect information, manage and report information related to fires	Core group of villagers who interested in technology, National Park staffs	Feb-24	RECOFTC/ National Park, Royal Project Initiative, local authorities	UAV

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Thailand	CBFiM Database collecting by GPS tracker for fire management in Cellular phone application	Participation approach. In class training and field exercise	Villagers can use GPS tracker to collect information for database - Villagers and National Park staffs can use database on mobile application for CBFiM	Knowledge: Using GPS tracker to collect information for cellular phone application. Skills: Skills to GPS tracker to collect information, enter information, manage and report information related to fires	Core group of villagers who interested in technology, National Park staffs	Feb-24	RECOFTC/ National Park, Royal Project Initiative, local authorities	GPS tracker Cellular phone Application

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Cambodia	Develop CBFiM plan at community level	Participation approach. In class training and site visiting	CBFiM Plan Framework - CBFiM Plan Framework development process CBFiM local facilitators	Knowledge: 5R knowledge. Integrated and participatory approach on CBFiM. - Preparation process, steps of CBFiM plan development - Participatory fire prevention plan framework - agree on plan by all parties Skills: - Skills that promote working with the community of local officials; - Integrating gender;	Community Fishery committee, Community Fishery members, village leader	Dec 2023-Jan 2024	Commune Council, Commune Administration Police, District Authorities, District Agriculture office, District Police	National Fishery Administration, Provincial Fishery Admin. Cantonment, Division Fishery Admin and fishery admin triage and RECOFTC

Country	Topic	Methodology	Result	Learning Objective	Participant	time	Partners	Resource
Cambodia	CBFiM forest fire monitoring mobile application or communication application (Telegram)	Participation approach. In class training and site visiting. Coaching and strengthening current capacities	Local community and forestry staff can use CBFiM forest fire monitoring mobile application local CBFiM Forest Fire - Local facilitators	Knowledge: Using application software for mobile phones to monitor forest fires. Skills: Skills to install and use software, enter information, manage and report information related to forest fires, - role of community CBFiM integrated in PEFS Mechanism	Community Fishery Committee, community patrolling team and village leaders	Nov 2023-June 2024	Commune Council, Commune Administration Police, District Authorities, District Agriculture office, District Police	National Fishery Administration, Provincial Fishery Admin. Cantonment, Division Fishery Admin and fishery admin triage and RECOFTC

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RECOFTC

RECOFTC is an international nonprofit organization working towards a future where resilient communities with respected rights thrive in forest landscapes that they manage sustainably and equitably. We take a long-term, landscape-based and inclusive approach in supporting local communities to secure their land and resource rights, stop deforestation, find alternative livelihoods and foster gender equality. With more than 36 years of experience, we have built trusting relationships with partners from communities, governments, businesses, academia and civil society organizations. Our innovations, knowledge and initiatives enable countries to foster good forest governance, mitigate and adapt to climate change and achieve the UN Global Goals.

We operate in the Asia-Pacific region, with country offices in Cambodia, Indonesia, Lao PDR, Myanmar, Nepal, Thailand and Viet Nam.

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