



Scoping study of research-to-action priorities for the Reversing Environmental Degradation in Africa and Asia (REDAA) programme: Southeast Asia

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RECOFTC

About the report

This scoping paper was written to inform and enhance the focus and research direction for the Reversing Environmental Degradation in Africa and Asia (REDAA) programme. It was commissioned by the International Institute for Environment and Development (IIED). Summaries of all the scoping papers can be found at www.redaa.org/scoping-studies.

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About the REDAA programme

REDAA is a programme that catalyses research, innovation and action at local, national and regional levels across Africa and Asia through a series of grant calls. Funded projects are interdisciplinary, often locally led and focus on solutions for ecosystem restoration and wildlife protection, enabling people and nature to thrive together in times of climate, resource and fiscal insecurity.

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Executive summary

Rationale and approach of the scoping study

This scoping study for Southeast Asia set out to identify six to 12 research-to-action priorities that the Reversing Environmental Degradation in Africa and Asia (REDAA) programme could potentially support, where **evidence** can be improved and taken up, **tools** can be improved and well used, and **governance systems** can be improved for environmental restoration and sustainable natural resource management. The scoping also identified emerging ecosystems and degradation hotspots where research-to-action priorities may be located. The research-to-action priorities were identified through literature reviews, key informant interviews, two workshops and field visits to Tonle Sap wetlands in Cambodia, Riau peatlands in Indonesia and Nan upland forests in Thailand.

Drivers and causes of environmental degradation across major ecosystems in Southeast Asia

Southeast Asia is home to an estimated 5.4% of the world's forests, 15% of the world's tropical forests, 6% of the world's peatlands — with 14% of global carbon stored in Southeast Asia's peatlands — and 35% of the world's mangroves. The region also contains extensive networks of lakes and rivers. Southeast Asia's forests are significant for millions of forest-dependent people's culture, wellbeing and livelihoods, and provide resilience to shocks such as extreme weather events. Peatlands also provide important livelihoods and ecosystem services to local communities, including flood and fire prevention, carbon sequestration and storage, provision of timber and non-timber forest products, and cultural and spiritual wellbeing. Lakes and rivers provide local communities with much of their protein intake and are important for their water-regulating services. Mangroves provide various ecosystem services for urban and peri-urban coastal communities, such as water filtration, mitigation of coastal erosion, and protection against tsunamis and cyclones. However, these ecosystems and services are often degraded and face continued threats.

Between the 1970s and 1995, the GDP of ASEAN (The Association of Southeast Asian Nations) countries increased at an average annual rate of 6.6%, which was more than double the average of other developing countries during the same period. After the economic crisis of 1997, ASEAN GDP continued to rise, more than quadrupling from US\$577 billion in 1999 to US\$3.0 trillion in 2020. This economic growth has had positive impacts; for example, from 2000–2018, all Southeast Asian countries recorded an increased Human Development Index (HDI). However, regional economic growth has been partially linked to agricultural expansion, driven by increasing regional and global trade and changes in production technologies. Agricultural growth came at the cost of declining natural forest cover, with oil palm, rubber, maize and rice leading the expansion. The forest industry developed a close relationship with agricultural land pioneers. Loggers operating legally and illegally opened up new land and established new roads, creating greater access to what were once hard-to-reach forest areas. Increasing industrialisation, urbanisation and related population growth have also been drivers of degradation.

The region lost an estimated 38.6 million hectares (ha) of forest between 1990 and 2020, an area larger than Japan. Many plantations are also heavily degraded in biodiversity terms. Eighty per cent of Southeast Asia's wetlands are threatened, and up to 45% of Southeast Asian peatland forests have been logged, drained, converted to agricultural land, or left degraded. Peatland forests have faced more pressure than other forests, especially in Indonesia. The water quality of Southeast Asia's lakes and rivers has degraded over the last decades due to pollution and unsustainable human interventions. Mangroves throughout the region are also threatened. Myanmar is a primary mangrove degradation hotspot, losing 35% of its mangroves from 1975–2005 and 28% between 2000 to 2014. The rate of mangrove loss in Myanmar was four times higher than the global average from 2000–2012.

Although deforestation rates in Southeast Asia have slowed over recent years, significant losses continue, caused primarily by large-scale agriculture, smallholder farming, the establishment of forest plantations, illegal logging and fires. Further, major threats to the region's inland freshwater systems come from agricultural and mining runoffs, untreated wastes and plastic pollution. Extensive hydrological alterations caused by diverting river flows for agriculture, industry and hydropower also threaten the region's wetlands and inland freshwater systems.

The key role of research-to-action in addressing degradation in Southeast Asia

The future of the region's major ecosystems appears mixed, with continued loss and degradation from the above threats and also increasingly from climate change. However, important conservation and restoration efforts have begun over recent years and are set to continue over the next decade, supported by the UN Decade on Ecosystem Restoration (2021–2030), among other initiatives such as REDAA. Bridging challenges and gaps, and scaling up best practice in the evidence base, tools and governance systems concerning restoration and sustainable natural resources management research and practice, can aid in reaching restoration targets and mitigating causes of degradation. This will require the scaling up of best practices and the development of innovative mechanisms that enable the transition from practices, processes and governance systems that drive/cause degradation towards those that are sustainable and provide improvements for Indigenous Peoples', ethnic minorities', local communities' and other marginalised groups' (women, youth, migrant workers, landless labourers, displaced peoples and LGBTQ+) equity and wellbeing, better economic returns and deliver more ecologically productive and diverse landscapes. In turn, this will necessitate concerted efforts from regional through to local levels to develop evidence, tools, policies and practice that support restoration and sustainable natural resources management in multifunctional landscapes, as well as governance systems that strengthen coordination between various agencies and stakeholders.

Research-to-action priorities

Through a literature review, key informant interviews and field visits (to Tonle Sap Cambodia, Riau Indonesia, and Nan Thailand), and an evaluation of the criteria presented in Table 1 of this report, the scoping study proposed 11 research-to-action priority outcomes for improving evidence, tools and governance systems. This is for the REDAA programme to contribute towards the overall aim of achieving the transition away from practices and processes that produce degradation towards those that deliver greater ecological productivity and social equitability.

For this scoping report:

Evidence refers to the evidence base — research quality, research institutes, research gaps and research uptake — from which sustainable natural resources management and restoration research and projects are developed.

Tools refers to the varying processes, methods and virtual and physical instruments employed to implement sustainable natural resources management and restoration activities.

Governance systems refer to structures and processes that enable sustainable equity and inclusive implementation of sustainable natural resources management and restoration initiatives.

The research-to-action priorities identified reflect the gaps in the knowledge/evidence base and findings of the scoping study analysis. These recognise that transitioning from practices and processes that drive/cause environmental degradation requires scaling up of best practices and the development of innovative restoration and sustainable natural resources management tools, practices, processes and policies. These are derived from effective regional to local multi-sectoral research networks and multi-sectoral research (that where appropriate, factors in intersectional theory and methods), which can aid in developing:

- sustainable, ecologically productive and climate resilient landscapes;
- economically equitable value chains and governance processes that benefit Indigenous Peoples and local communities (IPs and LCs), smallholders, women, youth and other marginalised

groups' (women, youth, migrant workers, landless labourers, displaced peoples and LGBTQ+) concerning several parameters – economics, socio-cultural and in terms of health and general wellbeing; and,

- governance systems that strengthen coordination between various agencies and stakeholders to deliver multiple objectives.

Evidence

1. **Multi-sectoral national research-to-policy networks engaged in environmental restoration and sustainable natural resource management are strengthened alongside the research-to-policy processes within such networks.** Strengthening research-to-policy networks will foster research that: better reflects evidence on issues faced by IPs and LCs, women and youth and other marginalised groups; builds more equitable and sustainable business models between IPs and LCs, women and youth, the private sector and other key stakeholders; addresses data and knowledge needs to strengthen policies; develops more sustainable management of landscapes; aids governments to make evidence-based decisions and develop appropriate national restoration targets and other commitments (such as Nationally Determined Contributions (NDCs)) across sectors, and support said targets. It is recommended that such work be transboundary to reflect common degradation issues and restoration research, the cross-boundary nature of issues such as the illegal timber trade and haze from forest fires, and to amplify learning opportunities.

REDAA may build on existing cross-sectoral and inclusive regional and national research-to-policy initiatives (eg. EXPLORE, The Sustainable Mekong Research Network (SUMERNET), Strengthening Human Rights and Peace Education in ASEAN/Southeast Asia (SHAPE SEA), Economy and Environment Program for Southeast Asia (EEP-SEA)) to implement certain REDAA research. This is a way to strengthen existing research networks, create a platform for sharing evidence and find pathways and processes to create stronger collaboration between researchers, IPs and LCs and women's organisations, CSOs, the private sector and governmental departments.

2. **Research collaborations between CSOs, NGOs, research institutes, IPs and LCs and women groups/networks are built, and existing collaborations are strengthened.** In doing so, IPs and LCs, women and youth groups/networks have increased capacity to develop research proposals, conduct or contribute to the research design process, collect data, analyse and communicate research findings to appropriate stakeholders. Understanding between IPs and LCs' needs and interests and research methods could be developed by creating dialogues between IPs and LCs and women groups and networks, and researchers, CSOs and NGOs. Further, researchers' capacity should be increased to undertake participatory-action-research with IPs and LCs and women to ensure research objectives are developed in partnership with them for systematic documentation or, at a minimum, research should adhere to do-no-harm principles and strive for transformative outcomes.

Further, strengthening collaborations between CSOs, NGOs, research institutes, IPs and LCs and women groups and networks should work towards enabling said stakeholders to better address challenges in developing more inclusive evidence-based research when accounting for risks and safeguards of a restrictive research environment and civic space. Strengthened research collaborations may help mitigate or better address the challenges faced while conducting research concerning capacity and working on contentious issues. Therefore, strengthening research networks and outputs should lead to research that better reflects issues identified by IPs and LCs, women and marginalised groups while recognising and mitigating the risks associated with research.

3. **Restoration and sustainable natural resources management initiatives integrate intersectional theories and methods more effectively into research and practice.**

Environmental degradation hits marginalised members of society the hardest, including IPs and LCs, women, youth, migrant workers, landless labourers, and displaced peoples. When intersectional inequalities are not factored into restoration or sustainable resources management initiatives, this can perpetuate injustices against marginalised communities. Understanding social dimensions, emphasising equity and intersectionality, is vital to ensure restoration and sustainable natural resources management initiatives mitigate the production of greater inequity and conflict. Online and in-person dialogues, workshops or courses for academics and gender and social inclusion officers, and other NGO staff to attend is one method to increase knowledge and understanding of intersectional theory and methods at the regional level. Ensuring activities under REDAA factor in intersectional theories and methods where possible will generate evidence and processes to support their effective integration in restoration and sustainable management initiatives, with the aim of reducing inequality for IPs and LCs, women, youth, migrant workers, landless labourers, and displaced peoples.

Tools

4. **Research and governance processes for integrating Traditional Ecological Knowledge (TEK) into restoration and sustainable natural resource management tools, research and projects (including in revegetation, hydrological restoration, fire management, developing sustainable livelihoods and monitoring activities) are strengthened, and best practices are scaled up.** Working groups within the ASEAN platform (such as the ASEAN Working Group on Social Forestry and the ASEAN Working Group on Forest and Climate Change) can be employed to develop shared principles and an ethical code of conduct that builds on deep listening with Indigenous Peoples. The ASEAN shared principles and ethical code of conduct may be developed initially through an Indigenous/ethnic people-led workshop (working with organisations, eg. Asia Indigenous Peoples Pact, AIPP or partnering with Mekong Regional Land Governance project) to re-imagine and re-develop equitable ways forward for TEK partnerships in restoration and sustainable natural resource management, with explicit considerations for the rights, livelihoods and leadership of Indigenous Peoples.
5. **Drawing on existing and ongoing research, sustainable and climate-resilient business models that demonstrate improving IPs and LCs', women's and youth's (and other marginalised groups) wellbeing, equitability in value chains, economic returns and landscape ecological productivity are identified, strengthened, and scaled up through participatory approaches.** It is recommended that such models are built through a systems perspective, whereby product-market development occurred in unison and was based on IPs and LCs' participation with researchers and the private sector from project inception. This requires facilitating agreements for community-private sector partnerships in landscapes. This priority should aim to strengthen existing networks within and across landscapes and business partnerships in value chains and develop processes that aid in addressing/mitigating conflict while establishing mutual benefits for all.
6. **Drawing on existing and ongoing research, existing and potential IP and LC-centred approaches and models — that provide direct financing through payment for sustainable ecosystem management and restoration through carbon trading, biodiversity offsets, and nature-based offsets to IPs and LCs — are identified. And, through further research, they are strengthened and scaled up, and novel models are developed where needed.** Best practices and novel mechanisms for engaging with carbon trading, biodiversity offsets and nature-based offsets (for example, the Trees4All and micro-credit schemes initiated by RECOFTC) should be developed, piloted and scaled up throughout the region. Research-to-action activities under this target should aim to engage and strengthen financing mechanisms that support IPs and LCs at all stages of transitioning from degraded to reforested landscapes to mitigate against any potential loss of income. Models should ensure they improve equity, have robust benefit-sharing mechanisms, and adhere to Free and Prior Informed Consent principles and processes. Respecting IPs and LCs' customary tenure arrangements and territory must be

the starting point for these initiatives, and such initiatives should link to processes aimed at strengthening tenure and resource rights.

- 7. Produce multi-objective economic evaluations, developed through multi-sectoral and participatory-action-research, to explore the costs and benefits of contrasting landscape uses and management policies and practices which factor in climate change scenarios.** Outcomes that are more likely to provide multiple benefits, are more equitable and sustainable, and have climate change-resilient outcomes, should be elaborated and effectively communicated to diverse stakeholders. This is to support them in adjusting policies and practices to yield more sustainable and ecologically productive and diverse landscapes. Ongoing initiatives such as the Biodiversity-Based Economy Development Office (BEDO) in Thailand and the increased focus on the bio-circular-green economy at the 2022 APEC conference, show a willingness of the private sector and government to strengthen their engagement in sustainable landscape development. Such multi-objective economic evaluations can support these transitions.

Governance systems

- 8. National through to local governance practices and processes for identifying priority areas for restoration and planning restoration initiatives, are strengthened through multi-sectoral and participatory-action-research that integrates intersectional approaches to addressing inequity (IPs and LCs, women, youth, migrant workers, landless labourers and displaced peoples) through said initiatives.** Using a cross-sector and intersectional approach, research will identify and use models and approaches to ensure the participation of IPs and LCs, CSOs and other key actors in decision making to identify, plan and implement actions on restoration at the local and national levels. Evaluating these approaches in specific sites and using comparative analytical tools can ensure the replicability and scalability of these models.
- 9. Governance coordination mechanisms and integrated landscape approaches to restoration and resource management are strengthened in priority landscapes through multi-sectoral and participatory-action-research and decision-making tools.** Integrated landscape approaches should try to build and strengthen cooperation between government agencies and Community-Based Organisations (such as Community Forestry Committees or Provincial Community Forestry Coordination bodies), smallholders and the private sector. They should use processes that aid in developing knowledge and organisational capacity and building trust, while considering risks and safeguards concerning power differentials and potential conflicts. Decision-making tools such as Companion Modelling (ComMod) or multi-objective economic evaluations can be employed to enhance effective governance in integrated landscape management.
- 10. IPs and LCs' tenure and resource rights are strengthened through participatory-action research. This requires researching/identifying formal and informal pathways and processes through which IPs and LCs can engage with policy processes to strengthen tenure and resource rights.** Targeted data and knowledge that can be used to advocate for IPs and LCs tenure and resource rights during formal policymaking processes should be produced through participatory-action-research. For example, evidence of how the Kor Tor Chor land use policy in Thailand is being implemented on the ground and how it can be improved to strengthen IPs and LCs' tenure and resource rights. IPs and LCs capacity to improve resource rights and access through informal pathways (such as engagement in local government or writing to government ministers) can be strengthened and scaled up. ASEAN Guidelines, such as the Recognition of Customary Tenure in Forested Landscapes, the Guiding Principles on Social Forestry Enabling Legal Frameworks, and the ASEAN Working Group on Social Forestry, can provide a platform and entry points for such initiatives.
- 11. Rural and urban youth engagement in restoration and sustainable natural resources management initiatives are strengthened** through the continued support of initiatives that

collaborate with youth. This is through formal and non-formal environmental education that provide youth opportunities to partake in sustainable landscape management activities, as young environmental entrepreneurs, and as environmental guardians. REDAA, for example, can collaborate with the Youth Taskforce under the UN Decade on Ecosystem restoration (2021–2030).

Proposing priority landscapes for REDAA

The RECOFTC-REDAA scoping team identified 13 potential priority landscapes within which REDAA-supported initiatives might best achieve some of the above priority outputs. These landscapes were identified through use of the following criteria: contain Key Biodiversity Areas or Important Bird and Biodiversity Areas; contain intact and fragmented key habitats, inclusive of protected areas; and have the potential to empower vulnerable groups, including Indigenous Peoples, women, youth, migrant workers and landless labourers. REDAA activities can be led by and lead to economic benefits for said communities.

There is no fixed definition of a landscape. Landscapes may be defined by ecological processes, social factors — such as jurisdictional boundaries or even the area of an NGO project — or elements of both. For this scoping study, landscapes were primarily defined as jurisdictional areas, including provincial and sub-national jurisdictions, protected areas, and as is the case for Tonle Sap, a UNESCO World Heritage Site. The report also recommends the Dawna Tenasserim Myanmar-Thailand transboundary landscape due to its importance for biodiversity and forest integrity in the region. These landscapes are indicated on the two maps below and are:

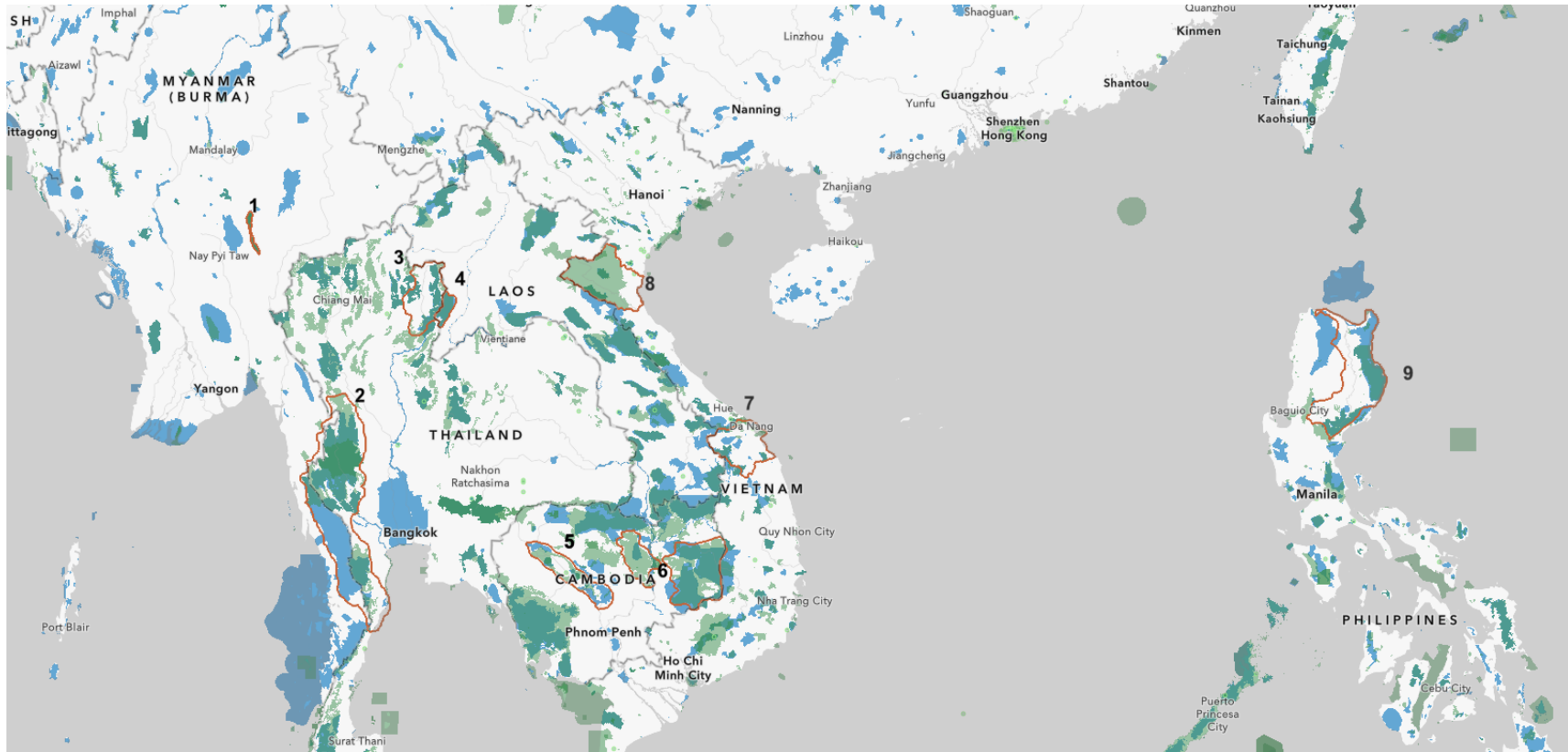
1. Inle Lake Wildlife Sanctuary, Myanmar
2. Dawna Tenasserim, a transboundary complex of protected areas in the Tanintharyi Region and the Kayin State of Myanmar and Western Thailand
3. Nan Province, Thailand
4. Nam Poui National Protected Area, Laos
5. Tonle Sap, UNESCO World Heritage Site, Cambodia
6. a) Prey Lang Wildlife Sanctuary and b) The Eastern Plains Landscape (, Seima Biodiversity Conservation Areas, Phnom Prich Wildlife Sanctuary, Mondulkiri Protected Forest), Cambodia¹
7. Quang Nam Province, Viet Nam
8. Nghe An Province, Viet Nam
9. Cagayan Valley Region, the Philippines
10. Riau Province, Sumatra Indonesia
11. North Kalimantan Province, Borneo, Indonesia
12. South Sulawesi Province, Sulawesi, Indonesia
13. Papua Barat, Papua and West Papua Provinces, Indonesia

Next steps

Consultations with key experts at local to regional level are now needed to consider, modify, fine-tune and further develop the priorities identified here, such that they can be incorporated in REDAA strategy.

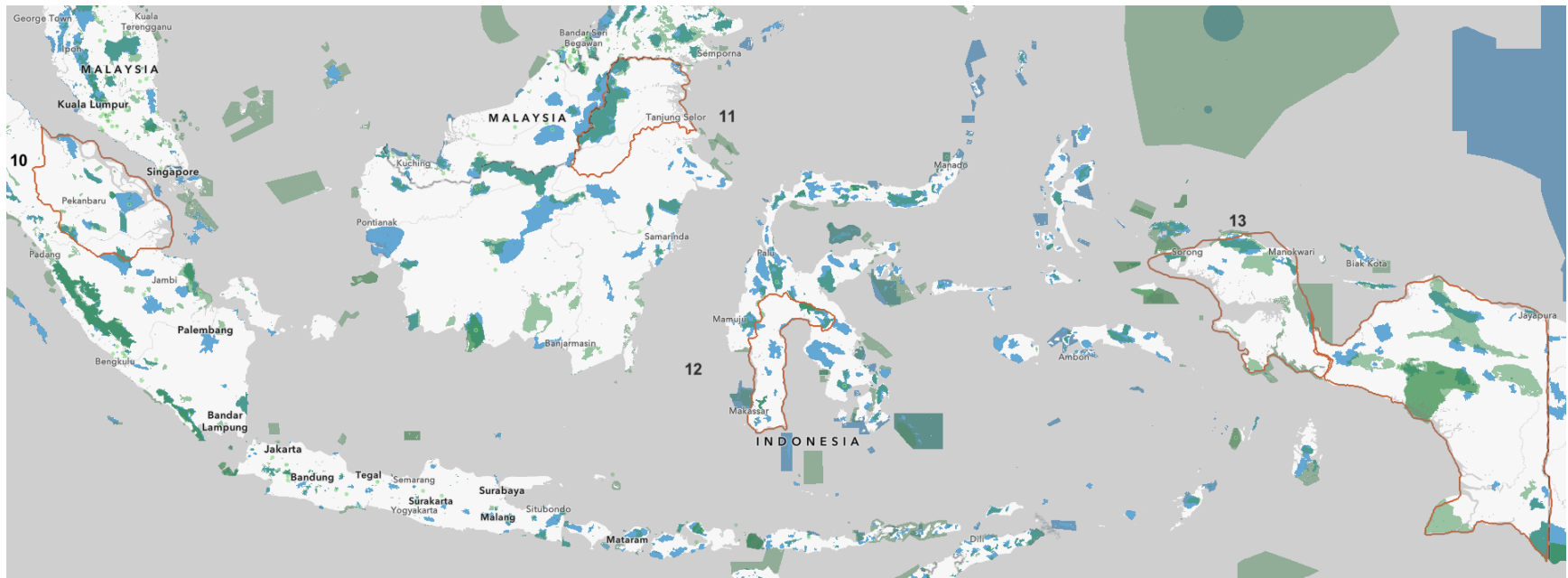
¹ Prey Lang Wildlife Sanctuary and Eastern Plains Landscape are considered two separate landscapes but presented together due to proximity on the figure of proposed landscapes .

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Proposed priority landscapes (circled in red and numbered) near Key Biodiversity Areas and Important Bird and Biodiversity Areas (blue) and protected areas (light green) (areas of darker green are the intersections of Key Biodiversity Areas and Important Bird and Biodiversity Areas and protected areas)

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Proposed priority landscapes (circled in red and numbered) near Key Biodiversity Areas and Important Bird and Biodiversity Areas (blue) and protected areas (light green) (areas of darker green are the intersections of Key Biodiversity Areas and Important Bird and Biodiversity Areas and protected areas)

Key definitions

Environmental degradation is defined “as the many human-caused processes that drive the decline or loss in biodiversity, ecosystem functions or ecosystem services in any terrestrial and associated aquatic ecosystems”. Degraded land, freshwater or ocean 'scapes can be defined as the state in which the 'scape “persistently declines or losses biodiversity and ecosystem functions and services that cannot fully recover unaided within decadal time scales” (Scholes et al., 2018, p.18). It is important to note that environmental degradation may also be politically defined by different parameters. For example, government officials and policy documents may consider a swidden landscape degraded, whereas IPs and LCs may consider a swidden landscape rich in biodiversity and ecosystem functions.

Indigenous Peoples, as defined by the [World Bank](#), refer to “distinct social, cultural, and ethnic groups whose norms and practices are tied to ancestral lands and natural resources where they live or from the land from which they have been displaced”. However, it is important to note that “[there is no generally accepted definition of Indigenous Peoples in a global context](#)”. In Southeast Asia, there is an ongoing debate regarding using the terms Indigenous Peoples or ethnic minorities (Baird, 2016). Some Indigenous Peoples choose to use the term ethnic groups. Further, some national governments, such as Laos, Myanmar, and Viet Nam, do not recognise the term Indigenous Peoples within their legal frameworks.

Intersectionality relates to theories and methodologies for examining the intersections of race, caste, ethnicity, disability, gender identity, sexual orientation, age and socioeconomic status. “Intersectional analyses are now widely used as a theory and methodology to understand entrenched social, political, and structural inequalities (Cho et al., 2013) and identities shaped at particular intersections of social marginalisation” (Elmhirst, 2022, p.4). In theory, restoration or natural resources management research/projects designed without considering how inequalities are produced may result in unintended consequences such as deepening inequality for marginalised groups, and further environmental degradation (Elmhirst, 2022, p.4).

Landscape. There is no fixed definition of a landscape. Landscapes may be defined by ecological processes, social factors — such as jurisdictional boundaries or even the area of an NGO project — or elements of both (Fischer, 2018). For peatlands, best practices recommend that they be managed as a hydrological unit. For wetlands, some studies suggest wetland management should extend beyond the wetland ecosystem to consider the entire basin (An & Verhoeven, 2019). A forest landscape may be defined as an area with natural forests, degraded forests, timber plantations, agricultural areas and degraded lands. Determinations of a landscape may also alter when considering varying timescales and management objectives (Fischer, 2018).

Landscape or a multifunctional 'scape (which includes land, freshwater and ocean scapes) **approach** “integrates functionally intact biodiversity with provisioning of material, non-material, and regulatory benefits, from local to larger scales, linking 'sharing' and 'sparing' concepts. It includes networks of protected areas and corridors, 'working' or 'managed' 'scapes modified for human use, and profoundly transformed ecosystems, such as urban and intensively farmed areas. For these innovative approaches to be successful and sustainable, equitably planned, and iterative participation of affected local communities and residents in their design and implementation will be essential to root solutions in local economies, needs, livelihoods and politics” (IPBES & IPCC, 2021, p.16).

Local communities for this scoping report, refers to rural, urban, and peri-urban communities that are not identified as or do not self-identify as Indigenous Peoples or ethnic minorities.

Smallholders “are small-scale farmers, pastoralists, forest keepers, fishers who manage areas varying from less than one hectare to ten hectares. Smallholders are characterised by family-focused motives such as favouring the stability of the farm household system, using mainly family labour for production, and using part of the produce for family consumption” (FAO, 2012).

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Sustainable livelihoods and landscapes here refer to “a characteristic or state whereby the needs of the present and local population can be met without compromising the ability of future generations or populations in other locations to meet their needs” when factoring in socio-cultural, political, economic and environmental parameters (IPBES secretariat, n.d.).

1 Introduction

1.1 Scoping study background and aims

While Southeast Asia covers 4% of the world's terrestrial area, it is home to a reported 20% of all species and contains four of the world's 25 biodiversity hotspots (Indo-Burma, Sundaland, the Philippines, and Wallacea) (Myers et al., 2000). The region is also home to a significant level of biocultural diversity. Cambodia, Laos, Myanmar and Viet Nam alone are home to an estimated 373 officially recognised Indigenous Peoples or ethnic groups (IWGIA, 2020a, 2020b; Minority Rights Group International, 2017, 2018). Many Indigenous Peoples and local communities (IPs and LCs)² living in or near forests, mangroves, wetlands and oceans depend on natural resources for their livelihood strategies and cultural practices (Franco et al., 2022). Further, nearly 70% of SEA's population lives in rural areas, depending on the land and its ecosystem services for their livelihoods (Tilahun et al., 2018).

Estimates of degraded land in Asia range from 12 million to 2.5 billion hectares (ha) (Gibbs & Salmon, 2015). Addressing environmental degradation is ever more crucial as global efforts to balance environmental protection and economic development, and address inequality are met with unprecedented obstacles such as the COVID-19 pandemic, climate change and the global economy teetering on the edge of a recession (United Nations, 2022). Scholes et al. (2018) state that "studies from Asia and Africa indicate that the cost of inaction in the face of land degradation is at least three times higher than the cost of inaction" with "on average, the benefits of restoration are 10 times higher than the costs" (p.10). Addressing environmental degradation through protecting, better managing and restoring natural ecosystems is vital for protecting biocultural diversity and improving the welfare of vulnerable rural and urban communities that rely on ecosystem services as essential components of their livelihood strategies and cultural systems.

1.2 Scoping study framework

This scoping study for SEA set out to identify six to 12 research-to-action priorities that the Reversing Environmental Degradation in Africa and Asia (REDAA) programme could potentially support where **evidence** can be improved and taken up, **tools** can be improved and well used, and **governance systems** can be improved for environmental restoration and sustainable natural resources management (Figure 1, Box 1). Two to four research-to-action priorities were to be identified for each of the three modalities (namely evidence, tools and governance systems). Research-to-action priorities were identified by reviewing (via a literature review, field visits and key informant interviews) **proven effective approaches, key gaps and opportunities** within the region for improved environmental restoration and sustainable natural resources management. This is through the three modalities and locations, and arenas in SEA where REDAA could support potential, incipient or existing initiatives.

²Please see the papers definitions regarding the terms Indigenous Peoples and local communities. As described in the definitions, there are ongoing debates in SEA regarding terms Indigenous Peoples and ethnic minorities, but in the report, we choose to use the terms Indigenous Peoples and local communities.

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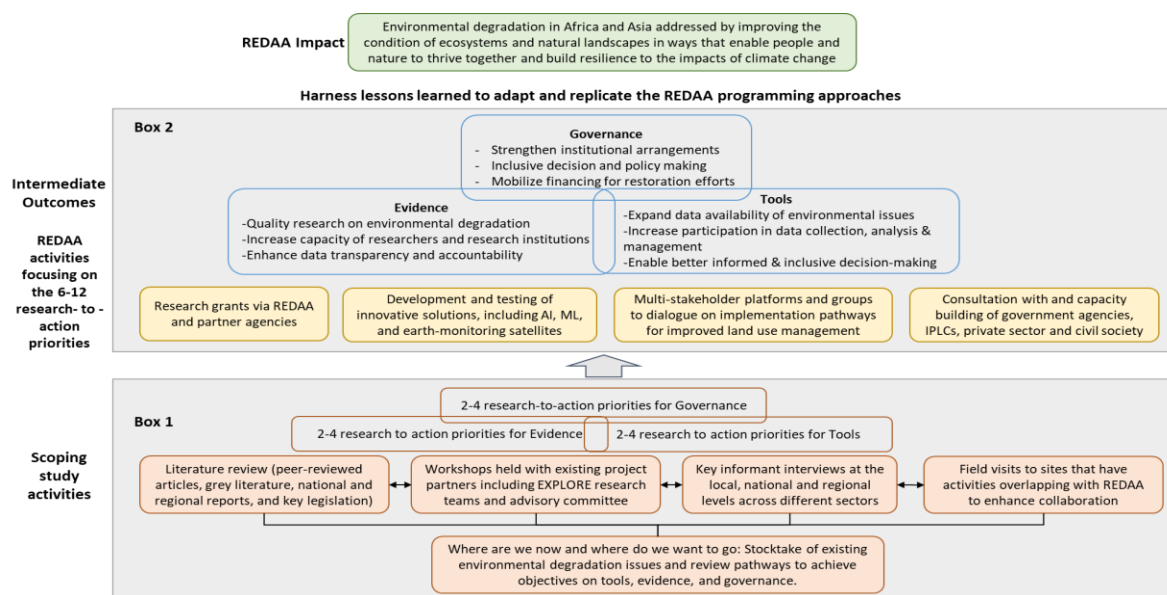


Figure 1: REDAA SEA scoping study framework

The identified research-to-action priorities from the three modalities will inform the proposed REDAA activities of research grants, development and testing of innovative solutions, multi-stakeholder platforms and consultations and capacity development of relevant stakeholders. Subsequently, REDAA interventions and investments in the identified research-to-action priorities will provide pathways towards the immediate outcomes of improved evidence (eg. higher quality research), tools (eg. improved uptake and systematic use of innovative research and communication tools), and governance systems (eg. participatory decision and policy-making processes) (Figure 1, Box 2).

The REDAA SEA scoping study will complement scoping already conducted for REDAA, which has identified emerging research-to-action priorities on environmental restoration and sustainable natural resources management. These include:

- Engagement with local experts in a bottom-up, locally-led process
- Leadership by IPs and LCs, including itinerant migrant workers, landless labourers and displaced peoples.
- Engagement with a multifunctional 'scape' approach which incorporates intact landscapes and the restoration/management of mixed landscapes
- Research should be place-based, collaborative, trans-disciplinary, and use diverse methods appropriate to the context.
- Local research often entails skilled facilitators, the development of relationships, trust, capacity and patience
- Research, tools and governance must engage with intersectional equality to be sustainable

The scoping studies have also identified emerging ecosystems and degradation hotspots where research-to-action priorities may be located; these include peatlands, wetlands, intersections between peatlands and forests, rivers, mangroves, and other coastal ecosystems, and 'intact' areas (those relatively free of mapped anthropogenic disturbance), possibly including parts of Malaysia, Indonesia, Myanmar and the Philippines.

1.3 Process and methods to identify research-to-action priorities

Step 1: Literature review and longlist

The RECOFTC-REDAA research team conducted a literature review using the guiding questions in Annex 1: **Guiding questions**. These were used to develop a long list of potential research-to-action priorities of key issues or strategic areas that REDAA could potentially support to aid the greater outcome of reversing environmental degradation in SEA. The RECOFTC-REDAA scoping team extracted peer-reviewed articles, grey literature and legislation from Google Scholar, SCOPUS, Web of Science and government databases for the literature review. The literature reviews identified drivers of degradation in the various ecosystems and countries, degradation hotspots, programmes and tools for restoration and sustainable natural resources management for various ecosystems, governance structures and issues, and research gaps. Search terms covered drivers of degradation, restoration and sustainable landscape management for key ecosystems in SEA, including forests, peatlands and wetlands (rivers, lakes, flooded grasslands and so on). Where possible, up-to-date research was cited, and the search prioritised identifying reviews from 2018 onwards relating to the search terms presented.

Step 2: Verification of longlist through field visits and key informant interviews

The field visits aided in contextualising the literature review findings, and evaluating, modifying and refining the selection of research-to-action priorities in the longlist (Annex 2: **Longlist of research-to-action priorities**). Three field sites were identified through the following criteria: were based within a landscape where RECOFTC has a presence³, were Key Biodiversity Areas (Annex 5), and issues of ongoing degradation and restoration initiatives were present. The three landscapes were: i) Tonlé Sap Lake, Siem Reap, Cambodia; ii) Riau peatlands, Indonesia; iii) Nan upland forests, Thailand (Figure 2).

³ RECOFTC's presence in landscape is emphasised due to the short timeframe for conducting the scoping. This also reflects the emphasis placed by Scoones (2021), REDAA ESRC Scoping paper, on the importance of relationships to "build common understanding, foster trust and provide the basis for genuine transdisciplinary engagement".

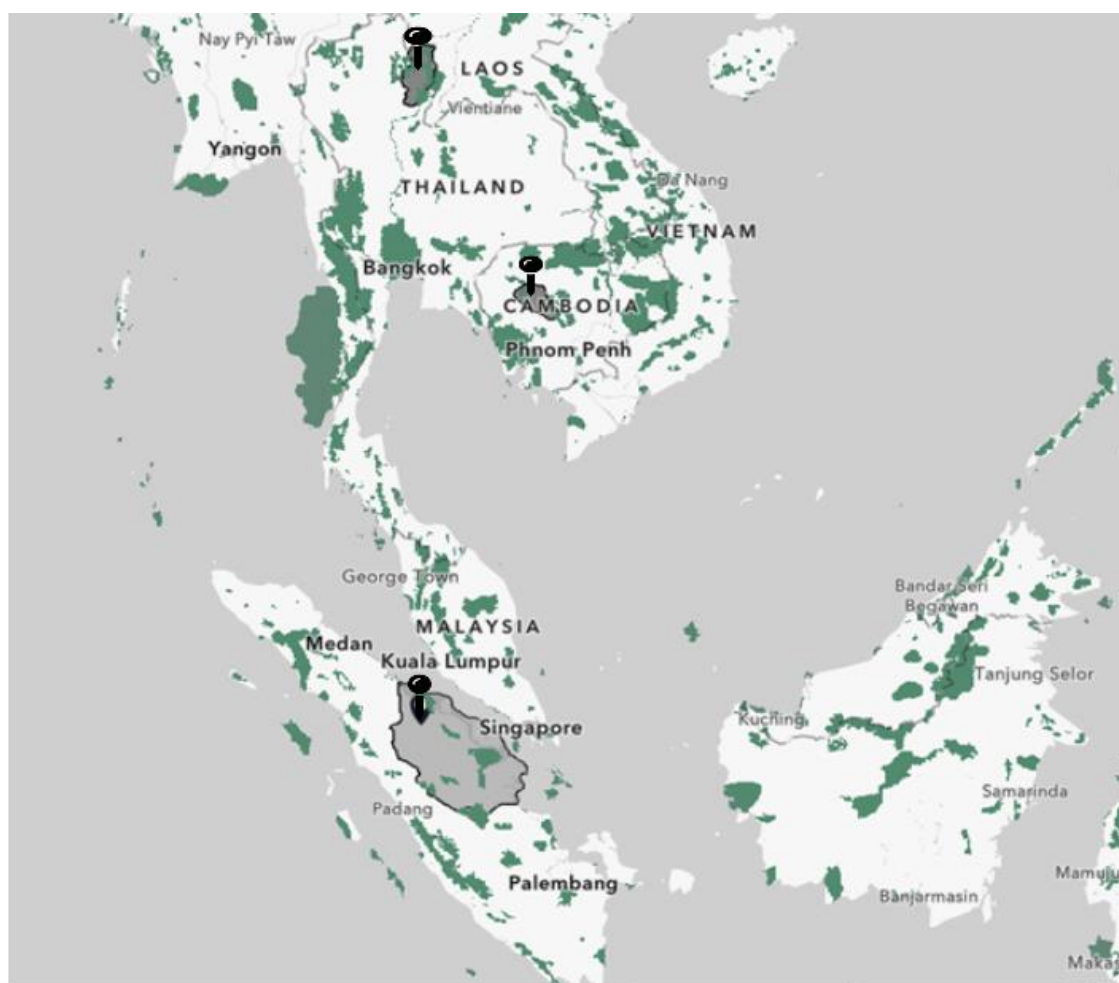


Figure 2: Map of Tonle Sap, Cambodia, Riau Indonesia and Nan Thailand in grey with Key Biodiversity Areas in green

During the field visit, researchers interviewed various stakeholder groups at the national, provincial and local levels, including government officers, the private sector, academics, NGOs, CSOs and IPs and LCs. In total, researchers interviewed 30 different organisations and 101 people (inclusive of group discussions). A full list of those organisations can be found in Annex 3: **Key informant interview participants**

The RECOFTC-REDAA scoping team conducted 12 key informant interviews (KIIs) with regional experts to evaluate, modify and refine the selection of research-to-action priorities in the longlist. Due to time limitations, KIIs were identified through known regional and national experts to the RECOFTC team and opportunity sampling. Stakeholder groups interviewed included NGOs, academics, donor agencies and the private sector. A total of 12 regional experts were interviewed for this stage. Annex 3 presents a list of people interviewed.

Step 3: Identification of six to 12 potential research-to-action priorities through a RECOFTC workshop and further key informant interviews

The RECOFTC-REDAA scoping team developed the research-to-action priority shortlist by evaluating, modifying and refining the longlist during the field visits and KIIs. Internally through a workshop, participants evaluated the shortlist against the criteria in *Table 1*. After the workshop, the RECOFTC-REDAA scoping team met to narrow down the six to 12 potential priorities from the workshop evaluation. The scoping team then verified the potential priorities through additional KIIs. A total of eight KIIs were conducted at this stage of the scoping (Annex 3: **Key informant interview participants**). After submitting the SEA REDAA scoping report, IIED will lead further regional consultations to refine and modify the potential research-to-action priorities.

Table 1: Criteria for identifying priorities

Impacts	Site-specific impact: if the issue(s) were addressed, it would have a major impact in a specific place
	Crosscutting impact: if the issue(s) were addressed, it would greatly impact systems or processes that affect many places
Participatory processes	Locally-led: the issue is best addressed by locally-led action, especially action led by Indigenous Peoples and local communities
	Intersectional: the issue is best addressed through intersectional understanding and empowerment of vulnerable groups, including Indigenous Peoples, women, youth, migrant workers, landless labourers and displaced peoples
Multi-sectoral	Cross-disciplinary and multi-stakeholder: the issue is best addressed by fostering multi-stakeholder and cross/trans-disciplinary collaborations
Value for money	Scale-appropriate: the issue can be usefully addressed with the scale of support that may be possible from the REDAA programme, eg. a grant of between about US\$10,000 and US\$100,000 over six to 24 months, or a grant of between US\$200,000 and US\$1 million over four years
	Timeframe-fitting: the issue can be completely addressed within six months to four years, or a significant contribution to addressing the issue can be made and verified within six months to four years
	Value for money: the ways in which the issue is addressed will provide good returns on investment, benefits to costs and value for money.

1.4 Report structure

Section 2 of the report reviews causes of environmental degradation in SEA, including socioeconomic trends and drivers of environmental degradation across SEA, causes of environmental degradation and hotspots across ecosystems (forests, peatlands, mangrove, freshwater wetlands), and governance impacts on environmental degradation.

Section 3 presents findings from a literature review, field visits (Tonle Sap wetlands in Cambodia, Riau Peatlands in Indonesia and Nan upland forests in Thailand) and KIIs of best practices and challenges concerning the evidence base, tools and governance systems of sustainable natural resources management and restoration in research and practice in SEA. It also presents recommendations for REDAA intervention based on the identified best practices, challenges and gaps.

Section 4 presents the proposed research-to-action priorities against the criteria for identifying priorities in Table 1.

Section 5 presents the proposed priority landscapes for REDAA intervention in SEA

Section 5 reviews tools and methods for determining priority landscapes for restoration, protection

Section 6 outlines key policies, interventions and research-to-policy platforms that REDAA may engage with in SEA

2 Drivers and causes of environmental degradation in Southeast Asia

2.1 Socioeconomic trends and drivers of environmental degradation across Southeast Asia

Between the 1970s and 1995, the GDP of ASEAN (The Association of Southeast Asian Nations) countries increased to an average annual rate of 6.6%, more than double the average of other developing countries during the same period (Setboonsarng, 1998). After the economic crisis of 1997, ASEAN member states' GDP continued to experience sustainable economic growth, with its GDP more than quadrupling from US\$577 billion in 1999 to US\$2,551 billion in 2016 (PwC, 2018). Economic growth resulted in poverty reduction. Between 2005 and 2018 in Myanmar, the percentage of the population living below the national poverty line declined from 48.2% in 2005 to 24.8% in 2018. In Cambodia, declines were 33% to 13.5% over the same period, Indonesia 16% to 9.8%, Laos 33.5% to 9.8%, Thailand 26.8% to 9%, and Viet Nam 18.1% to 6.8% (ASEAN Secretariat, 2020). Further, from 2000–2018, all SEA countries recorded an increased Human Development Index (HDI) (ASEAN Secretariat, 2020). Singapore and Thailand score well on health and education metrics of the HDI, and Brunei, Viet Nam, Malaysia, the Philippines and Indonesia are above the global average for tertiary education enrolment. However, during the same period (2005–2018), income inequality increased in Indonesia and Laos but declined slightly — despite remaining high — in Cambodia, Malaysia and Thailand. In recent years economic growth has slowed due to the impacts of the COVID-19 pandemic and energy and food price increases linked to the war in Ukraine (ADB, 2022b). The decline in economic activity driven by the pandemic is estimated to have increased the number of people in extreme poverty (those who live on less than US\$1.90 per day) by 5.4 million in 2020 (ADB, 2022a).

The economic growth in the region has been partially linked to agricultural expansion, driven by increasing regional and global trade and changes in production technologies (Booth, 2018). Smallholder/family farms and larger industrial plantations were, and are still, instrumental in agricultural expansion. Since the 1960s, Indonesia, Malaysia, and the Philippines began implementing comprehensive agricultural development policies, followed by Thailand in the 1970s and Viet Nam in the 1980s (de Koninck & Rousseau, 2013). In Thailand, the total irrigated area rose almost exponentially from 1960 to 2010 before levelling off (de Koninck & Rousseau, 2013). Although the area of irrigated land has always been high in Indonesia compared to other SEA countries, there was a sharp rise in irrigated areas from the mid-1990s to 2008 (de Koninck & Rousseau, 2013).

Agricultural expansion came at the cost of declining natural forest cover, with oil palm, rubber, maize and rice, leading the expansion (de Koninck & Rousseau, 2013). The forest industry “evolved in close relationship with agricultural land pioneering” as both legal and illegal loggers opened new land and established new roads, creating greater access (de Koninck & Rousseau, 2013). Although deforestation rates in SEA have slowed over recent years, significant losses continue (FAO, 2022b) (further details provided in section 2.2.1). Other forms of environmental degradation, such as an increase in harmful chemicals in water supplies, have also increased since the 1960s due to increasing industrialisation, urbanisation, and related population growth (Iwami, 2001).

Many key areas for biodiversity and the provision of ecosystem services cross boundaries. Further, evidence from past logging bans shows how policy efforts to decrease degradation in one country can

lead to increasing degradation in neighbouring countries (Lakanavichian, 2001). Therefore, regional cooperation is key to addressing environmental degradation throughout SEA.

2.2 Causes of environmental degradation and degradation hotspots across major ecosystems in Southeast Asia

Following the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) (2018b) and REDAA scoping study report developed by Judith Fisher for Tetra Tech International Development (on developing innovative landscape management regimes and nature-based solutions), this section discusses the causes of degradation within the major biomes and ecosystems of SEA. These include terrestrial biomes, of which tropical and subtropical forests are the predominant ecosystem in SEA (Figure 3); inland freshwater, predominantly lakes and rivers; wetlands, of which peatlands are the predominate wetland ecosystem in the region, and coastal biomes, which include mangroves and coral reefs. Coral reefs are not included in this report due to the scope identified in the previous REDAA scoping, which stated that for the REDAA programme, marine and coral reef ecosystems would not be considered.

For each ecosystem, this section summarises the coverage in SEA, its importance for biodiversity and ecosystem services, degradation hotspots across the region as identified in the scholarly and grey literature, and causes of degradation.

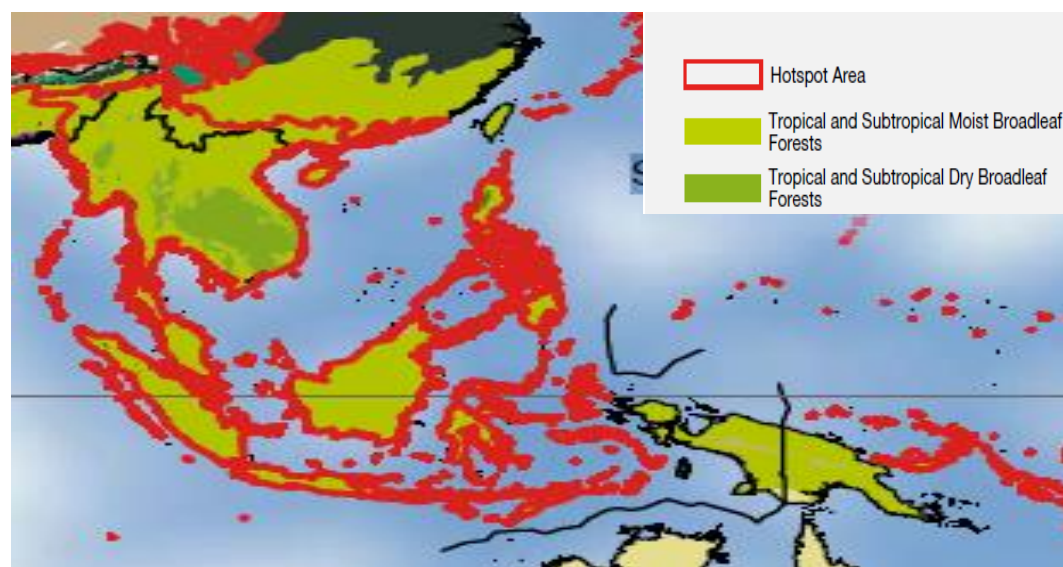


Figure 3: Major ecoregions in the Southeast Asia, South Asia and Northeast Asia geographical subregions as defined by IPBES (2018b)

2.2.1 Forests

The region is home to an estimated 5.4% of the world's forests (FAO, 2020) and 15% of the world's tropical forests (Stibig *et al.*, 2014). Across SEA, there are approximately 220 million ha, including 50.5 million ha of primary forest cover and 15.7 million ha of plantations (FAO, 2020) (

Table 2). The highest concentrations of biodiversity are found in primary forests, the largest area of which is located in Indonesia. The region's forests are also significant for millions of forest-dependent people (Table 3). Forests are important for peoples' culture, wellbeing and livelihoods and provide resilience to shocks such as extreme weather events (Veettil et al., 2018; Wang et al., 2019) and COVID-19⁴.



Figure 4: Forest cover in SEA 2019 (Copernicus Land Monitoring Service)

Table 2: Forest, primary forest and plantation forest areas in Southeast Asia 1990-2020 (FAO 2020) (NB. assessments of previous years are not fully comparable as forest cover is determined by different parameters)

	Forest cover 1990 % of the	The forest cover of the total	Forest cover 1990 (1,000 ha)	Forest cover 2020 (1,000 ha)	Plantation forest 1990 (1,000 ha)	Plantation forest 2020 (1,000 ha)	Primary forest 1990 (1,000 ha)	Primary forest 2020 (1,000 ha)

⁴ RECOFTC. June 2021. Contributions of community forestry to COVID-19 response and recovery in seven Asian countries. Bangkok, RECOFTC

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	total land area	land area is 2020 %						
Brunei	78.4	72.1	413	380	0.00	0.00	313	263
Cambodia	62.3	45.7	11,005	8,068	67.29	603.97	766	322
Indonesia	65.4	49.1	118,545	92,133	145.49	4525.70	59,743	44,740
Laos	77.3	71.9	17,843	16,596	6.00	168.00	No data	No data
Malaysia	62.8	58.2	20,619	19,114	1934.68	1697.12	1086	1086
Myanmar	60.0	43.7	39,218	28,544	30.70	427.09	3192	3192
the Philippines	26.1	24.1	20,619	19,114	260.62	380.52	861	861
Singapore	22.1	21.7	15	16	0.00	0.00	No data	No data
Thailand	37.9	38.9	19,361	19,873	1720.00	3537.00	No data	No data
Timor Leste	64.8	61.9	963	921	0.00	0.00	No data	No data
Viet Nam	28.8	46.7	9,376	14,643	745.00	4349.37	384	80
Totals			257,976	219,402	4,910	15,689	66,345	50,544

Table 3: Population of Indigenous Peoples (IWGIA 2022) and number and percentage of people in Southeast Asia living within a 1km and 5km buffer of forests in 2021 (calculations based on (Newton et al., 2020))

Country	Total population (2021) World Bank	Estimated Indigenous Peoples population	1 km Buffer		5 km Buffer	
			Number of forest-proximate people (2021)	Percentage of the population (2021)	Number of forest-proximate people (2021)	Percentage of the population (2021)
Brunei	441,532	No data	152,287	34.5	192,323	43.6
Cambodia	16,946,446.00	250,000–400,000	1,321,013	7.8	5,087,109	30.0
Indonesia	276,361,788	50,000,000–70,000,000	70,486,087	25.5	102,776,672	37.2
Laos	7,379,358	No data	3,157,814	42.8	4,984,248	67.5
Malaysia	32,776,195	33,450,000	8,645,867	26.4	10,133,123	30.9
Myanmar	54,806,014	No data	6,408,292	11.7	16,110,501	29.4

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the Philippines	111,046,910	10,000,000 – 20,000,000	23,730,678	21.4	34,864,362	31.4
Singapore	5,453,566	No data	32,398	0.6	64,006	1.2
Thailand	69,950,844	6,100,000	8,523,892	12.2	26,110,668	37.3
Viet Nam	98,169,829	14,100,000 (ethnic peoples)	10,706,303	10.9	25,410,032	25.9
Total	673,332,482		133,164,631	19.8	225,733,044	33.5



Figure 5: Forest landscape integrity in 2020 (Source: Global Forest Watch)

FAO (2020) estimates that the 11 countries in the region lost 38.6 million ha of forest between 1990 and 2020, an area larger than Japan. Much of SEA's remaining primary forests are degraded due to illegal logging and fires (See **Error! Reference source not found.**). Many plantations are also heavily degraded in biodiversity terms (Dang, 2022). It is estimated that approximately 80% of Laos' forests are degraded (Profor, 2019), while Myanmar has an estimated 25.7 million ha of degraded forests (Bhagwat et al., 2017).

Research to quantify the amount of greenhouse gas emissions (GHGs) from tropical deforestation and degradation between 2005 and 2010 found that 41% (2.56 Gt CO₂ yr⁻¹) of these types of emissions came from SEA (Estoque et al., 2019). The region is a GHGs emitter from the land use, land use change and forestry (LULUCF) sector. Indonesia has the largest footprint from deforestation, forest degradation and peatland exploitation, while Viet Nam has negative GHG from LULUCF (ASEAN Secretariat, 2021).

Pacheco et al. (2021) identified 24 global deforestation hotspots where deforestation significantly increased from 2004–2017, six of which were in SEA:

1. North and northeast Cambodia.
Cambodia lost 0.8 million ha of forest cover between 2004 and 2017 (19.6% of forest area in 2000)
2. Central and southern Laos.
Laos lost 100,000 ha of forest cover between 2004 and 2017 (3% of forest area in 2000)
3. Myanmar's northern Kachin and Shan States and southern Tanintharyi State.
Myanmar lost 0.8 million ha of forest cover between 2004 and 2017 (19.6% of forest area in 2000)
4. Sumatra, Indonesia, where deforestation is more active in the central-eastern and north-eastern areas of the island, particularly in Riau province
Sumatra island, Indonesia, lost 2.5 million ha of forest cover between 2004 and 2017 (25.2% of forest area in 2000)
5. Borneo — in Indonesian Borneo, deforestation is decreasing in West and Central Kalimantan and increasing in East Kalimantan — in Malaysian Borneo, deforestation is still an issue but is decreasing in the state of Sarawak
Borneo lost 5.8 million ha of forest cover between 2004 and 2017 (21.9% of forest area in 2000)
6. Papua, Indonesia, where deforestation is estimated to have doubled in 2017/18 (80,000ha) compared to 2006–2009 figures (40,000ha on average per year).

The direct causes of deforestation are similar across all six deforestation hotspots, with large-scale agriculture being a primary cause of forest loss or degradation across all the hotspots (Pacheco et al., 2021). In Cambodia and Myanmar, economic land concessions (ELCs) and large-scale agriculture concessions, respectively established by local and international companies, have been the primary causes of deforestation and degradation, where concessions have often been used as an instrument for illegal logging. In Myanmar, crops such as rice, nut trees, maize, rubber and oil palm drove deforestation and degradation (Pacheco et al., 2021). In Cambodia, the main crop was rubber. In Sumatra and Borneo, the expansion of oil palm plantations is the leading cause of deforestation in forests and peatlands. In Laos, smallholder farming is the leading cause of deforestation and degradation. Small-scale farmers working with intermediaries linked to large businesses or small-scale farmers contracted directly with agribusinesses carry out forest conversion for crops such as maize, cassava, sugarcane, rubber, coffee, cacao and pepper. Small-scale farmers are also a primary cause of deforestation and degradation in Cambodia and an important but secondary cause in Myanmar, Sumatra, Borneo, and Papua, Indonesia (Pacheco et al., 2021).

In Myanmar, clearing natural forests via legal and illegal logging (outside forest conversion from agricultural expansion) is a primary cause of deforestation. A vast majority of logs exported are illegal and are transported to regional and global markets via China, Thailand and Viet Nam (Pacheco et al., 2021). Illegal logging is also an important yet secondary cause of deforestation and degradation in Cambodia.

In Sumatra and Borneo, the establishment of pulpwood plantations is a primary cause of the clearance of natural forests, with Riau province, Sumatra and West and East Kalimantan in Borneo being the principal areas of recent expansions. In Laos, eucalyptus and acacia plantations are an important and secondary

cause of deforestation. Tree plantations are a lesser cause of deforestation and degradation in Cambodia (Pacheco et al., 2021).

Other causes of deforestation and degradation include urban expansion and fires, which are secondary causes in Cambodia, Sumatra and Borneo (Pacheco et al., 2021). Data from Global Forest Watch (2022) shows that from 2001 to 2021, Indonesia lost 2.84 million ha of tree cover from fires. The peak year was 2015/16, when 729,000ha of tree cover were lost. The impacts of these fires are felt far beyond the affected landscapes, including through haze pollution. The toxic smoke from the fires — which contains carcinogenic gases such as ammonia, benzene and hydrogen cyanide — can take a heavy toll on human health (Johnston et al., 2012; Weinhold, 2012).

Hydropower construction and transport infrastructure are also major secondary causes of deforestation and degradation in Laos, Myanmar and Borneo, with the expansion of road infrastructure in critical areas in Sumatra. Mining is also a major secondary cause of deforestation and degradation in Laos and Myanmar, and major but relatively less so in Cambodia, Sumatra and Borneo (Pacheco et al., 2021).

Intact and fragmented forests in SEA are mostly located within landscapes with urban and peri-urban areas. The ecosystem services provided by forests benefit urban and peri-urban communities, yet the responsibilities of the general population to protect forests are more acutely felt by rural people. Further, rapid urbanisation and consumption habits of local, regional and global urban populations contribute to forest loss through increasing demands for agricultural products.

The future of the region's forests appears mixed, with continued loss and degradation from the above threats, but also from increasingly changing climate, as well as improved conservation and restoration efforts. Estoque et al. (2019) proposed a worst-case scenario that would see the region's forests declining further, losing another 5.2 million ha by 2050, with others estimating a 40% loss of biodiversity by 2010 (Sodhi et al., 2004). However, the best-case scenario would see an addition of 19.6 million ha of forests. The region has recently experienced significant forest restoration, reforestation and afforestation activities – estimated to be 2.5 million ha from 2000 to 2019 (FAO 2020).

2.2.2 Peatlands

Approximately 6% (23.7 million ha) of the global peatlands are based in SEA, and 14% of global carbon is stored in SEA's peatlands (68 billion tonnes) (Omar et al., 2022; Page et al., 2011). Figure 6 shows the distribution of peatlands in the region and lists 52 key peatland areas. Indonesia has the largest peatland area in SEA, with nearly 20.7 million ha covering 10.8% of the country's territory (Table 4).

Peatlands have high endemic biodiversity supporting unique fauna and flora (Harrison & Rieley, 2018) and soil biodiversity (Liu et al., 2020). Posa et al. (2011) report that in SEA, 45% of mammal and 33% of bird species recorded in tropical peat swamp forests have an IUCN (International Union for the Conservation of Nature) Red List status of near threatened or higher. This includes iconic flagship species such as the orangutan (*Pongo sp.*), gibbon (*Hylobatidae sp.*), tiger (*Panthera tigris*), clouded leopard (*Neofelis diardi*) and Storm's stork (*Ciconia stormi*) (Harrison & Rieley, 2018). Peatlands also provide important livelihoods and ecosystem services to local communities, including flood and fire prevention, water filtration and purification, carbon sequestration and storage, provision of timber and non-timber forest products, and cultural and spiritual wellbeing" (Harrison & Rieley, 2018, p. 1).

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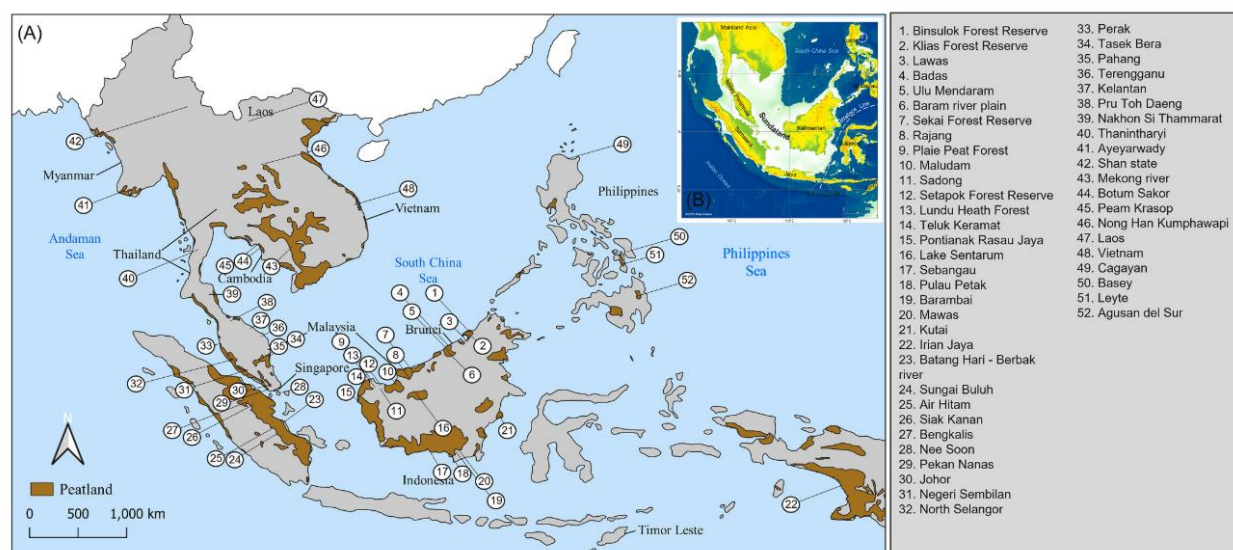


Figure 6: Peatland distribution in SEA and the approximate location of the 52 sites from Omar et al. (2022)

Table 4: Estimated area of peatlands covering SEA (modified from Aseanpeat, 2021a by Omar et al., 2022)

Country	Country area (ha)	Total peatland area (ha)	Percentage of the country occupied by peatlands
Brunei	576,500	90,900	15.8
Cambodia	18,103,500	4580	0
Indonesia	191,944,000	20,695,000	10.8
Laos	23,765,500	19,100	0.1
Malaysia	33,080,300	2,588,900	7.8
Myanmar	67,657,800	122,800	0.2
Singapore	72,860	50	0.1
Thailand	51,312,200	63,800	0.1
the Philippines	30,000,000	64,500	0.2
Viet Nam	22,121,200	53,300	0.2

Eighty per cent of SEA's wetlands are threatened (Hughes, 2017a), and up to 45% of SEA's peatland forests have been logged, drained, converted to agricultural land, or left degraded (Cole et al., 2021). Peatland forests have faced more pressure than other forests, especially in Indonesia. Available data from Miettinen et al. (2011) shows that between 2000 and 2010, peatland forests were lost at an average annual rate of 2.2% per year compared to 1.2% per year of the lowland evergreen forests. In peninsular Malaysia, Sumatra and Borneo, by 2015, only 6.4% of peatland forests remained intact (Miettinen et al., 2016). In the Indonesian islands of Sumatra and Kalimantan, between 2000 to 2018, the area of primary

forest on peatlands reduced from approximately 6 million ha to 3.4 million ha due to oil palm and logging operations (Nikonovas et al., 2020). The rate of deforestation peaked in 2012, with a notable fall since 2017, mainly attributed to the loss of forest area and policy change (Nikonovas et al., 2020). However, new policies, such as the 2020 expanded Food Estate Program, bring further threats to Indonesia's peatlands (Monitor Food Estate, n.d.).

Peatlands in SEA face continued threats from logging, agricultural conversion, drainage, fire and wildlife exploitation (Cole et al., 2021; Nikonovas et al., 2020). Drainage activities, such as building canals and irrigation systems, make peatlands more suitable for growing crops such as rice and oil palm, creating potentially devastating results for the ecosystem. The drainage activities lower the water table, exposing the peat layer to increased fire risk. Fire is used as a “cheap, fast and effective means to clear large areas of forest debris and regrowth” when establishing plantations (Page & Hooijer, 2016). Once established, peat fires “may burn for days, weeks or even months and are very difficult to control” (Page & Hooijer, 2016). “A single year of peatland fires in Southeast Asia is estimated to have released an amount of carbon equivalent to as much as 40% of all global fossil fuel emissions for that year (Page et al., 2002)” (IPBES, 2018a).

Climate change may also exacerbate peatland degradation when facing long droughts or floods. Much of SEA's peatlands are in low-lying areas projected to be impacted by climate change-related sea-level rise. It is projected that peatlands will see increased saline intrusion, reduced quality of freshwater supply, increased subsidence and flooding, and an increased fire and haze risk in areas with a low water level (Lo & Parish, 2015).

2.2.3 Lakes and rivers

In SEA, there is an extensive river and lake network. The Mekong river, which runs through China, Cambodia, Laos, Myanmar, Thailand and Viet Nam, is the twelfth longest river in the world and the longest in SEA. Other major rivers include the Irrawaddy (Myanmar), Salween (China, Myanmar and Thailand) and Sông Hông (China and Viet Nam). Table 5 shows a list of the major rivers and their length.

Table 5: List of major rivers in SEA, with approximate channel length and location (at least one river per SEA country is listed, including the longest rivers in the country, excluding Singapore)

River Name	Channel length (km)	Country/ies
Mekong	4,880	China, Cambodia, Laos, Myanmar, Thailand, and Viet Nam
Salween	2,820	China, Myanmar and Thailand
Irrawaddy	2010	Myanmar
Sông Hông	1,149	China and Viet Nam
Kapuas	1,143	Indonesia (Borneo)
Chao Phraya	1,110	Thailand
Mahakam	980	Indonesia (Borneo)
Barito River	900	Indonesia (Borneo)
Bengawan Solo	600	Indonesia (Java)
Rajang	563	Malaysia (Sarawak)
Kinabatangan	560	Malaysia (Saba)
Pahang	440	Peninsular Malaysia
Cagayan	350	the Philippines
Rio Grande de Mindanao	320	the Philippines
Belait	209	Brunei
Tutong	137	Brunei
Loes	80	Timor Leste

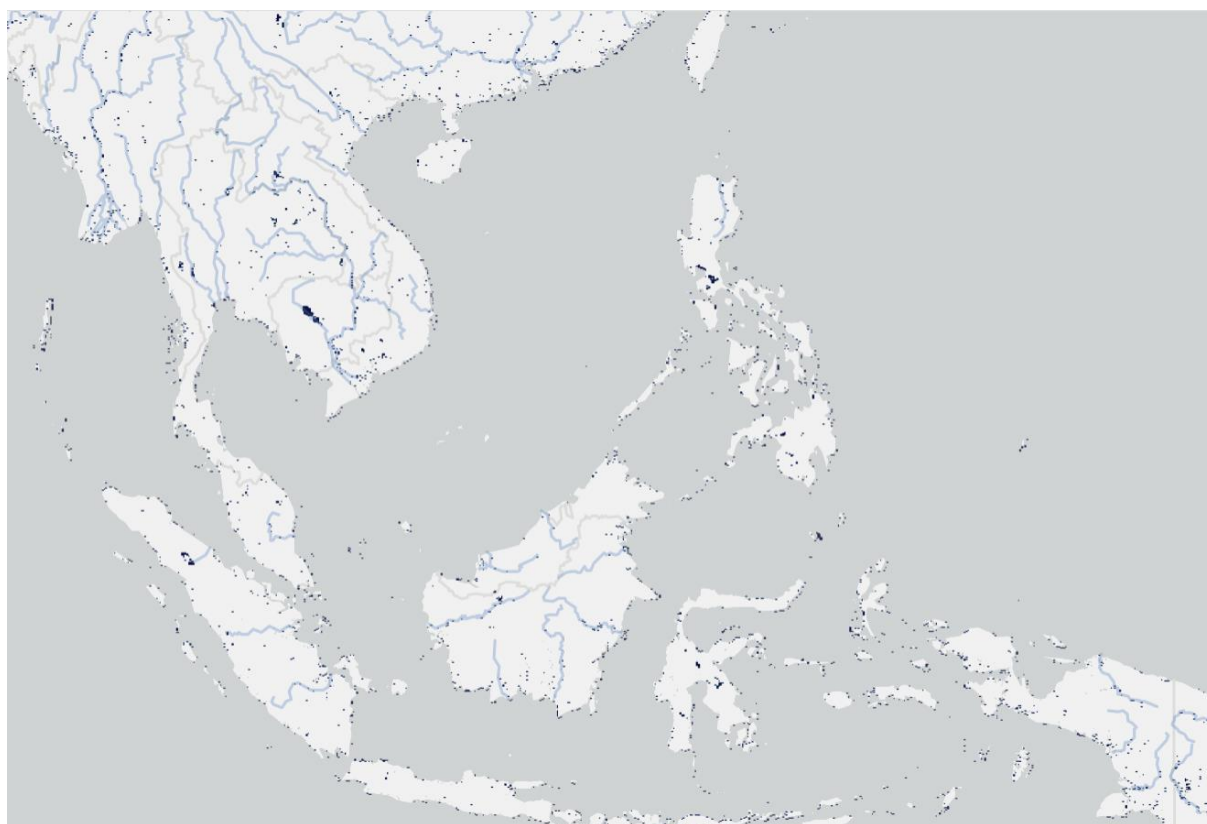


Figure 7: Permanent inland water bodies in SEA 2019 (Source: Copernicus Land Monitoring Service)

Cambodia harbours the largest permanent freshwater body in SEA, the Tonle Sap. Tonle Sap's watershed extends more than approximately 43% of the country (Uk et al., 2018). Tonle Sap has an area of 300,000ha in the dry season, expanding to more than 1,500,000ha in the wet season (Uk et al., 2018). Indonesia has more than 500 freshwater lakes with an area totalling 50,000ha (0.25% of Indonesia's total area). The largest lake is Lake Toba, with an area of 113,000ha (Giesen, 1994). Other important natural lakes in SEA include Songkhla lake, Thailand's largest natural lake, with an area of approximately 102,000ha, and Indawgyi Lake in Myanmar, with an area of approximately 254km². There are few natural lakes in Malaysia, and most are located in peatland swamp areas, but about 73 reservoirs have been created for water supply and hydropower (Sharip et al., 2008).

SEA's inland freshwater systems contain high levels of biodiversity. There are 1,230 freshwater fish species identified in Indonesia (IPBES, 2018b). The Mekong River system is thought to harbour 898 known indigenous fish species (IPBES, 2018b). The Philippines' inland water areas harbour around 348 freshwater fish, of which 16% are endemic and 56% indigenous (Palma, 2016). The Sulawesi Lakes Malili and Poso "are known to harbour a high number of endemic taxa such as 53 species of *Tylomelania* (endemic snails), 8 *Gecarcinucidae* (crabs), 18 *Caridina* (shrimps), 31 *Telmatherinidae* (sailfin silverside fish) and several freshwater sponges, eg. *Pachydictyum globosum*, *Nudospongilla vasta* (Meixner et al., 2007; von Rintelen et al., 2012)" (IPBES, 2018b, p. 200). Myanmar's Upper Chindwin River is home to many turtle and mollusc species (Aung et al., 2019). Lakes and rivers are also important livelihood sources for IPs and LCs. The Lower Mekong delta "provides local communities with up to 80% of their protein intake" (IBRRI & ICUN, 2020) as well as being important for their water regulating services (IPBES, 2018b).

The water quality of SEA's lakes and rivers has degraded over the last decade. Hotspots for degradation are "near Vientiane City; the Sekong, Sesan, and Srepok (3S) Rivers; the Tonle Sap Lake system; and the Mekong Delta" (Sor et al., 2021, p.1). Thailand's lakes and rivers have also decreased in water quality over the last decade (Chotpantarat & Boonkaewwan, 2018; Tian et al., 2019; Yadav et al., 2019). In Indonesia, reports confirm that the Citarum River suffers from pollution (Hairan et al., 2021), and Lake Toba suffers severe water pollution (World Resources Institute, 2018).

Agricultural and mining run-offs, as well as untreated wastes, are causes of degradation. Pollution from sewage and wastewater run-off is classified as "a major slow hazard" that threatens human health and wetland degradation (Cochard, 2017), with agent orange still impacting waterways and aquatic species in Viet Nam (Truong & Dinh, 2021). Hughes (2017a, p. 16) summarises:

"Northern SE Asia, pollution has driven the loss of almost all aquatic vertebrates in at least 5% of total stream length, with major reductions in aquatic diversity in other parts of waterways (Dudgeon 2005), and impairments of reproductive ability have been noted for some species (Huet al. 2009). Furthermore, the concentrations of organic and inorganic compounds from agricultural run-off and other forms of pollution have been shown to drive a shift from sensitive and specialist species to more generalist and common species within riverine systems (Choi et al., 2015)".

Plastic pollution of rivers is also of major concern, with reports of the monthly average amount of plastic items per hour flowing in SEA rivers being higher than the global average (Calcar & Emmerik, 2019). Approximately 385,300kg flow from the Chao Phraya to the sea annually, and 684,000kg from the Mekong (<https://theoceancleanup.com/sources/>). The highest freshwater plastic concentrations in SEA have been reported in the Saigon River (Chen et al., 2021). However, there are low levels of research on microplastic contamination in SEA rivers, with little work conducted in Malaysia, a known source of ocean plastics, making comparisons or determination of specific hotspots in SEA difficult (Chen et al., 2021). Rivers that flow through urban areas are particularly impacted by plastic pollution. The Marilao River that flows through Metro Manila has become synonymous with images of plastic pollution, with studies showing high levels of large plastic fragments in the waterways (Osorio et al., 2021; Tanchuling & Osorio, 2022). Lakes are also impacted by plastic pollution. Finnegan & Gouramanis (2021) estimated that between 2000 and 2020, 221,700 tons of plastic entered Tonle Sap. They note that well-implemented policy intervention has the potential to reduce plastic waste by 76% over the next decade.

Major threats to the region's inland freshwater systems also come from extensive hydrological alterations "caused by storage, abstraction and diversion of river flows for agriculture, industry and hydropower" (Gopal, 2013, p. 39). Lakes influenced by seasonal fluctuations, such as Tonle Sap in Cambodia, may disappear in the dry years (Gopal, 2013). Tonle Sap wet season water level shrunk by 20.6% when comparing 2010–2019 to 1996–2009 (Chua et al., 2022). These changes have been attributed to irrigation, channel incision, sand-mining operations (Chua et al., 2022) and upstream hydropower dams (Dang et al., 2021). While the impact of upstream hydropower dams on Tonle Sap is debated. Dang et al. (2021) conclude that "reservoir operation in Upper Mekong Basin is dampening the typical drastic transition of hydrological flow between the seasons in the Mekong mainstream and gradually shrinking the Tonle Sap Lake" (p. 1). Damming is also associated with habitat shifts, which impact fish diversity (IPBES, 2018b). If further damming continues in the Mekong, it is projected that migratory fish biomass may decline up to 70% (IPBES, 2018b). Figure 8 shows the cumulative impacts of various causes on the inland freshwater ecosystems in the Lower Mekong region.

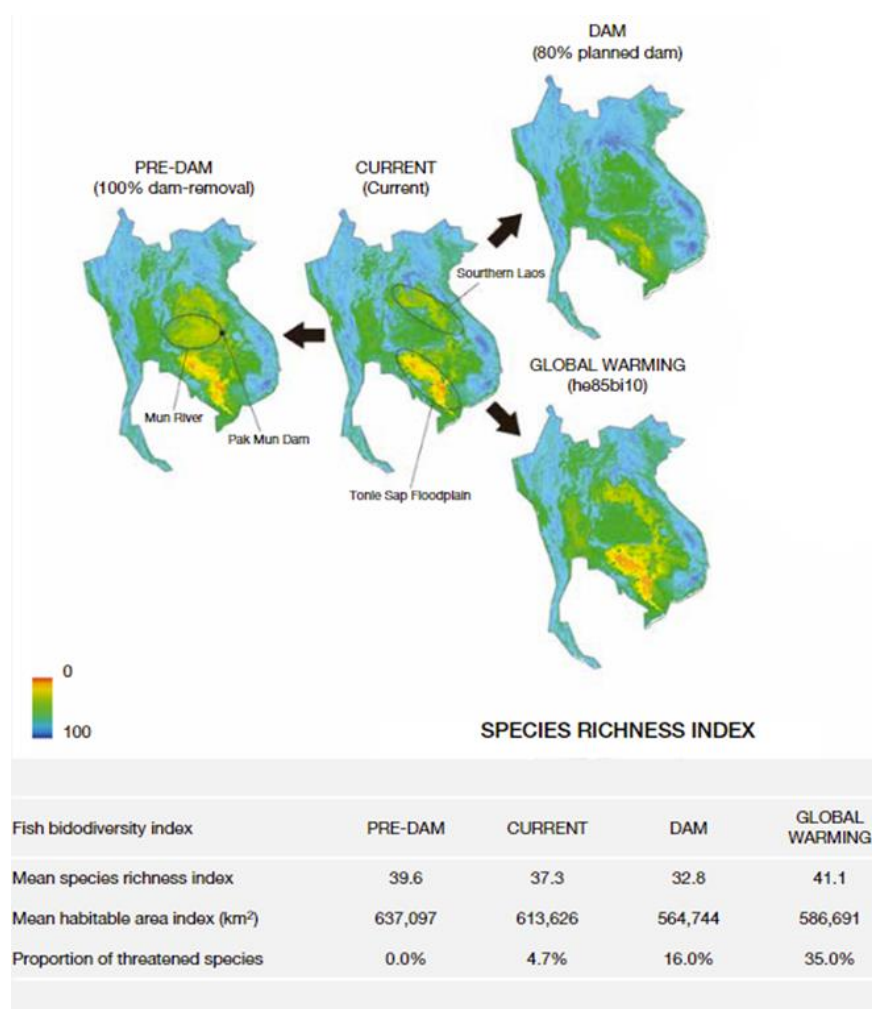


Figure 8: The cumulative impacts of various drivers on the inland freshwater ecosystems in the Lower Mekong Region (Source Kano et al., 2016 in IPBES, 2019b, p.201)

2.2.4 Mangroves

Approximately 35% of the world's mangroves are found in SEA. The region also contains the greatest mangrove diversity in the world; 51 of the world's known 73 species (Gandhi & Jones, 2019). The Philippines contains more than half of the mangrove species. *Bruguiera hainesii*, a rare mangrove tree species, can only be found in SEA, where it is thought that only 250 mature trees remain (IUCN, 2010). Mangrove ecosystems support habitats for many fish species, birds, crustaceans, reptiles and mammals (Honculada-Primavera, 2020). Further, mangroves are among the most carbon-rich, with a carbon storage potential of approximately three to five times higher than tropical upland forests (Save Our Mangroves Now!, n.d.).



Figure 9: Distribution of mangroves in Southeast Asia as of 2020 (Source Global Mangroves Watch)

Many species are endemic to mangrove ecosystems, and the IUCN has placed around 40% of mangrove animals on the Red List (Hughes, 2017a). Mangroves are an important livelihood resource for coastal communities that use various products for traditional and domestic needs, including “fish, crustaceans and molluscs for food; plants for housing, firewood, fodder, medicines and dyes and commercial sale (charcoal, logs, timber, wood chips, shrimps, molluscs and fish)” (Honculada-Primavera, 2020, p. 6). Mangroves supply various ecosystem services for urban and peri-urban coastal communities, such as water filtration, mitigating coastal erosion (Gandhi & Jones, 2019, p. 2) and protecting against tsunamis and cyclones (Marois & Mitsch, 2015). Mangrove ecosystem services are estimated to be worth US\$ 33,000–57,000 per ha (Save Our Mangroves Now!, n.d.).

Table 6: Mangrove extent (ha) by country and percentage of total coastline cover according to Global Mangrove Watch (<https://www.globalmangroveswatch.org/>) and total restorable area for certain countries as estimated by Earth Security (2022)

Country	Mangrove extent (ha) 1996	Mangrove extent (ha) 2020	Percentage of total coastline cover (2020)	Total restorable area (ha)
Brunei	11,462	11,497	50.13	na
Cambodia	64,654	62,692	57.37	na
Indonesia	3,127,302	2,953,398	42.97	186,611
Malaysia	531,482	524,575	51.15	16,764

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Myanmar	582,120	543,539	41.81	43,571
the Philippines	292,732	284,798	33.34	15,674
Singapore	840	730	12.33	na
Thailand	259,819	252,799	47.32	17,471
Timor Leste	1,047	1,050	7.29	na
Viet Nam	196,419	187,147	25.25	17,405
Total	5,067,877	4,822,225		

Gandhi & Jones (2019) identified Myanmar as a primary mangrove degradation hotspot. Myanmar lost 35% of its Mangroves from 1975 to 2005 and 28% between 2000 and 2014. The rate of mangrove loss in Myanmar was four times higher than the global average from 2000–2012. Secondary hotspots in SEA include Malaysia, Cambodia and Indonesia (Gandhi & Jones, 2019). The loss rate in Thailand and Viet Nam has remained steady at <3% and <2% in Singapore. Thailand's low rate of mangrove loss may be attributed to the large areas cleared over earlier decades. It is estimated that Thailand has lost up to 90% of its total mangroves (Hughes, 2017a). The rate of loss in Indonesia has been estimated to be relatively low at 3.86% (2000–2014) to 0.46% (2000–2012); however, due to the extent of mangrove forests in Indonesia, the loss has been estimated at nearly 100,000ha from 2000–2014 which was more than a third of Myanmar's total mangrove area in 2014 (Gandhi & Jones, 2019).

The loss of mangroves in SEA impacts 50 million migratory birds, while the expansion of shrimp farm enterprises and related aquaculture wastewater have greatly contributed to water pollution (Hughes, 2017a). Destruction of mangroves has led to coastal erosion and increased pollutants (Cochard, 2017) and affects the local people whose livelihoods and traditions are built around mangrove ecosystems. Further, mangrove degradation has wider economic consequences as “80% of global fish captures are mangrove dependant” (Hughes, 2017, p. 14).

The primary causes of mangrove loss include conversion for aquaculture, oil palm and rice paddies driven by economic development (Gandhi & Jones, 2019). Rapid urbanisation is another underlying driver of mangrove loss (IPBES, 2018b). Between 2000 and 2012, aquaculture conversion drove approximately 30% of mangrove loss in the region (Gandhi & Jones, 2019), with shrimp farming being a particular problem (Cochard, 2017). Natural causes of mangrove loss include tsunamis, hurricanes and cyclones (Gandhi & Jones, 2019). Climate change-related sea-level rise is projected to threaten further mangrove loss (Gopal, 2013), with the largest threat predicted for Viet Nam (IPBES, 2018b).

In Myanmar, smallholder rice paddies are a significant contributor to mangrove loss. In Malaysia and Indonesia, the conversion of oil palm largely by corporations has been a significant cause (Gandhi & Jones, 2019; Richards & Friess, 2016). In Viet Nam, the use of Agent Orange in the war (1955–1975) is thought to have caused considerable damage to mangroves (Hughes, 2017a).

Over the past 20 years, the drivers of mangrove loss, such as economic development, have become associated with mangrove gain as the importance of mangrove ecosystems and restoration projects gain ground (Hagger et al., 2022). The mangrove extent in Thailand increased from 248,136ha in 2015 to 252,799ha in 2020. Importantly Hagger et al. (2022) find that “community forestry is promoting mangrove expansion” with “sustainable development, community forestry, and co-management of protected areas” as “promising strategies to reverse mangrove losses” (p. 1).

2.3 Governance impacts on environmental degradation

Governance systems impact degradation in all ecosystems. According to Arifanti et al. (2022), in Indonesia, “most drivers of mangrove forest loss could be effectively managed by policy interventions” (p. 3), and contradictive management decisions stemming from unclear policy objectives between government agencies have inhibited mangrove protection. Weak governance is often driven by a lack of coordination between ministries engaged with management and limited institutional capacity (technical knowledge, human resources, finances, and so on) (Pacheco et al., 2021). Stimulating cooperation between government agencies at the national and local levels with the private sector and local communities to work harmoniously is often challenging and requires financial and capacity inputs (Parish & Chin, 2013). Poverty and insecure tenure also drive degradation in multiple landscapes (Le & Le, 2021; Mizuno et al., 2021; Pacheco et al., 2021). In Myanmar, political and military conflict are underlying drivers of deforestation, causing a lack of adherence to the law and displacement of communities (Pacheco et al., 2021). Anecdotal evidence shows that this has continued since the military coup of February 2021 (Cowan, 2022).

Indices, such as the World Bank Governance Indicators, Transparency International’s Corruption Perception Index and Freedom House’s Freedom in the World index, highlight the governance challenges facing nearly all the countries in SEA. These challenges are reflected in the restrictions facing CSOs in the region. CIVICUS (2021), which monitors freedoms in civic space, categorise Laos and Viet Nam as ‘closed’ and all the other countries as ‘repressed’ (Brunei, Cambodia, Myanmar, the Philippines, Singapore, Thailand) or ‘obstructed’ (Indonesia and Timor Leste). The challenges facing CSOs in the natural resource governance sector are even starker. Environmental defenders across the region come into violent conflict with the government and the private sector. This results in certain drivers of degradation, such as IPs and LCs’ tenure security, IPs and LCs’ lack of resource rights, and agricultural conversion by larger agribusinesses not being adequately recognised or addressed within policy frameworks (Lewis & Bulkan, 2022). Some international initiatives, such as FLEGT VPA and REDD+, mandate that civil society has a more prominent role, for example, in multi-stakeholder groups, and have funding, eg. from the European Union, to support their participation. But the challenging civic space persists within these initiatives (Lewis & Bulkan, 2022).

3 Best practices and challenges of sustainable natural resources management and restoration activities to reverse environmental degradation

This section presents the findings from a literature review and field visits (Tonle Sap wetlands, Cambodia, Riau Peatlands, Indonesia, and Nan upland forests in Thailand). It also includes findings from KIIIs of identified best practices and challenges of the evidence base, tools and governance systems, concerning the implementation and sustainability of natural resources management and restoration research/projects alongside specific recommendations for REDAA interventions. Please note that key findings from the field visits are integrated into this section and also presented in the landscape profiles in Annex 4.

For this report:

Evidence refers to the evidence base — research quality, research institutes, and research gaps — and the uptake of research from which sustainable natural resources management and restoration research and projects are developed.

Tools refers to the varying processes, methods and virtual and physical instruments employed to implement sustainable natural resources management and restoration activities.

Governance systems refer to structures and processes that enable sustainable equity and inclusive implementation of sustainable natural resources management and restoration initiatives.

3.1 Evidence

3.1.1 Best practices and challenges

Cross-sectoral cooperation in research

Effective cross-sector research has been found to foster trust between stakeholders and researchers that helps contribute towards common goals of restoration, carbon sequestration, improved livelihoods and local socioeconomic stability and equity (Mishra et al., 2021). However, Food and Agriculture Organization (FAO) and RECOFTC's studies on education and research on forest landscape management and governance in SEA found that there are “minimal engagement with IPLCs in research related to forest landscapes, which is particularly common for working with marginalized groups, including women, and preference for western scientific knowledge over traditional Indigenous knowledge” (eg. FAO 2022). IPs and LCs are best positioned to integrate Traditional Ecological Knowledge (TEK) to develop nature-based solutions to reversing degradation (Aronson et al., 2020; Nelson & Shilling, 2018; Robinson et al., 2021). However, academic institutes can be seen as somewhat of an ivory tower where the traditional knowledge of IPs and LCs, along with IPs and LCs' contribution to research, is undervalued. Further, there is a lack of funding mechanisms in SEA enabling IPs and LCs to be put front and centre of research. Additional comments on the benefits of cross-sectoral research and working with IPs and LCs can be found in section 3.2 on Tools and 3.3 on Governance systems.

Multidisciplinary and transboundary research

For effective landscape restoration, multidisciplinary approaches are recommended by researchers and practitioners with expertise in, for example, hydrology, microbial ecology, soil science, plant ecology, fire ecology and social sciences, among other topics (Mishra et al., 2021). However, there is low engagement with multidisciplinary research in SEA research institutes. This may be because academia's nature concerning funding, teaching and journal publication, favours keeping within one's discipline. Western universities have only begun to successfully foster interdisciplinary research in recent decades (Townsend et al., 2015).

Further, transboundary and regional research can effectively combine resources and knowledge to address common research questions, share best practices and research findings, and develop innovative restoration and natural resources management approaches. However, RECOFTC's studies on education and research on forest landscape management and governance in SEA, found limited transboundary research in SEA. Greater transboundary cooperation within research is justified under the regional targets and programmes established by ASEAN and other regional initiatives (see section 5).

Research balance

Regarding the evidence gaps, in general, the literature review showed that the focus of researchers and NGOs on lake and river restoration and sustainable natural resource management in SEA was considerably less compared to forests, peatlands and mangroves. There were no regional research reviews on effective river/lake restoration or sustainable management, while there were for the other ecosystems mentioned (at least in English). However, in SEA, there seems to be political will for a greater focus on lake and river research and restoration/sustainable management projects (see section 6.3.4).

SEA-based mangrove research was dominated by biodiversity and fewer social studies, of which most of the topics related to ecological economics (Gerona-daga & Salmoi, 2022). Likewise, Mishra et al. (2021) identified that a greater focus on social dimensions for peatland restoration is needed, with greater emphasis on local values and traditions. Additionally, critical scrutiny of forest restoration as policy discourse and restoration projects is needed from an environmental justice/political ecology lens (Elias et al., 2021; Osborne et al., 2021; Sigman & Elias, 2021). Understanding social dimensions, emphasising equity and intersectionality, is vital to ensure restoration and sustainable natural resources management serve to prevent greater inequity and dispossession (Elias et al., 2021; Osborne et al., 2021; Sigman & Elias, 2021).

Intersectionality

In theory, restoration or natural resources management research/projects designed without considering how inequality is produced, may result in unintended consequences such as deepening inequity for marginalised groups, and so further environmental degradation (Elmhurst, 2022, p.4). Further, different groups may have different socially and ecologically constructed understandings of degradation. Effectively integrating intersectional theory into environmental restoration and sustainable resource management agendas/projects can potentially aid in addressing localised inequalities more effectively and holistically. As recommended in Elmhurst's Scoping Study, "addressing intersectional inequalities means working through a multi-level, multiscale perspective rather than restricting analyses to the household or community level." Therefore, integrating situated understandings of "how social norms, formal laws, regulations and institutions sustain inequalities across arenas and scales, including within institutions, the state (including its local manifestations) and in research projects/teams" into NGO projects and even Annual/five-year Strategic Plans can help to more effectively address the root causes of inequality, mitigate instances NGOs are inadvertently perpetuating inequalities (Banks et al., 2015), and, enable NGOs to more effectively engage with local communities and governance structures to mitigate situated inequality and empower marginalised communities.

Intersectional theory and methods examine how socially, politically and economically-constructed processes and institutions across various scales (local, national, regional, global and time) (re)produce situated inequalities concerning intersectional identities (such as the intersections of gender, race, socioeconomic class, cultural and ethnic background, age and disability) (Elmhurst R., 2022, Reversing Environmental Degradation in Africa and Asia (REDAA), ESRC scoping brief: Scoping Brief #2: Intersectional Inequalities). Therefore, intersectional examinations of the production of inequality would benefit by engaging with local researchers well versed in the nuances of a country's (or region within a country) cultures, traditions and institutions. Leading researchers using the lens of intersectionality in environmental research and relatedly feminist political ecology (eg. A J Nightingale and R Elmhurst, J Martinez-Alier, D Rocheleau, and so on) are western-based. Without nationally-based researchers engaging with intersectional theory and methods from a national/local context, there is a possibility that examinations/understanding of intersectional inequality in SEA are imposed through western eyes (Said, 1978, 1994).

In a rapid assessment of the status of intersectional studies and research in SEA; a preliminary Google Scholar search in English (using the search terms intersectionality and Thailand, Viet Nam, Lao PDR, Indonesia, Malaysia, and Singapore) shows that the research lens of Intersectionality may not be as well developed in SEA countries as it is in the Americas (North and South). Researchers are examining intersectional issues in Thailand, Malaysia and Singapore (from Mahidol University, Asian Institute of Technology, Khon Kaen University, Thammasat University, Ramkhamhaeng University, Monash University Malaysia, University Putra Malaysia University of Singapore, Nanyang Technological University Singapore) in the fields of public health and social studies. In Vietnamese-based research, researchers of Vietnamese heritage are based at Australian and North American Universities. Researchers engaging in the Laos or Indonesian context were mainly western and from western universities.

In 2018, Center for International Forestry Research (CIFOR) produced a manual titled “Making sense of 'intersectionality': A manual for lovers of people and forests”. However, western researchers have very much developed the CIFOR manual. At an October 2019 RECOFTC workshop Chhun Hak, director general of the Ministry of Women's Affairs in Cambodia, noted that “terminology, such as intersectionality, is not well-known in Cambodia, and this absence in the language makes it difficult to discuss gender issues in local contexts”⁵. These examples indicate that efforts by the SEA development community to engage with local researchers in developing situated understandings and terms for intersectionality are limited. As such, one can assume that practical methods of integrating intersectional theory/methods into environmental restoration and sustainable resource management projects in SEA are limited.

Funding capacity development of SEA researchers to engage in intersectional theory and methods, developing research networks, and the capacity of SEA-based NGOs to engage with intersectional theory is innovative, very much needed and may have long-lasting impacts on how the SEA development community operates.

Research environment

Countries in SEA tend not to provide a safe environment for research. According to Kinzelbach et al. (2021), Laos and Thailand are ranked in the lowest category, while Cambodia and Viet Nam fare marginally better, with Indonesia, the Philippines and Timor Leste leading the region in terms of academic freedoms. Research related to environmental degradation, natural resource governance and human rights is particularly sensitive. This creates a less accessible research environment where certain topics are too contentious to examine, with government ministries desiring more oversight and say on the types of research conducted. In Indonesia, certain tools, such as remote sensing, are seen as too contentious to use (information obtained through personal communication). Further, as addressed in section 2.3, CSOs have limited freedoms, making it difficult to conduct action research with IPs and LCs concerning locally or nationally deemed contentious issues. CSOs who work closely with IPs and LCs are often best placed to identify research-to-action needs.

3.1.2 Recommendations for REDAA intervention

The review indicates that further cross-sectoral cooperation, and multidisciplinary and transboundary research, is needed, with a greater focus on the social dimensions, to develop effective sustainable natural resource management and environmental restoration projects. Building on existing cross-sectoral, transboundary, and multidisciplinary research-to-policy initiatives (such as EXPLORE or Stockholm Environment Institute (SEI) Asia; see section 6.4 for more detail) may provide REDAA with a platform to foster such improvements where appropriate. Such platforms could also strive to form closer relations with organisations such as the Asia Indigenous Peoples Pact, which works with a wide network of IPs and LCs, as well as organisations that focus on women's integration into national resources management in SEA (such as Women's Earth Alliance, which has been working with women to protect mangroves in Indonesia since 2005 and EmPower, who has been working with women in Viet Nam to build climate resilience). In cases where IPs and LCs' safety is safeguarded, and risks are considered, the involvement of government officials through participatory-action-research can also help foster greater trust between

⁵ <https://www.recoftc.org/news/asian-leaders-tackle-gender-inequalities-forestry>

government officials, IPs and LCs and researchers, and create a pathway to integrate research and research findings into decision-making process.

Further critical research of restoration discourse and projects is needed from an environmental justice/political ecology lens to ensure restoration initiatives do not lead to greater inequity. Integration of intersectional theory and methods into restoration and sustainable natural resources management projects, may help reduce inequality and address environmental degradation more effectively. Online/in-person dialogues, workshops or courses for academics, NGO gender and social inclusion officers, and other NGO employees to attend is one method to increase knowledge and understanding of intersectional theory and methods at the regional level. Ensure activities under REDAA factor in intersectionality and restoration, and sustainable management initiatives will generate evidence to support the effective integration of intersectional theories and methods to address inequalities.

Information obtained during the field visits and KIIs highlighted that stronger relations must be built between researchers and IPs and LCs. A greater focus is needed on participatory action research implemented locally to ensure research aims and objectives are developed in partnership with IPs and LCs, and research outputs address local needs. Research projects should also aim to develop IPs and LCs' capacity to develop research proposals, conduct or contribute to the research design process, collect data, and analyse and communicate research findings to appropriate stakeholders. Organisations such as the Asia Indigenous Peoples Pact, which works with a wide network of IPs and LCs, may be best placed to develop programmes and protocols for engagement with IPs and LCs through participatory action research and women's organisations.

Finally, there is a need to strengthen collaborations between IPs and LCs, CSOs, NGOs and research institutes, to enable said stakeholders to address challenges in developing more inclusive evidence-based research when accounting for risks and safeguards in the face of a restrictive research environment. Strengthened research collaborations may help mitigate or better address the challenges while conducting research. Therefore, strengthening research networks and outputs should lead to research that better reflects issues identified by IPs and LCs and marginalised groups while, recognising and mitigating the risks associated with research.

3.2 Tools

3.2.1 Best practices and challenges

A more detailed table of review findings of tools, recommendations and best practices regarding peatland and mangrove ecosystems can be seen in Annex 6.

Effective participation of all key stakeholders

Research shows that social inclusion and the active participation of all landscape stakeholders are important to project success and can bring about greater legitimacy, with stakeholders declaring greater perceived co-benefits (Miller et al. 2022). When diverse stakeholder participation is lacking, so is stakeholder buy-in, and often programmes are short-lived (Miller et al., 2022). For example, Ward et al. (2021) found that smallholders in Sumatran peatland were reluctant to allow canal blocking (a tool of peatland rehabilitation) on their land as they feared the impact of raised water levels on their crops and therefore were less likely to partake in restoration activities. Therefore, evidence and processes that develop trust between researchers and other stakeholders are vital to project success.

Restoration and sustainable natural resources management initiatives require the effective involvement of all relevant stakeholders through the inclusion and integration of their priorities for

conservation/restoration and development into designs; a clear participatory designing of all stakeholders' roles and responsibilities during all management phases; and working with interdisciplinary teams of researchers/experts together with local people (Camacho et al., 2020). Effective involvement often requires skilled facilitators to manage expectations, build trust, and anticipate and dissipate conflict. Additional information on multistakeholder and IP and LC engagement is found in section 3.3 on Governance systems.

Tools such as Companion Modelling (ComMod) can facilitate multi-stakeholder participatory decision-making processes concerning socio-ecosystem functions (Etienne, 2014).

“Companion Modelling (ComMod) is a participatory gaming and simulation approach that uses role-playing games and simulation models to tackle complex issues in the fields of renewable resources and environment management together with stakeholders. ComMod promotes dialogue, shared learning, and collective decision-making, strengthening the adaptive management capacity of communities facing wicked environmental problems. A ComMod approach is iterative and evolves with the participative process whereby stakeholders participate in the definition and design of the questions, models, simulations and outputs” (Wageningen School of Social Sciences (WASS), n.d.).

Wuthiwong (2019), using the ComMod approach in Wiang Sa District, Nan, Thailand, concerning community forestry management, found that using the approach “generated a shared understanding of the community forest ecosystem status” among local stakeholders and “supported collaborative community forest management at the subdistrict scale” (p. 1).

Multi-objective economic evaluations can also be important for exploring the costs and benefits of contrasting landscape uses and management policies and practices (Baker et al., 2002; Polasky et al., 2008). Multi-objective economic evaluations can present varying scenarios concerning multiple factors, including equitability, sustainability, climate change resilience, and management activities of various stakeholders. When developed with multi-stakeholder dialogues and communicated effectively, multi-objective economic evaluations can be a powerful tool to influence adjustments to policies and practices to yield more sustainable, ecologically productive, diverse landscapes (Baker et al., 2002; Polasky et al., 2008).

Revegetation methods

For peatlands and forests, revegetation processes include natural regeneration and assisted regeneration/planting. Natural regeneration has been found to be the most cost-effective approach for large areas. In peatlands, rewetted peat can function as an extensive seed bank source for regeneration (Yuwati et al., 2021). With assisted planting, the establishment of nurseries and seed banks of indigenous and peat-adaptive woody species has proved successful (Terzano et al., 2022). Before undertaking revegetation, for peatlands, Yuwati et al. (2021) recommended the following be determined: “peat soil condition; remaining stands, seed rain, underground seed stored and vegetative shoots; physical, chemical and biological changes of the peat soil for supporting plant growth; characteristics of plant species which survived on degraded areas; and the autecology of peat swamp forest species” (p. 16). Participation of communities in nursery management and restoration is recommended for success (Terzano et al., 2022).

Hand-planting techniques often fail regarding mangrove restoration due to a lack of existing mangroves in the regrowth area and a failure to address underlying ecological issues at the degraded site. Global Mangrove Alliance (n.d.) recommend “Community-based Ecological Mangrove Restoration (CBEMR)” to support “a holistic, science-based approach” that “encourages practitioners to mitigate mangrove stressors and facilitates natural mangrove regeneration”. Practitioners are advised to collaborate with local communities to examine social and technical challenges at the restoration site, “including site

hydrology, soil elevation relative to sea level, pressures on the mangroves and why a site is not naturally regenerating”. It is hoped that the CBEMR approach will result in a higher survival rate and floral diversity while being more cost-effective than building a nursery and planting. A CBEMR tool to enable natural regeneration, outlined in a project implemented by Wetlands International (n.d.), is “trapping mud behind temporary permeable structures to stabilise the coastline and allow mangroves to seed and grow and the introduction of environmentally friendly aquaculture practices”. Wetlands International (n.d.) describe how project leaders “engaged deeply with local communities, government agencies and knowledge institutes to address the root causes of coastal breakdown”.

For mangrove sites with limited access, Arifanti et al. (2022) suggest using Integrated Mangrove Sowing System (IMSS) and Unmanned Aerial Vehicle (UAV) Technology. IMSS is mapping and monitoring using UAVs and satellite technology. The UAV technology deploys seed balls to sites that are difficult to reach. This technology is being evaluated in Indonesia under different variables, including “tidal conditions, sediment variations, mangrove species zonation, and different salinity levels” (p. 8).

Hydrological restoration methods

Wetland ecosystems (peatlands, marshes, rivers, lakes and mangroves) often require hydrological restoration. An & Verhoeven (2019) recount that to restore wetland habitats, biodiversity and ecosystem services, wetland practitioners have developed several technologies based on long-term research projects, including wastewater treatment, land reformation and sediment extraction. Regarding river restoration, tools included bank stabilisation, channel reconfiguration, dam removal/retrofit, fish passage, floodplain reconnection and flow modification (Wohl et al., 2015). Additionally, tools for peatland rewetting include canal blocking, canal piling, drilling/boreholes and damming (Convention on Wetlands, 2021; Hasanah & Setiawan, 2020; Yuwati et al., 2021).

Hydrological restoration can be expensive, so further research is required into cost-effective methods. The Convention on Wetlands (2021) guidelines notes that dams to maintain water levels in rewetted wetlands will deteriorate over time; thus, any blocking system developed should be robust to remain effective with minimal maintenance. Digital models can also support effective hydrological management decisions, such as establishing canal blocking or installing water gates to maintain water levels in vulnerable areas (Avent, 2017). In Thailand, The Faculty of Engineering at Kasetsart University developed a hydrological modelling application – MIKE SHE – to maintain appropriate water levels in peatlands to avoid forest fires.

Hydrological restoration and irrigation management are also important for upland forest ecosystems. In Nan, Thailand, farmers reported that lack of water impeded restoration and crop diversification. Community forestry may be a way to promote a more stable water supply. Therefore, restoration activities in upland forests should also develop alongside irrigation and water supply improvement plans.

Fire management

Fire is a cause of degradation in many landscapes. It is recommended that efforts to reduce fires are weighted to focus on fire prevention over fire fighting (Page & Hooijer, 2016). Indeed, the ASEAN Guidelines on Peatland Fire Management (2015) state that 70% of fire management resources should be distributed towards fire prevention efforts. Page & Hooijer (2016) recommend that fire prevention in wetlands be done through rewetting and effective hydrological management, adopting zero burn policies, and awareness and education programs for IPs and LCs, smallholders and larger companies. It is recommended that IPs and LCs, and IPs and LCs' local knowledge, play an integral role in fire management (Terzano et al., 2022).

Development of sustainable livelihoods

Review findings show that current economic returns from degradation-related agricultural practices and commodities (eg. maize, oil palm, rubber) are higher and/or perceived by actors as more reliable than those related to more sustainable landscape practices. However, to stem environmental degradation, a fundamental shift is needed at the local level and through the entire value chain so that our economic system is founded on sustainable landscapes. Debrot et al. (2020) recommend that to be most effective, “a systems perspective” on product development is needed, “whereby product-market development occurs in unison and is based on a participative, inclusive, and fair development approach” (p. 2) where the species/product of choice for value-added product-market development in any specific community is developed through working with the community, researchers and the private sector.

In peatland ecosystems, tools for sustainable improvement of local livelihoods generally refer to the use of peatlands without drainage, which includes practices such as paludiculture (crop cultivation under wet or flooded conditions) and the subsistence-scale extraction of resources (Cole et al., 2021). However, Mishra et al. (2021) note that current economic returns from candidate high-water level crops are lower than those from conventional drainage-based crops such as oil palm. Therefore, further research and development are needed to develop economically-effective paludiculture crops (Mishra et al., 2021). Dommmain et al. (2016) suggest various practices for paludiculture, including agroforestry in protected and rehabilitated areas, cultivating bioenergy plants in deeply flooded areas with no prospect for reforestation and “large-scale mixed plantations of commercial peat swamp species as alternatives to drainage-based plantations” (p. 283).

Through reviewing lessons and insights from mangrove rehabilitation in the Philippines and Myanmar, Camacho et al. (2020) conclude that mangrove rehabilitation is successful if built around an integrated ecosystem-based approach that considers feedback between rehabilitation and other economic activities. However, Debrot et al. (2020) recognise that currently, products from mangrove ecosystems remain undervalued as “products of the poor” and that production at economies of scale, including quality standards, as well as marketing and value chain management, is essential to develop these products beyond their subsistence role.

Examples of sustainable livelihoods in mangrove ecosystems include [Mangrove Action Project \(MAP\) in Krabi, Thailand](#), where communities have established beehives for honey collection in mangroves which support and provide incentives for mangrove restoration. A women's group in the area developed honey-based value-added products such as medicinal balm, shampoo and bar soap. The group worked in partnership with local resorts and spas. A Village Conservation Fund was established with 10% of all honey and honey product sales.

Integration of traditional ecological knowledge

Working with IPs and LCs to develop appropriate restoration and sustainable natural resources management projects based on TEK or a mix of TEK with scientific tools and methods is recognised as a vital pathway to reversing degradation (Aronson et al., 2020; Nelson & Shilling, 2018; Robinson et al., 2021). Robinson et al. (2021) note that solely focusing on the ecological outcomes of restoration initiatives “undermines the potential to form deeper relationships and partnerships between TEK holders and their communities” and practitioners. Robinson et al. (2021) recommend that restoration projects are based on “shared principles and an ethical code of conduct” that builds on “deep listening with Indigenous peoples and engagement with humility and respect” as the starting point. Robinson et al. (2021) propose “an Indigenous-led workshop to re-imagine and re-develop equitable ways forward for TEK partnerships in restoration, with explicit considerations for the rights, livelihoods and leadership of Indigenous peoples”. The recommendations by Robinson et al. (2021) are ones we propose bringing forward into the REDAA programme where appropriate.

Financing sustainable natural resources management and restoration

SEA governments have ambitious restoration targets that require funding (see section 6.3). The Thai government has a national target to maintain 55% forest cover. Under this target, the Kor Tor Chor policy dictates that communities living in upland areas are required to reforest between 60% and 100% of their communal land. Communities in upland areas, expected to reforest a substantial percentage of productive land, need to find a stable source of income to adapt to these policy requirements.

There is a substantial cost to restoration. Estimates of peatland restoration range from US\$983-2,410 per hectare (Kiely et al., 2021; World Bank, 2016). Earth Security (2022) estimates mangrove restoration costs to be US\$9,500 / ha for the first five years and an additional US\$1,900 / ha for the following five years. However, restoration is likely to provide economic returns in terms of climate change mitigation, mitigation of natural disasters, and provision of ecosystem services. Kiely et al. (2021) estimated that if Indonesia's government had met their peatland restoration targets between 2004 and 2015, it would have saved the government US\$8.4 billion over the same period. Earth Security (2022) estimates restoration of approximately 190,000ha of mangrove forests in Indonesia would bring a financial return of \$5.3 billion in carbon sequestration (US\$60 per tonne CO₂) and US\$300 million in flood protection benefits.

The voluntary carbon market and specific initiatives such as REDD+ (under United Nations Framework Convention on Climate Change (UNFCCC)) have the potential to provide an alternative source of income for communities and governments managing resources. However, programmes such as REDD+ have been heavily criticised for putting government and private sector ambitions over IPs and LCs (Bayrak & Marafa, 2016; Chomba et al., 2016; Larson et al., 2013). Therefore, integration across voluntary carbon mechanisms and standards is required to strengthen engagement with IPs and LCs to include robust benefit-sharing mechanisms that support local socio-economic agendas and sustained economic inputs (Rosales et al., 2021), effective social safeguard and robust Free and Prior Informed Consent processes.

There are also novel mechanisms for IPs and LCs' engagement with the carbon markets, such as the Trees4All project initiated by RECOFTC's Thailand country programme in Nan. Trees4All raises funds for reforestation with donations starting at 100 Thai baht (US\$3) to sponsor tree planting of native species that can support communities' livelihoods in or near forests. Trees4All mobilises funding from the urban and private sectors to support IPs and LCs' tree planting. Trees4All promotes forest landscape restoration and facilitates connections with the private sector for long-term landscape management responsive to livelihood development and restoration of ecosystem services. Through Trees4All, micro-credit and tree sponsorship aim to close the gap for smallholders, offer a viable model of forest landscape management that can compete economically with existing land use, and connect the private sector to ways to fund tree plantations based in community forests.

Additionally, our field visits revealed that IPs and LCs and government officers protecting resources within and outside of protected areas (ie, community forests, conservation zones within community fisheries) or transitioning landscape practices towards more sustainable integrated practices, require sustainable financing mechanisms. IPs and LCs and local authorities patrolling wetlands or community forests for illegal activities or fire prevention may not have the tools, such as a watch tower, boat, motorcycles, labour and so on, to do so. Sometimes this financial deficit is filled by external funding from project donors (USAID, EU, Sida, FCDO). However, once the project has finished, ongoing financing is still required for machine maintenance, labour, gas, and so on, and to scale-up activities to other locations. Another example is that IPs and LCs and local authorities have the resources and funds to establish community nurseries but not the tools and finances to move the seeds from the nurseries to the restoration site.

Community sustainable financing mechanisms can be developed to fund restoration and protection tools. Local people often have innovative ideas on how to fund environmental protection initiatives. For example, a local community in Nan Thailand wanted to sell mushrooms from their community forest to fund necessary patrolling, maintenance and labour costs. However, the community stated they needed external assistance from researchers to provide knowledge about the optimum growing habitat for mushrooms in their locality or from NGOs to help them establish community-saving schemes. Regional development and communication of community-saving schemes and best practices are needed to support landscape protection and management.

Public-Private partnerships

Public-private partnerships and corporate social responsibility programmes (CSR) can provide financial benefits for restoration, rehabilitation and sustainable livelihood projects. In Nan Thailand, the CSR arm of Charoen Pokphand Group Co. has collaborated with local communities to identify products and markets for products that can aid IPs and LCs in diversifying production away from deforestation-led maize production towards commodities compatible with reforestation objectives (such as coffee). Engagement with the private sector is vital to transforming degradation-forward landscapes into sustainable ones. Larger corporations or research institutes can also play a research role in creating novel products or creating a market for existing products within a reforested or agroforestry landscape, such as timber-based buildings, traditional medicines, CSR business arms, and so on.

Monitoring and maintenance

Robust monitoring and reporting frameworks built from reliable data are essential for ensuring the success of restoration initiatives, understanding the drivers and causes of degradation, identifying best practices, and managing landscapes sustainably. However, the Convention on Wetlands (2021) noted a general lack of common monitoring concepts and protocols to assess the effectiveness of peatland restoration projects. Thompson (2018) found that mangrove restoration projects in Thailand often failed due to a lack of follow-up maintenance and monitoring activities. Wohl et al. (2015) conclude that for river restoration, there is “limited monitoring of restoration projects to quantitatively and objectively determine whether restoration goals were achieved” (p. 5981).

Gerona-daga & Salmooii (2022) recommend long-term monitoring to maintain short-term success. They recommend that biodiversity knowledge be “properly documented and systematically organised” to ensure effective monitoring (p.16). There is also a need to collect social as well as ecological data for ecosystems (Pritchard et al., 2022). Government departments often collect such data, sometimes annually, as is the case in Thailand. However, this data is often not readily accessible, with researchers having to sift through government websites to find the information. Initiatives such as OneMap in Viet Nam and [Agri-map](#) in Thailand make data collection on land-use parameters more accessible. However, databases that collect social as well as biological and governance parameters are needed. It is also important to note that monitoring protocols often reflect the needs of those designing them, which tends to fall on the side of donors or research institutes. It is equally, if not arguably more important, to focus on the data needs of IPs and LCs, and cost-effective data storage and management methods, so the data collected benefits the social-economic and ecological needs of IPs and LCs.

There have been concerted efforts to develop effective monitoring frameworks. For example, in 2020, CIFOR organised a series of online workshops to explore principles, criteria and indicators for effective monitoring and management of peatland restoration in Indonesia. In Riau, Indonesia, CIFOR worked with the University of Riau and the local government to develop a [Community-based Peatland Restoration Monitoring System](#). “The technique involves measuring groundwater and moisture levels in peatlands and keeping records of tree revegetation and livelihood revitalization efforts by tracking and sharing data about pineapple and coconut harvests”. Data for the initiative was accessible to all through an Android-

compatible, free open-source software. CIFOR has also developed reviews on [Participatory monitoring and forest restoration](#).

Community-based monitoring frameworks (Terzano et al., 2022) and data collection software (eg. Kobo toolbox and others), operated by local people via mobile devices and submitted to an online monitoring database, can help facilitate effective and timely monitoring (Okarda et al., 2019). Online open-access modelling and remote sensing data can also supplement field monitoring.

Under the United Nations Decade on Ecosystem Restoration [2021–2030], FAO is also establishing a Framework for Ecosystem Restoration Monitoring (FERM). FERM aims to support “the development of resource-efficient and fit-for-purpose monitoring that generates quality data and information and supports domestic restoration needs and other reporting processes with strong ownership by governments, relevant national entities, sub-national entities, NGOs, the private sector and civil society organizations”. It aims to enable “knowledge and technology transfer, as well helps to build the capacity of people, communities, and countries to monitor and report their own restoration progress, supporting the creation of information by those who are undertaking restoration efforts” (FAO, 2022a).

3.2.2 Recommendations for REDAA interventions

As the review highlighted, IPs and LCs and smallholders living on deforestation and degradation fronts and biodiversity hotspots, may be required to alter their livelihoods from degradation-driven to sustainable livelihoods or in line with restoration requirements. However, effective restoration and sustainable natural resources management projects should not be at the cost of IPs and LCs' livelihoods, wellbeing and culture. Instead, restoration and sustainable natural resources management should effectively contribute to sustainable improvements of IPs and LCs' wellbeing, better economic returns and should deliver more ecologically-productive and diverse landscapes.

One mechanism for achieving the goal outlined, and recommended for REDAA support, is strengthening and scaling up sustainable business models that demonstrate improvements to IPs and LCs' wellbeing, equitability in value chains, economic returns, and landscapes productivity. It is recommended that such models were built through a systems perspective, whereby product-market development occurred in unison and was based on IPs and LCs' participation with researchers and the private sector from project inception. This requires facilitating effective agreements for community-private sector partnerships in landscapes. Existing networks within the landscape and business partnerships in value chains and development processes should be strengthened by addressing/mitigating conflict, while establishing mutual benefits for all. Larger corporations can also play a research role in creating novel products or creating a market for existing products within a reforested or agroforestry landscape, such as timber-based buildings and traditional medicines.

A second mechanism is supporting research and projects that develop sustainable funding mechanisms to support IPs and LCs' livelihoods and their engagement in environmental restoration and protection activities. Existing and potential IPs and LCs-centred approaches and models that provide sustainable funding through payment for ecosystem services — including carbon trading to IPs and LCs engaged in environmental restoration and biodiversity protection activities — should be identified, strengthened and scaled up, and novel models developed where needed. Novel mechanisms for engaging with carbon trading, biodiversity offsets and nature-based offsets (for example, the Trees4All and micro-credit schemes initiated by RECOFTC) should be scaled up throughout the region. Research-to-action activities under this target should aim to engage and strengthen “sustainable” funding mechanisms that support IPs and LCs at all stages of transitioning from degraded to reforested landscapes, to mitigate against any potential loss of income. Models should ensure they improve equity, have robust benefit-sharing mechanisms, and adhere to Free and Prior Informed Consent principles and processes.

REDAA could also support the standardisation and strengthening of voluntary carbon mechanisms and standards, and biodiversity credits across SEA concerning engagement with IPs and LCs. These should include robust benefit-sharing mechanisms that support local socio-economic agendas and sustained economic inputs (Rosales et al., 2021), effective social safeguards and robust Free and Prior Informed Consent processes.

When transitioning from practices that cause environmental degradation to sustainable practices that aim to provide better economic returns and deliver more ecologically-productive and diverse landscapes, multi-objective economic evaluations can also be important tools for exploring the costs and benefits of contrasting landscape uses and management policies and practices. Therefore, this scoping study recommends developing multi-objective economic evaluations in vulnerable landscapes. They should be developed through multi-stakeholder dialogues and communicated effectively to influence adjustments to policies and practices. Ongoing initiatives such as the Biodiversity-Based Economy Development Office (BEDO) in Thailand and the bio-circular-green economy announced at the 2022 APEC conference, show a willingness of the private sector and government to engage with sustainable landscape management.

Regarding restoration tools, the review highlights that continued support is needed to strengthen and scale up best research practices and governance processes for integrating TEK into restoration and sustainable natural resource management tools research and projects (including in revegetation, hydrological restoration, fire management, developing sustainable livelihoods and monitoring activities). Support is needed to ensure restoration projects aim to integrate TEK into sustainable natural resources management and restoration projects and do so with “shared principles and an ethical code of conduct”. With perhaps the need to follow Robinson's et al. (2021) proposal to hold “an Indigenous-led workshop to re-imagine and re-develop equitable ways forward for TEK partnerships in restoration, with explicit considerations for the rights, livelihoods, and leadership of Indigenous peoples”. Again, organisations such as Asia Indigenous Peoples Pact may be best placed to develop an ethical code of conduct and ethical procedures. Further, project success not only depends on close cooperation with IPs and LCs but requires engagement with all relevant stakeholders from the outset to ensure roles and responsibilities are clearly defined, and challenges and potential conflicts are addressed. Finally, further support is required to develop more cost-effective, participatory environmental restoration and protection tools.

Best practices for community-based monitoring of restoration and sustainable natural resources management projects should also be identified and scaled up. This may include existing and ongoing frameworks such as CIFOR's Community-based Peatland Restoration Monitoring System developed by or through the FAO's FERM process.

3.3 Governance systems

3.3.1 Best practices and challenges

Equitable implementation of national restoration targets

Governments face challenges in implementing restoration targets (see section 6.3 for national restoration targets in SEA). What may be seen as an effective policy on paper, may be challenging to implement on the ground as the targets and policies do not take an integrated approach. For example, considering IPs and LCs' livelihoods within landscapes prioritised for restoration nor the ability of government staff to implement restoration activities (field visit observation in Nan). Also, ill-considered restoration projects established to reach a policy goal rather than to manage landscapes sustainably can result in reduced long-term success (Thompson, 2018) and sometimes devastating consequences. The environmental impacts can be seen in the devastating 2021 floods in Viet Nam, where plantations were especially prone to climate hazards with destructive landslides leading to large-scale loss of life and property. Further restoration has been implicated in green grabbing and dispossession of local communities (Corbera et al.,

2017; Pichler et al., 2021; Scheidel & Work, 2018), highlighting the urgency for better engagement with IPs and LCs and issues of equity when addressing and implementing restoration targets.

There are several online tools and models developed for determining priority landscapes for ecosystem restoration (see Schultz et al. (2022) for identification of research and critical review). The World Resources Institute (WRI) has developed an [Atlas of Forest Landscape Restoration Opportunities](#). The restoration opportunities correlate with areas of existing forest cover and moderate to low human pressure. In collaboration with the University of Cambridge, the Nature Conservancy (TNC) and IUCN have developed a [Mangrove Restoration Potential Map](#). The Map is an "interactive tool designed to explore potential mangrove restoration areas worldwide, along with the benefits associated with such restoration" (The Nature Conservancy, n.d.). The map estimates a Mangrove Restoration Potential area of 303,608ha in SEA, which has the potential to benefit more than 4.08 million people and sequester more than 190mg of soil and aboveground 'blue' carbon.

However, Schultz et al. (2022) recognise the "potential equity implications of using these prioritization exercises to guide global policy" (p. 1). Firstly, restoration priorities are primarily in "countries where displacing agriculture may be most detrimental to livelihoods: countries that are poorer, more populated, more economically unequal, less food secure, and that employ more people in agriculture" (Schultz et al., 2022, p. 1). Secondly, they show that "a similar pattern appears sub-nationally" (Schultz et al., 2022, p. 1).

Therefore, it is vital that first, national restoration priority areas are determined through prioritising equity. And second, when they are implemented, they are done so in a participatory manner to enhance livelihoods and other cultural and social parameters of IPs and LCs' wellbeing. The IUCN's guide to the Restoration Opportunities Assessment Methodology (ROAM) is one tool that aims to help "countries to rapidly identify and analyse FLR potential and locate special areas of opportunity at a national or sub-national level" and do so in a participatory manner with IPs and LCs.

Integrated landscape approaches

Integrated landscape approaches are recommended for effective restoration and sustainable natural resource management (Parish & Chin, 2013). "Integrated landscape approaches are governance strategies that attempt to reconcile multiple and conflicting land-use claims to harmonize the needs of people and the environment and establish more sustainable and equitable multi-functional landscapes" (Reed et al., 2020, p. 1). The definition of a landscape varies. For peatlands, best practices recommend that they be managed as a hydrological unit, as any 'off-site drainage' may offset any rewetting activities (Convention on Wetlands, 2021; Dommain et al., 2016). For Wetlands, some studies suggest wetlands management should extend beyond the wetland ecosystem to consider the entire basin (An & Verhoeven, 2019). This is particularly important when considering upstream causes of environmental degradation such as dams, canals for irrigation of farmland and the build-up of agrochemical pollutants. Peatland hydrological units and watershed basins may include multiple ecosystems — peatlands, forests, mangroves, lakes and rivers, agriculture, urban and peri-urban areas — increasing the complexity and need for effective integrated governance for sustainable natural resources management and restoration.

Effective integrated landscape approaches require cooperation between government agencies and all landscape stakeholders. Such approaches are challenging as landscapes (be it peat domes or entire basins) are usually fragmented under different land uses, including conservation, agricultural and infrastructure development, and are therefore managed by different government agencies. Additionally, they may cross jurisdictional boundaries, sometimes spanning several provinces or different countries. Regarding regional cooperation, there is a lack of coordination in management between countries, especially in the Mekong Delta region (Xu et al., 2019).

According to Arifanti et al. (2022), in Indonesia, conflicting management decisions stemming from unclear policy objectives between government agencies have inhibited mangrove protection. In Cambodia's Tonle Sap wetlands, "various government ministries' multiple mandates and management objectives create inefficiency and a lack of overall direction in management strategies and planning" (Blackham, 2017).

Arifanti et al. (2022) suggest that to help reduce the ambiguity of restoration and management objectives, there is a need to ensure policies determining management do not come under the jurisdiction of different government authorities. However, this is often difficult in practice as local government officers and national-level ministerial agencies are reluctant to transfer their jurisdiction and resources to a different agency.

Coordination mechanisms, and tools to enhance cooperation, are often the optimum solution. To enhance cooperation for the Tonle Sap Biosphere Reserve (TSBR), UNESCO has established a Coordination Mechanism which includes a Technical Working Group (which will provide technical assistance to the management of the TSBR and prepare the TSBR management plan), a Management Coordinating Working Group (which leads, coordinates and oversees the management of the TSBR), and Ministerial Gatherings convened annually by the Ministry of Environment, with ministerial and high-level participation (to provide strategic guidance and oversight and garner political support on long-term vision and priorities).

Cooperation between government agencies and Community-Based Organisations

Arifanti et al. (2022) summarise, "In general, where communities are empowered and given legal rights and authority to manage..., community-based management has proven to be effective". Community-Based Organisations (including Community Fisheries, Community Protected Areas, Community Forestry, Community Saving Groups, Community Product Groups, and so on) are important governance mechanisms. In Nan Thailand, Community Based Organisations work with the local Nan Community College and academics to protect and maintain Community Forests, of which there are more than 1,000 (field visit interviews).

Building effective partnerships between Community-Based Organisations and local government agencies is vital to the success of restoration projects and effective, sustainable natural resources landscape management. Co-management, in some cases, is more successful than community management alone. In the Tagal system in Sabah, Malaysia, government agencies and local communities sustainably manage inland fisheries (IPBES, 2018b). As previously noted, around Tonle Sap, Community Fisheries (CFis) are important tools in wetland governance, as IPs and LCs work with local government agencies to implement sustainable livelihood practices and patrol important conservation areas. Building the capacity of CFis in monitoring and patrolling sustainable fishing and agriculture, and other activities, such as ecotourism and sustainable financing, is key to sustainable wetland management (Avent, 2017). Another successful participatory model is the Indonesian Peat Care Village Program, which collaborates with local elites, farmers, women and youth to integrate peatland restoration into village development (plans and budget) and builds participatory governance of peatland restoration (Astuti et al., 2020).

However, it is important to recognise that there are significant power differences between government officers and communities, and governance in SEA countries is still very top-down. In Thailand, an "ongoing 7.4 billion Baht Nong Han water project aims to establish 69 interventions in the lake and nearby systems, 36 of which have been approved already for the project's first phase in 2021–22" (Ghimire, 2021). The project began without discussions with IPs and LCs (Ghimire, 2021). Participatory governance should therefore be developed from the ground up, be locally-led, and be based on the co-production of knowledge aimed at creating more equitable resource systems.

Private sector cooperation

SEA countries face challenges working within a policy environment that supports private industry over conservation targets. In Indonesia, Gaveau et al. (2017) found that the peatland rehabilitation and restoration approach implemented in Riau faced challenges. The government agency responsible was met with difficulties implementing rehabilitation and restoration inside 163 registered concession areas (67 pulpwood and 96 palm oil companies that comprised 47% or 1.8 million ha of peatlands in the province).

However, engagement with the private sector in national landscape governance is vital to reverse environmental degradation. Mechanisms for private sector engagement exist through multi-stakeholder platforms at the ASEAN level (Section 6.4). Incentive mechanisms are also needed to engage large private sector actors and smallholders in landscape-level discussions and planning. Such incentive mechanisms can be through policies and taxes regulating the private sector's environmental impacts and certification schemes such as the Roundtable on Sustainable Palm Oil (RSPO). As previously discussed, multi-objective economic evaluations can also be important for exploring the costs and benefits of contrasting landscape uses and management, and influencing adjustments to practices to yield more sustainable, ecologically-productive, diverse landscapes (Baker et al., 2002; Polasky et al., 2008). Further private sector engagement should involve research that can aid in developing more equitable supply chains and business models centred on producing more productive landscapes that benefit IPs and LCs and marginalised groups, including women and youth.

Insecure tenure

IPs and LCs continue to face barriers due to insecure tenure (Arifanti et al., 2022; Mizuno et al., 2021). Various assessments and programmes highlight the need to ensure IPs and LCs have strong and clear tenure rights (eg. FAO, 2016). Considerable progress towards tenure rights has been made in SEA over the last 30 years through the combined work of IPs and LCs, CSOs, NGOs, academics, donors and governments. However, while governments have mechanisms in their legal frameworks to support tenure rights (Lewis et al., 2022, under review), the vast majority of IPs and LCs still have insecure tenure and restrictive resource rights. The Rights and Resources Initiative's 2020 assessment estimated that "Indigenous and local community land and territories amounting to 81.7 million ha in Southeast Asia, a substantial portion (89.7%, or 73.3 Mha) is still unrecognized". A lack of secure tenure has negatively impacted restoration initiatives (Arifanti et al., 2022; Mizuno et al., 2021). Therefore, those working towards revising degradation must continue to focus on strengthening IPs and LCs' tenure and resource rights.

Participatory policymaking

At national levels, policymaking in SEA tends to be dominated by authoritarian regimes, as demonstrated by the various indices such as Economist Intelligence Unit's Democracy Index, CIVICUS, and Transparency International's Corruption Perception Index. This has been reflected in the governance of landscapes, particularly forest landscapes in the region, leaving little room for the rights and inclusion of IPs and LCs in policy and decision-making processes (Gritten et al., 2019). This situation is invariably worse for marginalised groups, especially women, and ethnic and Indigenous Peoples. While some countries in the region are signatories of UNDRIP and ILO Convention No. 169 and have made efforts to support the integration of representative decision-making bodies in state decision and policymaking processes, various challenges persist, with many being more systematic (ILO 2017).

In Thailand, for example, a technocratic committee of government officers and national academics developed the Kor Tor Chor policy (enacted in 2019), which outlines IPs and LCs' land rights within demarcated National Reserved Forests and Protected Areas and reforestation requirements. The academics were primarily from ecology/forestry and not social scientists nor members of civil society. As findings from the field visit in Nan show, despite ambitious restoration targets, this policy is overly complex to implement by local Royal Forest Department staff, and IPs and LCs' livelihoods have not been suitably considered. Failure to integrate IPs and LCs into decision-making processes can lead to inequitable policy outcomes.

However, there are formal and informal mechanisms through which IPs and LCs can engage in policymaking processes in SEA. In Thailand, a Kor Tor Chor network of NGOs and CSOs can provide government input every four years. This network may be best placed to use evidence from completed and ongoing research studies to determine what aspects of the Kor Tor Chor policy may or may not be working in aiding restoration and improving IPs and LCs' livelihoods. Informal mechanisms include writing an official letter to national government ministers asking them to address local environmental issues, as two Community Fisheries Committees highlighted during the field visit to Tonle Sap in Cambodia.

Youth engagement

Rural and urban youth are important for a sustainable future and for addressing climate change. Recognising this, youth engagement is increasingly important in the work of NGOs and International Organisations in SEA. Regarding rural youth, there are large migration flows of youth from rural to urban areas. As Deotti & Estruch (2016) summarise, globally:

“Young people account for the bulk of migration flows (Gingsburg et al., 2014; Awumbila et al., 2015; Msigwa, 2013). Young migrants aged 15–24 years account for one-eighth of migrant workers and are moving mainly in search of better livelihoods (UNICEF, 2014). Data collected in 150 countries and territories suggest that more than a quarter of young people are willing to locate to another country (ILO, 2014a). The same can be said for internal migration (Potts, 2008). Young people usually move out of rural areas towards urban areas, looking for employment in sectors other than agriculture (Ginsburg et al., 2014; Awumbila et al., 2015). ...In some cases, youth seek short-term seasonal employment to supplement their income in periods of the year when agricultural work is not available. In other cases, youth wish to move to urban areas for a longer period, attracted by the differences in expected returns and income (Harris and Todaro, 1970).... Rural youth may lack important skills and resources to be competitive in formal labour markets, both in rural areas of origin and urban areas of destination.”

Remittance from urban to rural economies is often a vital part of rural economies across SEA (and is likely to remain so in the future). It has been shown to positively impact restoration in forest landscapes (Peluso & Purwanto, 2018; Zhunusova et al., 2022) and could also have positive benefits in other ecosystems. IPs and LCs stewardship has also been found to play a positive role in maintaining forest landscapes (Zanotti & Knowles, 2020), making youth retention equally important. Therefore, skills should be provided, and opportunities created for the younger generations of rural IPs and LCs to partake in sustainable landscape management and develop sustainable business models. Opportunities should also be created to ensure the transfer of TEK and knowledge of sustainable landscape management to the youth.

Urban youth across SEA are often on the frontlines of climate change and environmental protests, indicating a concern for their future and frustration with the lack of government action (Barney, 2012; Peluso & Purwanto, 2018; Zhunusova et al., 2022). NGOs and International Organisations (eg. [WWF](#), [RECOFTC](#), [UNDP](#)) have engaged youth through young environmental entrepreneurs and environmental guardians projects. Such engagement must continue to be supported; doing so can aid in bringing about policy change (Vennghaus et al., 2022) and importantly, inspire hope at a critical juncture of human history

and planetary health. The UN Decade on Ecosystem Restoration (2021-2030) has also established a Youth Taskforce, in which the “United Nations Major Group for Children and Youth through the Children and Youth Organisation accredited to UNEP and SDG 2 Working Group will facilitate the engagement of youth advocates, youth-led restoration initiatives, and a wide range of formal and informal youth groups”. (<https://www.decadeonrestoration.org/task-forces/youth>) (see Section 6.1 for more information on the UN Decade).

3.3.2 Recommendations for REDAA intervention

The review highlighted that national, through to local governance approaches to identifying and implementing priority areas and initiatives for restoration should be strengthened through improved participatory processes, consideration of equity and scaling up of best practices. Using a cross-sector and intersectional approach, research should identify and use models and approaches to ensure the participation of IPs and LCs, CSOs and other key actors in decision making to identify, plan and implement actions on restoration at the local and national levels. Assessing these approaches in specific sites and using comparative analytical tools can ensure the replicability and scalability of these models.

The review highlights that integrated landscape approaches require cooperation between government agencies and all landscape stakeholders. Therefore, this report recommends that the REDAA programme engages with ongoing and newly-established processes to develop effective governance coordination mechanisms to support restoration and natural resources management. Integrated landscape approaches should try to build and strengthen cooperation between government agencies and Community-Based Organisations (such as Community Forestry Committees or Provincial Community Forestry Coordination bodies). This can be achieved through processes that aid in developing knowledge and organisational capacity, and build trust while considering risks and safeguards concerning power differentials and potential conflicts. Decision-making tools such as ComMod can enhance effective governance in integrated landscape management or multi-objective economic evaluations.

Continued attention to strengthening IPs and LCs' tenure, resource rights and participation in policymaking processes is important to reversing environmental degradation. Formal and informal pathways should be identified through which IPs and LCs can engage with policy processes to strengthen tenure and resource rights. Targeted data and knowledge that can be used to advocate for IPs and LCs tenure and resource rights during formal policymaking processes, should be produced through participatory-action-research (for example, evidence of how the Kor Tor Chor land use policy in Thailand is being implemented on the ground and how it can be improved to strengthen IPs and LCs' tenure and resource rights). IPs and LCs' capacity to improve resource rights and access through informal pathways (such as engagement in local government or writing to government ministers) can be strengthened. ASEAN Guidelines, such as the Recognition of Customary Tenure in Forested Landscapes, the Guiding Principles on Social Forestry Enabling Legal Frameworks, and the ASEAN Working Group on Social Forestry, can provide a platform and entry points for such initiatives.

Finally, rural and urban youth engagement in restoration and sustainable natural resources management initiatives requires continued support. Such support may be provided through ongoing initiatives (eg. [WWF](#), [RECOFTC](#), [UNDP](#)) that provide opportunities for youth through environmental education and to partake in sustainable landscape management as young environmental entrepreneurs, and as environmental guardians. REDAA can also collaborate with the Youth Task Force under the UN Decade on Ecosystem restoration (2021-2030) (see Section 6.1 for more details).

4 Research-to-action priorities

For details of how the RECOFTC scoping team identified the research-to-action priorities, please see section 1.3. In summary, a longlist of research-to-action priorities was identified through the review in

Section 3 (the review included information gained through literature reviews, field visits [Tonle Sap wetlands, Cambodia, Riau Peatlands, Indonesia, and Nan upland forests in Thailand] and KIIs) (Annex 2). The longlist was developed from the recommendations for REDAA interventions from the review (sections 3.1.2, 3.2.2 and 3.3.2). The RECOFTC scoping team, through workshops and further KIIs, evaluated the research-to-action priorities in the longlist against the criteria presented in section 1.3, *Table 1*, to determine the 11 research-to-action priorities. The 11 research-to-action priorities are listed below in section 4.1 and presented against the criteria in *Table 1* in section 4.2.

The research-to-action priorities identified reflect the gaps in the knowledge/evidence base. As well as the findings of the scoping study analysis, that recognise transitioning from practices and processes that drive/cause environmental degradation requires scaling up of best practices and the development of innovative restoration and sustainable natural resources management tools, practices, processes and policies. These should be taken from effective regional to local multi-sectoral research networks and multi-sectoral research (that where appropriate factors in intersectional theory and methods), which can aid in developing:

- sustainable, ecologically-productive and climate resilient landscapes;
- economically-equitable value chains and governance processes that benefit IPs and LCs, smallholders, women, youth and other marginalised groups (women, youth, migrant workers, landless labourers, displaced peoples and LGBTQ+), concerning several parameters; economics, socio-cultural and in terms of health and general wellbeing; and,
- governance systems that strengthen coordination between various agencies and stakeholders to deliver multiple objectives.

4.1 Research-to-action priorities

Evidence

1. **Multi-sectoral national research-to-policy networks engaged in environmental restoration and sustainable natural resource management are strengthened alongside the research-to-policy processes within such networks.** Strengthening research-to-policy networks will foster research that: better reflects evidence on issues faced by IPs and LCs, women and youth and other marginalised groups; builds more equitable and sustainable business models between IPs and LCs, women and youth, the private sector, and other key stakeholders; addresses data and knowledge needs to strengthen policies; develops more sustainable management of landscapes; aids governments to make evidence-based decisions and develop appropriate national restoration targets and other commitments (such as NDCs) across sectors, and support said targets. It is recommended that such work be transboundary to reflect commonalities of degradation issues and restoration research, the cross-boundary nature of issues such as the illegal timber trade and haze from forest fires, and to amplify learning opportunities.

REDAA may build on existing cross-sectoral and inclusive regional and national research-to-policy initiatives (eg. EXPLORE, The Sustainable Mekong Research Network (SUMERNET), Strengthening Human Rights and Peace Education in ASEAN/Southeast Asia (SHAPE SEA), Economy and Environment Program for Southeast Asia (EEP-SEA)) to implement certain REDAA research as a way to strengthen existing research networks, create a platform for sharing evidence, and find pathways and processes to create stronger collaboration between researchers, IPs and LCs and Women's organisations, CSOs, the private sector and governmental departments.

2. **Research collaborations between CSOs, NGOs, research institutes, IPs and LCs and women groups/networks are built, and existing collaborations are strengthened.** In doing

so, IPs and LCs, women and youth groups/networks have increased capacity to develop research proposals, conduct or contribute to the research design process, collect data, analyse, and communicate research findings to appropriate stakeholders. Understanding between IPs and LCs' needs and interests and research methods could be developed by creating dialogues between IPs and LCs and women groups and networks, and researchers, CSOs and NGOs. Researchers' capacity should be increased to undertake participatory-action-research with IPs and LCs and women to ensure research objectives are developed in partnership with them for systematic documentation. Or at a minimum, research should adhere to do-no-harm principles and strive for transformative outcomes.

Strengthening collaborations between CSOs, NGOs, research institutes, IPs and LCs and women groups and networks, should also work towards enabling them to better address challenges in developing more inclusive evidence-based research, when accounting for risks and safeguards of a restrictive research environment and civic space. Strengthened research collaborations may help mitigate or better address the challenges faced while conducting research concerning capacity and working on contentious issues. Therefore, strengthening research networks and outputs should lead to research that better reflects issues identified by IPs and LCs, women and marginalised groups, while recognising and mitigating the risks associated with research.

- 3. Restoration and sustainable natural resources management initiatives integrate intersectional theories and methods more effectively into research and practice.** Environmental degradation hits marginalised members of society the hardest, including IPs and LCs, women, youth, migrant workers, landless labourers and displaced peoples. When intersectional inequalities are not factored into restoration or sustainable resources management initiatives, this can perpetuate injustices against marginalised communities. Understanding social dimensions, emphasising equity and intersectionality, is vital to ensure restoration and sustainable natural resources management initiatives mitigate the production of greater inequity and conflict. Online and in-person dialogues, workshops or courses for academics and gender and social inclusion officers, and other NGO staff is one way to increase knowledge and understanding of intersectional theory and methods at the regional level. Ensuring activities under REDAA factor in intersectional theories and methods where possible will generate evidence and processes to support their effective integration in restoration and sustainable management initiatives, with the aim of reducing inequality for IPs and LCs, women, youth, migrant workers, landless labourers and displaced peoples.

Tools

- 4. Research and governance processes for integrating Traditional Ecological Knowledge (TEK) into restoration and sustainable natural resource management tools, research and projects (including in revegetation, hydrological restoration, fire management, developing sustainable livelihoods and monitoring activities) are strengthened, and best practices are scaled up.** Working groups within the ASEAN platform (such as the ASEAN Working Group on Social Forestry and the ASEAN Working Group on Forest and Climate Change) can be employed to develop shared principles and an ethical code of conduct that builds on deep listening with Indigenous peoples. The ASEAN shared principles and ethical code of conduct may be developed initially through an Indigenous/ethnic people-led workshop (working with organisations, eg. Asia Indigenous Peoples Pact, AIPP or partnering with Mekong Regional Land Governance project) to re-imagine and re-develop equitable ways forward for TEK partnerships in restoration and sustainable natural resource management, with explicit considerations for the rights, livelihoods and leadership of Indigenous peoples.

5. **Drawing on existing and ongoing research, sustainable and climate-resilient business models that demonstrate improving IPs and LCs', women's and youth's (and other marginalised groups) wellbeing, equitability in value chains, economic returns and landscape ecological productivity are identified, strengthened, and scaled up through participatory approaches.** It is recommended that such models are built through a systems perspective, whereby product-market development occurred in unison and was based on IPs and LCs' participation with researchers and the private sector from project inception. This requires facilitating agreements for community-private sector partnerships in landscapes. This priority should aim to strengthen existing networks within and across landscapes and business partnerships in value chains, and develop processes that aid in addressing/mitigating conflict, while establishing mutual benefits for all.
6. **Drawing on existing and ongoing research — existing and potential IP and LC-centred approaches, and models that provide direct financing through payment for sustainable ecosystem management and restoration through carbon trading, biodiversity offsets, and nature-based offsets to IPs and LCs — are identified and, through further research, are strengthened and scaled up, and novel models are developed where needed.** Best practices and novel mechanisms for engaging with carbon trading, biodiversity offsets, and nature-based offsets (for example, the Trees4All and micro-credit schemes initiated by RECOFTC) should be developed, piloted and scaled up throughout the region. Research-to-action activities under this target should aim to engage and strengthen financing mechanisms that support IPs and LCs at all stages of transitioning from degraded to reforested landscapes, to mitigate against any potential loss of income. Models should ensure they improve equity, have robust benefit-sharing mechanisms, and adhere to Free and Prior Informed Consent principles and processes. Respecting IPs and LCs' customary tenure arrangements and territory must be the starting point for these initiatives, and such initiatives should link to processes aimed at strengthening tenure and resource rights.
7. **Multi-objective economic evaluations developed through multi-sectoral and participatory-action-research are produced to explore the costs and benefits of contrasting landscape uses and management policies and practices which factor in climate change scenarios.** Outcomes that are more likely to provide multiple benefits, are more equitable and sustainable, and have climate change-resilient outcomes, should be elaborated and effectively communicated to diverse stakeholders. This is to support them in adjusting policies and practices to yield more sustainable and ecologically-productive and diverse landscapes. Ongoing initiatives such as the Biodiversity-Based Economy Development Office (BEDO) in Thailand and the increased focus on the bio-circular-green economy at the 2022 APEC conference, show a willingness of the private sector and government to strengthen their engagement in sustainable landscape development; and such multi-objective economic evaluations can support such transitions.

Governance systems

8. **National through to local governance practices and processes for identifying priority areas for restoration and planning restoration initiatives, are strengthened through multi-sectoral and participatory-action-research, that integrates intersectional approaches to addressing inequity (IPs and LCs, women, youth, migrant workers, landless labourers and displaced peoples) through said initiatives.** Using a cross-sector and intersectional approach, research will identify and use models and approaches to ensure the participation of IPs and LCs, CSOs and other key actors in decision making to identify, plan and implement actions on restoration at the local and national levels. Evaluating these approaches in specific sites and using comparative analytical tools can ensure the replicability and scalability of these models.

9. **Governance coordination mechanisms and integrated landscape approaches to restoration and resource management, are strengthened in priority landscapes through multi-sectoral and participatory-action-research and decision-making tools.** Integrated landscape approaches should try to build and strengthen cooperation between government agencies and Community-Based Organisations (such as Community Forestry Committees or Provincial Community Forestry Coordination bodies), smallholders and the private sector. They should use processes that aid in developing knowledge and organisational capacity and building trust, while considering risks and safeguards concerning power differentials and potential conflicts. Decision-making tools such as ComMod or multi-objective economic evaluations can be employed to enhance effective governance in integrated landscape management.
10. **IPs and LCs' tenure and resource rights are strengthened through participatory-action research, which will require researching/identifying formal and informal pathways and processes through which IPs and LCs can engage with policy processes to strengthen tenure and resource rights.** Targeted data and knowledge that can be used to advocate for IPs and LCs' tenure and resource rights during formal policymaking processes, should be produced through participatory-action-research (for example, evidence of how the Kor Tor Chor land use policy in Thailand is being implemented on the ground and how it can be improved to strengthen IPs and LCs' tenure and resource rights). IPs and LCs' capacity to improve resource rights and access through informal pathways (such as engagement in local government or writing to government ministers) can be strengthened and scaled up. ASEAN Guidelines, such as the Recognition of Customary Tenure in Forested Landscapes, the Guiding Principles on Social Forestry Enabling Legal Frameworks, and the ASEAN Working Group on Social Forestry, can provide a platform and entry points for such initiatives.
11. **Rural and urban youth engagement in restoration and sustainable natural resources management initiatives are strengthened** through the continued support of initiatives that collaborate with youth. This is through formal and non-formal environmental education and by providing youth opportunities to partake in sustainable landscape management activities, as young environmental entrepreneurs, and as environmental guardians. REDAA, for example, can collaborate with the Youth Taskforce under the UN Decade on Ecosystem restoration (2021-2030).

4.2 Evaluation of research-to-action priorities

The RECOFTC-REDAA scoping team evaluated each research-to-action priority against the criteria in Table 1 and repeated below to ensure that the priorities: have both site-specific and cross-cutting impacts; are best addressed through locally-led participatory action research by IPs and LCs, women, and youth and other marginalised groups; are best addressed through intersectional examinations and the empowerment of vulnerable groups (including IPs and LCs, women, youth, migrant workers, landless labourers and displaced peoples); foster multi-sectoral and cross/trans-disciplinary collaborations; and, provides value for money in terms of being scale-appropriate and time fitting within the REDAA programme's financial capacity and time-period, and will provide cost-effective benefits. Section 4.2.1 provides a table of the full evaluation of the evidence research-to-action priorities against the criteria, Section 4.2.2 provides the evaluation of the tools research-to-action priorities against the criteria, and Section 4.2.3 does so for governance systems.

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Criteria for identifying priorities

Impacts	Site-specific impact: if the issue(s) were addressed, it would have a major impact in a specific place
	Crosscutting impact: if the issue(s) were addressed, it would greatly impact systems or processes that affect many places
Participatory action research participatory processes	Locally-led: the issue is best addressed by locally-led action, especially action led by IPs and LCs
	Intersectional: the issue is best addressed through intersectional understanding and empowerment of vulnerable groups, including Indigenous Peoples, women, youth, migrant workers, landless labourers and displaced peoples
Multi-sectoral	Cross-disciplinary and multi-stakeholder: the issue is best addressed by fostering multi-stakeholder and cross/trans-disciplinary collaborations
Value for money	Scale-appropriate: the issue can be usefully addressed with the scale of support that may be possible from the REDAA programme, eg. a grant of between about US\$10,000 and 100,000 over six to 24 months, or a grant of between US\$200,000 and 1 million over four years
	Timeframe-fitting: the issue can be completely addressed within six months to four years, or a significant contribution to addressing the issue can be made and verified within six months to four years
	Value for money: the ways in which the issue is addressed will provide good returns on investment, benefits to costs and value for money.

4.2.1 Evidence

	Priorities	Multi-sectoral national research-to-policy networks engaged in environmental restoration and sustainable natural resource management are strengthened alongside the research-to-policy processes within such networks	Research collaborations between CSOs, NGOs, research institutes, IPs and LCs and women groups/networks are built, and existing collaborations are strengthened	Restoration and sustainable natural resources management initiatives integrate intersectional theories and methods more effectively into research and practice
Impacts	Site-specific impact: if the issue(s) were addressed, it would have a major impact in a specific place	This priority would help strengthen national research-to-policy networks engaged in restoration and sustainable natural resources management. Consideration should be given to networks that include institutions based in or with a long history of working in priority landscapes. This, among others, would help to achieve site-specific impacts.	<p>This priority would help to strengthen CSOs, NGOs and academic national platforms and collaborations, leading to more effective research outcomes and impacts, including in the landscapes.</p> <p>This priority should have impacts at the regional, national and landscape levels. IPs and LCs organisations working across scales can strengthen their capacity to engage in research and build more effective cooperation with research institutes, and better use evidence for more effectively advocating their positions, interests and needs.</p>	Not implicit in the priority. However, if researchers and NGOs effectively integrate intersectional theories and methods into their participatory-action-research and project, this may have positive impacts on lowering inequity at many sites.

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	Priorities	Multi-sectoral national research-to-policy networks engaged in environmental restoration and sustainable natural resource management are strengthened alongside the research-to-policy processes within such networks	Research collaborations between CSOs, NGOs, research institutes, IPs and LCs and women groups/networks are built, and existing collaborations are strengthened	Restoration and sustainable natural resources management initiatives integrate intersectional theories and methods more effectively into research and practice
Impacts	Cross-cutting impact: if the issue(s) were addressed, it would greatly impact systems or processes that affect many places	In SEA, although ongoing processes and initiatives are working towards improving research-to-policy processes and networks, such initiatives would benefit from stronger and more sustained collaboration between researchers, IPs and LCs and women's organisations, CSOs and government agencies. Stronger collaboration can help to ensure participatory-action-research undertaken reflects the issues faced by IPs and LCs, builds more equitable and sustainable business models between IPs and LCs and the private sector and other stakeholders, and addresses data and knowledge requirements to strengthen policies concerning reducing inequity, developing more ecologically-productive and diverse landscapes, and aiding governments to have proper decision making, appropriate national restoration targets and other commitments (such as NDCs), and support their achievement.	This priority is cross-cutting. Building more effective and stronger collaborations between research institutes, NGOs, CSOs and IPs and LCs in SEA could strengthen research-to-action processes where research objectives are developed in partnership with IPs and LCs, ensuring that, as a minimum, the research adheres to the do-no-harm principles and strives for do-good, transformative outcomes.	In SEA, research concerning intersectional theory and methods is undeveloped, while understanding it is vital to ensure the effectiveness of restoration activities. By filling the gap at the regional level, REDAA can fund the capacity development of SEA researchers to engage in intersectional theory and methods, developing research networks, and developing the capacity of SEA-based NGOs to engage with intersectional theory is innovative, very much needed and may have long-lasting impacts on how the SEA development community operates
Participatory processes	Locally-led: the issue is best addressed by locally-led action, especially action led by Indigenous Peoples and local communities (IPs and LCs)	This priority requires a strong commitment to engaging with IPs and LCs. Strengthening research-to-policy networks will likely foster research that better reflects the issues faced by IPs and LCs through participatory approaches, and provide enough evidence to strengthen research-to-policy processes.	This is implicit in the priority, whereby the priority is strengthening IPs and LCs' capacity to lead and communicate or make use of research results. CSO-inclusive or Indigenous Peoples and local communities-led organisations, and NGO networks in SEA, have also proven effective in creating awareness of IPs and LCs' rights and issues, and influencing policies to strengthen IPs and LCs rights.	Intersectional inequalities are best understood as examining inequality at the local level and how such inequality is produced across scales (local, provincial, national). Integrating intersectional theories and methods into restoration and sustainable natural resources management initiatives should help to address inequality at the local level.

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	Priorities	Multi-sectoral national research-to-policy networks engaged in environmental restoration and sustainable natural resource management are strengthened alongside the research-to-policy processes within such networks	Research collaborations between CSOs, NGOs, research institutes, IPs and LCs and women groups/networks are built, and existing collaborations are strengthened	Restoration and sustainable natural resources management initiatives integrate intersectional theories and methods more effectively into research and practice
Participatory processes	Intersectional: the issue is best addressed through intersectional understanding and empowerment of vulnerable groups, including Indigenous Peoples, women, youth, migrant workers, landless labourers, and displaced peoples	Strengthening multi-sectoral national research-to-policy networks should aim to empower IPs and LCs, women and other vulnerable groups through more effective participation in research, and processes that better connect research and knowledge gathered at the local level with key stakeholders in the private sector and government	This priority is best addressed through not only working with IPs and LCs but working and empowering vulnerable groups within IPs and LCs, including women, youth, migrant workers, landless labourers and displaced peoples	Addressed by default
Multi-sectoral	Cross-disciplinary and multi-stakeholder: the issue is best addressed by fostering multi-stakeholder and cross/trans-disciplinary collaborations	This priority is best addressed by fostering multi-stakeholder and cross/trans-disciplinary collaborations. Issues facing environmental degradation do not belong to only one sector.	This priority is best addressed by fostering collaborations between IPs and LCs, CSOs, NGOs and research institutes	This priority aims to foster stronger collaborations between researchers, NGOs and marginalised groups.
Value for money	Scale-appropriate: the issue can be usefully addressed with the scale of support that may be possible from the REDAA programme, eg. a grant of between about US\$10,000 and 100,000 over six to 24 months, or a grant of between US\$ 200,000 and 1 million over four years	The priority may be best addressed by supporting existing research-to-policy networks engaged in environmental restoration and sustainable natural resource management. This is to strengthen their networks to develop more targeted research to impact issues identified by IPs and LCs and other vulnerable groups, to build more equitable and sustainable business models between IPs and LCs and the private sector. It will also strengthen policies concerning reducing inequity, developing more ecologically productive and diverse landscapes and achieving national restoration targets and other commitments (such as NDCs).	The priority may be best addressed by supporting existing IPs and LCs, CSO/NGO networks and their collaboration, or developing new processes to enable better/strengthen collaboration with research institutes. Depending on the funding needs and identified activities, this priority can be addressed through small or large grants.	This is feasible to be addressed through REDAA projects/activities i) targeted at building networks of researchers and NGOs at the regional level to champion intersectional approaches, and further develop methodologies and engage with other key stakeholders ii) through incorporating intersectional theories and methods into REDAA research and project activities

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	Priorities	Multi-sectoral national research-to-policy networks engaged in environmental restoration and sustainable natural resource management are strengthened alongside the research-to-policy processes within such networks	Research collaborations between CSOs, NGOs, research institutes, IPs and LCs and women groups/networks are built, and existing collaborations are strengthened	Restoration and sustainable natural resources management initiatives integrate intersectional theories and methods more effectively into research and practice
Value for money	Timeframe-fitting: the issue can be completely addressed within six months to four years, or a significant contribution to addressing the issue can be made and verified within six months to four years. These issues help to build or build on existing, long-term networks.	If building on existing networks and multi-stakeholder groups, then impacts would be seen in the first year. Nevertheless, sustainable outcomes would take three or more years reflecting integrated changes needed.	This priority is time fitting, working through existing organisations and networks, it would ensure more significant contributions	This priority is time fitting, working through existing organisations and networks, it would ensure more significant contributions
	Value for money: the ways in which the issue is addressed will provide good returns on investment, benefits to costs and value for money.	This priority should strengthen the evidence base and work towards ensuring research more effectively addresses multi-stakeholder needs concerning producing equitable, sustainable, more ecologically-productive and diverse landscapes, and knowledge derived through research is more effectively integrated within policies.	Short-term benefits may be seen through the increased capacity of IPs and LCs to undertake research and build partnerships that respond to a community's or network's needs. Longer-term impacts would be seen through more effective participatory approaches that aid in developing more equitable, productive, and sustainable landscapes and strengthened resource rights for IPs and LCs. Further, depending on the political environment, this priority could help/provide more support to IPs and LCs and vulnerable groups in a way that helps them strengthen equity and rights and develop sustainable landscape practices to yield greater economic returns.	Short-term benefits may be seen through the increased capacity of IPs and LCs to undertake research and build partnerships that respond to a community's or network's needs. Longer-term impacts would be seen through more effective participatory approaches that aid in developing more equitable, productive and sustainable landscapes, and strengthened resource rights for IPs and LCs.

4.2.2 Tools

	Priorities	Research and governance processes for integrating TEK into restoration and sustainable natural resource management tools, research and projects (including in revegetation, hydrological restoration, fire management, developing sustainable livelihoods and monitoring activities) are strengthened, and best practices are scaled up.	Drawing on existing and ongoing research, sustainable and climate-resilient business models that demonstrate improving IPs and LCs', women's and youth's (and other marginalised groups) wellbeing, equitability in value chains, economic returns and landscape ecological productivity are identified, strengthened and scaled up through participatory approaches.	Drawing on existing and ongoing research, existing and potential IPs and LC-centred approaches and models that provide direct financing through payment for sustainable ecosystem management and restoration through carbon trading, biodiversity offsets, and nature-based offsets to IPs and LCs, are identified and, through further research, are strengthened and scaled up, and novel models are developed where needed.	Multi-objective economic evaluations developed through multi-sectoral and participatory-action-research are produced to explore the costs and benefits of contrasting landscape uses and management policies and practices which factor in climate change scenarios.
Impacts	Site-specific impact: if the issue(s) were addressed, it would have a major impact in a specific place	Site-specific impacts would be seen by creating more extensive processes for integrating TEK into restoration and sustainable natural resources activities	Business models considering sustainable components (diversified crops and so on) can potentially develop local economies where IPs and LCs benefit from their choices/inputs	IPs and LCs-centred engagement with carbon trading, biodiversity offsets, and nature-based offsets through collaboration with multiple stakeholders across scales, which can benefit IPs and LCs and provide alternatives to the more top-down models such as REDD+ and Voluntary Carbon Mechanisms. Building in IPs and LCs in business and finance models or other benefit-sharing mechanisms ensures buy-in of conservation goals with the added value of integrating local Indigenous knowledge (TEK)	Economic valuation of contrasting land use and land policy frameworks is a widely used approach for developing evidence for advocating for more sustainable, productive and resilient landscapes. However, the impacts of the application of such tools tend to take place more subtly and over longer timeframes than other interventions.
	Cross-cutting impact: if the issue(s) were addressed, it would greatly impact systems or processes that affect many places.	As mentioned above, this priority would have major site-specific impacts if in place through creating more extensive processes for integrating TEK into restoration activities	Any business model has a value chain, so it has a cross-cutting impact that originates at the source. Cross-cutting impacts will be shown through improved partnerships between business model/value chain actors, through which there is high potential through long-term collaboration.	Identification and scaling up of proven IPs and LC-centred carbon trading, biodiversity offsets and nature-based offsets models can have cross-cutting impacts.	This tool will likely have cross-cutting impacts and potentially affect processes across many sites.

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	Priorities	Research and governance processes for integrating TEK into restoration and sustainable natural resource management tools, research and projects (including in revegetation, hydrological restoration, fire management, developing sustainable livelihoods and monitoring activities) are strengthened, and best practices are scaled up.	Drawing on existing and ongoing research, sustainable and climate-resilient business models that demonstrate improving IPs and LCs', women's and youth's (and other marginalised groups) wellbeing, equitability in value chains, economic returns and landscape ecological productivity are identified, strengthened and scaled up through participatory approaches.	Drawing on existing and ongoing research, existing and potential IPs and LC-centred approaches and models that provide direct financing through payment for sustainable ecosystem management and restoration through carbon trading, biodiversity offsets, and nature-based offsets to IPs and LCs, are identified and, through further research, are strengthened and scaled up, and novel models are developed where needed.	Multi-objective economic evaluations developed through multi-sectoral and participatory-action-research are produced to explore the costs and benefits of contrasting landscape uses and management policies and practices which factor in climate change scenarios.
Participatory processes	Locally-led: the issue is best addressed by locally-led action, especially action led by IPs and LCs	The priority requires engagement with IP and LC working groups and networks to develop more robust frameworks and guidelines for collaborating with IPs and LCs and integrating TEK into restoration	If improving existing business models is accepted by other actors and space is created for IPs and LCs, IPs and LCs can contribute to local economic development	It is implicit that IPs and LCs-centred approaches and models for engagement with carbon trading, biodiversity offsets and nature-based offsets are locally-led	While the participation of IPs and LCs is important to the successful application of this tool, the key to successful application is a representation of the interests of all major stakeholders within and downstream of the land or waterscape. However, promoting outcomes that provide more equitable, sustainable and climate change-resilient outcomes, should benefit IPs and LCs.
	Intersectional: the issue is best addressed through intersectional understanding and empowerment of vulnerable groups, including Indigenous Peoples, women, youth, migrant workers, landless labourers and displaced peoples	It is recommended that intersectional considerations be at the centre of the redevelopment of equitable ways forward for TEK partnerships in restoration and sustainable natural resources management	It is fundamental that business models collaborate with women's groups and other marginalised groups to advance equity	It is recommended that IPs and LCs-centred approaches and models for engagement with carbon trading, biodiversity offsets and nature-based offsets include mechanisms and processes to reduce inequity amongs various vulnerable groups and robust benefit-sharing mechanisms are in place	Because of the inherent complexity of multi-objective economic evaluations of large areas with diverse stakeholder groups, the additional complexities of intersectionality are not usually a central feature

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	Priorities	Research and governance processes for integrating TEK into restoration and sustainable natural resource management tools, research and projects (including in revegetation, hydrological restoration, fire management, developing sustainable livelihoods and monitoring activities) are strengthened, and best practices are scaled up.	Drawing on existing and ongoing research, sustainable and climate-resilient business models that demonstrate improving IPs and LCs', women's and youth's (and other marginalised groups) wellbeing, equitability in value chains, economic returns and landscape ecological productivity are identified, strengthened and scaled up through participatory approaches.	Drawing on existing and ongoing research, existing and potential IPs and LC-centred approaches and models that provide direct financing through payment for sustainable ecosystem management and restoration through carbon trading, biodiversity offsets, and nature-based offsets to IPs and LCs, are identified and, through further research, are strengthened and scaled up, and novel models are developed where needed.	Multi-objective economic evaluations developed through multi-sectoral and participatory-action-research are produced to explore the costs and benefits of contrasting landscape uses and management policies and practices which factor in climate change scenarios.
Multi-sectoral	Cross-disciplinary and multi-stakeholder: the issue is best addressed by fostering multi-stakeholder and cross/trans-disciplinary collaborations	Strengthening partnerships and processes between IPs and LCs, NGOs, academics and government agencies should be central to this priority	Partnership processes are key to developing diversified business models, whereby clear benefits (win-win) must be clarified among the actors	Partnership processes between IPs and LCs, NGOs and business and government departments are key to developing such models and approaches	Interdisciplinarity and multi-stakeholder representation are at the core of multi-objective land-use evaluation and optimisation
Value for money	Scale-appropriate: the issue can be usefully addressed with the scale of support that may be possible from the REDAA programme, eg. a grant of between about US\$10,000 and 100,000 over six to 24 months, or a grant of between US\$200,000 and 1 million over four years	This priority is scale-appropriate; smaller grants that can be used to identify best practices for TEK partnerships in restoration and larger grants to support workshops to re-imagine and re-develop equitable ways forward for TEK partnerships in restoration. With potential engagement with the ASEAN Working Group on Social Forestry (AWG-SF).	Smaller grants can be used to clarify which IPs and LC corps/products can be incorporated into existing business models with some piloting (including market research and community enterprise development). Larger grants can focus on developing improved business models with supply chain actors/multi-stakeholder while ensuring better business/supply chain transparency (source of products, management practices, rights) and guiding policies/strategies, as well as capacity development for key actors.	The priority can be usefully addressed with the scale of support under REDAA. This priority can be supported by small and large grants to strengthen existing models and in processes required to scale up such models.	The priority can be usefully addressed with the scale of support under REDAA. This tool may be implemented in a few key landscapes that would benefit. Landscape with multi-sectoral governance bodies and processes in place may best benefit from such a tool (eg. Tonle Sap and Riau). This tool can also be used to advocate for policy change and work with larger private sector businesses that are working towards developing more sustainable practices.

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	Priorities	Research and governance processes for integrating TEK into restoration and sustainable natural resource management tools, research and projects (including in revegetation, hydrological restoration, fire management, developing sustainable livelihoods and monitoring activities) are strengthened, and best practices are scaled up.	Drawing on existing and ongoing research, sustainable and climate-resilient business models that demonstrate improving IPs and LCs', women's and youth's (and other marginalised groups) wellbeing, equitability in value chains, economic returns and landscape ecological productivity are identified, strengthened and scaled up through participatory approaches.	Drawing on existing and ongoing research, existing and potential IPs and LC-centred approaches and models that provide direct financing through payment for sustainable ecosystem management and restoration through carbon trading, biodiversity offsets, and nature-based offsets to IPs and LCs, are identified and, through further research, are strengthened and scaled up, and novel models are developed where needed.	Multi-objective economic evaluations developed through multi-sectoral and participatory-action-research are produced to explore the costs and benefits of contrasting landscape uses and management policies and practices which factor in climate change scenarios.
Value for money	Timeframe-fitting: the issue can be completely addressed within six months to four years, or a significant contribution to addressing the issue can be made and verified within six months to four years. These issues help to build or build on existing, long-term networks.	The priority can be addressed within the timeframe but may require continued engagement after four years.	See above.	This priority is timeframe-fitting.	See above.
	Value for money: the ways in which the issue is addressed will provide good returns on investment, benefits to costs and value for money.	This priority will provide benefits when considering longevity, lower costs and sustainability when working with TEK in environmental restoration and sustainable natural resources management projects.	This priority may produce increased social practices (IPs and LC rights, livelihoods, overall governance systems), reduced conflict between supply chain/business actors, and access to sustainable finance improves business practices. However, there may not be a high economic return on investment for diversified crops and scaling up may be challenging.	This priority should benefit by providing needed IP and LC-centred models and scaling up such models for engagement with carbon trading, biodiversity offsets, nature-based offsets and developing further multi-stakeholder partnerships	If implemented through effective multi-stakeholder dialogue and engagement, this priority should lead to the planning and implementation of more equitable, sustainable and climate change-resilient landscapes

4.2.3 Governance systems

	Priorities	National through to local governance practices and processes for identifying priority areas for restoration and planning restoration initiatives are strengthened through multi-sectoral and participatory-action-research that integrates intersectional approaches to addressing inequity (IPs and LCs, women, youth, migrant workers, landless labourers, and displaced peoples) through said initiatives	Governance coordination mechanisms and integrated landscape approaches to restoration and resource management are strengthened in priority landscapes through multi-sectoral and participatory-action-research and decision-making tools	IPs and LCs' tenure and resource rights are strengthened through participatory-action research, which will require researching/identifying formal and informal pathways and processes through which IPs and LCs can engage with policy processes to strengthen tenure and resource rights	Rural and urban youth engagement in restoration and sustainable natural resources management initiatives are strengthened
Impacts	Site-specific impact: if the issue(s) were addressed, it would have a major impact in a specific place	This priority is site-specific as different sites have different potentials to explore opportunities to develop processes towards more inclusive governance and participation in restoration initiatives. Such activities or research under this priority could offer good comparison opportunities.	This priority is site-specific as it aims to improve governance coordination mechanisms to support integrated landscape approaches to restoration and natural resources management	The impacts will be felt at the local/site level, as the key is straightening tenure and resource rights	This priority can be site-specific as the REDAA programme should aim to strengthen youth participation in restoration and natural resources management within targeted landscapes.
	Cross-cutting impact: if the issue(s) were addressed, it would greatly impact systems or processes that affect many places	This priority could have cross-cutting impacts, especially considering the scaling up of best practices	This priority does not have direct cross-cutting impacts but can do so through sharing best practices and lessons learnt	This priority should aim to provide evidence to prove why IPs and LCs' role in the policymaking process is important. Strengthening participatory processes in one site will provide lessons learned and best practice models that can be replicated in other areas.	This priority can have cross-cutting impacts if working with youth at the regional and national levels
Participatory processes	Locally-led: the issue is best addressed by locally-led action, especially action led by IPs and LCs	This priority should involve IPs and LCs in decision-making processes regarding restoration priority areas at the national and local levels	As stated in the priority, integrated landscape approaches should try to build and strengthen cooperation between government agencies and Community-Based Organisations through processes that aid in developing knowledge, organisational capacity and building trust	IPs and LCs' participation is required in decision-making processes regarding strengthening tenure and resource rights	This issue is best addressed by providing opportunities for urban and rural youth to be included in sustainable landscape management activities

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	Priorities	National through to local governance practices and processes for identifying priority areas for restoration and planning restoration initiatives are strengthened through multi-sectoral and participatory-action-research that integrates intersectional approaches to addressing inequity (IPs and LCs, women, youth, migrant workers, landless labourers, and displaced peoples) through said initiatives	Governance coordination mechanisms and integrated landscape approaches to restoration and resource management are strengthened in priority landscapes through multi-sectoral and participatory-action-research and decision-making tools	IPs and LCs' tenure and resource rights are strengthened through participatory-action research, which will require researching/identifying formal and informal pathways and processes through which IPs and LCs can engage with policy processes to strengthen tenure and resource rights	Rural and urban youth engagement in restoration and sustainable natural resources management initiatives are strengthened
Participatory processes	Intersectional: the issue is best addressed through intersectional understanding and empowerment of vulnerable groups, including Indigenous Peoples, women, youth, migrant workers, landless labourers and displaced peoples	Restoration requires effective land use plans that cut across sectors (eg. agriculture, infrastructure, village plans) and scales. This means various actors, including vulnerable groups, must be involved.	It is recommended that integrated landscape approaches to restoration and natural resource governance are strengthened through the participation and empowerment of vulnerable groups	It is recommended that this priority extend to scale-up best practices of involvement of vulnerable groups (Indigenous Peoples, women, youth, migrant workers, landless labourers and displaced peoples) in participatory decision-making processes, which could lead to more equitable resource rights	It is recommended that this priority extend to empowering vulnerable youth groups, including Indigenous Peoples, women, youth, migrant workers and displaced peoples
Multi-sectoral	Cross-disciplinary and multi-stakeholder: the issue is best addressed by fostering multi-stakeholder and cross/trans-disciplinary collaborations	Sustainable land use requires inputs from all sectors and determining priority areas for restoration will require the involvement of all multiple stakeholder groups	This priority requires cross-disciplinary and multi-stakeholder approaches to developing effective landscape governance	It is essential to engage the government, private sector, academics, CSOs and IPs and LCs on the issue of tenure, resource rights and participation in policymaking to ensure policies are grounded and appropriate for IPs and LCs and because the land is a cross-sectoral issue	Youth integration requires the strengthening of all aspects of restoration and sustainable natural resources management initiatives through participation in governance processes, collaborating with researchers, NGOs/CSOs and developing young entrepreneurs through private sector participation
Value for money	Scale-appropriate: the issue can be	This priority can be scale-appropriate but may require further cost-benefit analysis	This can be scale-appropriate but may require further cost-	This priority may be scale-appropriate by working on a few sites where there	This priority may be scale-appropriate by working with

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	Priorities	National through to local governance practices and processes for identifying priority areas for restoration and planning restoration initiatives are strengthened through multi-sectoral and participatory-action-research that integrates intersectional approaches to addressing inequity (IPs and LCs, women, youth, migrant workers, landless labourers, and displaced peoples) through said initiatives	Governance coordination mechanisms and integrated landscape approaches to restoration and resource management are strengthened in priority landscapes through multi-sectoral and participatory-action-research and decision-making tools	IPs and LCs' tenure and resource rights are strengthened through participatory-action research, which will require researching/identifying formal and informal pathways and processes through which IPs and LCs can engage with policy processes to strengthen tenure and resource rights	Rural and urban youth engagement in restoration and sustainable natural resources management initiatives are strengthened
	usefully addressed with the scale of support that may be possible from the REDAA programme, eg. a grant of between about US\$10,000 and 100,000 over six to 24 months, or a grant of between US\$200,000 and 1 million over four years	of specific sites, and benefits may be seen quicker at some sites than others depending on the existing strength of participatory processes and multi-stakeholder networks (both formal and informal). This helps reduce costs from conflict.	benefit analysis of specific sites, and benefits may be seen quicker at some sites than others depending on the strength of existing participatory and multi-stakeholder governance processes	are opportunities for participatory processes concerning tenure and resource rights to be strengthened. Or where participatory-action research can be undertaken to produce knowledge/data to be used to advocate for IPs and LCs' tenure and resource rights during specific policymaking processes and multi-stakeholder consultations. Evidence from a few sites can impact policy at the national level. Further good models of participatory policymaking can be shared and help shape regional developments.	ongoing projects to strengthen rural and urban youth engagement in restoration and sustainable natural resources management initiatives, developing a new initiative under REDAA or integrating youth across all appropriate REDAA activities
	Timeframe-fitting: the issue can be completely addressed within six months to four years, or a significant contribution to addressing the issue can be made and verified within six months to four years. These issues help to build, or build on existing, long-term networks.	It will take some time to address the issues on IPs and LCs. However, it helps strengthen the level of understanding and respect among agencies. Timeframe-fitting is dependent on specific issues and levels of stakeholder engagement.	The strengthening of governance coordination mechanisms and integrated landscape approaches may be addressed within the programme timeframe. However, any governance coordination mechanisms and integrated landscape approach must be developed by improving stakeholders' capacity so the initiatives can continue to sustain themselves after funding has finished.	This priority will need long-term engagement, but it can be built on existing networks and projects, such as RRI, Tenure coalitions, and NGOs/CSOs networks that engage in land tenure.	As above.
Value for money	Value for money: the ways in which	This priority should aid in developing participatory processes to determine	Benefits will be seen through improving the capacity of IPs	This priority can provide a greater outreach benefit if coordinated with	Youth engagement can affect longer term policy

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	Priorities	National through to local governance practices and processes for identifying priority areas for restoration and planning restoration initiatives are strengthened through multi-sectoral and participatory-action-research that integrates intersectional approaches to addressing inequity (IPs and LCs, women, youth, migrant workers, landless labourers, and displaced peoples) through said initiatives	Governance coordination mechanisms and integrated landscape approaches to restoration and resource management are strengthened in priority landscapes through multi-sectoral and participatory-action-research and decision-making tools	IPs and LCs' tenure and resource rights are strengthened through participatory-action research, which will require researching/identifying formal and informal pathways and processes through which IPs and LCs can engage with policy processes to strengthen tenure and resource rights	Rural and urban youth engagement in restoration and sustainable natural resources management initiatives are strengthened
	the issue is addressed will provide good returns on investment, benefits to costs and value for money	restoration target areas, develop greater equity in such processes, benefit IPs and LCs and other stakeholders involved in restoration activities, and develop more effective community-based forest landscape restoration programmes in many ASEAN countries	and LCs and better relations between IPs and LCs and government departments to manage resources, and improved processes for different government agencies to coordinate natural resources management. Furthermore, effective governance could lead to less dependence on financial inputs from donor organisations.	ongoing initiatives and ongoing policy processes at the regional and national levels. Further, insecure tenure has been found to drive degradation. Therefore, secure tenure and resource rights may mitigate the costs of further degradation and lessen issues of inequity among IPs and LCs and other marginalised groups.	change, create local economic opportunities for rural youth and engage rural and urban youth as environmental gradians, which could mitigate costs of continued degradation depending on the type and level of engagement

5 Proposing priority landscapes for REDAA

As previously outlined, integrated landscape approaches are recommended for effective restoration and sustainable natural resource management. “Integrated landscape approaches are governance strategies that attempt to reconcile multiple and conflicting land-use claims to harmonize the needs of people and the environment and establish more sustainable and equitable multi-functional landscapes” (Reed et al., 2020, p. 1). Landscapes are often multi-functional and, as such may include multiple ecosystems (peatlands, forests, mangroves, lakes and rivers, agriculture, urban and peri-urban areas, and so on) – degraded, fragmented and intact areas – and different management systems (villages, municipalities, protected areas, Ramsar sites, and so on).

There is no fixed definition of a landscape. Landscapes may be defined by ecological processes, social factors — such as jurisdictional boundaries or even the area of an NGO project — or elements of both (Fischer, 2018). For peatlands, best practices recommend that they be managed as a hydrological unit. For wetlands, some studies suggest wetland management should extend beyond the wetland ecosystem to consider the entire basin (An & Verhoeven, 2019). A forest landscape may be defined as an area with natural forests, degraded forests, timber plantations, agricultural areas and degraded lands. Determinations of a landscape may also alter when considering varying timescales and management objectives (Fischer, 2018).

The RECOFTC-REDAA scoping team identified 13 potential priority landscapes for REDAA interventions through the following criteria; contain Key Biodiversity Areas or Important Bird and Biodiversity Areas (Box 1); contain intact and fragmented key habitats — inclusive of protected areas — (Table 7 – number of protected areas in SEA); and, have the potential to empower vulnerable groups including Indigenous Peoples, women, youth, migrant workers and landless labourers, and REDAA activities can be led by and lead to economic benefits for said communities.

For this scoping study, landscapes were primarily defined as jurisdictional areas, including provincial and sub-national jurisdictions, protected areas, and as is the case for Tonle Sap, a UNESCO World Heritage Site. The report also recommends the Dawna Tenasserim Myanmar-Thailand transboundary landscape due to its importance for biodiversity and forest integrity in the region.

Figure 10 and Figure 11 show the proposed 13 priority landscapes (circled in red and numbered) located near Key Biodiversity Areas and Important Bird and Biodiversity Areas (blue), and protected areas (light green). Table 8 summarises the 13 proposed priority landscapes. Annex 7 presents some ongoing projects and initiatives with which REDAA could coordinate activities within each landscape.

Table 7: Terrestrial protected areas (PA) as a percentage of total land area within ASEAN Member States as of 2022 (source <https://www.protectedplanet.net>)

Country	Total number of Protected Areas	Protected areas land cover (1000 ha)	% of Total land area
Brunei	56	596.2	46.87
Cambodia	39	7252.7	39.74
Indonesia	733	23,194.6	14.7
Laos	31	4322	18.69
Malaysia	528	4420.5	13.33
Myanmar	53	4428.9	6.58
the Philippines	273	4741.2	15.87
Singapore	4	3.4	5.55

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Country	Total number of Protected Areas	Protected areas land cover (1000 ha)	% of Total land area
Thailand	246	9603.8	18.55
Viet Nam	209	2499.4	7.58
Total	2172	61,062.7	13.57

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Table 8: Proposed 13 priority landscapes

Reference numbers in Figures 10 and 11	Landscape name	Landscape juridical boundaries	Country/ies	Ecosystems	Contains areas with intact forest (according to Global Forest Watch – 2020)	Indigenous Peoples / Ethnic communities	Causes of degradation (NB. climate change projected to threaten all landscapes including changes to prescription and sea-level rise)
1	Inle Lake	Inle Lake Wildlife Sanctuary	Myanmar	Lake, swamps, marshes, peatland / floating villages, agricultural lands and rural areas	Not applicable	Seven ethnic communities call the Inle Lake home: Intha, Pao, Bamar, Taung Yo, Danu, Palaung, and Shan	Logging, pollution, unsustainable agriculture and tourism
2	Dawna Tenasserim	A transboundary complex of protected areas in the Tanintharyi Region and the Kayin State of Myanmar and Western Thailand	Myanmar and Thailand	Intact forest, lowland and upland evergreen and deciduous forests / rural and peri-urban areas	Yes	The Dawna Tenasserim is home to the Burma, Karen, Mon, Rakhine, Pao, Salone and Malay (Bashu) ethnic groups and thousands of refugees and internally displaced people	Illegal logging and hunting, conversion for agriculture and infrastructure
3	Nan	Province	Thailand	Lowland and upland evergreen and mixed deciduous	Yes	Seven ethnic minorities are residents in the landscape	Forest conversion for agriculture
4	Nam Poui	Nam Poui National Protected Area	Laos	Mixed deciduous forest / rural areas	Yes	Hmong, Khmu, Malabri and Eiwman ethnic groups	Illegal logging, conversion for agriculture and mining, infrastructure (planned hydropower dam)
5	Tonle Sap	UNESCO World Heritage Site	Cambodia	Lake, swamps, marshes, peatlands, flooded forests / floating villages, agricultural lands and rural areas, peri-urban areas	Contains a small area of intact flooded forest	Dominated by Khmers, with minority groups of Cham and Vietnamese.	Hydrological alterations, deforestation and land conversion for

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Reference numbers in Figures 10 and 11	Landscape name	Landscape juridical boundaries	Country/ies	Ecosystems	Contains areas with intact forest (according to Global Forest Watch – 2020)	Indigenous Peoples / Ethnic communities	Causes of degradation (NB. climate change projected to threaten all landscapes including changes to prescription and sea-level rise)
							agriculture, fires, pollution
6	a) Pray Lang b) The Eastern Plains Landscape	Prey Lang Wildlife Sanctuary, Seima Biodiversity Conservation Areas, Phnom Prich Wildlife Sanctuary, Mondulkiri Protected Forest	Cambodia	a) Largest lowland evergreen forest in Cambodia b) Dry Forest / agricultural lands and rural areas, peri-urban and urban areas	Yes	Khmer, Kuy, Bunong	Conversion for agriculture and other industries such as cement, illegal logging and hunting and mining
7	Quang Nam	Province	Viet Nam	Evergreen forests, peatlands, mangroves (small areas) / agricultural lands and rural areas, peri-urban and urban areas	No	33 ethnic groups live in the landscape	Conversion for agriculture, hydropower, roads, urban areas, mining and fires
8	Nghe An	Province	Viet Nam	Evergreen forests, elfin cloud forests, peatlands, / agricultural lands, rural areas, and peri-urban and urban areas	Yes	20 ethnic groups live in the landscape	Conversion for acacia and roads, mining and pollution from mining. Illegal logging and fires
9	Cagayan valley	Region	the Philippines	Evergreen forests, peatlands, / agricultural lands and rural areas, peri-urban and urban areas	Yes	Tagalog, Ilokano, Ibanags, Itawits and Malawegs	Conversion for agriculture, illegal logging, flooding and pollution
10	Riau	Province	Sumatra Indonesia	Peatland forests, mangroves / agricultural lands and rural areas, peri-urban and urban areas	Yes	Malay, Minangkabau, Batak, Banjar, Bugis, Chinese	Forest conversion and hydrological alterations for palm oil and other crops, illegal logging, fires
11	North Kalimantan	Province	Borneo, Indonesia	Evergreen tropical rainforest, peatland forests, mangroves / agricultural lands and rural areas, peri-urban and urban areas	Yes	Dayaks, Javanese Tidung, Suluk, Banjarese, Murut, Lun Bawang / Lun Dayeh	Mining, conversion for agriculture and forestry, illegal logging and fires

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Reference numbers in Figures 10 and 11	Landscape name	Landscape juridical boundaries	Country/ies	Ecosystems	Contains areas with intact forest (according to Global Forest Watch – 2020)	Indigenous Peoples / Ethnic communities	Causes of degradation (NB. climate change projected to threaten all landscapes including changes to prescription and sea-level rise)
12	South Sulawesi	Province	Sulawesi, Indonesia	Tropical moist forests, dry forests, montane forests, peatlands, mangroves / agricultural lands, rural areas, and peri-urban and urban areas.	Yes	Buginese, Makassarese, Toraja, Mandarese, Javanese, Chinese, forest dwelling ethnic Kajang peoples and the coastal Karampuang groups	Conversion for agriculture, mining and related pollution, illegal hunting, infrastructure development
13	Papua Barat	Two Provinces	Papua and West Papua, Indonesia (Papua Barat)	Evergreen peatlands, mangroves / agricultural lands and rural areas, peri-urban and urban areas	Yes	More than 25 ethnic groups live in Papua, and more than 25 ethnic groups live in West Papua	Conservation for agriculture and forestry, logging, infrastructure development and mining

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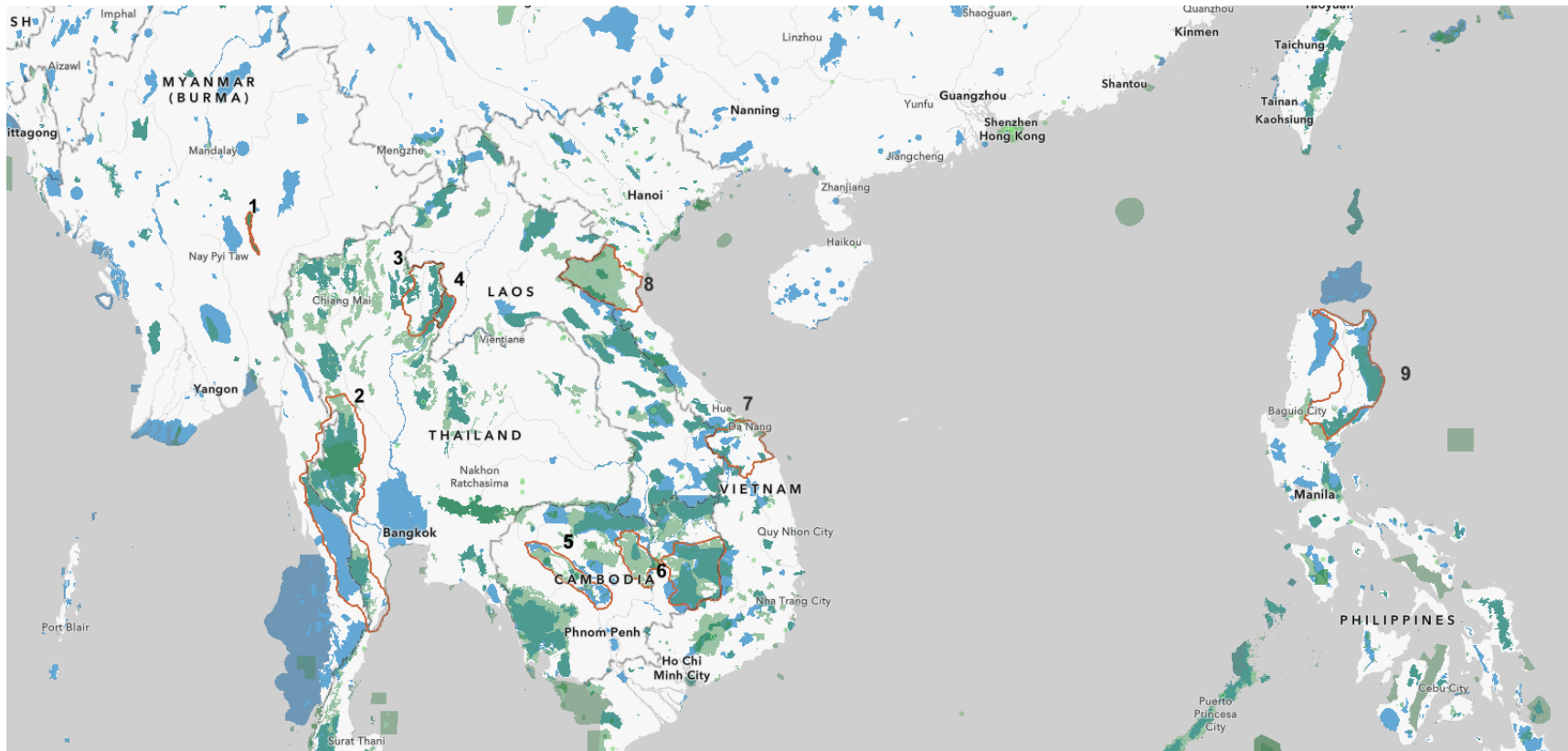


Figure 10: Proposed priority landscapes (circled in red and numbered) near Key Biodiversity Areas and Important Bird and Biodiversity Areas (blue) and protected areas (light green) (areas of darker green are the intersections of Key Biodiversity Areas and Important Bird and Biodiversity Areas and protected areas)

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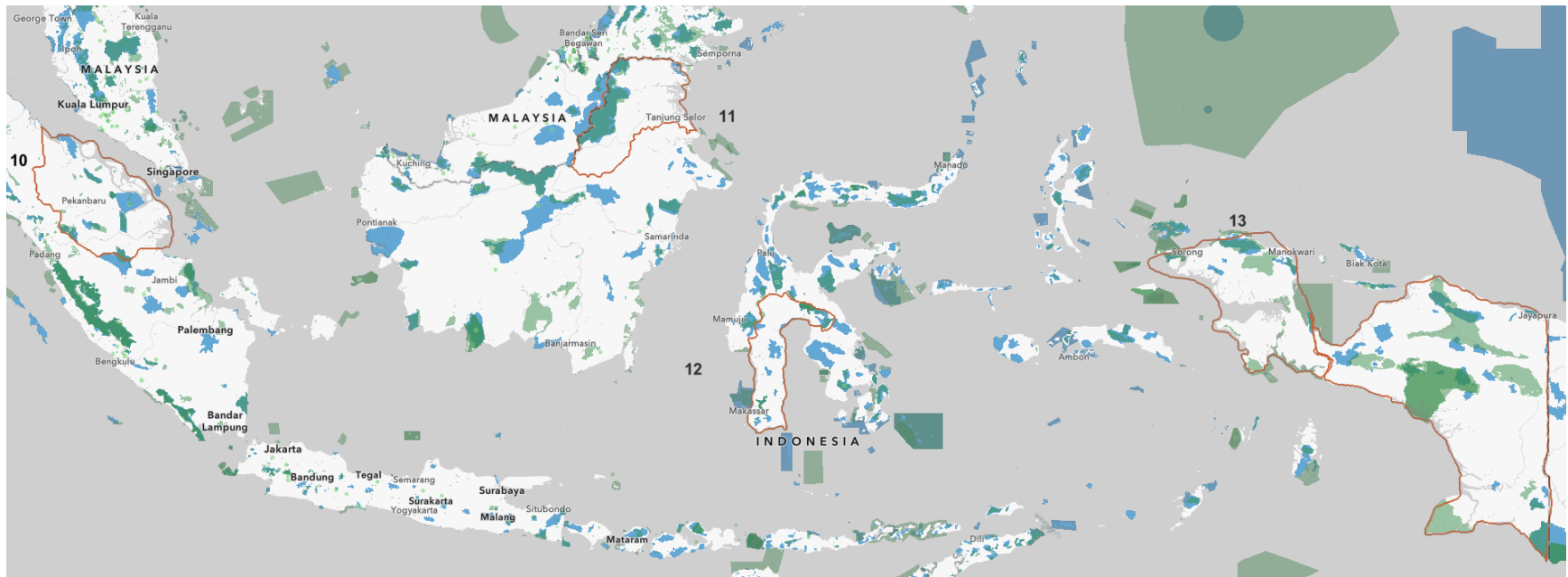


Figure 11: Proposed priority landscapes (circled in red and numbered) near Key Biodiversity Areas and Important Bird and Biodiversity Areas (blue) and protected areas (light green) (areas of darker green are the intersections of Key Biodiversity Areas and Important Bird and Biodiversity Areas and protected areas)

6 Policies and initiatives for REDAA engagement

This section presents key initiatives, policy mechanisms and research-to-policy platforms that support the aim of reversing environmental degradation in SEA, under which the REDAA initiative is likely to find support.

6.1 UN Decade on Ecosystem Restoration (2021-2030)

“Led by the United Nations Environment Programme and the Food and Agriculture Organization of the United Nations”, the [UN Decade on Ecosystem Restoration](#) “is building a strong, broad-based global movement to ramp up restoration and put the world on track for a sustainable future. That will include building political momentum for restoration and thousands of initiatives on the ground. The UN Decade runs from 2021 through 2030, which is the deadline for the Sustainable Development Goals and the timeline scientists have identified as the last chance to prevent catastrophic climate change.”

This scoping study recommends that activities under REDAA join with United Nations Environment Programme and the FAO to work for better coordination with ongoing initiatives in the region and access to knowledge on restoration tools and practices. “An FAO-led Taskforce, working across more than 43 organizations, has been established to prepare guiding principles and collate good practices on ecosystem restoration and Indigenous knowledge around the world. It will focus on the dissemination of restoration knowledge over the next ten years”.

The FAO also works with 335 technical experts from 116 organisations to collaboratively develop a monitoring framework for the United Nations Decade on Ecosystem Restoration. The Framework is intended to “enable consistently and transparent monitoring and reporting of the progress of restoration efforts throughout the duration of the UN Decade. It is composed of a registry that compiles data on restoration activities and initiatives from various data sources, and a geospatial platform for visualizing data.” The monitoring is also intended to link to SDG goals and national restoration targets to incentivise government commitments to restoration.

The United Nations Decade on Ecosystem Restoration has also established a Youth Taskforce, a Finance Taskforce and a Science Taskforce.

6.2 Cross-cutting initiatives

REDAA should aim to aid SEA governments in achieving policy targets under One Health, Bio-circular-green (BCG) Economy and Nationally Determined Contributions (NDCs).

One Health is an “integrated, unifying approach that aims to sustainably balance and optimise the health of people, animals, and ecosystems. It recognizes that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are intricately linked and interdependent. The approach mobilizes multiple sectors, disciplines, and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development” ([OHHLEP, 2022](#)).

ASEAN has taken steps to endorse One Health. “The Southeast Asia One Health University Network (SEAOHUN), established in 2011 with support from the United States Agency for International Aid (USAID), aims to develop a resilient and competent One Health workforce through education, research, and training provided by university networks in Southeast Asia. As of this year (2021), SEAOHUN consists of 92 universities in eight ASEAN countries (Cambodia, Indonesia, Lao PDR, Malaysia,

Myanmar, Philippines, Thailand, and Viet Nam). The network of universities collaborates to improve their workforce capacity with cross-sectoral competencies and multiple disciplines to prevent, detect and respond to infectious disease threat effectively.”

Bio-circular-green (BCG) Economy is a policy discussed during APEC 2022. The BCG Economy is a policy that aims to guide reframing development approaches, rethink “how resources should be utilized,” and remind APEC why inclusive and active participation is important for realising a sustainable future. The BCG Economy aims to be a pathway to address development challenges interlinked with climate change (Calizo, 2022).

However, protesters outside the APEC 2022 conference were concerned that the BCG Economy is a form of greenwashing. In Thailand, there is concern that the BCG model will negatively impact IPs and LCs' livelihoods and rights (Lawattanatrakul, 2022). “Activist Pachara Khamchamnan, secretary for the Northern Peasant Federation (NPF) and a member of the People's Movement for a Just Society (P-Move), noted that the government does not have a plan to reduce carbon emissions or regulate the industrial sector, but plans to increase forest areas to increase carbon absorption and for carbon credits, and that the plan is likely to worsen land rights and community rights that have been issued, further marginalizing communities living in forest areas” (Lawattanatrakul, 2022).

Nationally Determined Contributions (NDCs) under the Paris Agreement. “The Paris Agreement (Article 4, paragraph 2) requires each Party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve. Parties shall pursue domestic mitigation measures to achieve the objectives of such contributions. Parties are requested to submit the next round of NDCs (new NDCs or updated NDCs) by 2020 and every five years thereafter (e.g. by 2020, 2025, 2030), regardless of their respective implementation time frames” ([UNFCCC](#)).

In 2020 “Singapore updated its target to peak emissions by 2030”. “Viet Nam changed its base year to 2014, and its emissions reduction target to 9% (unconditional) and 27% (conditional)”. Thailand, October 2022, submitted an updated NDC setting a target of reaching Carbon Neutrality by 2050. “Cambodia updated its GHG reduction target to 41.7% (of which 59.1% is from forestry and land use) by 2030 or equivalent to 64.6 MtCO_{2e}”. “Brunei Darussalam set a target of 20% reduction of GHG emissions by 2030” (Yurnaidi et al., 2021). As of November 2021, all SEA countries have NDCs in place.

Convention on Biological Diversity, COP 15 2022 – *The following text derives from the [CBD website](#), where a full summary of the agreement can be found.* At the end of COP15, 188 governments “(95% of all 196 Parties to the UN CBD, as well as two non-Parties – the United States and The Vatican) finalized and approved measures to arrest the ongoing loss of terrestrial and marine biodiversity and set humanity in the direction of a sustainable relationship with nature, with clear indicators to measure progress”. Measures include “by 2030: Protect 30% of Earth’s lands, oceans, coastal areas, inland waters; Reduce by \$500 billion annual harmful government subsidies; Cut food waste in half.” COP15 delegates agreed to establish within the Global Biodiversity Fund a “multilateral fund for the equitable sharing of benefits between providers and users of DSI, to be finalized at COP16 in Türkiye in 2024”. “The agreement also obligates countries to monitor and report every five years or less on a large set of ‘headline’ and other indicators related to progress against the GBF’s goals and targets. Headline indicators include the percent of land and seas effectively conserved, the number of companies disclosing their impacts and dependencies on biodiversity, and many others”. “Emphasized throughout the approved documents are the needs to foster the full and effective contributions of women, persons of diverse gender identities, youth, Indigenous peoples and local communities, civil society organizations, the private and financial sectors, and stakeholders from all other sectors”.

6.3 Key regional and national policies and targets concerning different ecosystems

REDAA should aim to aid SEA governments in achieving policy and restoration targets within various primary ecosystems. Such targets are presented below.

6.3.1 Forests

SEA governments have ambitious targets for restoration (Table 9). The REDAA programme can work towards ensuring such targets are implemented equitably and sustainably.

Table 9: Reforestation targets across SEA (no data for Timor Leste)

Country	Estimated degraded land (million ha)	Estimated degraded land as % of total land area	Target forest cover % (year)
Cambodia	2.6	15	60 (2030)
Indonesia	59.9	30	53 (2020)
Laos	8.7	36	70 (2035)
Myanmar	4.2	6	45 (2030)
the Philippines	7.6	25	30 (2028)
Thailand	2.3	4	55 (2036)
Viet Nam	9.7	30	42 (2030), 42-43% (2050)

6.3.2 Wetlands and peatlands

In Cambodia and Viet Nam, "wetland issues have been integrated into national strategies and planning processes related to poverty reduction, water resources management, marine resources, national forest, and agriculture" (IPBES, 2018b). Malaysia's National Wetland Policy, formulated in 2004, has recently been revised to align with relevant existing policies (Parlan et al., 2021). In 2017, Myanmar drafted a national wetland policy (IPBES, 2018b).

The Paris Agreement contains the target of the rewetting of 500,000 km² of drained peatlands worldwide by 2050-2070, which will require an enormous upscaling of restoration practices, including an improved understanding of good practices (Convention on Wetlands, 2021). ASEAN⁶ has been creating the policy framework for protecting the region's peatlands since 2002, when the ASEAN Agreement on Transboundary Haze Pollution (ATHP) was signed. By 2015 all ASEAN member states (AMS) had signed the agreement. Under the ATHP, between 2006-2020, ASEAN implemented the Peatland Management Strategy; between 2014-2020, the ASEAN Programme on Sustainable Management of Peatland Ecosystems developed the ASEAN guidelines of Peatland Fire Management. ASEAN is now developing a new ASEAN Haze-Free Roadmap (2022-2030) and a new ASEAN Peatland Management Strategy (2022-2030). This includes the development of a ten-year Investment framework for Haze-Free, Sustainable Land Management in SEA, supported by the "Measurable Action for Haze-Free Sustainable

⁶ Note Timor Leste is not a member of ASEAN

Land Management in Southeast Asia (MAHFSA) Programme. ASEAN priorities identified for 2022-2030 include:

- Further action is to determine the extent and status of peatlands at national levels
- Public and stakeholder awareness and participation
- Peatland fire prevention
- Policy and regulation development for peatland management
- Biodiversity conservation
- Integrated management of peatlands
- Peatland restoration
- Regional cooperation
- Best management practices, and
- Financing in action.

The status of the National Action Plan on Peatlands (NAPP) across ASEAN

The following is adapted and quoted from ASEAN (2021) and Global Environment Centre (2021).

- Brunei's National Action Plan on Peatlands (NAPP) was endorsed in 2015. A peatland assessment is under way in preparation for NAPP in Cambodia
- In Indonesia, the Peatland Restoration Agency also focuses on rewetting degraded peatlands across seven prioritised peat provinces. They are also beginning the Protection and Management of Peatland Ecosystem (RPPEG) for 2020-2049 (Yuwati et al., 2021)
- Malaysia's National Action Plan for Peatlands (NAPP), implemented between 2011-2020, has been approved for an extension to 2030
- For Myanmar, there are peatland elements in national plans and policies, and a peatland assessment is "underway in preparation for the development of the NAPP with support from the Mekong Peatlands Project"
- In Thailand, a Forest Fire Control Unit has been established under the Department of National Park, Wildlife and Plant Conservation (DNP), with special support given to provinces with extensive peatland areas. The NAPP was approved in 2015 by the Sub-Committee for Wetlands Management of Thailand under the Ministry of Natural Resources and Environment. The NAPP needs to be revised and extended to 2030
- Viet Nam has had a NAPP in draft form since 2006. This was translated into local languages in 2014 and is awaiting government approval

6.3.3 Mangroves

Mangroves are included in the Wetland policies of Myanmar, Malaysia and Viet Nam. Specifically, Thailand's 12th National Economic and Social Development Plan (NESDP) (2017–2021) contained a goal to enlarge the mangrove forest to 8,000 ha. These targets align with broader policies to reach and maintain 55% forest cover in Thailand. Indonesia's Presidential Decree No. 73 of 2012 on the National Strategy for Mangrove Ecosystem Management "regulates the norms, standards, principles, criteria, and indicators of mangrove forest management. The government also issued Presidential Decree No. 73/2015 on the Implementation of the Management of Coastal Areas and Small Islands at the National Level, intending to manage national coastal areas and small islands in a harmonious, synergistic, integrated, and sustainable manner" (Arifanti et al., 2022, p. 2).

Recently the World Bank approved a soft loan for the Government of Indonesia to implement a five-year (2022 to 2027) programme called the Mangroves for Coastal Resilience. It will focus on strengthening the policy and institutions for mangrove management and rehabilitation, promoting sustainable mangrove

management, and improving the livelihood opportunities for Indonesian coastal communities living around mangrove forests in selected areas (World Bank, 2022).

There have been two ASEAN Mangrove Congresses (held in 2012 and 2017 in the Philippines). The congress aimed to strengthen mangrove research and development in the ASEAN region by enhancing inter-agency and inter-sectoral coordination at the national and regional levels. Priority research areas and policy gaps identified included continuing conservation and restoration programmes and developing mechanisms linking science, policy and action.

6.3.4 Inland freshwater: rivers and lakes

Countries across SEA have begun to establish policies focused on rivers and lakes. In 2010, Malaysia announced its decade-long Strategic Plan for Sustainable Lake and Reservoir Development and Management (2010-2020). In 2020, Indonesia announced a plan to restore 15 degraded lakes impacted by pollution, logging and destructive fishing practices across the country by 2024. In 2021, the Philippines Department of Science and Technology established a new research and development Center for Lakes Sustainable Development. In August 2021, ASEAN and the Mekong River Commission held the first Water Security Dialogue to discuss innovative solutions to address water security challenges across the region. Additionally, the Mekong River Commission for Sustainable Development (MRC), an intergovernmental organisation for regional dialogue and cooperation, has been active in some form since 1995. MRC “serves as a regional platform for water diplomacy and a knowledge hub of water resources management for the sustainable development.”

6.4 Research to policy platforms

There are ongoing regional interventions to foster greater regional and cross-sectoral research that REDAA could benefit from synergising activities or collaboration.

Platform and interventions from the inter-governmental side (to name a few):

- As part of their action programme, the ASEAN Strategic Plan of Action for ASEAN Cooperation on Forestry (2016-2025) aims to strengthen research and development through enhanced cooperation between local research institutions, including networking
- The ASEAN Haze Portal (a "knowledge management platform on sustainable peatland and haze management") aims to facilitate networking and knowledge-sharing among policymakers and other relevant practitioners in SEA (<https://hazeportal.asean.org/>)
- The ASEAN Mangrove Congresses aimed to strengthen mangrove research and development in the ASEAN region by enhancing inter-agency and inter-sectoral coordination at the national and regional levels, although meetings have not occurred recently
- The ASEAN Social Forestry Network (ASFN) is a government-driven social forestry network that links government forestry policymakers with members of civil society, research organisations, academia, the private sectors, and experts in related fields
- The Asian Forest Cooperation Organization (AFoCO) is another example of a treaty-based intergovernmental organisation that promotes regional and cross-sectoral cooperation towards achieving shared Sustainable Development Goals and increased forest cover across Asia in line with regional and global forestry objectives.

From the research side, the Stockholm Environment Institute (SEI) Asia aims to foster regional and multidisciplinary research that bridges research and policy. Further, RECOFTC's EXPLORE Program⁷ (supported by CIFOR-ICRAF and funded by Sida) aims to develop the capacity of researchers and research institutions in the region to design and implement high-quality research and how to translate research into policy. Under SEI Asia, the Sustainable Mekong Research Network (SUMERNET) is a "research and policy engagement initiative" focusing on water insecurity in the Mekong Region.

Interventions such as EXPLORE and SUMERNET also aim to strengthen engagement with IPs and LCs and marginalised groups and support greater gender equity through forest landscape governance research. SEI Asia aims to build partnerships with a diversity of groups and sectors ranging from academia, media and policy to civil society and the private sector, as well as working closely with IPs and LCs, marginalised groups and supporting gender equity.

The Mekong Land Research Forum is an academic forum, an online site for academic papers and reports, a research network and a platform that distributes information on presentations and key events. The forum seeks to bring research and policy closer together by making research more accessible and distilling key messages and points of debate to provide clear information. The Mekong Land Research Forum online site was developed in 2015 by a team at the University of Sydney. The Regional Centre for Social Science and Sustainable Development at Chiang Mai University manages the resource as part of the Mekong Land Research Forum. Such a forum could be important to REDAA to engage with research on land and policy.

The Indo-Burma Ramsar Regional Initiative (IBRRI) was established in 2016 by Ramsar National Focal Points in Cambodia, Laos, Myanmar, Thailand, and Viet Nam and IUCN's Asia Regional Office. The IBRRI Strategic Plan for the period of 2019 to 2024 objectives are "to share knowledge, ensure the conservation of key wetland species, help develop and strengthen policy on wetlands, raise awareness and promote education and ensure that the Regional Initiative is sound and sustainable" (IUCN, 2109). REDAA may choose to engage with or build on such an initiative.

7 RECOFTC-REDAA Southeast Asia scoping study limitations

As the scoping study was time and resource-limited, the review may not provide the depth of information and breadth of knowledge that could be gained from a longer study, which can engage further with relevant experts and conduct further fieldwork in other key landscapes. If further scoping is undertaken, each research-to-action priority could be researched and reviewed to gain additional insights and develop baseline data and figures to measure REDAA progress against. Additionally, further scoping could help determine more specific research-to-action priorities in each of the priority landscapes that, if addressed, can aid towards reversing environmental degradation.

The scoping study attempted to interview policymakers at national and regional levels and stakeholders involved in initiatives supporting reversing environmental degradation, such as IUCN and FAO. However, a longer scoping would have enabled discussions with organisations supporting initiatives. Further discussions and consultations could ensure that the research-to-action priorities fully align, support and complement ongoing initiatives and policies. Further, the research-to-action priorities place the participation and engagement with IPs and LCs, women and youth at the centre of the REDAA

⁷ <https://www.recoftc.org/projects/explore>

programme. Going forward, it is suggested that further engagement in the scoping with IPs and LCs, women and youth groups, where possible, is needed to ensure that the priorities address their interests in the specific landscapes proposed and across SEA.

Moreover, the scoping review was framed and structured around the three modalities: evidence, tools and governance systems. Evidence, tools and governance systems are broad terms. It is recommended that if such a study is undertaken again, research-to-action pathways and processes are more fully and systematically accounted for. For example, evidence can be divided into the evidence base (research quality and research institutes) and research processes (research methods, research processes, research tools, and research collaborations). Tools can be further divided into tools (low-tech, hi-tech) and methods implemented and used to address degradation and undertake restoration in different ecosystems. And governance systems can be discussed in terms of the actors and processes across varying scales engaged in designing research and developing research agendas, implementing research, uptake of research into policy and practice, and implementing activities to reverse environmental degradation and restoration. However, such a framing would require a longer period than the two-month timeframe of this scoping study and may be overly complex when accounting for the variety of ecosystems and countries in SEA that produce a multitude of research-to-action pathways and processes.

A further limitation is the identification of two to four research-to-action priorities for each of the three modalities: evidence, tools and governance systems. As there is often considerable overlap between the modalities, a condition that removed the requirement of the modalities in defining research-to-action priorities may have presented less constrained priorities able to address more than one aspect of the research-to-action pathway (this does not propose omitting the modalities or research-to-action pathway as an analytical framework for the review – rather only when proposing the research-to-action priorities).

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Annexes

Annex 1: Guiding questions

- **Ecosystems and landscapes**
 - What are the key ecosystems in SEA?
 - What are the key drivers of degradation, and where are the degradation hotspots?
 - Where are key areas identified for protecting biodiversity and restoration projects, and how have these areas been identified?
- **Evidence quality and use**
 - How can evidence use be improved for better action to tackle environmental degradation in the region? Regarding reliability, accessibility, communication, trust in research and supporting the co-production of research and knowledge products and knowledge brokers between different stakeholders.
- **Tools**
 - What key evidence gaps need to be addressed to improve the tools to tackle environmental degradation in the region?
 - What are the proven effective tools that can help reverse environmental degradation in the region, and what are the opportunities and challenges in making them more widely used?
 - What tools need to be developed to address specific issues and challenges, especially those faced by IPs and LCs and marginalised groups?
- **Governance systems**
 - What are the best practices for landscape governance, how is governance enacted, and the key issues that need to be addressed?
 - What are the opportunities and processes through which to address governance issues?

Annex 2: Longlist of research-to-action priorities

Evidence

- **Multidisciplinary and transboundary/regional research-to-policy networks are strengthened.** REDAA may build on existing cross-sectoral, transboundary and multidisciplinary research-to-policy initiatives
- Intersectional inequalities are more effectively integrated into restoration and sustainable natural resources management initiatives. Environmental degradation hits marginalised members of society, including women, and many restoration programmes continue these injustices. Inequalities are also found at the intersections of gender, race, socioeconomic class, cultural and ethnic background, age and disability. Understanding social dimensions, emphasising equity and intersectionality, is vital to ensure restoration and sustainable natural resources management initiatives mitigate the production of greater inequity. Online in-person workshops or courses for academics and gender and social inclusion officers, and other NGO staff to attend is one method to increase knowledge and understanding of intersectional theory and methods at the regional level.
- **Stronger partnerships are built between research institutes and IPs and LCs in SEA.** In doing so, IPs and LC networks have increased capacity to write research proposals, conduct research, collect data, write up and report research findings, and communicate research findings

to appropriate stakeholders. SEA researchers' capacity is increased to undertake participatory action research to ensure research aims and objectives are developed in partnership with IPs and LCs, and research outputs address local needs.

- **Platforms are developed to enable CSOs and academics to address challenges to conducting research in terms of risks and safeguards and foster more effective research and cooperation between CSOs and academics in the face of the ongoing restrictive research environment.** CSOs have limited freedom in the region. CIVICUS (2021), which monitors freedoms in civic space, categorise Laos and Viet Nam as Closed and all the other countries as either Repressed (Brunei, Cambodia, Myanmar, the Philippines, Singapore, Thailand) or Obstructed (Indonesia and Timor Leste). This results in certain drivers of degradation, such as IPs and LCs' tenure security, IPs and LCs' lack of resource rights, and agricultural conversion by larger agribusiness not being recognised or addressed within policy frameworks.
- **Ecological knowledge of peatland restoration is increased.** More knowledge is needed about the choice of strategic species to kick-start peatland regeneration. There are gaps in knowledge on how the choice of restoration species impacts peatland ecosystem functioning, including the quality of aboveground and below-ground litter inputs to the peat, carbon and nutrient fluxes, and mitigation of carbon loss.

Tools

- **Sustainable business models are developed as key components of restoration and sustainable natural resources management initiatives to improve IPs and LCs' wellbeing, provide better economic returns and deliver more ecologically-productive and diverse landscapes.** Such business models should provide additional and/or more stable economic returns from products and services already sustainably used within the landscape or innovative business models developed. It is recommended that such research take a systems perspective to product development, whereby product-market development occurs in unison and is based on IPs and LCs' participation with researchers and the private sector from project inception. Such approaches should also aim to strengthen existing networks within the landscape.
- **Reports or models based on robust data are developed, or existing reports are synthesised, outlining the costs of 'business as usual scenarios' and nature valuations for various land-based and fisheries sectors and degradation-related commodities (oil palm, pulpwood, sugar cane, and so on) in SEA.** Such evidence should be effectively communicated to the private sector and national governments to persuade them, with economic arguments, to alter practices and build more sustainable and ecologically-productive and diverse landscapes.
- **Sustainable funding mechanisms that support IPs and LCs' livelihoods and their engagement in environmental restoration and protection activities are developed, and best practices are scaled up.** This could be through better engagement with carbon trading, biodiversity offsets, and nature-based offsets that have been shown to improve equity, have robust benefit-sharing mechanisms and thorough Free and Prior Informed Consent processes.
- **Community-based revegetation, hydrological restoration and fire management continue to be supported, and best practices scaled up; best practices should include the integration of TEK into sustainable natural resources management and restoration projects.** To do so, an ASEAN shared principles and an ethical code of conduct that builds on deep listening with Indigenous peoples and respect can be developed. The ASEAN shared principles and an ethical code of conduct may be developed through an Indigenous-led workshop to re-imagine and re-develop equitable ways forward for TEK partnerships in restoration, with explicit considerations for the rights, livelihoods and leadership of Indigenous peoples.
- **Research and projects develop and implement cost-effective, participatory environmental restoration and protection tools.**

- **Community-based monitoring frameworks and data collection tools and methods are established at the regional and/or landscape level in-line with parameters set by IPs and LCs. This is to help address their data needs, support IPs and LCs' decision-making processes, and assist IPs and LCs in providing evidence of good management practices and tenure, while working with local government or during participatory policymaking processes.** Further, data should be stored and made accessible through cloud-based platforms, such as the Kobo toolbox and low-tech methods when internet access is not possible. Monitoring should also be low-cost, built on TEK and in collaboration with researchers and users of more advanced technologies (such as remote sensing). Existing online data collection tools and platforms, such as OneMap initiatives, should also be made more accessible for IPs and LCs.

Governance systems

- **Effective tools such as IUCN's Restoration Opportunities Assessment Methodology (ROAM) are used by SEA's national and local governments to evaluate restoration target areas, considering equity dimensions and consultation with IPs and LCs.** Shortfalls of ROAM should be assessed, and other available tools evaluated. ASEAN may be a good platform to disseminate an effective tool.
- **Effective governance coordination mechanisms are developed in vulnerable landscapes to support integrated landscape approaches to restoration and natural resources management.** Integrated landscape approaches should try to build and strengthen cooperation between government agencies and Community-Based Organisations through processes that aid in developing knowledge, organisational capacity and build trust while considering risks and safeguards concerning power differentials and potential conflicts. Decision-making tools such as ComMod can be employed to support integrated landscape approaches.
- **IPs and LCs' tenure, resource rights and participation in policymaking processes are strengthened.** Formal and informal pathways should be identified through which IPs and LCs can engage with policy processes to strengthen tenure and resource rights and even deliver restoration targets. Further, targeted evidence needed to effect policy changes within such processes should be identified and addressed. The ASEAN Guidelines on the Recognition of Customary Tenure in Forested Landscapes (under the ASEAN Working Group on Social Forestry) could provide a platform for such initiatives.
- **Rural and urban youth engagement in restoration and sustainable natural resources management initiatives are strengthened** through the continued support of initiatives that collaborate with youth through environmental education. Also by providing youth opportunities to partake in sustainable landscape management activities, as young environmental entrepreneurs, and as environmental guardians.

Annex 3: Key informant interview participants

Name	Country or Regional	Sector	Organisation
Interviewed regarding preliminary scoping of research-to-action priorities			
David Brand	Regional	Private Sector / Financing	New Forest
Ivar T Jorgensen	Regional	Donor	Norad
AnnaMaria Oltorp	Regional	Donor	Sida
Chea Sam Ang	Cambodia	Government agency	Ministry of Environment
Oskar Haq	Cambodia	NGO	Oxfam
Hong Chamnan	Cambodia	Government agency	Chief of the Department of Fresh Water of the Ministry of Environment
Markus Buerli	Cambodia	Donor	SDC
Nathalie Faure	Regional	NGO	RECOFTC
Regan. Pairojmahakij	Regional	NGO	RECOFTC
Martin Greijmans	Regional	NGO	RECOFTC
Peter Cutter	Regional	NGO	RECOFTC
Ei Htwe	Regional	NGO	RECOFTC
Provided a secondary review of inputs to identified research-to-action priorities			
Dindo Campilan	Regional	International organisation	IUCN
Ahmad Dhiaulhaq	Regional / Indonesia expertise	Academic	Research Institute for Humanity and Nature (RIHN), Kyoto, Japan.
Suriyan Vichitlekarn	Regional	NGO	Mekong Institute
Kittisak Rattanakrajangsri	Regional	NGO	Chairperson of AIPP and IPF
Oliver Agoncill	Regional	International organisation	ASEAN Centre for Biodiversity
Francis X. Johnson	Regional	Research Institute	Stockholm Environment Institute
Natalie Campbell	Regional	NGO	MLRG
Damen, Beau	Regional	International organisation	FAO-RAP

Interviewed during field visits

Cambodia Tonle Sap: Eight organisations/group discussions, 52 people in total

Oxfam (2 people, male, Phnom Penh) WCS (3 people, male, Phnom Penh), Department of Fisheries (3 people, male, Phnom Penh), EU Our Tonle Sap (2 people, male, Tonle Sap), Department of Fisheries (3 people, male, Siem Reap), CFI Committee: Kampong Phluk floating village Siem Reap (11 people, 3 female), CFI Committee: Chong Khneas floating village Siem Reap (15 people, 3 female), CFI Committee: Prek Toal floating village Battambang (13 people, 1 female – including one local Fisheries Department staff).

Riau, Indonesia: 18 organisations, including one group discussion, 32 people in total

Expert Governor office (1 person - Riau), Former Head of Deputy BRGM (Peatland and Mangrove Restoration Agency) (1 person - Riau), Village Facilitator BRGM (Peatland and Mangrove Restoration Agency) (1 person - Riau), Head BPDAS (Watershed Management Agency) (1 person - Riau), Head of Forest Planning and Utilization Division Provincial Forestry Department (1 person - Riau), Research and Information Division Jikalahari (1 person - Riau), Former Head FKKM (1 person - Riau), Head FKKM (1 person - Riau), Director Yayasan Mitra Insani (YMI) (1 person - Riau), Perkumpulan Elang (1 person - Riau), Forest Programme Manager Rainforest Alliance (RA) (1 person - Bali), Project Manager Proforest (1 person - Jakarta), Multi-stakeholders Engagement Coordinator Daemeter (1 person - Riau), Winrock International (1 person - Riau), Lecturer UNRI (University of Riau) (1 person), Village Facilitator Core-SPLP programme (1 person - Riau), Member of sago community-based enterprise (1 person - Riau), KWT Berkah Bertani (women group enterprise) (15 people - Riau)

Nan Thailand: eight organisations, 17 people in total

Provincial Governor (1 male), Nan Community College (2 people, 1 male, 1 female), Hill Tribe development agency (3 people, male), Joko – NGO (1 male), Huk Muang Nan – NGO (2 male), Charon Pockland Corporate Social Responsibility in Nan (3 people – 2 male, 1 female) Ban Nalau Community Forest (2 female) RECOFTC Thailand Country Program (4 people, 1 male, 3 female).

Annex 4: Landscape profile and field visit findings

Wetlands

Tonle Sap, Cambodia

Tonle Sap is the largest permanent freshwater body in SEA. Its watershed area extends over approximately 43% of the country (Uk et al., 2018). Tonle Sap’s “surface area changes seasonally from approximately 3,000km² in the dry season to more than 15,000km² in the wet season” (Uk et al., 2018). The flood pulse is vital in maintaining system dynamics such as sediments and nutrients load, fish production, and the structure and distribution of flooded vascular plants (Shivakoti et al., 2022). The Tonle Sap floodplain can be divided into 5 habitat types: “open water, gallery forest, seasonally flooded habitat, transitional habitat and rain-fed habitat” (Uk et al., 2018). As such Tonle Sap landscape has rich biodiversity including “phytoplankton, mollusks and arthropods, fish, reptiles, birds, and mammals (Shivakoti et al., 2022). Tonle Sap landscape is also of high cultural and economic importance, more than 3.7 million live on and around the lake and are highly dependent on its resources. There are 170 floating villages on the lake and for some of these communities almost 95% of their income is derived from fishing.

Landscape	1,483,339 ha (core zone 42,257 ha; buffer zone (541,482 ha; transition area 899,600 ha).
Degraded forest	Between 1993-2017 Tonle Sap lost 1,521,820 ha of forest with an annual forest loss rate of 0.6% (Chen et al., 2022).
Local communities	3.7 million people live in and around the area.
Ethnic groups / Indigenous Peoples	170 floating villages - Cham, Vietnamese, and Khmer.
Protected Areas	100% (1,483,339 ha) of Tonle Sap has been designated as a UNESCO Biosphere Reserve. There are three Ramsar sites, Prek Toal (21,342 ha) Boeung Tonle Chhmar (28,000 ha) and Stung Sen (9,293).

_swamp_forest_39.pdf

Cf area legally registered 430 ha

Forest area target

Protected areas 74,363 protected and manged under Kuan Kreng landscape strategy

Degraded land area 48% of the land area contains degraded forests, and 50% contains moderately degraded forests, leaving only 2% of the land area to be classified as being in good condition (undp)

Population of ethnic groups / Indigenous Peoples

Poverty level

Deforestation trend

Future trends

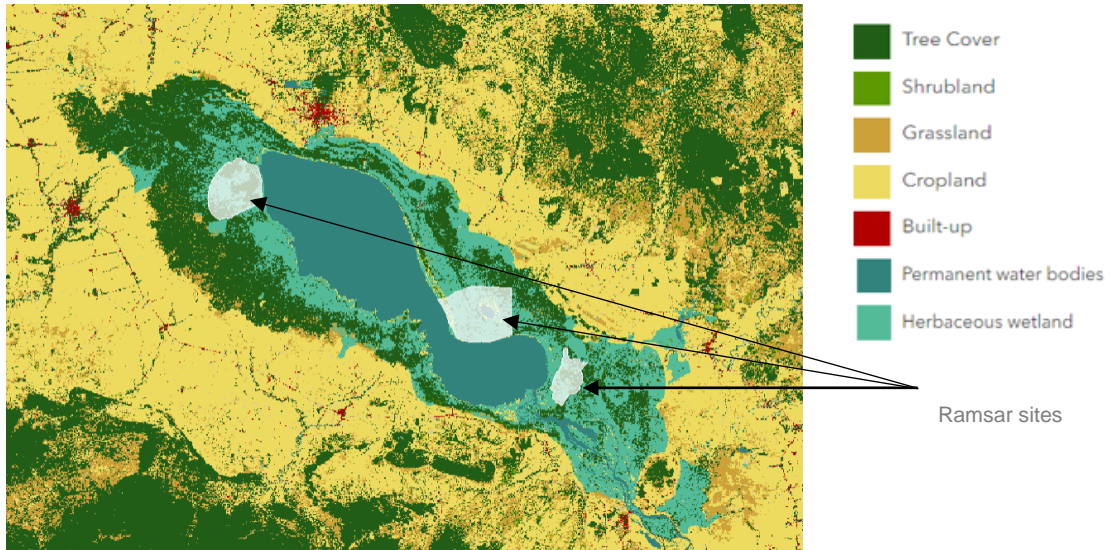
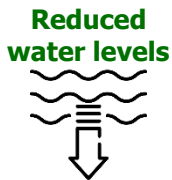


Figure 12: Tonle Sap as shown in the European Space Agency WorldCover 2020 and Ramsar sites (using ArcGIS)

Drivers of environmental degradation



The water level in Tonle Sap during the wet season shrunk by 20.6% when comparing 2010–2019 to 1996–2009 (Chua et al., 2022). These changes have been attributed to irrigation, channel incision, sand-mining operations (Chua et al., 2022), upstream hydropower dams (Dang et al., 2021) and climate change, although changes in precipitation play a smaller role than the previously mentioned (Kallio & Kummu, 2021). Dang et al. (2021) conclude that “reservoir operation in Upper Mekong Basin is dampening the typical drastic transition of hydrological flow between the seasons in the Mekong and gradually shrinking the Tonle Sap Lake”. Damming is also associated with habitat shifts which impact fish diversity (IPBES, 2018b). If further damming continues in the Mekong, it is projected that migratory fish biomass may decline up to 70% (IPBES, 2018b). The impact on lower fish populations further impacts the local people and birds who depend upon fish.

Deforestation & land conversion



It is estimated that between 1993 and 2017 Tonle Sap lost 1,521,820 ha of forest cover with an annual forest loss rate of 0.6%. Most of the forest loss was driven by forest conversion for agricultural economic land concessions (Chen et al., 2022). The rate of forest loss around Tonle Sap was larger than the national forest loss. Logging is also a result of firewood collection and charcoal production (Chen et al., 2022). Deforestation has substantially impacted the flooded forest area. In the 1960s, the area of flooded forest was around 614,000 ha. By 1997 the area had reduced to 350,000 ha (ADB 2005). Forest loss increases erosion and sediment loss. Establishing protected areas alongside national forest reforms may have slowed the rate of forest loss (Chen et al., 2022).

Fire



Fire risk has dramatically increased due to the lower water table. Fires result from accidental incidents, from converting flooded forests to agricultural fields and fires in adjacent agricultural fields to forests that jump across. Further, in the dry season, farmers who send their cattle to graze in the flooded forest area at the end of the dry season use fire to ‘flush’ their cattle out to retrieve them. In Koh Chivang district, a 2016 fire burnt 80% of their flooded forests. Fires destroy critical fish spawning grounds. The fire caused many floating villages in Koh Chivang to abandon fishing due to low fish stocks. Many now grow chilli and other crops. A map showing the extent of the 2019 fires can be found here <https://www.qrida.no/resources/15558>.

Pollution



Tonle Sap is a pollution hotspot (Chea et al., 2016). EK et al. (2020) reported that nitrogenous, sulphur-containing, phosphorus-containing, pharmaceuticals, personal care products (PPCPs) and pesticides were dominant in water samples. Shivakoti et al. (2020) detected pesticides in fish samples, including the banned DDT, which may result in a public health issue among people who consume fish from Tonle Sap. Harmful bacteria and algae have also been found in the lake (Shivakoti et al., 2020). A villager reported that it is not uncommon to develop a skin rash from the water during the dry season when water levels are low. Plastic pollution is also an observable issue reported by villagers we spoke to.

Governance



CFIs are important tools in wetland governance. Building the capacity of CFI in monitoring, patrolling, sustainable fishing and agriculture, and other activities, such as ecotourism and sustainable financing, is key to sustainable wetland management (Avent, 2017), as is building effective partnerships between CFIs and local government agencies (Avent, 2017). CFI communities work with local government agencies to implement sustainable livelihood practices and patrol important conservation areas. However, villagers and local government officers reported that they have minimal resources to effectivity patrol activities and reforest the land. One local government official told us they have seeds to replant the flooded forest but not the boat or human resources.

Further, wetland governance in Cambodia is complex as no single government authority has overarching management responsibility. Instead, responsibilities are divided under various ministries depending on the management activities and objectives (Blackham, (2017). These include the Ministry of Environment, Ministry of Agriculture, Forestry and Fisheries, Ministry of Water Resources and Meteorology, Ministry of Land Management, Urban Planning and Construction, Ministry of Tourism, Ministry of Interior, Ministry of Rural Development and Ministry of Mines and Energy (Blackham, 2017).

Land rights have also been a concern for IPs and LCs who live in and on the lake. A Tonle Sap Zoning regulation was enacted in 2011. There are three management zones. In Zone 1 and 2, farming is allowed. Agriculture and fishing are officially banned in Zone 3, which is closest to the lake. These regulations were not imposed until 2021. Prime Minister Hun Sen “ordered a crackdown on all clearing and agricultural use of flooded forest land” so the government could work to restore the degraded forest. However, these regulations impacted IPs and LCs living in and around the lake who depend on fish and agriculture for their livelihood and have lived there decades before the regulation’s enactment (Keeton-Olsen & Long, 2022). Realising this in May 2022, Hun Sen announced that some areas should be re-zoned from Zone 3 to 2 and up to October 2022, 24,940 ha of land has been redistributed to 17,349 families (Sreylin, 2022).

Ongoing landscape initiatives

According to a 2021 UNESCO study (not published information shared internally), there have been 47 projects so far in Tonle Sap, of which 26 are completed. Of the 21 ongoing projects, 13 are funded by the EU and the others from other development agencies, including Asian Development Bank (ADB), United States Agency for International Development (USAID) and World Bank. The total cost of all projects is US\$745 million. Most of the funding has been directed to developing livelihoods (more than 20%), then infrastructure development (around 11%), then fisheries (around 9%) and governance (around 6.9%), with the rest going towards biodiversity and

ecotourism. However, the logic for the UNESCO study allocating livelihoods as separate from fisheries and ecotourism is unclear.

Below is a highlight of some of the past and ongoing activities in Tonle Sap.

Past initiatives

- Under the Science and Technology Research Partnership for Sustainable Development Project (SATREPS) project (2016-2021), Shivakoti et al. (2020) developed a multi-level hydrodynamic model for analysing the inundation level, water quality and the water environment in the lake and its floodplain. They suggest using this model with remote sensing data and data obtained from ground monitoring tools to fill information gaps for executing the above-mentioned modelling tool.

Ongoing initiatives

- The CaPFish Aquaculture project (2019-2025) aims “to overcome the constraints of Cambodia’s aquaculture sector and ensure more sustainable growth, resilience to climate change and inclusion. This project also contributes to the diversification and improvement of food security for the rural population” (AFD, 2018)
- Water Resource Management and Agro-ecological Transition for Cambodia (WAT4CAM) project (2018-2025) aims to strengthen hydraulic systems in Tonle Sap
- The Sustainable Landscape and Ecotourism Project (2019-2025) aims “to improve protected areas management and to promote ecotourism opportunities and non-timber forest product value chains in the Cardamom Mountains-Tonle Sap landscape” (World Bank, 2019).
- The Fisher Folks Making Circular Economy Work For The Western Tonle Sap Lake (FOSTER) (2021-2024) aims to “support the economic empowerment of members of Community Fisheries in floating villages in the Tonle Sap through interventions to diversify their livelihood by creating income generation opportunities through community-led entrepreneurship and employment in ecotourism, sustainable agriculture, renewable energy while also improving WASH, health and education outcomes” (Oxfam, 2021).
- The Generating Resilient Environments and Promoting Socio-Economic Development of the East Tonle Sap Lake (GREEN) (2021-2025) “aims to improve the vulnerable East Tonle Sap Lake (ETSL) fishing communities’ socio-economic status and resilience to climate change through increased access to water, sanitation, hygiene (WASH), waste management services and products, green economies, and education” (VSO, 2021).
- The Sustainable Assets for Agriculture Markets, Business and Trade (SAAMBAT) (2019-2027) project’s objective is to “sustainably increase the productivity of rural youth, enterprises and the rural economy, thus contributing to the goal of reduced poverty and enhanced food security” (IFAD, 2019).
- Spatial Monitoring and Reporting Tool (SMART). WCS has trained communities and conservationists on data collection and recording of patrolling information, illegality threats and biodiversity information using the SMART Mobile. The SMART application supports “a broad range of conservation activities, including biodiversity conservation, law enforcement, tourism and visitor management, natural resources use intelligence, and performance and threat level assessments” (SMART, 2022).
- WCS, under the Our Tonle Sap Project, will develop a vegetation management, rehabilitation plan, and activities. The action will build capacity in vegetation management and pilot vegetation rehabilitation in critical areas. The activities will also include piloting ecological engineering – digging ponds, dikes and bunds – to retain water in areas that used to be flooded for much of the year and are critical for fish bloodstock and nesting waterbirds.
- WCS, under the Our Tonle Sap Project, will work with the private sector to help reduce the impact of agricultural intensification. The action will use Sustainable Rice Platform (SRP) Standards. WCS will also collaborate with female entrepreneurs in fishing communities to develop livelihood strategies that can replace fishing and incentivise flood forest protection.
- WCS and partners under the Our Tonle Sap Project “will develop a user-friendly web portal using the latest cloud-based satellite image analysis techniques.” The web portal will be used “to support government and development agencies to evaluate potential impacts of development on the TSB” (Internal document).
- The Department of Fisheries has developed provincial fire management plans, which include an awareness-raising component; however, they stated that they only have 10% of the budget to implement the fire

management plans. They stated that work with NGOs only makes up a portion of the remaining budget needed. They wanted to collaborate with communities to develop low-cost fire fishing and prevention methods. RECOFTC, under the Our Tonle Sap Project, is working with six communities in Tonle Sap to develop Community Based Fire Management Plans.

Identified research-to-action landscape priorities

The following research-to-action priorities were identified through a literature review of the various project documents, academic articles written on the Tonle Sap Landscape, and Key Informant Interviews from the field visit

Evidence



Develop further understanding of local ecology and hydrology

- According to Uk et al. (2018), “More efforts must be undertaken to assess the cumulative impacts of water infrastructure (ie. dams) and climate change on the nutrient dynamics in the TSL ecosystem, in terms of both integrated water resource management as well as their effects on water flows and sediment delivery”.
- According to Uk et al. (2018), “comprehensive monitoring of fishery production/catches and the carbon pathway (eg. using stable isotopes) is also needed to increase our scientific knowledge on production in this lake ecosystem”.
- Develop a freshwater services metrics framework to quantify the freshwater services in the Tonle Sap (Shivakoti et al., 2020).

Monitor and reduce pollution

- Concerning pollution, Shivakoti et al. (2020) recommend that “continuous monitoring and improvement in research capacity will be necessary to properly assess contamination pathways and health impacts on the people living around the lake as well as through fish consumption”. Because of the persistent nature of certain pesticides, efforts need to be enhanced by strengthening regulations on markets and distributions, as well as on how to use pesticides in an environmentally-sustainable manner appropriately.

Improve and diversify livelihoods

- More research and development are needed to assess viable livelihood strategies that will address poverty and diversification of livelihoods in an ecologically and economically-sustainable manner, as in some communities 95% of income comes from fishing. A past livelihood project aimed to help communities diversify their livelihood through Siamese Crocodile farming. However, crocodiles are on the CITES list, although this has been the case since 1975, and captive bred populations can be traded. The farmers stated they could no longer get a fair price for crocodile meat (around \$1 per crocodile). The crocodiles also need to feed on fish and other means, which is costly. The development of alternative livelihoods needs to be ecologically and economically sustainable.

Tools



Improve and diversify livelihoods

- Fishing communities face problems due to the costs of fishing materials from intermediaries. Intermediaries loan fishing equipment to fishers at a high interest rate at the start of the fishing season. If the catch is low for one year due to hydrological changes, deforestation, illegal fishing or natural disasters, fishers cannot repay the loan, creating a cycle of debt. Experts in the area first noted that more models for community sustainable financing models that remove reliance on intermediaries and the high-interest burden are needed to add community resilience. Secondly, aggregation of

Community Fishery communities may give communities more bargaining power with actors higher up the value chain or have greater potential to develop value-added products at the local/landscape level (field visit observations).

- Due to the persistence of harmful bacteria and algae, “alternatives for safe drinking water, sanitation, hygiene (WASH) and safer disposal of human waste” should be found for floating village communities (Shivakoti et al. 2020).
- There are other floating village communities around Tonle Sap, such as Prek Toal in Kaoh Chiveang, that would benefit from the scaling up of ecotourism initiatives through working with relevant departments such as the Ministry of Tourism and Ministry of Environment, which could ensure that ecotourism can have a wider reach and the types of ecotourism activities are diverse. The capacity building could help communities to develop the skills needed to develop ecotourism proposals and submit the proposals to the relevant ministries. Community Learning Centres can also be useful tools to help communities to develop small ecotourism-based businesses and develop local value-added products.
- More sustainable partnerships between the public and private sectors for sustainable development need to be developed
- NGOs collaborating with academics, communities and larger private sector actors could pilot a process of developing landscape co-operatives to increase the price that communities can get for their catch or create an IPs and LC-led product-development group.

Reduce pesticide pollution

- Shivakoti et al. (2020) recommend that “Because of the persistent nature of certain pesticides, efforts need to be enhanced by strengthening regulations on markets and distributions, as well as on how to use pesticides in an environmentally sustainable manner appropriately.” There should be “public-awareness on occupational health hazards brought about by improper handling, use and dosing of pesticides.”
- Shivakoti et al. (2020) recommend that “longer-term use of harmful pesticides should be phased out by providing environmentally sound alternatives to control pests such as Integrated Pest Management (IPM), organic farming, or good agriculture practices (GAP)”.

Reduce plastic pollution

- The CFI community visited during the field visit commented on the extent of plastic pollution in the lake and suggested an awareness campaign was needed concerning the impacts of plastic pollution both at the local and national level on people living on the Tonle Sap and the ecosystem. There is also a need to examine and improve current plastic and waste disposal methods around Tonle Sap. One Cfi community commented that water disposal was \$100 for every collection from the community.
- Research and development of innovative tools to tackle plastic pollution are needed. Or piloting of tools used to manage plastic pollution in other areas of the world is needed.

Monitoring and maintenance for reforestation

- Once seedlings have been planted, there is little monitoring and maintenance to ensure survival rates. Financing options are needed to ensure CFIs working with local government officers have the tools, funding and skills necessary to conduct monitoring and maintenance.

Monitoring and patrolling for illegality

- CFIs are required to patrol their conservation zone to prevent illegal logging of flooded forests in the dry season and illegal fishing in the wet season. However, there is often a

lack of funds to do so. Sustainable financing models are needed so communities have the fund needed for gas and boat maintenance when patrolling.

Monitoring and reporting for hydrology and ecology

- We recommended that future projects continue to assess the data gaps needed to develop further and verify Shivakoti’s et al. (2020) multi-level model for analysing the inundation, water quality and the water environment in the lake and its floodplain
- Continue to monitor water quality (Shivakoti et al., 2020).
- According to Uk et al. (2018), “There are still insufficient hydrological monitoring stations in the TSL basins, for example, hindering verification of modelling efforts (eg. data on the discharge and water level are not available at the outlet of some sub-basins around TSL).....More attention should be given to hydrological monitoring stations, with data recorded in all sub-basins around TSL to strengthen current understanding and modelling of the hydrology and hydrodynamics in the TSL basin accurately and reliably”.

Governance



Improved governance

- There is a lack of facilitation joined conservation and sustainable development between the various NGO and development agency projects around Tonle Sap, so greater coordination is needed. Relatedly there is a lack of information sharing and digital platforms across the Tonle Sap – of lessons learnt and how to join projects together.
- Tonle Sap should be governed and managed as an integrated lake basin, as lake management does not stop at the lakeside but extends throughout the entire basin. However, the governance of Tonle Sap as it stands is complex. Better policy recommendations and closer work of Ministries with NGOs and development agencies may aid in producing more effective management of Tonle Sap Landscape and the entire basin.
- Tonle Sap Biosphere Reserve is a new Coordination Mechanism for the Tonle Sap Biosphere Reserve (TSBR) under UNESCO; it includes:
 - Technical Working Group - provides technical assistance to the management of the TSBR; prepares the TSBR management plan, and monitors its implementation; identifies challenges and recommends solutions to the Management Coordinating Working Group (MCWG) based on evidence and data; conducts scientific and socio-economic research at the TSBR, and shares among platform members
 - Management Coordinating Working Group - leads, coordinates, and oversees the management of the TSBR, approves the management plan, and monitors the implementation of activities; defines initiatives to promote biodiversity and environmental conservation and livelihood resilience; promotes research and experience sharing to raise awareness of the ecosystems in the TSBR
 - Ministerial Gathering - convened annually by the Ministry of Environment, with Ministerial and high-level participation; provides strategic guidance and oversight and garners political support on long-term vision and priorities
- We recommend that the new Coordination Mechanism begin developing the technical capacity for an integrated lake basin plan and the steps needed for such a plan to be implemented in Cambodia
- Building the capacity of IPs and LCs to advocate and work with decision makers is vital to long-term sustainability. During the field visit to Tonle Sap, Cambodia, the RECOFTC scoping team spoke with two CFI Committees whose livelihoods depend on fishing and healthy fish habitats. One CFI Committee relayed to us how they successfully wrote to the Ministry of Environment asking for their help to make their local lake areas deeper as it is an important fish spawning habitat. The lake dried up in previous years due to high summer temperatures and nearby farmers' diversion of lake water for irrigation.

Another Committee told us how they effectively worked with the local Fisheries Department to establish a nursery to reforest the flooded forest and have been undertaking reforestation activities. This community also wrote to the Ministry of Environment requesting to establish tourism activities based on their local produce and culture. Their plans were rejected, but they plan to write and revise the proposal and resend it.

Landscape stakeholders

Ministry of Water Resources (MOWRAM), Ministry of Public Works and Transport (MPWT), Ministry of Rural Development, Ministry of Environment (MoE), Ministry of Interior (MoI), Ministry of Land Management, Urban Planning and Construction (MLMUPC), Ministry of Industry, Mines and Energy (MIME), Ministry of Agriculture, Forestry and Fisheries, Department of fisheries, Tonle Sap Authority, RECOFTC, Oxfam, WCS UNESCO, CI, IPs and LCs.

Landscape stakeholders interviewed during fieldwork

Oxfam (2 people, male, Phnom Penh) WCS (3 people, male, Phnom Penh), Department of Fisheries (3 people, male, Phnom Penh), EU Our Tonle Sap (2 people, male, Tonle Sap), Department of Fisheries (3 people, male, Siem Reap), CFI Committee: Kampong Phluk floating village Siem Reap (11 people, 3 women), CFI Committee: Chong Khneas floating village Siem Reap (15 people, 3 women), CFI Committee: Prek Toal floating village Battambang (13 people, 1 woman – including one local Fisheries Department staff).

Peatland

Riau, Indonesia

Riau is a province which has quite a large area of peatland. Around 5.1 million hectares or 55% of the province's land area is peatland, which spread over 59 Peat Hydrological Units to 11 regencies/cites. Around 2.4 million ha is considered as protected peat while 2.7 million ha could be cultivated for other purposes. From 2.7 million ha, around 1 million ha is used for crop plantations such as palm oil while 1.3 million ha is under the pulp and paper plantation. Forest and peatland fires are still common in Riau which cause problems to health and people's welfare. Riau is also a coastal area that is rich in mangroves. Around 126,000 ha in Riau is mangrove. Based on the analysis of Jikalahari in 2020, the remaining natural forest only covers an area of 1,442,669 ha from the previous record natural forest in 1982 which was 6,727,546 ha. Riau is also a province that has an area of largest oil palm plantation in Indonesia. The area of oil palm plantations in Indonesia is 13.5 million ha of which 2.9 million ha are in Riau. The development of oil palm in Riau increased people's income and created jobs but the way it carried was done through forest conversion and fire.

Landscape	5.1 million hectares. 59 Peat Hydrological Units to 11 regencies/cites
Natural flooded/peat swamp forest area	1,442,669 ha in 2020 1,442,669 ha in 1982
Local communities	Total population of 6,39 Million (2020) in Riau
Ethnic groups / Indigenous Peoples	Malay (38.7%) Javanese (27.2%) Minangkabau (11.8%) Batak (7.1%) Banjar (4.6%), Bugis (2.3%), Chinese (2.2%), Ohters (6%) (Nagata et al., 2014)
Protected Areas	2.4 million ha of peatland is protected

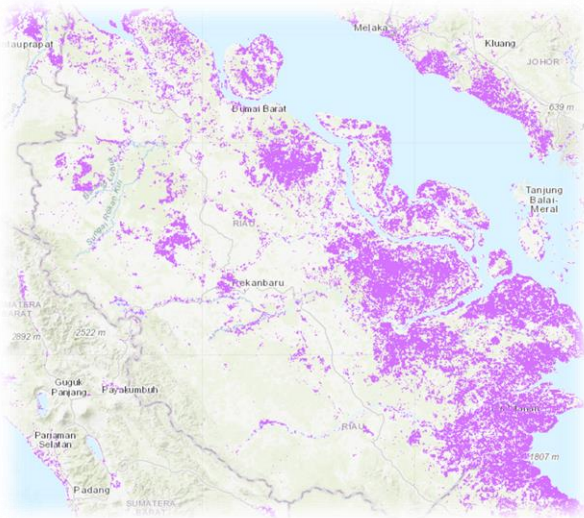


Figure 13: Map showing Riau Peatlands <https://www2.cifor.org/global-wetlands/>

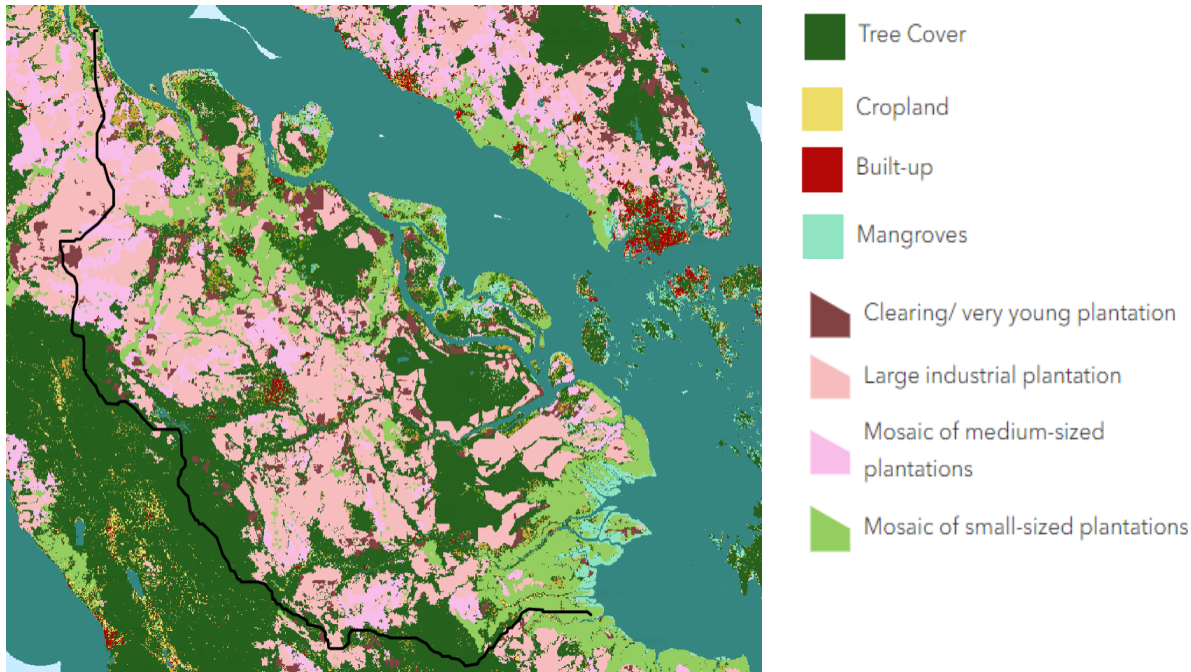


Figure 14: Riau as shown in the European Space Agency WorldCover 2020 and Tree Plantations by plantation types in Global Forest Watch (using ArcGIS)

Drivers of environmental degradation

Agricultural conversion, illegal logging and forest fire are key drivers of deforestation in Riau, and land tenure conflicts are common. The Kampar Peninsula and Kerumutan contain areas of relatively intact peatlands. The landscape of the Kampar Peninsula, which is located between the Siak River and Kampar River, has a forest cover of 385,807 ha, while Kerumutan Landscape, which is located between the Kampar River and Indragiri River, has a forest cover of 427,000 ha.

Palm Oil



Palm oil accounts for 35% of deforestation on forest cover loss in Riau. Palm oil plantations cover around 59% (5.4 million ha) of Riau land. Local communities plant palm oil due to its stable price and practical management. However, due to a low understanding of cultivation techniques, the productivity of community palm oil plantations is below 14.8 tons/ha/year, lower than in private plantations in general (20-25 tons/ha/year). As a result, local communities tend to pursue open forest land to get better income. Palm oil corporations play a key role in deforestation as it was found that in 2017, around 33 corporations illegally built their plantation in the designated forest area of 103,320 ha. Other findings in 2015, from the Special Task Committee from Provincial Legislation, show that around 378 palm oil companies that control 1.8 million ha of land did not have licences and permits from the governments.

Fire



In 2019, around 8,736 hotspots were found in Riau, and half were identified as potential fire spots. Despite the trend decreasing yearly, the threat remains as 9,713.80 ha of forest land was burned that year. One-third of the burning area occurred in the concession areas. Communities are still opening the forest land through slash-and-burn methods, especially for palm oil plantations. The local communities use slash and burn as their traditional practice. Palm oil corporations are also using slash-and-burn methods, and around 11 corporations are allegedly identified as using these methods. Pulp and paper plantations operate in deep peat areas and cause fire risk and

environmental degradation concerns. The large number of canals created to dry peat also increases the fire risk.

Illegality



Illegal logging is still a threat to the protected forest in Riau. This is still occurring, especially in the Kerumutan Landscape.

Governance



Overlapping land use designations, managed by different ministries, cause competing claims and conflicts. Customary rights are still not recognised by the government, causing conflicts with local communities claiming rights to the forests. Moreover, the Ministry of Environment and Forestry (MoEF) and provincial government are still in dispute on Riau Spatial Planning 2017-2037, including forest usage and allocations. The MoEF refused to approve the planning as it legally changed the state forest zone status and function to a non-state forest, enabling 32 palm oil corporations to operate legally.

Past and ongoing initiatives

Since 2015, the Peatland and Mangrove Restoration Agency (BRGM) has initiated several efforts, such as rewetting, revegetation and economic revitalisation, to restore and protect the Riau peatland area. This initiative was done by collaborating with international NGOs such as Daemeter, Winrock International and Proforest. Other initiatives in peat were also done through social forestry programmes by the provincial government and local NGOs. Private companies such as APRIL and APP have initiated some programmes related to forest restoration, fire mitigation and community livelihoods. Other advocacy NGOs focus on monitoring deforestation and degradation in Riau. Below is a summary of these initiatives.

Past initiatives

- BRGM undertook a livelihood and agroforestry model survey in Siak and Pelalawan Districts to analyse communities' behaviours and practices of their land management
- Several research projects have investigated deforestation and encroachment by palm oil and pulp and paper corporations. For example, a report by Riau Provincial Special Committee for Monitoring and Evaluation of Permits indicated that in 2015 there were 1.8 million ha of illegal palm oil associated with 378 companies. This investigation also includes hot spots and fire occurrences in the concessions.
- A team of experts from universities, government officers and NGOs conducted field visits in 59 Peat Hydrological Areas to formulate a Peat Ecosystem Protection and Management Plan (RPPEG) for Riau Province. The report can be used as a reference in spatial planning and plantation areas to minimise the use and expansion of oil palm land in protected areas such as peat areas.
- Eyes on the Forest use GIS and remote sensing to investigate those who clear forests and grab land. The tool is also used to inform those who buy products made from the commodities grown on these lands (such as palm oil and pulp) and those parties that regulate the use of these lands and develop that information as campaign and advocacy products.
- National and local NGOs developed an online platform [Pantau Gambut](#) to provide the public and decision-makers access to information to jointly monitor the development of activities and commitments to restore peat ecosystems in Indonesia, especially in Riau. It was used as an advocacy tool to monitor governments,

corporates and NGOs on peat restoration and investigate those who destroy peat areas. The monitoring uses information from planning documents, remote sensing and fieldwork investigations.

- A mechanism by the provincial government called Trees Adoption was used to promote forest protection by the communities under the social forestry scheme. For trees with a 40cm diameter, the communities will receive Rp 200,000, while for trees with less than 40cm diameter, they will receive Rp 50,000.
- BRGM implemented several activities under three main programmes: restoration, revegetation and revitalisation. Between 2021-2022, BRGM in Riau Province developed 120 canal blockings in four districts (Pelalawan, Rokan Hilir, Indragiri Hulu and Indragiri Hilir), rehabilitated 108 ha of burnt land and facilitated 20 farmer groups in these areas. Besides these three programmes, BRGM also successfully developed 19 Peat Care Village models and Young Generation Cares for the Prosperous Peat Village by collaborating with Riau University and Lancang Kuning University.
- Daemeter, ProForest and BRGM mainstreamed three programmes (village, mills and multi-stakeholder cooperation) for the implementation of the National Sustainable Palm Oil Program through (i) village assistance programmes such as village planning, training, participatory mapping, and demo plots; (ii) palm oil involvement such as awareness raising, ISPO compliance, smallholder supply chain survey, and deforestation monitoring; and (iii) multi-stakeholder cooperation such as collaborating with local governments and other partners working in Siak and Pelalawan. Aligning with existing initiatives and programmes in the district, namely the Siak District Green Action Plan and the Regional Action Plan for Sustainable Oil Palm Plantation in Pelalawan District.
- APP Sinar Mas implemented a programme in Riau called Prosperous Village Fire-Care (DMPA) in 2016. The programme includes community livelihood empowerment, participatory mapping, technology transfer, forest protection, conflict prevention and resolution, and product marketing partnerships. The programme also aims to educate and improve the livelihood of the communities. The programme is mainly implemented in surrounding AAP's concessions. In addition, it relates to the government initiative on climate change adaptation called Climate Village Program.
- BRGM and IPB University developed a knowledge portal called Knowledge Management of Tropical Peat Restoration (KMSTROPER). The portal aims to guide peat restoration implementation and help stakeholders solve problems in the fields. The portal stores more than 100 research titles across 17 universities in Indonesia, and the public can access the research results and database.
- The problems and lessons learned directed the Governor of Riau Decree No Kpts.803/IV/2022 on the Protection and Management Plan Riau Province Peat Ecosystem in 2021 - 2050, and the formation of a Peat and Mangroves Restoration and Rehabilitation Team under the Governor of Riau Decree No Kpts. 871/VIII/2021.

Current initiatives

- The National Mangrove Rehabilitation programme aims to rehabilitate 600,000 ha of mangroves in Indonesia by 2024. Initially focused on four provinces that contain a significant portion of existing and degraded mangrove areas, namely East Kalimantan, North Kalimantan, North Sumatra, and Riau
- Local Action Plan on Sustainable Palm Oil Plantations of Riau Province 2022-2024 under the Riau Government Regulation No 9/2022 to control oil palm expansion to the forest
- Since 2015, BRGM has initiated several efforts, such as rewetting, revegetation and economic revitalisation, to restore and protect the Riau peatland area. This initiative was done by collaborating with international NGOs such as Daemeter, Winrock International and Proforest. Other initiatives in peat were also done through social forestry programmes by the provincial government and local NGOs. Private companies such as APRIL and APP have initiated some programmes related to forest restoration, fire mitigation and community livelihoods.
- APRIL programme focuses on peat restoration to its concessions in the heart of Kampar Peninsula and Padang Island, around 150,693 ha. The key research in this area includes a biodiversity survey, forest and hydrological restoration, integrating carbon with biodiversity and community, and weather monitoring.

- Local Action Plan on Sustainable Palm Oil Plantations of Riau Province 2022-2024 under the Riau Government Regulation No 9/2022 to control oil palm expansion to the forest
- Village Facilitators Network under the DFID/FCDO-funded Production Landscapes Programme launched in 2019; the network supports: the exchange of information and capacity building locally, such as training; bridge/connect between practitioners at a sub-national level (Riau Province) and national level, and discussions on different issues on sustainability, including High Conservation, Value/High Carbon Stock, gender, and Free Prior Informed Consent

Identified research-to-action landscape priorities

Evidence



- Computer modelling and simulation based on accurate research data are needed to enable different stakeholders to better assess the benefits of optimal restoration/ landscape management practices
- Action research is needed to develop a mechanism to change communities' land-use behaviour, including economic incentives such as carbon trading and the market
- Develop community-based peat management models such as paludiculture and agrosilvofishery that integrate community participation, private sector partnership and peat landscape ecosystem policy
- National academics working in unison with IPs and LCs should identify additional paludiculture crops and tree species for further research and development as economically viable palm oil alternatives supporting a more sustainable landscape management model. The involvement of private companies such as APRIL in researching suitable models that serve the company's interest and local needs would be highly considered.
- Research and mapping customary right claims
- Research how to use communities' traditional fire and peat management knowledge
- Further research and studies are needed to implement Protection and Management Plans Riau Province Peat Ecosystem 2021-2050.

Tools



- Continue funding for Young Generation Cares for the Prosperous Peat Village, which strengthens young urban and rural people's participation in participatory action research on peat restoration
- Develop a tool for the Integrated Water Management Design of a Peat Hydrological Unit (KHG) to assist water management in peat areas. The tool is built as a water balance model that combines surface hydrology and groundwater hydrology to predict the rise and fall of groundwater levels in peatlands. The tool can model the effectiveness of canal blocks in maintaining groundwater levels and model land barriers to reduce seepage or water leakage from peatlands.

- Strengthen and develop a peat knowledge portal at the local level as learning and knowledge management on peat restoration at the provincial level
- Strengthen and fund the social forestry programme in Riau by identifying problems faced by IPs and LCs before and after licensing application, training communities and social forestry facilitators on peat management, business plans, market, and financing
- Strengthen OneMap policy, working with government agencies, including landscape and provincial levels, and other stakeholders

Governance



- Develop a landscape-based peatland management model as a public-private-community partnership that encourages multi-functions and multi-benefits from peat management that align with production, conservation and community livelihood goals
- Implement a policy that encourages the application of paludiculture through the formation of specific areas (kawasan khusus). The government can design market-demand paludiculture estates in these areas and provide community capital and mentoring mechanisms. This policy can be integrated with the Provincial Development Plan of Riau (2019 - 2024) on Green Riau.

Opportunities



- National level
 - Government commitment to restore 1.2 million ha of peatland and 600,000 ha of mangrove forest by 2024
 - In the 2022 Nationally Determined Contribution (NDC) document, the government commits to raising its emission reduction target to 32% in 2030 and, with international support, to 43%.

Landscape stakeholders interviewed during fieldwork

Expert Governor office (1 person - Riau), Former Head of Deputy BRGM (Peatland and Mangrove Restoration Agency) (1 person - Riau), Village Facilitator BRGM (Peatland and Mangrove Restoration Agency) (1 person - Riau), Head BPDAS (Watershed Management Agency) (1 person - Riau), Head of Forest Planning and Utilization Division Provincial Forestry Department (1 person - Riau), Research and Information Division Jikalahari (1 person - Riau), Former Head FKKM (1 person - Riau), Head FKKM (1 person - Riau), Director Yayasan Mitra Insani (YMI) (1 person - Riau), Perkumpulan Elang (1 person - Riau), Forest Programme Manager Rainforest Alliance (RA) (1 person Bali), Project Manager Proforest (1 person Jakarta), Multi-stakeholders Engagement Coordinator Daemeter (1 person - Riau), Winrock International (1 person - Riau), Lecturer UNRI (University of Riau) (1 person), Village Facilitator Core-SPLP programme (1 person - Riau), Member of sago community-based enterprise (1 person - Riau), KWT Berkah Bertani (women group enterprise) (15 people - Riau)

Forests

Nan, Thailand

The Nan landscape in Thailand is home to a forest ecosystem of vital importance to the country's largest watershed, the Chao Phraya. In the Nan landscape, forested mountains surround river valleys that support extensive agricultural systems. Stretched across 1.2 million hectares, the Nan contains the Nan River, a principal tributary of the Chao Phraya River contributing 40 percent of its flow. The Chao Phraya supports the rich agriculture of central Thailand and the livelihoods of the urban delta communities, such as Bangkok, the capital. Due to agricultural land conversion in the Nan landscape, soil and sediments released into the river threaten the health of this ecosystem. Investments in sustainable forest management and agroforestry in Nan Province are crucial to protecting the Nan and Chao Phraya watersheds. The 480,000 people living in Nan Province include six ethnic minorities. Securing their rights will enable them to generate incomes from agriculture and protect the ecosystem creating benefits for all of Thailand.

Landscape area	1,200,000 ha
Forest cover	61.45%
Degradation	From 2000 to 2020, Nan experienced a net change of minus 49,000ha (-4.7%) in tree cover. With the area of stable forest being 787,000 ha, forest gain 42,100ha, forest loss 91,100ha and area of forest disturbed being 160,000ha (Global Forest Watch)
Population	480,000
Ethnic groups / Indigenous Peoples	Northern Thai (80%) mainly live in the lowlands and five ethnic minority groups the Lau (42% of the five) Hmong (31.9% of the five), Mien, Khmu and Mlabri. The majority live outside the municipal areas (88%).
Protected Areas	Nanthaburi National Park (87,700ha), Doi Phu Kha National Park (170,400ha), Si Nan National Park (102,400ha), Khun Sathan National Park (40,500ha), Khun Nan National Park (24,900ha)

registered

Forest area target

Protected areas 74,363 protected and managed under Kuan Kreng landscape strategy

Degraded land area 48% of the land area contains degraded forests, and 50% contains moderately degraded forests, leaving only 2% of the land area to be classified as being in good condition (undp)

Population of ethnic groups / Indigenous Peoples

Poverty level

Deforestation trend

Future trends

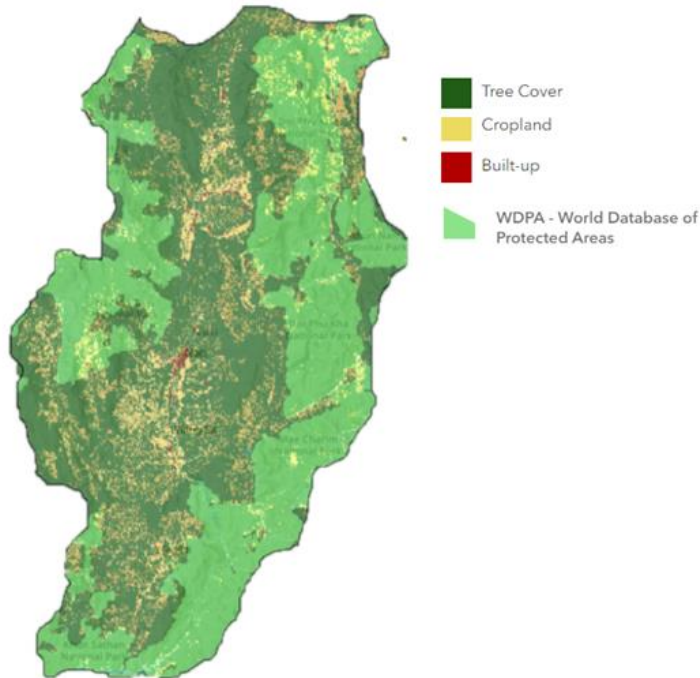


Figure 15: Riau as shown in the European Space Agency WorldCover 2020 and Protected areas from the WDPA (using ArcGIS)

Drivers of environmental degradation

The Nan landscape in Thailand and the people and biodiversity it shelters are threatened by land conversion and insecure land tenure. Agricultural land conversion is driving deforestation, increasing local people's vulnerability to natural disasters, food insecurity and other effects of climate change. Erosion and logging destabilise the landscape and lead to severe flooding, landslides, inconsistent water supply and poor water quality.

Land Conversion for maize



Zeng et al. (2018) found that "forest loss in Nan Province during 2001–2016 was 66,072 ha (9.1% of the forest cover in 2000) and that the majority of this lost forest (92%) had been converted into crop (mainly corn) fields by 2017. Annual forest loss is significantly correlated with global corn price ($p < 0.01$), re-confirming agricultural expansion as a key driver of forest loss in Nan Province." Maize farming on steep hills and overuse of agrochemicals leads to soil erosion and lower yields, leading farmers to encroach further and clear forests (Baicha, 2016) Trisurat et al. (2019) determine that Nan's protected areas are important for protecting the remaining forest cover as well "as patrolling at-risk deforestation areas, riding road expansion in pristine forest areas, and promoting incentive schemes for farmers to rehabilitate degraded ecosystems". However, farmers have been switching to more sustainable practices in recent years. Pongkijvorasin & Teerasuwannajak (2019) find that the "fundamental mechanism driving a sustainable transformation from highland maize farming to reforestation comprises 3 pillars. These are 1) realization of adequate economic, health or environmental benefits derived from the alternatives; 2) a sense of belonging and attachment towards the forest and 3) effective enforcements of communal rules and regulations."

Governance



Nan has the third highest land tenure insecurity among the provinces of Thailand. Complex legal regulations and unclear guidelines make it difficult to get sustainably harvested teak to timber-consuming markets. Local people, particularly women and low-income groups, have limited involvement in decisions about allocating and managing natural resources. Annual income per household is around US\$7,000. Nan has the highest unemployment rate and one of the highest debt burdens of all provinces in the country.

Past and ongoing landscape initiatives

Past initiatives

- Teerasuwanajak & Pongkijvorasin (2017), gathering data from 146 household surveys in seven areas of Nan and in-depth interviews with local stakeholders, government, and development agencies found that "different agricultural systems and business models fare different impacts on the economic, social and environment". They found that "Contract farming reduces price uncertainty for farmers but creates significant negative impacts on social and environment. Farmers' aggregation help strengthen farmers' capacity and open market opportunity, but it does not guarantee a lift in bargaining power. Cultivating high-quality products may add value to the final product and benefits the environment. However, farmers must be linked to the high-end market and pass a quality guarantee system. Product processing helps diversify market risk, but whether the value added will be returned to farmers is questionable." Nan Community College worked with a local CSO to train IPs and LCs in participatory GIS to analyse the number of Community Forests in Nan and the total Community Forest area. GIS mapping enabled communities to register their Community Forest with the Royal Forestry Department after implementing the 2019 Community Forest Act. The communities also hold their data and are better positioned to negotiate with local government agencies over their land and resource rights.
- In Santisuk District, RECOFTC helped establish a nursery that the local communities use for reforestation and also sell seeds, plants and saplings to neighbouring districts in Nan and even the Royal Forestry Department. The nursery to date has produced 1,339 seedlings from eight indigenous tree species.
- RECOFTC established an online portal (nanportal.com) where smallholders can input information on teak trees on their lands. The information can be used for forest garden registration, legal logging and local business planning and development. The platform enables smallholders to manage their logging activities, negotiate with buyers and coordinate with local government to gain permission to log their timber.
- RECOFTC started a smallholder timber control pilot in Santisuk District in line with the timber legality assurance system of the Forest Law Enforcement, Governance and Trade (FLEGT) initiative of the European Union
- RECOFTC Worked with 17 communities on forest governance, 16 communities on timber legality and 31 communities on forest landscape restoration
- RECOFTC hosted a public forum in Nan on gender equality with nine local and national media partners
- V4MF (Voices for Mekong Forests) project built the capacity of CSOs networks and promoted good governance practices and governance within the Mekong. It was supported by the EU.

Current initiatives

- Nan Community College works with Is and PLCs to identify capacity and research needs. If a knowledge gap is found, Nan Community College often collaborates with researchers from Chiang Mai University to fill the gap. In 2022 Nan Community College, Chiang Mai University and a local CSO, Joko, began a project to establish the optimum requirements for mushroom growth in forest areas, so the community can grow and sell mushrooms within their Community Forest. The local communities intend profits from the mushrooms to support a Community Forest Patrol group to help maintain the Community Forest and firebreaks.
- In Nan, there are more than 1,000 Community Forests. Agarwal et al. (2022) found that "despite high rates of deforestation in the province, community-managed forests are well conserved." Moreover, forest

patches in national parks and national forests are better conserved when they overlap with community-managed forests. Community forests, as a bottom-up land use institution, are effective in forest conservation. Communities maintaining community forests within their landscape have observed that they add resilience to their landscape through soil stability and a more stable water supply. However, additional revenue streams are needed from the community forest to maintain the labour required for its maintenance and protection (field visit observations).

- RECOFTC started an initiative called Trees4All that raises funds for reforestation with donations starting at 100 Thai baht (US\$3) to sponsor tree planting of native species that can support the livelihoods of communities living in or near forests. The Wyss Academy Foundation supports this initiative. It mobilises funding from the urban and private sectors to support IPs and LCs' tree planting. Trees4All promotes forest landscape restoration and facilities connected with the private sector for long-term landscape management responsive to livelihood development and restoration of ecosystem services. Through Trees4All, micro-credit and tree sponsorship will close the gap for smallholders, offer a viable model of forest landscape management that can compete economically with existing land use, and connect the private sector to ways to fund tree plantations based in community forests. RECOFTC partners with local hotels and the Ministry of Tourism to advertise the fundraising initiative. The donations aim to incentivise communities to increase areas under forest cover. Communities will grow seedlings from their community forest, propagate good-quality seeds and sell them for additional income. They can also use the planted trees as financial collateral to diversify their livelihoods. All funds will be managed by a committee and given to local farmers who want to reduce monoculture farming areas and increase the area under forest cover in Nan.
- In Nan Thailand, the CSR arm of Charoen Pokphand Group Co. collaborates with local communities to identify products and markets for products that can aid IPs and LCs in diversifying production away from deforestation-led maize towards commodities compatible with reforestation objectives (such as coffee). Engagement with the private sector is vital to transforming degradation-forward landscapes into sustainable ones.
- The government established the "Nan Sandbox scheme", where various pilot projects concerning land tenure reform, restoration and addressing the issues of deforestation can be piloted, with the government working with the public sector.

Identified research-to-action landscape priorities

The following research-to-action priorities were identified through Key Informant Interviews (KIIs), participating in a RECOFTC 2-day workshop in Nan Province and a field visit to IPs and LCs in Nan.

Evidence



- Communities working in unison with large private sector actors, academics and NGOs could work to identify business models with minimal environmental impacts, provide an economic return for communities and the private sector, and help communities diversify away from monoculture landscape practices. Academics can work with IPs and LCs to identify potential products/services and assess the value chain to examine where IPs and LCs can access more returns on their products and examine potential benefits/negatives of business proposals on equity, gender equity and social inclusivity. NGOs can play the role of facilitator and provide capacity to communities to work closely with the private sector, manage businesses and develop funding proposals. Further financial leverage could be gained from private sector actors beyond companies' Corporate Social Responsibility programmes. Big companies are increasingly interested in developing long-term business partnerships for mutual benefits. These companies include Charoen Pokphand Group and Kasikorn Bank Group.
- Consolidate information on research/projects in Nan to assess the various restoration mechanisms' strengths, weaknesses and gaps concerning livelihoods and environmental and sociocultural impacts. Such research would be of use to provide evidence to the Royal Forest Department of successful community-driven restoration activities, which may support building trust between the Royal Forest Department and IPs and LCs, which in turn could help speed the pace of permitting IPs and LCs' tenure

rights under the Kor Tor Chor policy and may eventually lead to further policy change where rules around resource management are less restrictive.

- Funding is needed to enable the continuation and growth of local CSOs, IPs and LCs, the private sector and academic networks best placed to undertake community-based action research
- Within Nan landscape, IPs and LCs, CSOs, NGOs and Nan Community College have the knowledge and are willing to transform their landscape from monoculture maize crops to a diverse agroforestry system, introduce teak forestry plots, and establish diverse forested areas to access carbon financing. However, to ensure there is no loss to IPs and LC's livelihoods (during the transition phase and when the landscape has been restored), markets are needed for the diversifying products being promoted in Nan to ensure the sustainability of restoration projects. If there are no markets for new forest products, farmers will convert their area back to maize monoculture, which ensures a stable, albeit low, income. Market analyses at the local level can aid IPs and LCs in determining which products to plant. Additionally, concerted efforts by national government agencies are required to develop policies that support local growers to diversify production and businesses to support forest-landscape based/agroforestry products. In this case, research needs may be directed at the national level. For example, economic modelling by national research institutes or universities on how government subsidies can aid in developing a green economy may be beneficial. Larger corporations or research institutes can also play a research role in creating novel products or creating a market for existing products within a reforested or agroforestry landscape, such as timber-based buildings, traditional medicines, CSR business arms, and so on.

Tools



- Working with low-tech and high-technology approaches can benefit IPs and LCs and restoration. Communities that hold their data are better positioned to negotiate with local government agencies over their land and resource rights. Methods should be appropriate to the research questions and, if developed through a community-based action research approach, be appropriate to the capacity of local stakeholders. However, communities should be trained to implement high-tech tools through participatory training where possible.
- Nan landscape has more than 1,000 Community Forests; however, only 56 are considered legal under the 2019 Community Forestry Act. RECOFTC is collaborating with local communities, the local tourism authority and hotels to pilot a Trees4All initiative which asks tourists to provide a one-off payment to support the planting of community forests. Collaborating with communities and development partners, RECOFTC aims to further apply the idea of Carbon Neutral Tourism into practices, where voluntary payments are provided to Community Forests when travelling to Nan. Such projects will benefit from further funding, private-sector engagement, and an effective communications strategy to scale up to other areas of Thailand and other countries in SEA.
- Nan Thailand farmers reported that lack of water impeded restoration and crop diversification. Community Forestry may be a way to promote a more stable water supply. Therefore, restoration activities in upland forests should also develop alongside irrigation and water supply improvement plans.
- Establish a central online platform to enable communication and create a space that facilitates collaboration among IPs and LC entrepreneurs, researchers and the private sector.

Governance



- Sustainable timber production on public land can improve livelihoods while increasing forest cover. However, current laws, policies and other challenges prevent this from happening. Smallholders on public land cannot develop enterprises that supply timber until issues relating to legality are addressed. Laws and policy reformation are needed to enable smallholders to produce and sell timber legally, including smallholder-friendly plantation registration and simpler procedures for acquiring permits to harvest and process timber. Some of the gaps in the regulatory framework could be addressed

by greater coordination and information-sharing among the relevant government agencies during policy development.

- Technocrats in the government developed the 2014 Kor Tor Chor policy that outlines IPs and LCs' land rights within demarcated National Reserved Forests and Protected Areas and reforestation requirements. The academics were mainly from ecology/forestry and not social scientists nor members of civil society. As findings from RECOFTC show, despite ambitious restoration targets, this policy is overly complex to implement by local Royal Forest Department Staff, and IPs and LCs' livelihoods have not been suitably considered. A Kor Tor Chor network of NGOs and CSOs can provide government input every four years. This network may be best placed to use evidence from completed and ongoing research studies to determine what aspects of the Kor Tor Chor policy may or may not be working in aiding restoration and improving IPs and LC's livelihoods. REDAA funding could be best placed to support this network to consolidate existing evidence, conduct further studies, and establish preliminary meetings to prepare them for future Kor Tor Chor policy meetings.
- More effective mechanisms need to be developed for communicating land and resource rights to IPs and LCs and local government officers
- Nan Community College needs further funding to build a network throughout the country with other community colleges and communicate and share best practices for undertaking participatory action research with IPs and LCs via national conferences and online video platforms
- Improve coordination between government and Community-Based Organisations to improve data management on various aspects of community landscapes such as tenure rights, forest cover and carbon storage, biodiversity, and so on

Annex 5: Key Biodiversity Areas in Southeast Asia (Source: Global Forest Watch)



Annex 6: Literature review summary for peatland and mangroves (*please note much of the content of the tables is quoted directly from the journal articles cited as these tables serve as raw data for the scoping study literature review*)

Peatlands

	Tools	Recommendations and best practices	Research and capacity gaps
Rewetting	Tools for rewetting include canal blocking, canal piling, drilling/borehole, and damming (Convention on Wetlands, 2021; Hasanah & Setiawan, 2020; Yuwati et al., 2021) and hydrological modelling	The Convention on Wetlands (2021) guidelines notes that any dam will deteriorate over time; thus, any blocking system developed should be robust to remain effective with minimal maintenance. Central Kalimantan researchers used PVC pipes filled with peat soil to block the canals (Yuwati et al., 2021). In Southern Thailand, The Faculty of Engineering at Kasetsart University developed a hydrological modelling application – MIKE SHE – to maintain appropriate water levels to avoid forest fires.	How species or phenological types (eg. stilt roots, buttresses, surface roots, and so on) and the forest floor structure contribute to water retention and regulation and how these functions can be restored (Convention on Wetlands, 2021).
Revegetation	Natural regeneration and revegetation with assisted regeneration/planting	Natural regeneration is the most cost-effective approach for large areas, and the rewetted peat can function as an extensive seed bank source for regeneration (Yuwati et al., 2021). Before undertaking revegetation, Yuwati et al. (2021, p. 16) recommended the following be determined: "peat soil condition; remaining stands, seed rain, underground seed stored and vegetative shoots; physical, chemical and biological changes of the peat soil for supporting plant growth; characteristics of plant species which survived on degraded areas; and the autecology of peat swamp forest species". With assisted planting, the establishment of nurseries and seed banks of indigenous and peat-adaptive woody species has shown successful revegetation practices (Terzano et al., 2022).	More knowledge is needed about the choice of strategic species to kick-start peatland regeneration (Convention on Wetlands, 2021). There are gaps in knowledge on how the choice of restoration species impacts peatland ecosystem functioning, including the quality of aboveground and below-ground litter inputs to the peat, carbon and nutrient fluxes, and mitigation of carbon loss (Mishra et al., 2021). Increased understanding of soil biota in ecosystem restoration and the linkages between aboveground and below-ground biota in both mitigating peat loss and enabling vegetation establishment during restoration (Mishra et al., 2021).

	Tools	Recommendations and best practices	Research and capacity gaps
Revitalisation (Livelihoods)	Using peatlands without drainage includes practices such as paludiculture (crop cultivation under wet or flooded conditions) and the subsistence-scale extraction of resources (Cole et al., 2021).	Dommain et al. (2016) suggest various practices for paludiculture, including agroforestry in protected and rehabilitated areas, cultivating bioenergy plants in deeply flooded areas with no prospect for reforestation and "large-scale mixed plantations of commercial peat swamp species as alternatives to drainage-based plantations". The Roundtable on Sustainable Palm Oil (RSPO) has developed a manual on best management practices for existing oil palm cultivation on peat and recommends that the water table be 50cm below the surface.	Research is needed to examine which economically useful native tree species/ plantations are tolerant of high-water levels (Page & Hooijer, 2016). As current economic returns from candidate high-water level crops are lower than those from conventional drainage-based crops such as oil palm, research and development are needed to develop economically-effective additional paludiculture crops (Mishra et al., 2021). Many timber and non-timber species have been recommended as paludiculture options; however, few species provide significant economic returns (Yuwati et al., 2021). Further, changes exist in aiding local people to change their livelihoods as people tend to prefer the status quo and relative stability (Yuwati et al., 2021); therefore, more evidence is needed to convince local people to change their livelihood practices. A greater focus on social dimensions for peatland restoration is needed, with greater emphasis placed on local values and traditions (Mishra et al., 2021).
Reducing fires	Rewetting and effective hydrological management, adopting zero burn policies alongside awareness and education programmes with IPs and LCs (Page & Hooijer, 2016)	Tools for reducing fires should be weighted to focus on fire prevention over firefighting (Page & Hooijer, 2016). THE ASEAN Guidelines on Peatland Fire Management (2015) recommend that 70% of fire management resources be distributed towards fire prevention efforts.	In this area, financial capacity and human resources are lacking in most SEA countries to implement awareness-raising, fire prevention and firefighting activities.
Community-based reporting and monitoring	Reporting and monitoring using accessible data collection software	Terzano et al. (2022) notes that "community-based monitoring systems in peatland areas can serve as more efficient alternatives to conventional systems". "Data collection software (e.g., Kobo toolbox and others) operated by locals via offline mobile devices, for submission of data to an online monitoring database, allows community-based reporting and monitoring to provide data in a periodic and timely manner (Okarda et al., 2019)" (Terzano et al., 2022). Mishra et al. (2021) recommend a need for improved approaches that integrate data from field monitoring, modelling and remote sensing to evaluate the benefits of rewetting, seasonal fluctuations, and the key drivers of below-ground processes, including carbon and nutrient cycling (Mishra et al., 2021).	In general, further research and action are needed to determine the exact extent and status of peatlands at the national level (Global Environment Centre, 2021). There is a reported general lack of common monitoring concepts and protocols to assess the effectiveness of restoration projects (Convention on Wetlands, 2021). In 2020, CIFOR organised a series of online workshops to explore principles, criteria and indicators for effective monitoring and management of peatland restoration in Indonesia. Indicators included bio-physical indicators – relating to the ecological, hydrological and fire aspects of peatland -; social indicators – relating to social networks, equity, trust, and justice -; economic indicators - particularly to monitor existing incentives and new livelihood options - and governance indicators exploring what policies are needed and appropriate at the local, provincial and national level for successful implementation (Bhomia & Murdiyarso, 2021). We suggest that participatory monitoring protocols be developed using the CIFOR indicator and other monitoring tools.

	Tools	Recommendations and best practices	Research and capacity gaps
Participatory restoration and sustainable natural resources management	<p>Effective and participatory engagement with stakeholders is needed at the project's outset (Ward et al., 2021)..</p> <p>Examine barriers to effective stakeholder participation (Ward et al., 2021).</p> <p>Integrate cultural capital and local knowledge (Miller et al., 2022).</p>	<p>Ward et al. (2021) found that smallholders in Sumatra were reluctant to allow canal blocking on their land as they feared the impact of raised water levels on their crops and therefore were less likely to partake in restoration activities.</p> <p>Reviewing several peatland projects, Miller et al. (2022) summarise that social inclusion and the active participation of all projects' physically proximate stakeholders proved more important to project success and brought the projects legitimacy and greater perceived co-benefits. Miller et al., (2022) found that when "diverse stakeholder participation was lacking, programmes proved unpopular and/or were short-lived".</p> <p>Projects that ignored cultural capital and local knowledge were also short-lived (Miller et al., 2022).</p>	<p>Creating evidence-based and landscape models that show successful livelihood development in rehabilitated peatlands is effective.</p> <p>There is a need to conduct research examining barriers to effective stakeholder participation, which will cut across other ecosystems.</p>
Integrated landscape approach		<p>Jessup et al. (2020) suggest that an integrated landscape approach for socially-inclusive peatland restoration includes: the blocking of drainage canals and revegetation in the deep-peat core zone, forestry and agroforestry in shallow-peat buffer zones, aquaculture, and duck farming in fully rewetted peat; and more intensive tree plantations and agriculture on surrounding non-peat mineral soils. Jessup et al. (2020) suggest that approaches require private investment linked to community-oriented enterprises and a blended public and private investment model in the core zone.</p>	<p>Mechanisms for more effective coordination are needed</p>

Mangroves

	Tools	Recommendations and best practices	Research and capacity gaps
Site selection and knowledge	Hydrological classification based on data such as water levels and (van Loon et al., 2016), satellite maps to assess historical mangrove cover, past research, participatory approaches	Lewis et al. (2019) recommend that "multiple coastal basins containing mangroves should be considered", and site selection should look at the "history of changes in areal cover of mangroves and changes in hydrology at specific potential rehabilitation sites". Biswas et al. (2009) recommend that knowledge of past conditions, ecological structure, function, and societal resources is essential when designing a restoration plan.	Capacity-building of local governments to manage mangrove ecosystems. Arifanti et al. (2022) suggest developing a set of criteria to define, delineate and prioritise restoration areas. Existing rubrics include "former mangrove areas, proximity to existing intact/healthy mangroves, tidal range, and projected vulnerability to sea-level rise, among others," and proposals to add "mangrove plant diversity based on historical species composition/distribution to integrate data on genetic connectivity for transboundary biodiversity conservation."
Species restoration	Nurseries, genetic testing, ecological and silvicultural knowledge, human resources for replating	Arifanti et al. (2022) recommend that important tools in restoration success include genetic testing to develop a wide genetic diversity, establish mangrove nurseries, establish pioneer species able to withstand hydrodynamic pressure and changes in sediment, base species selection on a clear understanding of biophysical processes such as tidal patterns, species salinity tolerance, and pests and diseases. Camacho et al. (2020) recommended that species selection is determined based on ecological and silvicultural knowledge in conjunction with the needs and priorities identified by stakeholders. For sites with limited access, Arifanti et al. (2022) suggest using Integrated Mangrove Sowing System (IMSS) and Unmanned Aerial Vehicle (UAV) Technology. IMSS is mapping and monitoring using UAVs and satellite technology. The UAV technology deploys seed balls to sites that are difficult to reach. This technology is currently being tested in Indonesia under different variables, including "tidal conditions, sediment variations, mangrove species zonation, and different levels of salinity."	
Hydrological restoration	Dykes and dams, fences, rubble-mounds	Tools for restoring hydrological functions include an optimised dike design that considers hydrodynamic loads and water levels, successfully supporting mangrove restoration activities in Viet Nam (Gerona-daga & Salmooii, 2022). Alternatively, permeable dams constructed at various locations were found to help mangrove rehabilitation in an Indonesian project site by re-establishing sediment flows (Gerona-daga & Salmooii, 2022).	Gerona-daga & Salmooii (2022) suggest designing objectives and restoration programmes to be more strategic to adapt to the impacts of climate change. In doing so, "recent integration of innovative (eg. bamboo, Melaleuca entrapping microsities, rubble-mounds) and technological designs (eg, coastal engineering) needs to be expounded", "while some technological innovations, such as permeable dams, dykes, and T-groins/fences, are costly and therefore their implementation would be financially difficult for most, if not all, SEA

	Tools	Recommendations and best practices	Research and capacity gaps
			countries, they are a “necessity to ensure faster and sustained mangrove forest recovery”.
Livelihoods		Through reviewing lessons and insights from mangrove rehabilitation in the Philippines and Myanmar, Camacho et al. (2020) conclude that mangrove rehabilitation was successful if built around an integrated and ecosystem-based approach that considers feedback between rehabilitation and other economic activities with a comprehensive site assessment that includes a biophysical and socioeconomic characterisation.	Debrot et al. (2020) recognise that “the large array of non-timber forest products (NTFPs) that mangroves offer has rarely been developed beyond the subsistence level and remain undervalued as “products of the poor” and that “Several ecological characteristics make commercialisation of mangrove NTFPs particularly challenging. Production at economies of scale, including quality standards and marketing and value chain management, is essential to develop these products beyond their subsistence role.” They suggest, “To be most effective, a systems perspective on NTFP development is needed, whereby product-market development occurs in unison and based on a participative, inclusive and fair development approach. The species/product of choice for value-added product-market development in any specific community or area will depend on several factors,” and that village or district-level cooperatives may be particularly useful in this approach. Awareness-raising and training for the community to develop processed commodities from mangroves (Arifanti et al., 2022) Breeders should explore the potential of mangrove species to produce non-timber forests and medicine products (Arifanti et al., 2022). More effective sustainable silviculture systems and techniques need to be developed to stem the overexploitation of woody materials (Arifanti et al., 2022).
Participatory approaches		Evidence shows that IPs and LCs’ participatory inclusion in all stages of restoration activities (planning, implementation and monitoring) enabled success (Camacho et al., 2020; Holl et al., 2018). Other key factors identified included: the effective involvement of all relevant stakeholders through the inclusion and integration of their priorities for conservation and development into the rehabilitation designs; the clear participatory designing of all stakeholders’ roles and responsibilities during all management phases; and collaborating with interdisciplinary teams of researchers/experts together with local people (Camacho et al., 2020). Further, to better ensure success, restoration tools, including site selection, nursery management, out planting, algae removal, seedling establishment/maintenance and field monitoring, should be participatory (Camacho et al., 2020).	“Information about the benefits/values of mangrove forests, both direct and indirect, needs to be widely disseminated to increase people’s awareness of the ecological role of mangrove forests” this may aid people in understanding the importance of sustainable management. (Arifanti et al., 2022).
Monitoring and maintenance	Algae removal, seedling maintenance	Thompson (2018), reviewing mangrove restoration projects in Thailand, concluded that effective maintenance and monitoring are key to restoration success, and projects without a plan after planting often fail. Cadier et al. (2020) recommend a monitoring	Gerona-daga & Salmooii (2022) recommend that monitoring be done long-term to ensure short-term successes are maintained. They recommend that “knowledge on mangrove biodiversity should be properly documented and systematically organised to ensure effective

	Tools	Recommendations and best practices	Research and capacity gaps
		<p>framework for restoration projects, based on a recovery wheel that includes carbon dynamics, nutrient dynamics, sediment dynamics, primary productivity, and secondary productivity as criteria, with various indicators listed for each criterion. Cadier et al. (2020) recommend that projects choose the most appropriate monitoring indicators based on their restoration objectives and goals. However, further criteria relating to IPs and LCs' livelihoods, wellbeing and culture can be added, as well as criteria relating to equity and intersectionality and governance systems. Miller et al. 2020, note that it is important to factor in social criteria such as improved income, health, education and improved social systems to capture and monitor all potential social outcomes of mangrove restoration.</p>	<p>monitoring. Effective use of biodiversity data requires the integration of disconnected datasets for strategic prioritisation. Further, they suggest “using a database as a repository of biodiversity-related information. In this manner, information will be collated (at country-level) and integrated at a regional level to provide timely and relevant information to researchers and policymakers.”</p> <p>Monitoring should be done systematically and involve revisited permanent plots (Brown et al., 2014).</p> <p>Environmental DNA (eDNA) tools can supplement conventional biodiversity monitoring methods. Such tools promise to be less time-consuming and, although expensive to develop, maybe less so than conventional biodiversity monitoring methods to implement. Remote sensing and access through free satellites is another effective tool in the assessment and monitoring of Spatio-temporal changes to mangrove forests at lower costs.</p> <p>Numerous studies have noted the lack of consistency in how mangroves are defined (eg, mangrove forest only; mangrove habitat including water bodies). This reiterates the need to develop robust and standardised, well-reported methods for accurately quantifying mangrove distribution (Gandhi & Jones, 2019).</p>

Annex 7: Ongoing initiatives in the 13 proposed priority landscapes

Reference numbers in Figures 10 and 11	Landscape name	Country/ies	Ongoing initiatives
1	Inle Lake	Myanmar	- Most initiatives have been halted since the military coup in February 2021
2	Dawna Tenasserim	Myanmar and Thailand	- Most initiatives in Myanmar have been halted since the military coup in February 2021 - Dawna Tenasserim is one of WWF's key landscapes, which they are engaged in with ongoing projects, including a rewilding project
3	Nan	Thailand	- Nan Community College works with IPs and LCs to identify capacity and research needs. If a knowledge gap is found, Nan Community College often collaborates with researchers from Chiang Mai University to fill the gap. In 2022, Nan Community College, Chiang Mai University and a local CSO, Joko, began a project to establish the optimum requirements for mushroom growth in forest areas, so the community can grow and sell mushrooms within their Community Forest. The local communities intend profits from the mushrooms to support a Community Forest Patrol group to help maintain the Community Forest and firebreaks. - In 2021, RECOFTC started an initiative called Trees4All that raises funds for reforestation with donations starting at 100 Thai baht (US\$3) to sponsor tree planting of native species that can support the livelihoods of communities living in or near forests. - Nan is a RECOFTC programme landscape. By 2030, the organisation is working to lift more than 11,000 people out of poverty, empower marginalised groups to take active roles in decision making by increasing representation in community forest groups to at least 35%, strengthen the capacity of more than 120 smallholders to sustainably improve forest productivity and foster sustainable management of 4,300 hectares of forests. - The government established the "Nan Sandbox scheme", where various pilot projects concerning land tenure reform, restoration and addressing the issues of deforestation can be piloted, with the government working with the public sector.
4	Nam Poui	Laos	- WWF Laos has Nam Poui as a priority landscape. Nationally and in the landscape, WWF Laos is working with the government, civil society and private sector to address the threats to biodiversity. The work in the landscape includes the Nam Poui Elephant Project. WWF's overall objectives in the landscape are, by 2025. - RECOFTC also has Nam Poui as a focus landscape for supporting sustainable forest landscape management, particularly in ensuring that local people have clear and strong rights and capacity to manage their forest. By 2030, RECOFTC is working to lift more than 5,000 people out of poverty, empower 400 women to take active roles in decision making, strengthen the capacity of people to adapt to climate change and foster sustainable management of 20,000 ha of forest.

Reference numbers in Figures 10 and 11	Landscape name	Country/ies	Ongoing initiatives
5	Tonle Sap	Cambodia	<ul style="list-style-type: none"> - The CaPFish Aquaculture project (2019-2025) aims “to overcome the constraints of Cambodia’s aquaculture sector and ensure more sustainable growth, resilience to climate change and inclusion. This project also contributes to the diversification and improvement of food security for the rural population” (AFD, 2018) - Water Resource Management and Agro-ecological Transition for Cambodia (WAT4CAM) project (2018-2025) aims to strengthen hydraulic systems in Tonle Sap - The Sustainable Landscape and Ecotourism Project (2019-2025) aims “to improve protected areas management and to promote ecotourism opportunities and non-timber forest product value chains in the Cardamom Mountains-Tonle Sap landscape” (World Bank, 2019). - The Fisher Folks Making Circular Economy Work For The Western Tonle Sap Lake (FOSTER) (2021-2024) aims to “support the economic empowerment of members of community fisheries (CFIs) in floating villages in the Tonle Sap through interventions to diversify their livelihood by creating income generation opportunities through community-led entrepreneurship and employment in ecotourism, sustainable agriculture, renewable energy while also improving WASH, health and education outcomes” – (Oxfam, 2021) - The Generating Resilient Environments and Promoting Socio-Economic Development of the East Tonle Sap Lake (GREEN) (2021-2025) “aims to improve the vulnerable East Tonle Sap Lake (ETSL) fishing communities’ socio-economic status and resilience to climate change through increased access to water, sanitation, hygiene (WASH), waste management services and products, green economies, and education” (VSO, 2021). - The Sustainable Assets for Agriculture Markets, Business and Trade (SAAMBAT) (2019-2027) project’s objective is to “sustainably increase the productivity of rural youth, enterprises and the rural economy, thus contributing to the goal of reduced poverty and enhanced food security” (IFAD, 2019) - Monitoring and Reporting Tool). WCS has trained Communities and conservationists on data collection and recording of patrolling information, illegality threats and biodiversity information using the SMART Mobile. The SMART application is designed to support “a broad range of conservation management activities, including biodiversity conservation, law enforcement, tourism and visitor management, natural resources use, intelligence, and performance and threat level assessments” (SMART, 2022) - WCS-RECOFTC Our Tonle Sap Project (2022-2027)
6	Prey Lang and the Eastern Plains Landscape	Cambodia	<ul style="list-style-type: none"> - Greening Prey Lang, USAID funded project implemented by Tetra Tech, CI and WCS. Launched 2019, focused on the protection of the Sanctuary, including through livelihood development, and REDD+ - The Prey Lang Community Network (PLCN) is a network of local community members working to save the Prey Lang forest from illegal logging and industrial agriculture. PLCN has 400 active members from communities in Prey Lang’s surrounding provinces. - Prey Lang is a RECOFTC programme landscape where, by 2030, it aims to lift more than 90,000 people out of poverty, empower 67,000 women to take active roles in decision making, strengthen the capacity of more than 126,000 people to adapt to climate change and foster sustainable management of 264,815 ha of forests. <p>WWF -in Eastern Plains - has projects to reintroduce tiger to Srepok Wildlife Sanctuary and works with communities to develop sustainable supply chain of commodities such as rubber, pepper and cassava.</p>
7	Quang Nam	Viet Nam	<ul style="list-style-type: none"> - The Sida-funded Explore Program (2020-2027), which RECOFTC and CIFOR-ICRAF are implementing, is working to develop the capacity of researchers of forest landscape governance in Southeast Asia. The Explore Program will be providing new research grants from Q2 2023. - Quang Nam is one of RECOFTC’s focus landscapes in Viet Nam until 2030 - Viet Nam signed a FLEGT VPA with the EU in 2018 to eliminate illegal timber from the country’s supply chain. This is particularly significant considering the scale of Viet Nam’s wood processing industry - the 2030 target of the

Reference numbers in Figures 10 and 11	Landscape name	Country/ies	Ongoing initiatives
			<p>Sustainable Wood Processing Industry Development Scheme is to achieve an export of US\$25 billion for wood and forest products.</p> <ul style="list-style-type: none"> - WWF-Laos is also working with the Department of Forestry on The Carbon and Biodiversity Phase 2 Project (CARBI 2), which focuses on protecting, restoring, and the sustainable use of ecosystems and conserving biological diversity in the Central Annamites Landscape, including Quang Nam. BMU, Germany, funds CARBI2. - The USAID SFM Project (2020-2025, budget US\$36.3 million) is working with the Government of Viet Nam to reduce carbon emissions associated with deforestation, the degradation of natural forests, and poor plantation management. This includes Quang Nam. The USAID Biodiversity Conservation Project (2020-2025, budget US\$38 million) is working to maintain and increase forest quality and protect and stabilise wildlife populations in Viet Nam’s national parks and nature reserves. This project also covers Quang Nam.
8	Nghe An	Viet Nam	<ul style="list-style-type: none"> - CIFOR-ICRAF has led various research projects on the effectiveness of Payments for Forest Environmental Services in Viet Nam, including in Quang Nam. Norad and USAID support the work. This work is linked to CIFOR-ICRAF PEER Project - analysing the socioeconomic and land cover impacts from Viet Nam’s PFES (started in 2008) and REDD+ (started in 2012) programs. The PEER Project runs until December 2022. - The USAID SFM Project (2020-2025, budget US\$36.3 million) is working with the Government of Viet Nam to reduce carbon emissions associated with deforestation, the degradation of natural forests and poor plantation management. This includes Nghe An Province. - The Government of Viet Nam has had numerous programmes addressing forest protection and restoration in the country, including in Nghe An. The discourse on these programmes has moved from focusing on conservation to economic development and, more recently, climate change. This discussion and focus are reflected in the tree species planted and support of civil society and government agencies, as well as the private sector (including state-owned enterprises), and disputes linked to the methods and outcomes of these different programmes. The most recent programme, One Billion Green Trees (Decision No 524/QĐ-Ttg 2021), aims to plant a billion trees nationwide by 2025. This latest programme is partly in response to the devastating floods and storms that hit Viet Nam in 2020. - Nghe An is a RECOFTC programme landscape where, by 2030, it aims to help Viet Nam meet its climate pledge to reduce 2.4 million tons of carbon dioxide in Nghe An, support 237 households in seven villages to receive forest titling certifications, foster sustainable management of 1,300 ha of mountain ecosystems, strengthen the capacity of 500 people to adapt to climate change and pilot two new sustainable business models for equitable partnerships between communities and the private sector.
9	Cagayan valley	the Philippines	<ul style="list-style-type: none"> - “Humanitarian Assistance to Typhoon Vamco Affected Communities in Region II” is a consortium project of CARE Philippines, ACCORD, Plan International and Action Against Hunger implemented in various municipalities in the provinces of Cagayan and Isabela – since 2020 - The Regional Department of Environment and Natural Resources has partnered with the PhilNew Hydro Power Corporation (PHPC) in a 3-year reforestation project in Tumauni, Isabela, starting May 2022. - Department of Environment and Natural Resources (DENR), since 2022, has had a forest lands grazing management agreement (FLGMA) programme - ADB - Philippines: Integrated Natural Resources and Environmental Management Project

Reference numbers in Figures 10 and 11	Landscape name	Country/ies	Ongoing initiatives
10	Riau	Sumatra Indonesia	<ul style="list-style-type: none"> - The National Mangrove Rehabilitation programme aims to rehabilitate 600,000 ha of mangroves in Indonesia by 2024. Initially focused on four provinces that contain a sizeable portion of existing and degraded mangroves areas, namely East Kalimantan, North Kalimantan, North Sumatra, and Riau - Local Action Plan on Sustainable Palm Oil Plantations of Riau Province 2022 -2024 under the Riau Government Regulation No 9/2022 to control oil palm expansion to the forest - Since 2015, Peatland and Mangrove Restoration Agency (BRGM) has initiated several efforts, such as rewetting, revegetation and economic revitalisation, to restore and protect the Riau peatland area. This initiative was done by collaborating with international NGOs such as Daemeter, Winrock International and Proforest. Other initiatives in peat were also done through social forestry programmes by the provincial government and local NGOs. Private companies such as APRIL and APP have initiated some programmes related to forest restoration, fire mitigation and community livelihoods. - APRIL programme focuses on peat restoration to its concessions in the heart of Kampar Peninsula and Padang Island, around 150,693 ha. The key research in this area includes a biodiversity survey, forest and hydrological restoration, integrating carbon with biodiversity and community, and weather monitoring. - Local Action Plan on Sustainable Palm Oil Plantations of Riau Province 2022 -2024 under the Riau Government Regulation No 9/2022 to control oil palm expansion to the forest - Village Facilitators Network under the DFID/FCDO-funded Production Landscapes Programme launched in 2019, and the network supports: the exchange of information and supports capacity building locally, such as training; bridge/connect between practitioners at a sub-national level (Riau Province) and national level, and discussions on different issues on sustainability, including High Conservation, Value/High Carbon Stock, gender, and Free Prior Informed Consent
11	North Kalimantan	Borneo, Indonesia	<ul style="list-style-type: none"> - Government of Indonesia (Indonesia Environment Fund (IEF), Ministry of Environment and Forestry, Coordinating Ministry of Maritime and Investment Affairs, Peatland and Mangrove Restoration Agency) as of May 2022 begun a project designed to support the Government's National Mangrove Rehabilitation programme that aims to rehabilitate 600,000 ha of mangroves by 2024. - The Borneo Initiative works in the area to restore degraded forests to regain their value through sustainable forestry working with forest communities. - In 2020, the government of North Kalimantan (Kaltara) joined with Yayasan Konservasi Alam Nusantara (YKAN) to work towards Sustainable Natural Resources Management in North Kalimantan Province. - The Association of Women Organizations (GOW) has been working with women farmers and traders, with the support of the local government, to create more awareness for green and healthy living and empower women at the local market to drive change for more sustainable and equitable production and consumption.
12	South Sulawesi	Sulawesi, Indonesia	<ul style="list-style-type: none"> - Community Adaptation for Forest-Food Based Management in Saddang Watershed Ecosystem, South Sulawesi, implemented by Kemitraan, including strengthening Social Forestry, funding through Adaptation Fund. Launched in 2020. - CIFOR-ICRAF has been researching social forestry, agroforestry, and related topics in South Sulawesi for many years. This includes the five-year project that started in 2022: Sustainable Landscapes for Climate-Resilient Livelihoods in Indonesia (Land4Lives). The Project, funded by Global Affairs Canada (GAC), aims to increase Indonesia's economic and climate-resilience livelihoods and food security for poor and vulnerable groups, particularly women and girls. Land4Lives will be implemented in South Sumatra, South Sulawesi, and East Nusa Tenggara.

Reference numbers in Figures 10 and 11	Landscape name	Country/ies	Ongoing initiatives
			<ul style="list-style-type: none"> - The Sida-funded Explore Program (2020-2027), which RECOFTC is implementing and CIFOR-ICRAF is working to develop the capacity of researchers of forest landscape governance in Southeast Asia. One of the key project partners is UNHAS, with researchers from that institution receiving grants to conduct research.
13	Papua Barat	Papua and West Papua, Indonesia (Papua Barat)	<ul style="list-style-type: none"> - There are ongoing led Peatland and forest restoration initiatives in Papua Barat. Papua Barat has also been an important site for REDD+ initiatives over recent years. - The Indonesian government declared West Papua a conservation region in 2015 - Papua Barat is a key landscape for WWF

