Tetra Tech International Development

REDAA Scoping Study report: the development of innovative landscape management regimes and nature-based solutions

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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 UK Foreign, Commonwealth and Development Office through the Expert Advisory Call Down Service (EACDS) – Lot B. Summaries of all the scoping papers can be found at www.redaa.org/scoping-studies.

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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Acronyms and abbreviations

ACB	ASEAN Centre for Biodiversity
AFR100	African Forest Landscape Restoration Initiative
AHP	ASEAN Heritage Parks
AIPP	Asia Indigenous Peoples Pact
AMME	ASEAN Ministerial Meeting on the Environment
AMS	ASEAN Member States
ASEAN	Association of Southeast Asian Nations
AHP	ASEAN Heritage Parks
ASOEN	ASEAN Senior Officials on the Environment
ASOF	ASEAN Senior Officials on Forestry
ASPEN	ASEAN Strategic Plan on the Environment
AWGCC	ASEAN Working Group on Climate Change
AWG CITES & WE	ASEAN Working Group on CITES and Wildlife Enforcement
AWGCW	ASEAN Working Group on Chemicals and Waste
AWGCME	ASEAN Working Group on Coastal and Marine Environment
AWGEE	ASEAN Working Group on Environmental Education
AWGESC	ASEAN Working Group on Environmentally Sustainable Cities
AWGNCB	ASEAN Working Group on Nature Conservation and Biodiversity
AWGWRM	ASEAN Working Group on Water Resources Management
CBD	Convention on Biological Diversity
CF	Community Forests
CFM	Collaborative forest management
CDA	Chilika Development Authority
DD	Data deficient
DFSC	Deforestation-free supply chain
FAO	Food and Agriculture Organization
FCDO	The Foreign, Commonwealth and Development Office
FLR	Forest Landscape Restoration
FPIC	Free, Prior and Informed Consent
GBF	Global Biodiversity Framework
GFPDF	Ghana Forest Plantation Development Fund
GPFLR	Global Partnership on Forest and Landscape Restoration
HKH	Hindu Kush Himalayan
HOB	Heart of Borneo Initiative
ICCA	Indigenous and Community Conserved Areas
ICIMOD	International Centre for Integrated Mountain Development
IFL	Intact Forest Landscapes

ILK	Indigenous and local knowledge
ILKTF	Indigenous and Local Knowledge Task Force
ICCA	Indigenous Community Conserved Areas
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IPs and LCs	Indigenous Peoples and local communities
ITCZ	Intertropical Convergence Zone
IUCN	International Union for the Conservation of Nature
IUCNB	IUCN Bangladesh
JFM	Joint Forest Management
LDC	Least developed countries
LULCC	Land use and land cover changes
MR	The Mekong Region
MSA	Mean species abundance
NCP	Nature's contributions to people
NBSAP	National Biodiversity Strategy and Action Plan
NBS	Nature-based solutions
NDC	National Determined Contributions
NTFP	Non-timber forest products
ODA	Official Development Assistance (UK)
PA	Protected Area
PSF	Peat swamp forest
RED	Research and Evidence Division
REDAA	Reversing Environmental Degradation in Africa and Asia
REDD+	Reducing Emissions from Deforestation and Degradation
ROAM	Restoration Opportunities Assessment Methodology
RQ	Research Question
SA	South Asia
SALT	Society for Alternative Learning and Transformation
SAARC	South Asian Association for Regional Cooperation
SEA	Southeast Asia
SER	Society for Ecological Restoration
SDG	Sustainable Development Goals
SSA	Sub-Saharan Africa
TAL	Terai Arc Landscape
TBL	Transboundary landscape
UNCCD	United Nations Convention to Combat Desertification
UN-DER	UN Decade on Ecosystem Restoration
UNEP	United Nations Environment Programme

UNFCCC	United Nations Framework Convention on Climate Change

1. Overarching review

1.1. Background

To ensure that the United Kingdom Foreign, Commonwealth and Development Office (FCDO) remains a global leader in knowledge and innovation, the Research and Evidence Division (RED) contributes to the achievement of the UK Official Development Assistance (ODA) strategy. The ODA strategy strives to ensure that taxpayer investments bring maximum strategic coherence, impact and value for taxpayers' money while accelerating progress of the 2030 Agenda. The RED Climate, Energy and Water Research team is commissioning a series of scoping studies to identify the focus topics and issues with which the Reversing Environmental Degradation in Africa and Asia (REDAA) programme can fund high quality and problem-based focused research which generates new knowledge and technologies while delivering tangible development impacts. By working with FCDO, this work integrates diplomacy and development to deliver greater impact. The FCDO Corporate Report Outcome Delivery Plan 2021-2022 includes the two following statements in the Priority Outcomes Delivery Plan Outcomes Strategy:

"Our G7 and COP26 presidencies will help us to garner global action on climate change, protect democratic values and preserve the space for resilient and open societies to flourish"

"Tackling climate change and halting biodiversity loss is one of our foremost international priorities. We will combine our international leadership through COP26 and our G7 Presidency with our development programming to accelerate the transition to a zero-carbon global economy, protect and restore biodiversity and support adaptation and resilience – particularly for the most vulnerable worldwide." (Foreign, Commonwealth and Development Office, 2021).

The findings and recommendations within this Scoping Report support both these FCDO Outcomes Strategies, and provide innovative approaches for their delivery (Section 5).

The REDAA programme focusses on addressing the challenge of environmental degradation in Africa and Asia while developing innovative solutions which support the design and implementation of sustainable livelihood strategies for local communities. The recently released Intergovernmental Platform on Climate Change (IPCC) Working Group II Sixth Assessment Report on Climate Change 2022 Impacts, Adaptation and Vulnerability places a strong focus on the interactions between climate, ecosystems and their biodiversity, and human society. The IPCC report found that to reduce climate risks and establish resilience, it is important to incorporate human health, well-being, equity and justice using ecosystem-based approaches to conserve and restore ecosystems and their biodiversity (IPCC, 2022). Likewise, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) Intergovernmental Panel on Climate Change (IPCC) Biodiversity and Climate Report has identified that "measures narrowly focussed on climate mitigation and adaptation can have direct and indirect negative impacts on nature and nature's contributions to people" (Intergovernmental Platform on Biodiversity and Ecosysytem Services (IPBES), 2021). The REDAA programme is well aligned with the findings of these two Reports and seeks to improve the condition of ecosystems and natural landscapes, enabling people and nature to thrive together while building the resilience to the impacts of climate change.

Important to the REDAA programme is the incorporation of restoration, new nature-based solutions (NBS) including emerging technologies, and the better management and preservation of natural ecosystems, while also working with local communities to alleviate poverty and improve the welfare of the poorest and most vulnerable groups. The programme will also improve the resilience and adaptation capacity of low-income countries in the three sub-regions of Sub-Saharan Africa (SSA), South Asia (SA) and Southeast Asia (SEA) while also contributing to achieving global emission reduction targets set under the Paris Agreement.

1.2. Objectives of the Scoping Study

1) Identify the needs, opportunities and experience that can inform programming choices for REDAA to produce and apply evidence and learning to support improved landscape management and NBS.
2) Provide recommendations on research needs and link these with research priorities and interventions for the REDAA programme.
3) Identify key gaps in knowledge and understanding in ecosystem management and restoration.
4) Identify barriers to actions and policy implementation in each region.

5) Identify potential solutions to restore and manage regional ecosystems.
6) Identify and organise analysis around specific ecosystem types or specific ecosystem sub-regions within the region.
7) Assess the priority gaps and barriers and consider the feasibility of actions to be undertaken over a three-year time frame of the REDAA programme.
8) Key focus on poverty alleviation which benefits natural environments delivered through interactions between people and nature, ensuring the poverty alleviation actions do not end up causing environmental harm.
9) Actively mainstream and include gender, marginalised groups, disability, complex intersectional inequalities, gender equality, women's empowerment and the full enjoyment of human rights for women and girls, and equal opportunities for young people in education and employment (United Kingdom et al., 2021).
10) Incorporate new policy developments during the UK's COP26 and G7 Presidencies in relation to nature, biodiversity and the environment (UK Presidency, 2021; UN Climate Change Conference, 2021; United Kingdom et al., 2021).
11) Provide a robust assessment of gaps and intervention opportunities to inform the REDAA programme.

1.3. Methods

Research questions were identified to understand the socio-economic and environmental contexts of landscape management options and NBS in the geographies of SSA, SA and SEA with a key focus on preventing biodiversity loss and poverty alleviation for marginalised peoples.

The research questions are set out below:

1) What are the drivers of environmental degradation in the three regions across important ecosystems?
2) What is the relationship between social inequality (including a focus on gender and Indigenous groups) and environmental degradation and restoration?
3) What are the critical gaps in knowledge of ecological science and ecosystem function in relation to degradation and restoration?
4) What innovative approaches (to governance, social inclusion and finance) have shown promise in halting environmental degradation and promoting restoration?

These areas of enquiry provide the structure for the evidence review in each of the selected geographies.

1.3.1. Literature review methodology

A semi-systematic review using Web of Science and Scopus databases was conducted to search the literature to be reviewed to respond to the four research questions. A review of the grey literature was also conducted using a wide number of sources. Key words were established for the literature search to ensure both the socio-economic contexts, environmental aspects, degradation types, relevant ecosystem types by region, and land management approaches including restoration and NBS literature were sourced (Figure 1).

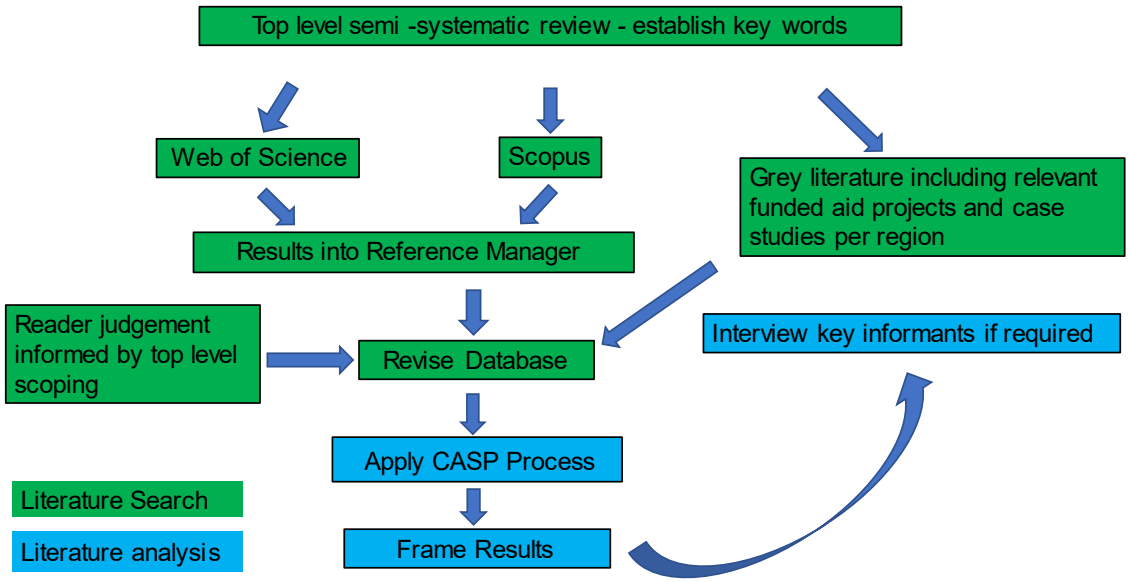


Figure 1: Methodology for literature review and analysis[1]

1.4. Evidence review and findings: design considerations for the REDAA programme

Table 1 sets out the overarching and interrelated design principles as gleaned from the scoping research. These should be considered general recommendations to underpin the overall REDAA programme design based on the research so far. These are not context / geography-specific recommendations for the REDAA sub-regions, which are explored and elaborated in subsequent sections of the report, but rather flexible principles that can span the whole programme design.

Table 1: REDAA design principles based on scoping research

Overarching design principles for REDAA	
1	**Focus on the 'triple win'** – For the REDAA programme to have maximum value, investments in landscapes must focus on i) halting biodiversity loss, ii) poverty alleviation and iii) climate change action (ie. the triple win.)
2	**Focus on intact ecosystems** – A central focus for REDAA should be on intact ecosystems as they yield more positive impact in globally significant environmental values relative to degraded ecosystems,

[1] CASP inclusion/exclusion protocol for literature review

Screening Question		Yes	No	Can't tell
A	Does this work address a clear question?			
1 a	A clear statement of the aims of the research?			
1 b	Have an appropriate study design?			
2	Is the work relevant to the research questions and the purposes of the literature review?			
B	Are the results of the study valid?			
3	Does the work clearly explain its research methods?			
4	Does the work elaborate concepts or theory in a meaningful fashion?			
C	How are the results?			
5	Are the results of the work explicit and easy to understand?			
6	Is the work and conclusion sufficiently presented to support descriptive findings?			
7	Does the work add to the knowledge or theory in the field?			
8	Are the results important in practice?			

	including imperilled biodiversity, carbon sequestration and storage, water provision, Indigenous culture, and the maintenance of human health.
3	**Consider intersectionality** – It is recommended that REDAA include target areas where vulnerability is highest, including poorest communities, lowest income countries, inequalities, women, youth, disabled, and other marginalised groups such as Indigenous peoples. The selection of locations for further research will therefore take account of biodiversity objectives, provision of services and poverty alleviation objectives.
4	**Apply multifunctional 'scape approach** – This approach — considered in each of the selected regions in the following sections of this report — should be applied for the identification of the locations in which the REDAA programme can provide the most innovative and effective solutions, integrating global and large-scale targets within local geographies, while alleviating poverty.
5	**Proactively encourage nature-proofing** – Delivering improved management of ecosystems and natural resources in target countries, REDAA programming must be underpinned by an understanding that nature-proofing, as well as climate-proofing, is essential and safeguards are adequately designed and integrated into improved management and conservation approaches.
6	**Promote IPs and LC agency via bottom-up management and governance** – Triple win objectives will be achieved more effectively through strong inclusion of Indigenous Peoples and local communities (IPs and LCs) and an integration of a 'human-nature' relationship approach. This is a bottom-up, rather than a top-down approach, to programme design and implementation that is critical to REDAA success.
7	**Nature-based solutions under REDAA must take a multi-dimensional approach incorporating Indigenous rights as well as programmatic outcomes** – The use of NBS in the REDAA programme will need to ensure it aligns well with the justice, human rights, poverty alleviation objectives and outcomes for the programme, along with the intersection with the prevention of biodiversity loss, particularly focusing on local place-based projects.
8	**Holistic design will be essential** – REDAA programming must tackle the underlying drivers of degradation, biodiversity loss, poverty and marginalisation to provide the necessary enabling conditions for success. Integrated approaches that harmonise sectoral development policies and enhance livelihood resilience, without environment and development trade-offs, will be essential. REDAA projects, which incorporate socio-ecological approaches and intersect Indigenous lands with intact landscapes, are those most likely to alleviate poverty, prevent biodiversity loss and maintain ecological integrity.

To meet the Aims and Objectives of the REDAA programme, it will be necessary to understand approaches that provide beneficial outcomes for people, and in particular, the alleviation of poverty across all classes of marginalised people. (This is encapsulated in research question 2 above.) Restoration, conservation and other land management practices often focus on protecting, conserving and managing or restoring the natural ecosystem. Often there is a focus on considering the ecosystem services provided by the natural systems in isolation from people. This can be to the detriment of assisting the poor to move sustainably out of poverty, as the most powerful actors become dominant while seeking to benefit from profitable ecosystem services (Thoms, 2008; Lakerveld *et al.*, 2015; Pascual *et al.*, 2017; Mace, Schreckenberg and Poudyal, 2018; Kumeh *et al.*, 2021; Marlène Elias, Joshi and Meinzen-Dick, 2021; Singh *et al.*, 2021). Indeed, it is well understood that unless the rights and responsibilities of Indigenous people are recognised, the crisis of biodiversity loss and ecosystem degradation cannot be adequately addressed (Swiderska, K. 2021).

This report will provide an overarching understanding of the evidence on key overlapping matters of relevance to all sub-regions and will then be followed by a more focused evidence review for each of the three sub-regions; SSA, SEA and SA. I acknowledge the invaluable conversation had with Joji Carino from the Forest People's Programme, to support the evidence review.

1.4.1. Focusing on intact ecosystems and a multifunctional landscape approach

To respond to this topic, we first need to find out the human footprint across these three regions to understand where the most effective investments in land management may occur from an ecological perspective.

Areas with high levels of degradation are least likely to provide biodiversity outcomes. They are also more likely to be negatively impacted by climate change. Such negative impacts on land resources will provide limited opportunities to alleviate poverty. Much of the earth's terrestrial surface has been converted by direct human pressure.

There are some ecosystems, however, which do remain free from significant human impact and are critical to support planetary and therefore human health for those who rely on these places for their survival. Between 2000 and 2013, 1.9 millionkm^2 of land became highly modified. Tropical and subtropical grasslands, savannah and scrubland ecosystems were the most greatly affected, however the rainforests of Southeast Asia also underwent rapid modification.

The highest losses of intact lands occurred in the African nations. Predictions on proposed future socio-economic development in the African nations also coincide with areas where the highest biodiversity impacts are likely to occur (Williams *et al.*, 2020). Maintaining natural forest cover in the Congo Basin will be challenging (Betts *et al.*, 2017) with an expected five-fold increase in population growth by 2100, accompanied by industrial timber harvesting and large-scale agricultural development inside remaining old-growth forests (Tyukavina *et al.*, 2018). Likewise in the Southeast Asian region, extreme levels of intact ecosystem loss are the Sumatran freshwater swamp forests (Indonesia), and rainforests of Indonesia, which contain 10% of the world's plants, 12% of mammals, 16% of reptile amphibians and 17% of birds (Margono *et al.*, 2014). Countries with the greatest area of remaining wilderness (areas completely free of mapped anthropogenic disturbance), for each of the focus regions in descending order are detailed in Table 2 below (Williams *et al.*, 2020).

Table 2: Countries with the greatest area of remaining wilderness

Sub-Saharan Africa		**South Asia & Southeast Asia**	
Areas completely free of mapped anthropogenic disturbance	**Relatively free of mapped anthropogenic disturbance**	**Areas completely free of mapped anthropogenic disturbance**	**Relatively free of mapped anthropogenic disturbance**
Mauritania	Libya	Brunei	Malaysia
Western Sahara	Western Sahara		Indonesia
Niger	Niger		Nepal
Libya	Namibia		Myanmar
Mali	Kenya		The Philippines
Namibia	Zambia		
	Liberia		

The earth's remaining wilderness areas are important buffers against the effects of climate change and other human impacts. The first impacts on wilderness areas are the most damaging (Betts *et al.*, 2017), these ecosystem impacts and their many associated values can never be fully restored. The loss of intact lands undermines climate change mitigation impacts, as they make contributions to the residual terrestrial carbon sink (Watson *et al.*, 2018).

For the REDAA programme, the locations that can benefit most from investments will be in landscapes where the prevention of biodiversity loss and the survival of people and poverty alleviation will intersect, while incorporating climate mitigation, adaptation and collaboration (UN Climate Change Conference, 2021). This can be termed the 'triple win' *(Shakya & Soanes, 2018).*

To achieve this, the site locations for the REDAA programme should focus on intact ecosystems, as emerging evidence indicates a number of benefits when compared to focusing on degraded ecosystems. For example, a range of mitigation measures including more carbon storage both above and below ground, increased carbon capture and sequestration, reduced risk of drought; biodiversity values including intra-species genetic biodiversity, functional biodiversity; and increased basis for the material and spiritual aspects of traditional Indigenous cultures to function. *(Watson, J.E. et al., 2018)* Approaches should consider both past and future risks to these landscapes.

The multifunctional 'scape approach has been used as it provides a framework to identify the locations in which the REDAA programme can provide the most innovative and effective solutions, integrating global and large-scale targets

within local geographies, while alleviating poverty (Figure 2). A multifunctional 'scape approach, for land and freshwater biomes, includes landscapes with large intact wilderness and natural places. Large intact natural areas may intersect with governance approaches by Indigenous peoples, marginalised communities, property owners, and or government depending on local conditions (IPBES and IPCC, 2021). Further discussions on multifunctional 'scape locations and their intersections with REDAA projects able to alleviate poverty will be addressed in the SSA, SEA and SA sections of this report[2].

The findings of the IPBES and IPCC co-sponsored workshop on Biodiversity and Climate identified a need for investment in research using the multifunctional 'scape approach to better understand how local context dependencies are able to deliver on multiple objectives including habitable climate, self-sustaining biodiversity and a good quality of life for all. This aligns well with the needed research to effectively implement the REDAA programme, which has also been identified as a research gap in the IPBES/IPCC Report (IPBES and IPCC, 2021).

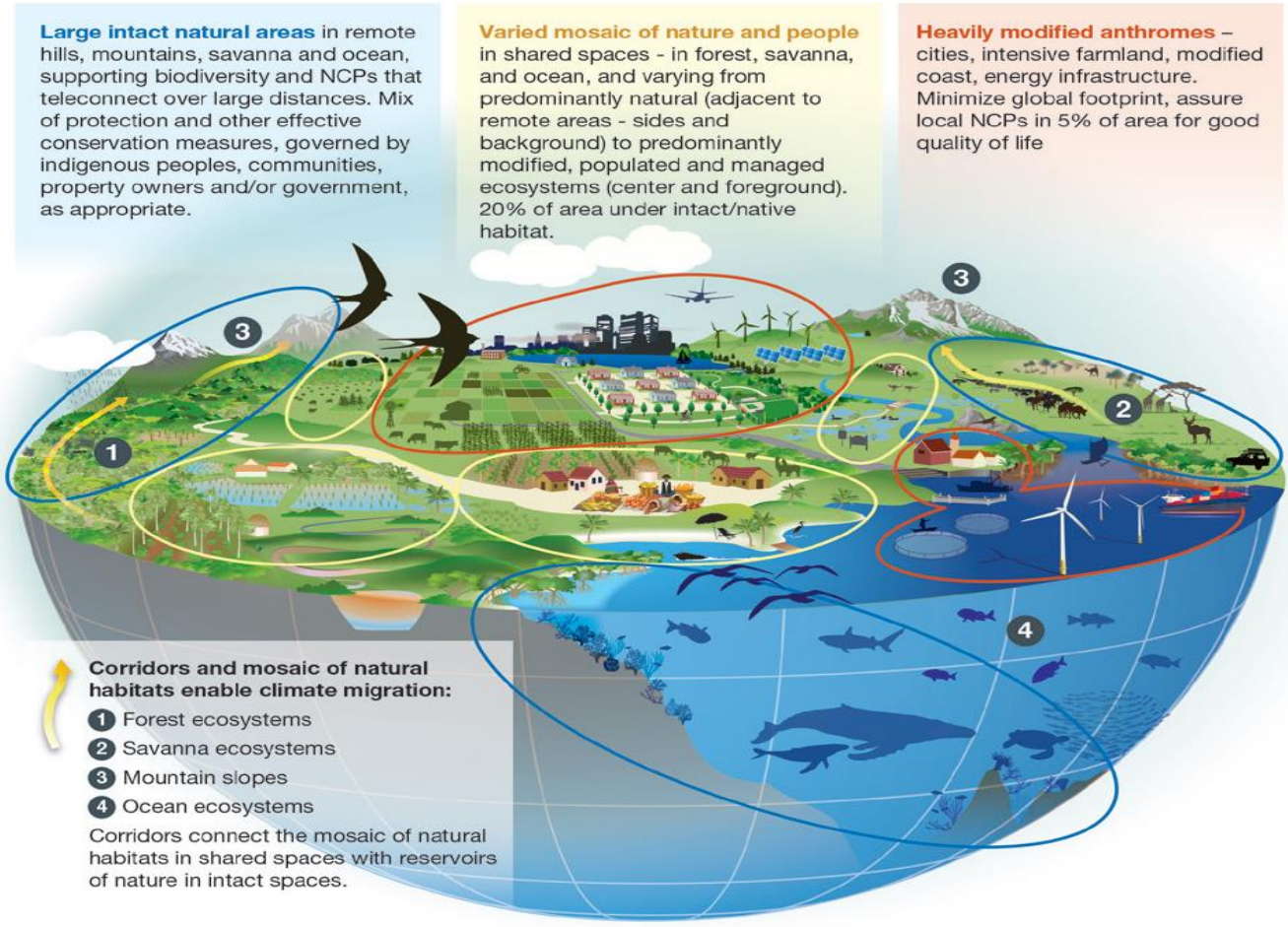


Figure 2: A multifunctional 'scape across land, freshwater and marine biomes with large, intact wilderness spaces (blue circles), shared spaces (yellow circles) and anthromes (red circles) from (IPBES and IPCC, 2021). In shared spaces the mosaic of intact natural habitat provides critical contributions from nature to people. Corridors of natural habitat (yellow arrows) facilitate climate migration of species up elevational gradients (IPBES and IPCC, 2021).

1.4.2. Consider nature-proofing and climate-proofing REDAA programme

Biodiversity is not just about the wealth of nature, but also the health of nature. Loss of biodiversity undermines ecosystems' abilities to function effectively and efficiently, and therefore undermines nature's ability to support a healthy environment. This is particularly important in a changing climate in which loss of biodiversity reduces nature's

[2] See sections 2.7, 3.2, 4.2, 5.1.1, 5.1.4 below.

resilience to change. It is also particularly important for people of a lower socio-economic background who are more directly dependent on nature, and who will be hit the soonest and hardest because of their existing vulnerability to climate change. REDAA programming must be underpinned by an understanding that nature-proofing, as well as climate-proofing development interventions are essential to understanding the risks of biodiversity loss and building in biodiversity safeguards to any future development interventions. As well as avoiding undermining biodiversity, REDAA programming should actively research ways that maximise its potential (Roe, 2019).

Intact landscapes build resilience to climate change, while many development projects and private sector investments aim to climate-proof investments. However, while doing this, it is critical that they are also nature-proofed, to ensure they do not contribute to or exacerbate biodiversity loss. When biodiversity is lost, so are the potential — often unexplored — benefits that biodiversity provides to build resilience to climate change (Roe, Seddon and Elliott, 2019).

1.4.3. Integrate intersectional equalities

As we work to ensure that the REDAA programme alleviates poverty, it has become increasingly important to incorporate the intersectionality and multiple interwoven forms of inequity and marginalisation, such as race/ethnicity, indigeneity, class, gender, age, disability and spatial location, into the REDAA programme (Figure 3). To ensure intersectional equalities are delivered by the REDAA programme, it is important that REDAA concentrates its efforts at locations which intersect intact landscapes with the poorest communities, lowest income countries, inequalities, women, youth, disabled, and Indigenous peoples. This aligns well with the Least Developed Countries (LDC) 2050 Vision for a climate-resilient future to support the emergence of climate-resilient people with just, inclusive, happy and poverty-free societies; growth within ecological limits and with landscapes and ecosystems which are sustainably managed, using NBS (Initiative for Least Developed Countries, 2019).

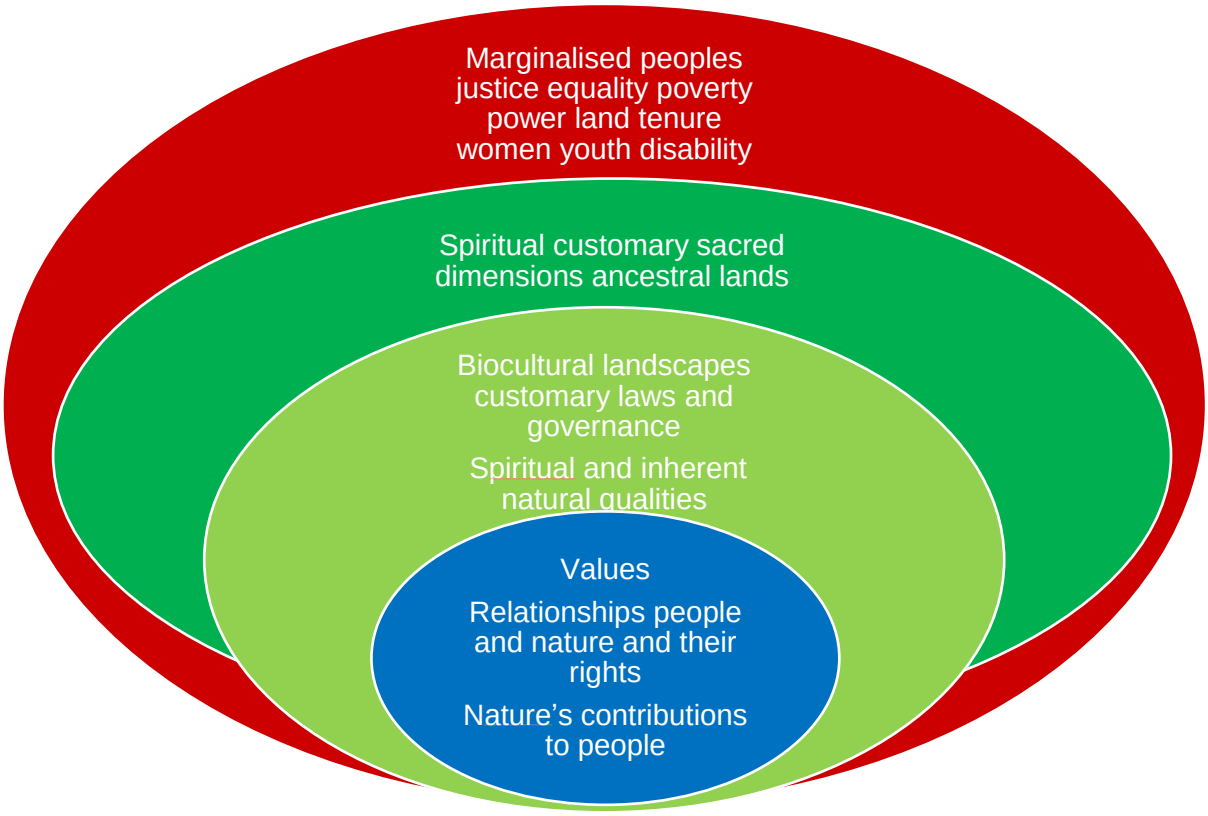


Figure 3: The intersectional inequity and justice aspects to be incorporated into the REDAA programme to reduce poverty alleviation and biodiversity loss (Fisher JL 2022)

1.4.4. Indigenous Peoples can promote the triple win

Approximately 50% of the world's land is collectively managed by Indigenous peoples under customary tenure systems, with the lands of IPs and LCs containing much of the world's remaining biodiversity. Nature is generally declining less rapidly in Indigenous peoples' land than in other lands. IPs and LCs are becoming increasingly

recognised for the significant role they play in managing the health of ecosystems, having knowledge based in diverse values of nature, confronting societal pressures, while having internal governance mechanisms that can provide significant understanding for other governance structures.

IPs and LC values, ways of life, knowledge, resource governance and management systems, economies and technologies can provide solutions to regional and global problems, while incorporating shared views of solidarity and safeguarding intersectional equality (Gratani *et al.*, 2016; Forest Peopes Programme, 2020; Brondízio *et al.*, 2021; Redvers *et al.*, 2022). This can be demonstrated with reference to the triple win:

- **Halting biodiversity loss** – Recognising the knowledge, innovations, practices, institutions and values of IPs and LCs, and ensuring their inclusion and participation in environmental governance enhances the conservation, restoration and sustainable use of nature, as well as their quality of life. Governance, including customary institutions and management systems and co-management regimes that involve IPs and LCs, are an effective way to safeguard nature and its contributions to people, by incorporating locally attuned management systems and Indigenous and local knowledge *(*IPBES, 2019*).*
- **Poverty alleviation –** IPs and LCs are well placed to better protect their lands and forests from illegal encroachment and develop productive activities related to forestry, tourism, aquaculture, or other income-generating enterprises (World Bank 2021). Furthermore, IPs and LC lands provide valuable ecosystem services. Ensuring these lands are sustainably managed can help ensure regular economic activities like agriculture or raising cattle can continue over time (World Economic Forum, 2022).
- **Climate change action** – IPs and LCs are key actors in achieving emissions targets, as globally much of IPs and LC lands (up to 90% in some countries) are carbon sinks and each hectare of IPs and LC land sequesters an average of 30 metric tons of carbon every year. This is about twice as much as lands outside IPs and LC protection (Forest Declaration Assessment, 2022*).*

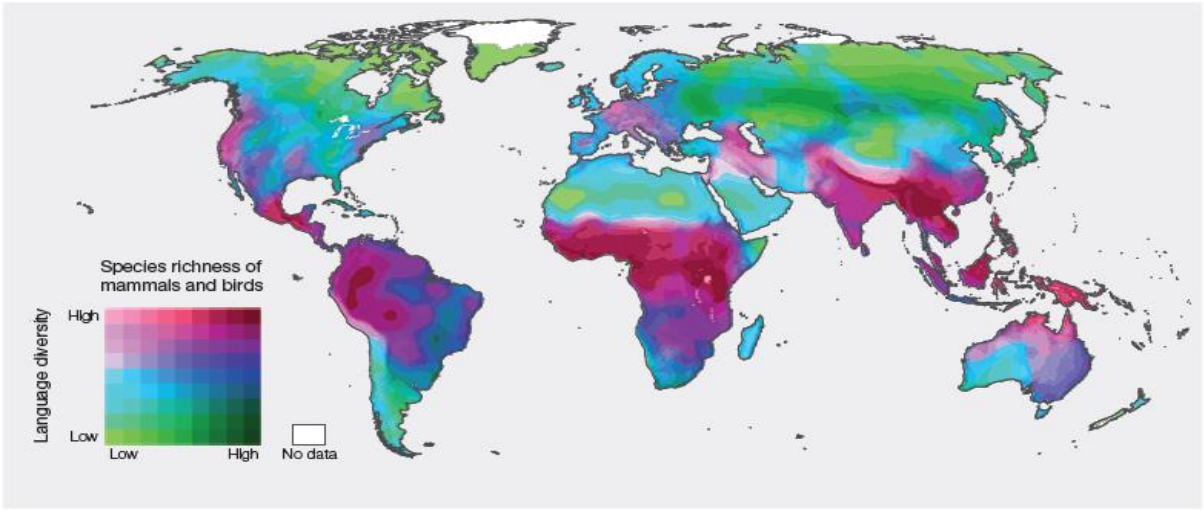


Figure 4: Interactions between cultural diversity and biodiversity (IPBES, 2018b)

Understanding the interactions and co-occurrences between Indigenous language diversity and high biodiversity spots and the convergence of these factors, can be used to identify the most appropriate places and peoples to work with to achieve REDAA outcomes across the target regions. In Figure 4, those regions are represented by the darkest magenta colours and occur across all three geographies. Further information in sections related to the individual geographies (SSA, SEA and SA) will help to identify the ecosystem types most likely to interact with intact places, Indigenous peoples and other communities' lands, governance opportunities, and other REDAA criteria to identify the locations most suitable to deliver on REDAA outcomes. Indeed, often land management practices based on traditional intergenerational knowledge transfer, while working with Indigenous peoples, have proven to be sustainable over long periods of time (Albrecht *et al.*, 2009; Renwick *et al.*, 2017; Vigilante *et al.*, 2017; Reyes-García *et al.*, 2019a; Jarvis *et al.*, 2021). They also offer alternate models of land management to the numerous current approaches, in which the human-nature relationship is dominant.

For the REDAA programme, using approaches that integrate human-nature relationships provide the potential to create a collective sense of purpose, with a common goal and interests, moral obligations and interdependence

between people and biodiversity to protect and restore land and communities, while also balancing the project actions with the needs of future generations.

Thirty-eight per cent of Intact Forest Landscapes (IFL) occur within Indigenous peoples' lands, while the loss of IFL has been considerably lower on Indigenous peoples' lands than on other lands. This outlines the importance of maintaining Indigenous peoples' lands for climate mitigation to reduce degradation (Fa *et al.*, 2020; Sze *et al.*, 2021), and importantly for their complex local knowledge, passed down through generations, with sophisticated kinships systems and relationships to the land which are more-than-human (Dudgeon and Bray, 2019).

There are numerous examples across different regions that demonstrate the flaws in top-down approaches to land management, restoration and conservation practices, often having questionable social and ecological outcomes (McElwee, 2009; Brondizio and Le Tourneau, 2016; Coleman *et al.*, 2021). Projects implemented by transnational NGOs, with people-centred conservation interventions, often have flawed understandings of Indigenous practices, and perpetuate power imbalances which can lead to dispossession of Indigenous lands. Reflections on such collaborations with Indigenous communities in Sarawak, Malaysia, and Palawan, Philippines provide insights into these often complex situations which often do not work in the interests of Indigenous communities (Rubis and Theriault, 2020).

There is a growing body of evidence demonstrating the critical importance and value of 'bottom-up' projects led by local communities, working respectfully with local people. These projects use the central principle of allowing participants to give or withhold Free, Prior and Informed Consent (FPIC) for projects that may affect them or their territories and to ensure ethical and equitable relationships (Fa *et al.*, 2020). The IPBES Indigenous and Local Knowledge Task Force (ILKTF) (https://ipbes.net/indigenous-local-knowledge) has developed methodological guidance for working with Indigenous peoples (https://ipbes.net/modules-assessment-guide) which could be used as guidance for working with Indigenous peoples in REDAA projects.

Bottom-up approaches are increasingly being shown to promote holistic approaches that link nature and culture within integrated social-ecological systems. As well as rights-based collaborative approaches that support and promote community ways of life, enrich relationships between humans and nature, provide qualitative focus on fair and good governance, justice and equity to deliver the outcomes required by the REDAA programme across the three geographic regions (Meli *et al.*, 2019; Forest Peoples Programme, 2020; Knapman and Leth, 2020; Dixon, Wood and Hailu, 2021). To be effectively governed, projects aiming to enhance the natural socio-ecological systems must involve local and Indigenous populations, improve their quality of life, with wider regional, national and international goals being reconciled with local and Indigenous needs and cultural perspectives, which vary widely (IPBES, 2019b).

Indigenous peoples have demonstrated their aptitude over generations to cope with and adapt to environmental change. This resilience to change comes as a result of their ways of being, their interconnected roles of collective action, relationships with place through belief systems, identity, knowledge and livelihood practices, providing them with intergenerational skills to understand, resist and respond to change, while maintaining their connections with place (Ford *et al.*, 2020). It is this strength and knowledge of place which best suits them to lead projects with the aims and objectives of the REDAA programme.

1.4.5. Nature-based solutions must take account of Indigenous rights

At the United Nations Environment Assembly on 2 March 2022, governments formally agreed a definition of NBS and recognised the important role they can play in the global response to climate change. The UNEA resolution formally adopted the definition of NBS as:

"actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits."

Several authors have expressed concerns that the term NBS, if used incorrectly, may come at the cost of carbon rich and biodiverse native ecosystems and local resource rights. This is especially the case for those focusing on tree planting for carbon sequestration and the expansion of forestry framed as a climate change mitigation solution. Specialists also highlight that well designed NBS can deliver multiple benefits for people and nature (Townsend, Moola and Craig, 2020; Seddon *et al.*, 2021).

The use of NBS in the REDAA programme will need to ensure they align well with the justice, human rights, poverty alleviation objectives and outcomes for the programme, along with the intersection with the prevention of biodiversity loss, particularly focusing on local place-based projects. A case study highlighting how the inappropriate use of NBS has been applied, without consideration of Indigenous rights, is highlighted in the Southeast Asia section.

1.4.6. Holistic approach to restoration, land management and ecosystem-based approaches

REDAA projects, which incorporate socio-ecological approaches and intersect Indigenous lands with intact landscapes are those most likely to alleviate poverty, prevent biodiversity loss and maintain ecological integrity (Kotru et al., 2020). Indeed, to achieve the goals and outcomes of the REDAA programme, a multifaceted approach is required. (This will be investigated further within each sub-geography, SSA, SEA and SA, and by key ecosystem types of interest.)

Holistic responses that consider the multiple causes of degradation, biodiversity loss, poverty and marginalisation are required to provide the necessary enabling conditions for success. In selecting peoples and places to implement the REDAA programme, governance, integrated approaches which harmonise sectoral development policies and enhance livelihood resilience, without environment and development trade-offs, will be essential.

Many restoration approaches and other growing initiatives place a strong focus on restoring degraded lands. However, it is advised the REDAA programme place a stronger focus on land management options that use a holistic, integrated multifunctional ‘scape approach focused on intact ecosystems (Betts *et al.*, 2017; Woroniecki, 2019) and biocultural approaches (Constant and Taylor, 2020; Winter, Ticktin and Quazi, 2020).

The findings (Section 5) are based on the review of evidence across SSA, SEA and SA most likely to enable the delivery of the outcomes and objectives of the REDAA programme, focused on local communities, inclusive and just governance structures with control maintained within local communities.

1.5. Ecosystem focus - implementation of the REDAA programme

Having provided a comprehensive understanding of the key matters of importance for the REDAA programme, Sections 2, 3 and 4 will relate the findings from Section 1 to the three geographic regions of SSA, SEA and SA.

Following the intersectoral approach recommended for the REDAA programme, the greatest evidence exists for a focus on peatlands for the REDAA programme to implement the multifunctional ‘scape approach. Across the geographies they intersect with forests, wetlands, rivers, coastal systems and for South Asia, which is not so well endowed with peatlands except perhaps associated with the Kerala biodiversity hotspot, the areas in most need of additional research and assistance are wetland systems.

2. Sub-Saharan Africa

2.1. Introduction

This section refers to Sub-Saharan Africa (SSA) by sub-regions; Central Africa, East Africa, Southern Africa and West Africa (IPBES, 2018g) to align with geographies and climatic types which dictate ecosystem locations, and a regional alignment with the political geographies of low income and low-to-middle income countries. As shown in Figure 5, across these sub-regions there are significant regional, sub-regional and national variations in biodiversity, climate, ecosystems and physical geographies.

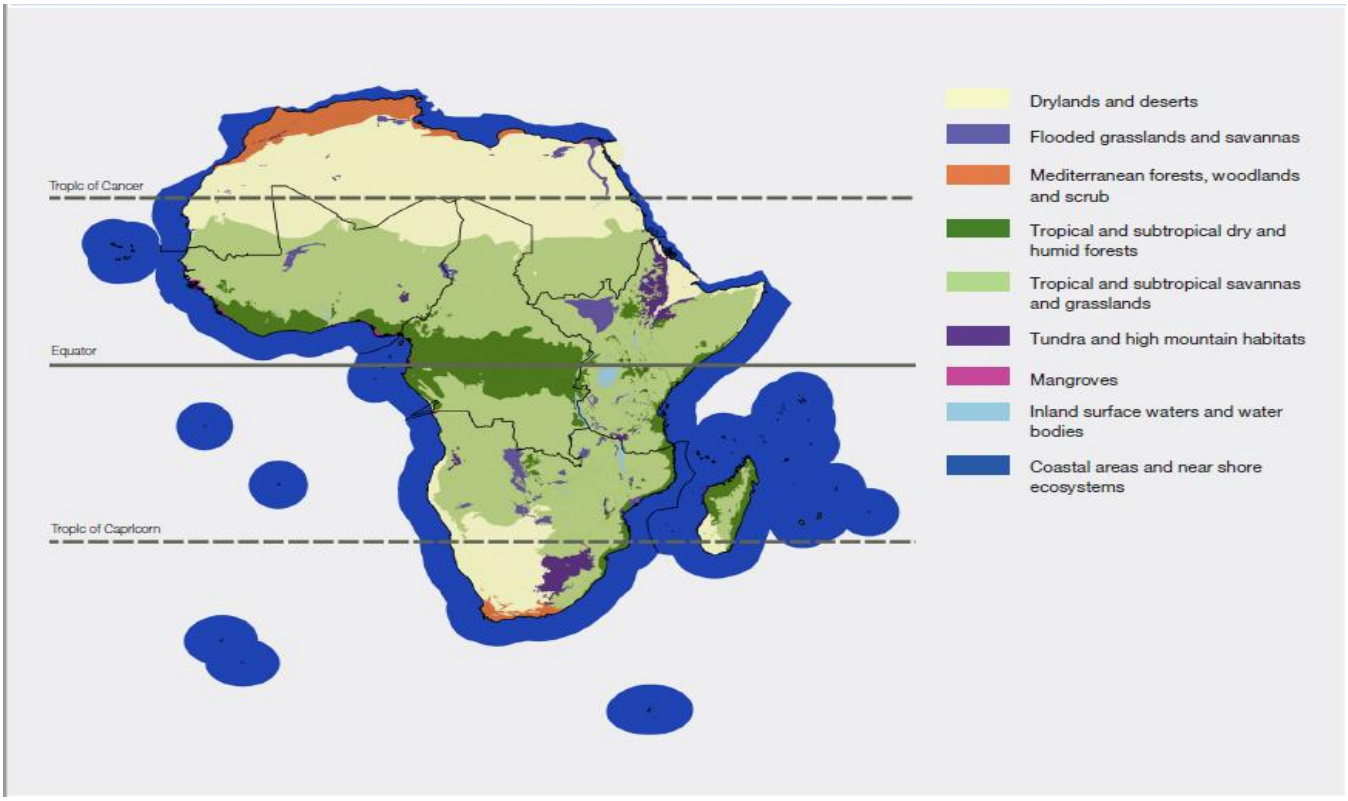


Figure 5: Map of Africa showing sub-regions and ecosystem units of analysis (Olson et al., 2001; IPBES, 2018g)

Compared with other parts of the world, Africa has a low ecological and carbon footprint, rich natural resources and significant Indigenous and local knowledge to manage these resources[3]. However, rising population and densities and increasing economic growth, provide challenges in preventing further biodiversity loss. In many parts of Africa, these pressures have resulted in the degradation of ecosystems, further increasing their vulnerability to climate change (Sintayehu, 2018). Climate change further compounds these negative impacts, leading to changes in ecosystem structure. This concerns a broad range of ecosystems, including savannas, tropical forests, coral reefs, aquatic habitats, wetlands, and montane ecosystems (Kapuka & Hlasny, 2021). The impacts of increasing extreme weather and climate events have exposed millions of people to acute food insecurity and reduced water security, with communities in Africa suffering the largest impacts. Global hotspots of human vulnerability are West-Central Africa, East Africa and South Asia (IPCC, 2022).

The four African sub-regional climatic types are:

1) Mediterranean climate at the southernmost fringes,

[3] The number of published studies on the valuation of ecosystem services in Africa is relatively low, with the majority having been conducted in Southern Africa (22%), East Africa and adjacent islands (37%), and in marine and coastal ecosystems (23%) and, surprisingly, in inland waters and forests (20%) (Figure 14) (IPBES, 2018g). The importance of inland fisheries for livelihoods, and the need for purified water across SSA dictates economic values work around inland waters.

2) Equatorial and tropical climates, characterised by high mean rainfall in Central Africa and across the southern part of West Africa,
3) Climates ranging from hyper-arid to semi-arid, with very sparse or no rainfall, in a great part of North Africa and West Africa, and part of Southern Africa, and
4) Subtropical climate in East Africa and adjacent islands, and a great part of Southern Africa.

These climatic variations have contributed to broad biodiversity and species richness at the ecosystem, species and genetic levels.

The key ecosystem types, as defined by the IPBES African Assessment, are:

- Drylands and deserts
- Forests
- Grasslands and savannas (dominant)
- Inland waters and wetlands
- Coastal and marine
- Cultivated lands

For the REDAA programme, neither marine nor cultivated lands will be considered.

Africa hosts eight of the world's 36 biodiversity hotspots, including large numbers of endemic or threatened species (Mittermeier, R A, Mittermeier *et al.*, 2002). The hotspots include the Cape Floristic Region, the Eastern Afromontane, Coastal Forests of Eastern Africa, the Guinean Forests of West Africa, Madagascar and the Indian Ocean Islands, the Maputaland-Pondoland-Albany, the Mediterranean Basin, the Horn of Africa, and the Succulent Karoo (IPBES, 2018g). The areas closest to wilderness include parts of the Sahara Desert, the Horn of Africa, Sudd Swamp, Congo Basin forest, Miombo woodland, Kalahari Desert and the Namib Desert (Burgess *et al.*, 2004) (Figure 10).

Africa also boasts 369 wetlands of international importance (Ramsar sites), 142 UNESCO World Heritage Sites, 1,255 important bird and biodiversity areas and 158 Alliance for Zero Extinction sites where endangered or critically endangered species occur. The Congo forests of Central Africa, the Miombo-Mopane woodlands and grasslands, the Serengeti, the Okavango, the Sahara-Sahel, the Kalahari Desert, and the Namib Desert are among the world's most renowned wilderness areas. Many of these areas are important components of the flyways for migratory species recognised in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (https://www.unep-aewa.org/). The African continent makes up 20.2% of the earth's land and hosts a quarter of the world's mammal species, while East and Southern African rangelands shelter the greatest diversity of large mammals. The continent is also home to approximately one fifth of the world's bird species, high levels of amphibian diversity and endemism in Central Africa, with at least one sixth of the world's plant species being endemic to Africa. Several global centres of species richness and endemism for freshwater fish, molluscs and crustaceans occur in Africa (Figure 10) (IPBES, 2018g). Semi-arid regions of Africa have the highest number of mammal species, with more than 50% of their range occuring within Indigenous Peoples lands (O'Bryan *et al.*, 2021). The proportion of terrestrial and inland water areas covered by Protected Areas are 19.1% in Central Africa, 14.8% in Eastern Africa, 5.8% in Northern Africa, 20.4% in Southern Africa and 15.5% in Western Africa (Barnes, 2015). However, only Central and Southern African regions have attained the Aichi Biodiversity Target 11 on terrestrial Protected Areas[4].

Table 3 sets out the main recommendations based on the scoping research.

Table 3: Region-specific recommendations: SSA

Sub-Saharan Africa: key recommendations for REDAA	
1	**Multifunctional 'scape approach** – This will deliver the greatest ecological, economic and social benefits for the people of SSA. These should be delivered in close collaboration across the project cycle – from design to completion – with Indigenous people.
2	**Focus on intact ecosystems -** A focus on intact landscapes is further recommended to avoid the potential negative impacts demonstrated by other restoration projects across sub-regions of SSA.

[4] Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes (https://www.cbd.int/aichi-targets/target/11).

	Evidence based on peatlands, an intact ecosystem in the Congo Region, will be provided to support the implementation of the REDAA programme in peatland ecosystems[5]. Intact landscapes have been by the intersection of globally important areas, areas with least threats, large areas of habitat, and low human population densities (Figure 10) (Burgess *et al.*, 2004). Such intact ecosystems provide opportunities for the REDAA programme to engage with local communities to develop evidence-based ecological research and knowledge using a multifunctional 'scape approach.
3	**Focus on peatlands in the Cuvette Centrale (in Democratic Republic of the Congo) and central Congo Basin -** Based on remotely-sensed data, these are one of the most extensive tropical peatland complexes in the tropics, approximately 145,500km^2, and store an estimated 30.6 Pg of carbon. Extensive peat deposits are beneath the swamp forest vegetation. These peatlands occupy large interfluvial basins, are mostly rain-fed systems with a low nutrient status. This recent assessment suggests that the Congo peatlands area is more than five times the area previously reported for the Congo Basin. Field studies have identified extensive peat deposits beneath the swamp forest vegetation. (Peat is defined as material with an organic matter content of at least 65% to a depth of at least 0.3 metres (Dargie et al., 2017)). The current low level of human intervention suggests the opportunity exists for the REDAA programme to advance knowledge, which is currently limited, to work with local communities who will have excellent long-term knowledge to maintain the peatlands in a largely intact state, while protecting the peat carbon pool and improving the livelihoods of people living in and around these peatlands (Dargie *et al.*, 2019).
4	**REDAA governance mechanisms must use integrated cross-sectoral approaches that are cognisant of the indirect drivers of biodiversity loss** - These must have a key focus on reducing biodiversity loss while alleviating poverty. To achieve successful governance outcomes across peatland ecosystems, consideration of the intersections of customary law, marginalised peoples, justice, equality, poverty, power, land tenure, women, youth, disability, the spiritual customary and sacred dimensions of ancestral lands, values and world views will achieve successful outcomes (Giljam, 2017; Vasseur *et al.*, 2017; Mace, Schreckenberg and Poudyal, 2018; Bansard and Schöder, 2021; M. Elias, Joshi and Meinzen-Dick, 2021).
5	**The development of REDAA land management projects in SSA should work closely with local communities** – These are the most aligned with the REDAA programme objectives and will likely see higher success rates. Therefore close collaboration with Indigenous peoples is strongly recommended.

2.2. Implementing a multifunctional 'scape approach - evidence review

As set out in Section 1.4 above, a multifunctional 'scape approach, concentrating on intact landscapes and interactions with Indigenous and local knowledge, will offer the most effective delivery for the REDAA programme across geographies. Based on the following evidence, this will deliver the greatest ecological, economic and social benefits for the people of Sub-Saharan Africa, by adapting and mitigating threats to biodiversity loss, restoring ecosystem function and integrity, integrated with a reduction in poverty led by Indigenous and local people. A focus on intact landscapes is further recommended to avoid potential negative impacts demonstrated by other restoration projects across sub-regions of SSA.

2.2.1. Drivers of environmental degradation

To effectively implement the ecological aspects of the REDAA programme, it is important to understand the causes or drivers of biodiversity loss, to provide an evidence base for best practice restoration governance, development, planning and implementation.

Drivers of biodiversity change are increasing across all ecosystem types and regions of Africa (as set out in Figure 6), some at greater rates than others. The key drivers of change are climate (Arara, 2010; Naidoo, Davis and Archer Van Garderen, 2013; Midgley and Bond, 2015; Abalo *et al.*, 2021; Martens *et al.*, 2021), habitat conversion (Sloan and Sayer, 2015; Rudel *et al.*, 2020, 2020), overharvesting (Bailis *et al.*, 2015; Stafford *et al.*, 2017; van Velden, Wilson

[5] More detailed information on other SSA ecosystems and land management actions is included in Appendix 2

and Biggs, 2018; von Maltitz *et al.*, 2019), pollution, invasive species (Galabuzi *et al.*, 2014a; Stafford *et al.*, 2017; Cardoso *et al.*, 2021; Martens *et al.*, 2021) and illegal wildlife trade (Poulsen *et al.*, 2017; Gore *et al.*, 2019; Lunstrum and Givá, 2020; Plowman, 2020; Rosen, 2020; Zhang *et al.*, 2020; Cardoso *et al.*, 2021). These drivers have resulted in negative impacts on biodiversity, livelihoods and ecosystem services, and a loss in Africa's natural and cultural heritage, and income potentials.

Terrestrial and inland waters have been most seriously impacted across all regions. Conversion of forest and rangelands for agriculture, mining and urban development has depleted biodiversity, resulted in soil erosion, fragmentation and catchment wide degradation, while also impacting livelihoods (Chevallier and Harvey, 2016). The illicit wildlife trade has caused negative social and ecological impacts (IPBES, 2018g).

Climate change is a key potential threat to the Congo Basin peatland carbon stocks and has the potential to destabilise carbon stocks across the whole area. Socio-economic developments are increasing across Central Africa and, while much of the peatland area is protected by forms of conservation designation, there is still a potential for hydrocarbon exploration, logging, plantations and other forms of disturbance which will significantly damage peatland ecosystems.

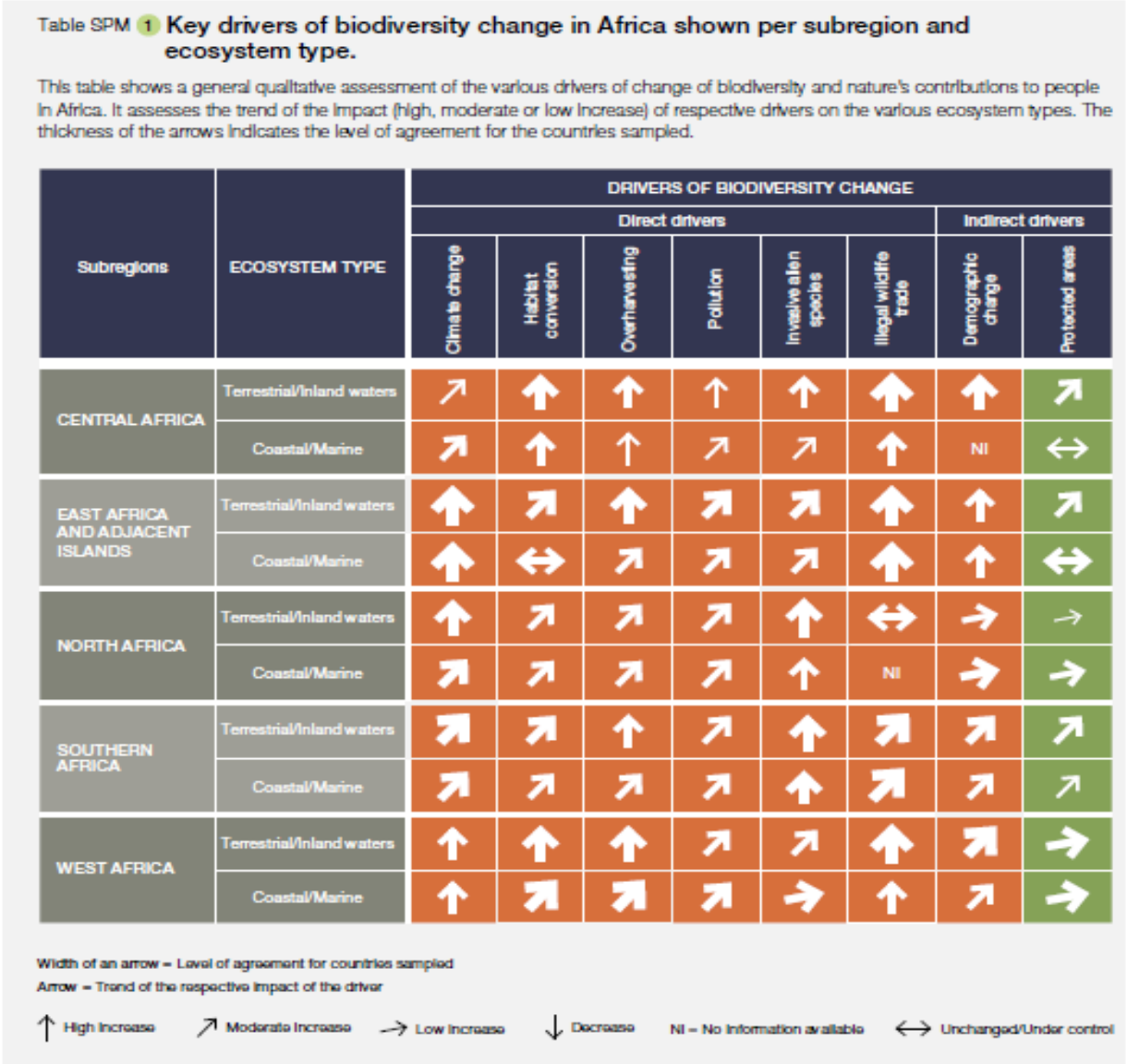


Table SPM 1 **Key drivers of biodiversity change in Africa shown per subregion and ecosystem type.**

This table shows a general qualitative assessment of the various drivers of change of biodiversity and nature's contributions to people in Africa. It assesses the trend of the impact (high, moderate or low increase) of respective drivers on the various ecosystem types. The thickness of the arrows indicates the level of agreement for the countries sampled.

Subregions	ECOSYSTEM TYPE	DRIVERS OF BIODIVERSITY CHANGE							
		Direct drivers						Indirect drivers	
		Climate change	Habitat conversion	Overharvesting	Pollution	Invasive alien species	Illegal wildlife trade	Demographic change	Protected areas
CENTRAL AFRICA	Terrestrial/Inland waters	↗	↑	↑	↑	↑	↑	↑	↗
	Coastal/Marine	↗	↑	↑	↗	↗	↑	NI	↔
EAST AFRICA AND ADJACENT ISLANDS	Terrestrial/Inland waters	↑	↗	↑	↗	↗	↑	↑	↗
	Coastal/Marine	↑	↔	↗	↗	↗	↑	↑	↔
NORTH AFRICA	Terrestrial/Inland waters	↑	↗	↗	↗	↑	↔	→	→
	Coastal/Marine	↗	↗	↗	↗	↑	NI	→	→
SOUTHERN AFRICA	Terrestrial/Inland waters	↗	↗	↑	↗	↑	↗	↗	↗
	Coastal/Marine	↗	↗	↗	↗	↑	↗	↗	↗
WEST AFRICA	Terrestrial/Inland waters	↑	↑	↑	↗	↗	↑	↗	→
	Coastal/Marine	↑	↗	↗	↗	→	↑	↗	→

Width of an arrow = Level of agreement for countries sampled
Arrow = Trend of the respective impact of the driver

↑ High increase ↗ Moderate increase → Low increase ↓ Decrease NI = No information available ↔ Unchanged/Under control

Figure 6: Key causes of biodiversity change by sub-region and ecosystem type (IPBES, 2018g)

The current low levels of human intervention suggest there is an opportunity for the REDAA programme to advance the limited knowledge, by working with local communities who will have excellent long-term knowledge to maintain the

peatlands in a largely intact state, while protecting the peat carbon pool and improving the livelihoods of people living in and around these peatlands (Research questions 1-5) (Dargie *et al.*, 2019).

2.2.2. Interactions between causes or drivers of biodiversity change and land degradation

The cost of inaction in preventing land degradation in Africa is at least three times higher than the cost of action (IPBES, 2018b). Degradation from non-timber natural resource extraction is increasing across more than 50% of the total land area for each African region (except the north where there is insufficient data to analyse) (Figure 7). The causes of biodiversity change and degradation can be quite different (Figures 6 and 7), however they have overlapping and cumulative impacts. For example, unregulated land cover change caused by non-timber natural resource extraction, extractive industry and energy development; infrastructure and industrial development, and urbanisation are detrimental to biodiversity and Africa's long-term sustainable development. The conversion of forest, rangelands, and other natural areas, such as wetlands for food production and urban development is occurring rapidly and transforming African societies (IPBES, 2018b).

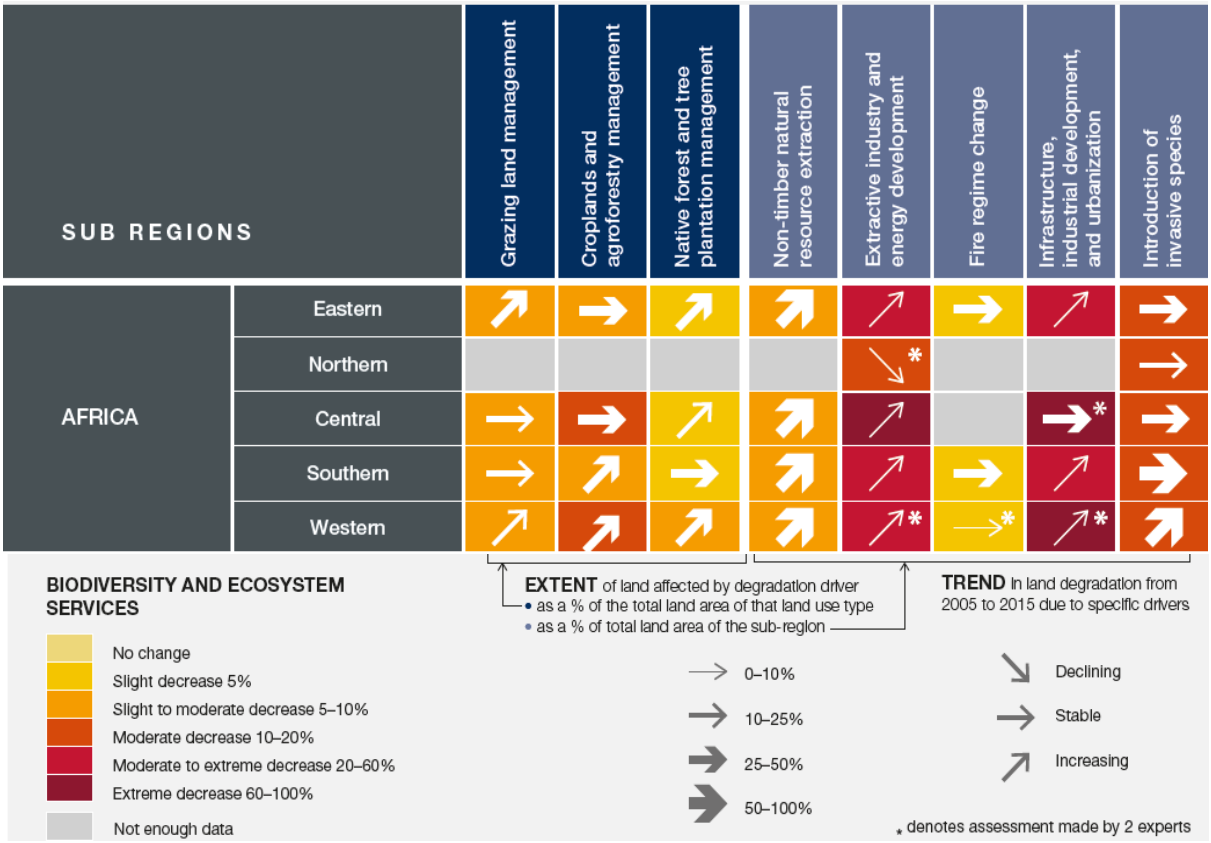


Figure 7: Status, trend and extent of causes of degradation of land across African sub-regions (IPBES, 2018b)[6]

2.2.3. Indirect drivers of change

People's interactions with the environment are complex. The interplay of indirect drivers of change to land use are also complex, and often lead to decisions being made a great distance from the local place and communities they impact. Indirect causes of change can include international, national and subnational decisions (Figure 8). Governance, economic and institutional factors at the national and regional levels are key causes which lead to the direct impacts on and loss of biodiversity, and increase poverty through habitat conversion, overgrazing, overharvesting and poor land management (Talukder *et al.*, 2021).

[6] Trends in land degradation from 2005 to 2015 due to specific drivers are shown by the angle of the arrows. The time period 2005–2015 was chosen to identify more recent trends in land degradation. The extent of land affected by each driver is expressed as a percentage of the total land area of that land use type (IPBES, 2018b).

External climate mitigation decisions on energy, such as biofuel production, are influenced by policies in rich nations, and can spark global demand for commodities, resulting in livelihood displacement from small-scale subsistence agriculture to large-scale agriculture intensification based on global demands (Zabel *et al.*, 2019).

An increase in land acquisition (land grabs) to meet local, national and global food and renewable energy demands, is driving changes in land ownership and nature's contributions to people. As a result, land ownership is shifting from small-holder farmers to large-scale commercial farming, at the expense of critical ecosystems. These include wetlands, rangelands and forests as the consequent shift from subsistence to intensive agriculture occurs (Figure 8).

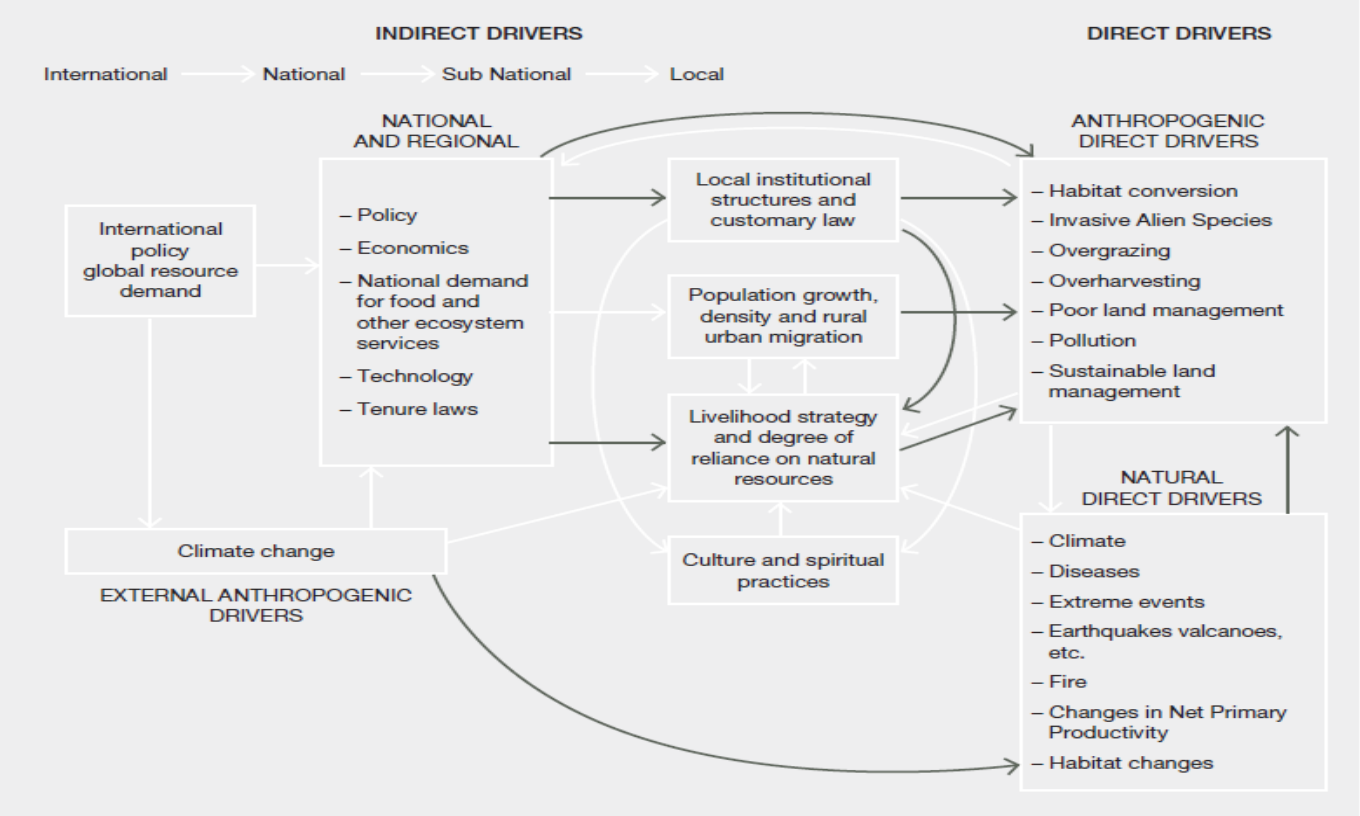


Figure 8: Complex interactions between direct and indirect causes which have negative impacts on local individuals and communities (IPBES, 2018g)

Foreign exchange earnings from resource exports have enabled African countries to access important intermediate inputs, along with finance for some national development programmes which access non-renewable natural resources. Although there may have been financial benefits for African countries, the acquisition and rapid depletion of natural resources impact biodiversity and livelihoods, limiting the countries' use for future generations, and increasing poverty at a time of a rapidly growing population (UN, 2012; Acheampong *et al.*, 2021).

Additional information on the impacts of population expansion and development corridors can be found in Appendix 1.

2.2.4. Governance

Inclusive and equitable governance approaches are critical for effective interactions between people and nature. Good governance approaches are essential for effective projects whatever the size of the project. Far too many land management projects do not reach their objectives due to governance failures, including limited consideration or understanding of the role of governance (Myers *et al.*, 2018; Golebie *et al.*, 2021). The evidence review has identified the need to ensure REDAA governance mechanisms use integrated cross-sectoral approaches, with a key focus on reducing biodiversity loss while alleviating poverty (Giljam, 2017; Vasseur *et al.*, 2017; Mace, Schreckenberg and Poudyal, 2018; Bansard and Schöder, 2021; M. Elias, Joshi and Meinzen-Dick, 2021). To achieve successful governance outcomes across peatland ecosystems, consideration of the intersections of customary law, marginalised peoples, justice, equality, poverty, power, land tenure, women, youth, disability, the spiritual customary and sacred dimensions of ancestral lands, values and world views will achieve successful outcomes (Giljam, 2017; Vasseur et al., 2017; Mace, Schreckenberg and Poudyal, 2018; Bansard and Schöder, 2021; M. Elias, Joshi and Meinzen-Dick, 2021).

An excellent example of good governance approaches is the Society for Alternate Learning and Transformation (SALT) which works in Kenya: Tharaka Nithi County in the Eastern Kenya and the lower side of Mt. Kenya towards River Tana (Tharaka South Sub-County), with Embu County in Mbeere and Narok County in Loita Forest, to restore harmonious relationships between people and Planet Earth (https://saltnet.org/chumvi/).

2.2.5. Land management options

The land management programmes most relevant to the REDAA programme have been reviewed, as a basis to understand their effectiveness, and gather learning for the REDAA programme. The overarching recommendation from the evidence review is that the most successful outcomes are from projects more aligned with the multifunctional 'scape approach and delivered by Indigenous peoples.

Varied approaches to restoration and land management are being implemented, many dominated by large-scale programmes, and often based on international decisions by the UNCCD (United Nations Convention to Combat Desertification), UNFCCC (United Nations Framework Convention on Climate Change), and the Ramsar Convention. Poor governance is the key overlapping problem across many programmes, regardless of the ecosystem type in which they operate. For example, The Alliance for a Green Revolution in Africa has used value-laden decision making, which has led countries or economic federations to privilege one policy over others (ie. a green revolution based on facilitated access to chemical inputs, mechanisation, patented seeds and market-driven economy), which has resulted in the displacement of rural populations into areas vulnerable to deforestation and desertification (Feintrenie *et al.*, 2014)[7].

Ecosystem restoration can be considered as a land management option, and evidence on restoration across Sub-Saharan Africa, including at the ecosystem level, is considered in detail in Section 5.

2.2.6. Working with Indigenous peoples and local actors

Indigenous peoples, community-conserved territories and areas governed by Indigenous peoples have provided positive outcomes for the conservation of biological and cultural diversity (Roe, Nelson and Sandbrook, 2009). The precarious situation of Indigenous and local people cannot be addressed by local participation alone in conservation projects. Existing development models continue to put pressure on their resources and livelihoods. Some traditional herder conflicts in SA result from the expansion of monocultures, which reduce the extent of traditional grazing territories, resulting in conflict between traditional herders and small farmers (Turner, 2004).

Ghana has recognised the oldest community-protected area in Africa, the Boabeng Fiema Monkey Sanctuary, created in 1975. Other examples of Indigenous and community-conserved areas are well known in Africa: the Wechiau hippo sanctuary in north-western Ghana, officially recognised in 1999; the Urok Islands community protected marine area in Guinea Bissau, recognised in 2005; the village hunting zone of Boumoana in eastern Burkina Faso; the sacred forests in the centre of Benin and the south-eastern Togo; the village hunting zones in Central Africa and the zones of cynegetic interest in the south-eastern and north of Cameroon. Revival or modification of traditional practices and/or new initiatives have succeeded in protecting and restoring natural resources, and the communities' cultural values. The communities' management decisions and efforts lead to the conservation of habitats, species, genetic diversity, ecological functions/benefits and associated cultural values, while often the conscious objective of management is not conservation (for example, it may be livelihoods, security, safeguarding cultural and spiritual values).

The Communal Areas Management Programme for Indigenous Resources, known as CAMPFIRE, is a programme developed largely around the concept of managing wildlife and wildlife habitat in the communal lands of Zimbabwe for the benefit of inhabitants. It was one of the first programmes to consider wildlife as renewable natural resources, while addressing the allocation of its ownership to Indigenous peoples in and around conservation protected areas (Frost and Bond, 2008). During 1989-2001, CAMPFIRE generated more than US$20 million of transfers to the participating communities, 89% of which came from sport hunting. The scale of benefits varied greatly across districts, wards and households. Twelve of the 37 districts with authority to market wildlife produced 97% of all CAMPFIRE revenues, reflecting the variability in wildlife resources and local institutional arrangements. CAMPFIRE has led to biodiversity benefits; for example, elephant numbers have increased, buffalo numbers are either stable or there has been a slight decrease, and habitat loss has reduced.

[7] An analysis of numerous community-focussed, and other land management programmes across SSA are provided in Appendix 2 as background material to assist the REDAA programme to understand what has and hasn't worked in SSA

The last two decades have seen greater appreciation of the role of traditional knowledge and practices in preserving biodiversity, motivated by Indigenous peoples' desire to live in their ancestral lands and safeguard local food security (Langton and Shmelev, 2005; Chibememe *et al.*, 2014). The subsistence role, rather than productivity role, of diverse Indigenous economies including fishing, hunting, herding and agriculture, provides positive benefits to the environment. The disenfranchisement of local communities from traditional governance and management roles in relation to natural resources is now more and more opposed by international conventions and non-governmental organisations.

Land management projects in Sub-Saharan Africa, aligned with the REDAA programme, are those which work with Indigenous peoples (Rist and Dahdouh-Guebas, 2006; Smyth, 2015; Gratani *et al.*, 2016; Reyes-García *et al.*, 2019a; Fa *et al.*, 2020; Rubis and Theriault, 2020; Dawson *et al.*, 2021; Welch and Coimbra, 2021; Laltaika, 2022) and local communities (Whande, 2009; Tengö *et al.*, 2021), with approaches being used worth considering during the development of the REDAA programme.

2.2.7. Cultural practices

In 1975, African governments recognised the rights of Indigenous communities and the importance of Indigenous knowledge in natural resource conservation and management. This resolution noted the importance of traditional ways of life and land ownership, calling on governments to maintain and encourage customary ways of living. It urged governments to devise means by which Indigenous peoples could bring their lands into conservation areas without relinquishing their ownership, use and tenure rights. This recognition supports the implementation of the REDAA programme's multifunctional 'scape aligned with Indigenous and local communities. In many African cultures, decisions arise from spiritual and ancestral beings who are a part of nature. Some people perceive nature as benign and sacred, which should be treated with reverence and moderation. Cultural practices among many societies in Africa have demonstrated values, beliefs and norms which preserve biodiversity and ecosystems.

For example, among the coastal societies in Kenya, important forest blocks have been preserved through the Kaya customary laws. In other cultures, for example, the Masai, Samburu and Pokot, clans are believed to have blood relations with different animal species, hence the killing of those species is prohibited, which leads to their preservation. In the Tharaka area of north-central Kenya, communities have two levels of justice to protect riparian areas along streams and rivers (Mburu and Kaguna, 2016a). Cultural practices and spirituality have contributed to the enhancement of biodiversity and ecosystem services in the arid and semi-arid area of Tharaka, Kenya. These communities are reverting to renew their traditional knowledge, including bringing back indigenous seeds for food, trees, and fruit-trees (Mburu and Kaguna, 2016b). Further examples of traditional and spiritual customs in Africa can be found here (Mburu and Kaguna, 2016b; Roué *et al.*, 2016). Local Indigenous knowledge is important to maintain the integrity of intact ecosystems, in co-development with ecological research to seek new ecological knowledge in peatlands and associated ecosystems.

2.2.8. Economic value of biodiversity in SSA

The true value of biodiversity and its contributions to human wellbeing is underappreciated in African decision making, in particular for non-material and regulating contributions, and few valuation studies have been conducted in Africa. However, where they have been conducted, the results demonstrate their ecosystem and economic values (Figure 9) (IPBES, 2017). Ecosystem service valuations across the SSA sub-regions are presented in Figure 10.

Material values include the provision of food and feeds, regulating values include climate regulation and pollination, and non-material values are linked to physical and psychological experiences. Figure 10 provides a summary of the relative proportion of material, non-material and regulatory values in different sub-regions of Africa. To make informed environmental decisions, understanding and considering differing values is likely to lead to different decisions than those made without this knowledge (IPBES, 2018g). Figure 10 provides important knowledge to incorporate into REDAA programme decision making.

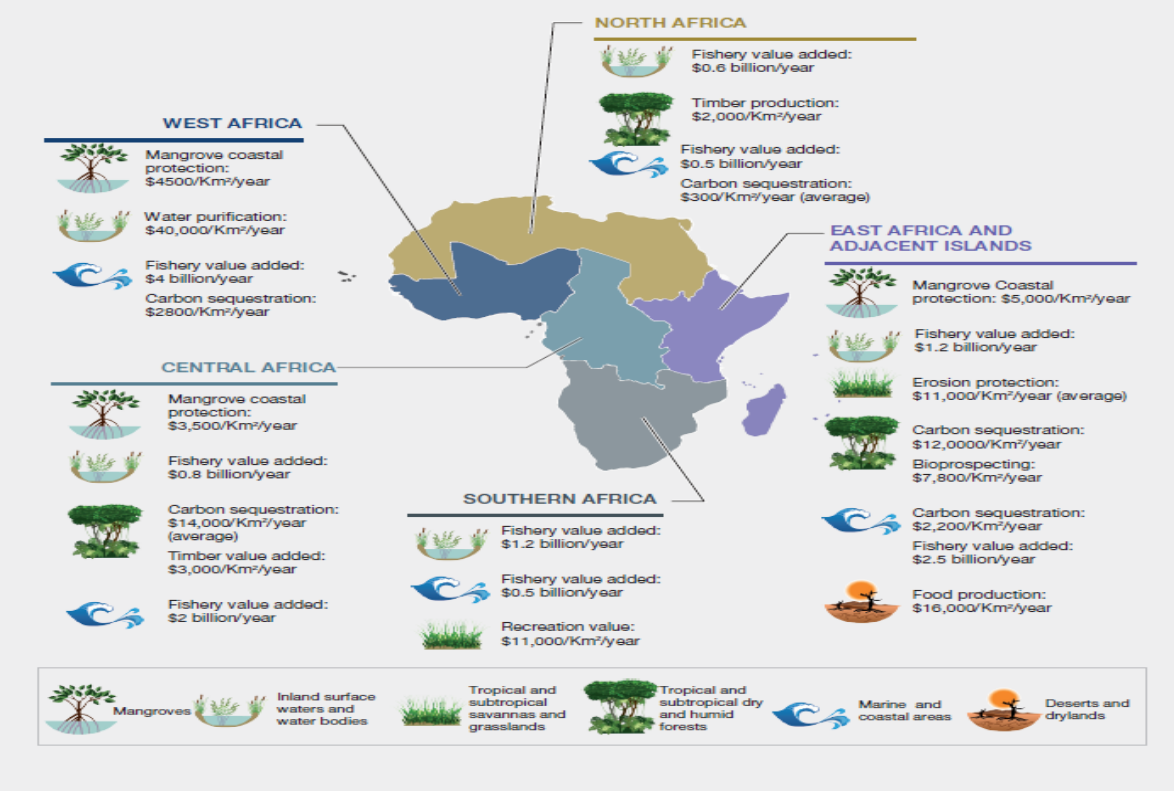


Figure 9: Indicative lists of economic values of nature's contributions to people in Africa. Sample values of some ecosystem services in selected ecosystems (freshwater, marine and coastal areas and forests) in Africa (IPBES, 2018g)

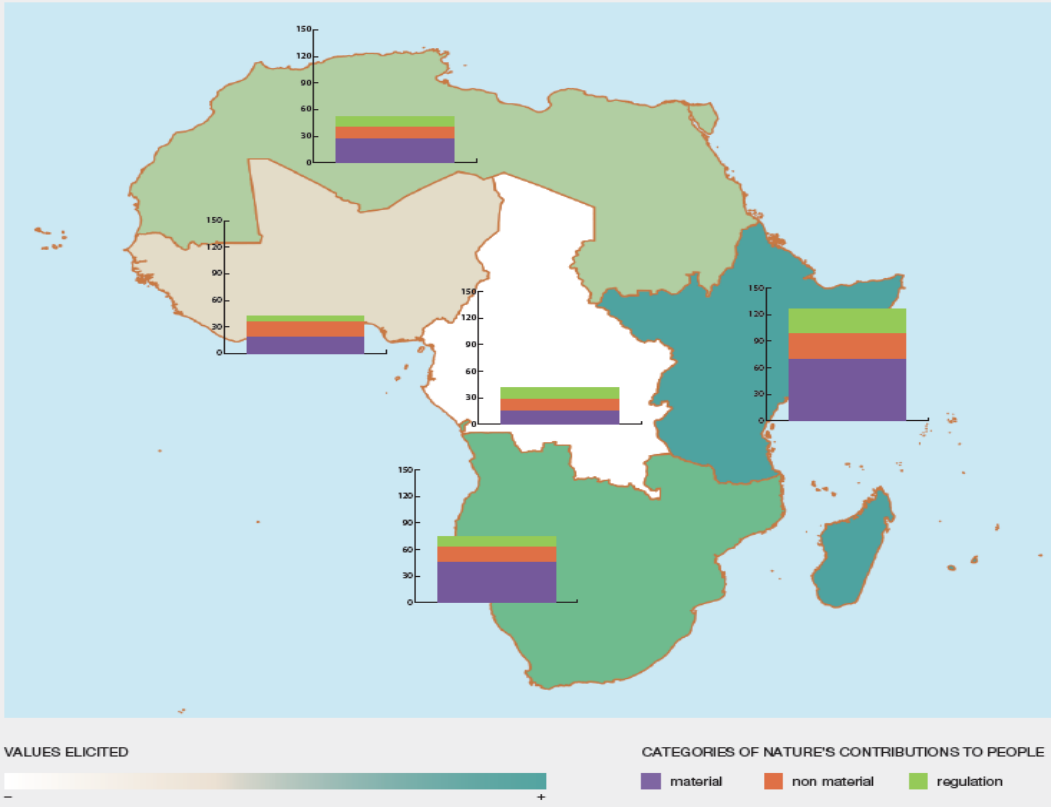


Figure 10: Values representation per sub-region and targeted nature's contributions to people. Source: see Appendix AfRA 2.1; Available at https://www.ipbes.net/ sites/default/fi les/synthesis_of_information_on_ecological_and_socio-economic_ benefits_of_bes_in_africa.xlsx.

2.2.9. Least developed and low- and medium-income countries

It is recommended that REDAA programming primarily focuses on LDCs and low- and medium-income countries, as these can be considered the most vulnerable, and have rich biodiversity. Forty-nine countries make up Central, West, Southern and East Africa and adjacent islands. Of these, four low-income countries are in Central Africa, seven low-income countries are in East Africa and adjacent islands, one is in Southern Africa and nine are in West Africa. Low- to middle-income countries are also found across the four sub-regions of Africa. Table 4 provides the potential countries for the implementation of the REDAA programme. Peatland ecosystems fall within Democratic Republic of Congo.

Table 4: Least developed countries and their income levels, by African regions

Region	Least developed countries Low income	Least developed countries Medium income
Central Africa	Burundi, Central African Republic, Chad, Democratic Republic of Congo	Sao Tome and Principe
East Africa and adjacent islands	Eritrea, Ethiopia, Madagascar, Rwanda, Somalia, South Sudan, Uganda	Comoros, Djibouti, United Republic of Tanzania
Southern Africa	Malawi, Mozambique	Lesotho, Zambia
West Africa	Burkina Faso, Gambia, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Sierra Leone, Togo	Senegal

3. Southeast Asia

3.1. Introduction

The Southeast Asian (SEA) region is a major contributor to global biodiversity (The ASEAN Secretariat, 2017). It is endowed with rich natural resources which sustain essential life support systems. The region is almost entirely covered by four biodiversity hotspots, with exceptionally high levels of species richness and country-endemic species. Apart from providing water, food and energy, these natural resources play an important role in sustaining a wide range of economic activities and livelihoods. The ASEAN (Association of Southeast Asian Nations) region has a total land area of 432,563,000 hectares (ha) (as of 2013), 3% of the world's total land area, with a total forest area of 211,172,000 ha (as of 2012) (ASEAN Secretariat, 2016). Although occupying only 3% of the earth's total surface, the ASEAN region contains 18% of all species assessed by the International Union for the Conservation of Nature (IUCN) (David Cooper and Noonan-Mooney, 2013), and is home to three of the 17 known mega-diverse countries (ie. Indonesia, Malaysia and the Philippines) (ASEAN Centre for Biodiversity, 2017a). The population of Southeast Asia is 673,721,354 (April 11, 2021), equivalent to 8.58% of the total world population (United Nations Population Division, 2021) (https://www.worldometers.info/), placing biodiverse regions under extensive human pressures.

SA has one-third, or 86,025km^2, of all known global coral reefs and 60% of tropical peatlands (23 million ha). Peatlands are rich in biodiversity, and home to many endemic, rare and endangered species, with unique ecosystem services. More than 80 billion tonnes of carbon are stored in forests and peat layers up to 25m deep. They contribute significantly to the livelihoods of a substantial number of people, including poor communities who live in and around peatlands. Understanding the importance of peatlands, the ASEAN Member States developed an ASEAN Peatland Management Strategy (ASEAN Secretariat, 2013).

Table 5 below sets out the specific recommendations for REDAA for SEA based on the scoping:

Table 5: Region-specific recommendations: SEA

Southeast Asia: key recommendations for REDAA	
1	**The REDAA programme should seek to collaborate with existing institutions –** The ASEAN Working Group on Nature Conservation and Biodiversity (AWGNCB) is already established, and its mandate includes the implementation of the programmes and activities of the Strategic Priority Area of "Conservation of key terrestrial biodiversity areas including Protected Areas", and potentially provide key linkages and knowledge to support the delivery of the UK REDAA programme in Southeast Asia. The ASEAN Centre for Biodiversity (ACB) is also a key body for the REDAA programme to align with; the ACB works closely to support the AWGNCB, which provides technical guidance to the ACB by recommending key focus areas of work across ASEAN for biodiversity, while undertaking concrete actions to ensure the region's rich biological diversity is protected, conserved and sustainably-managed. The ASEAN Heritage Parks (AHP) may also provide an entry point for REDAA objectives.
2	**Ecological site selection for the REDAA programme in SEA must not only consider intact ecosystems, but also take a longer-term perspective –** Biodiversity loss and degradation rates are significantly higher in Southeast Asia than elsewhere in Asia. Selection of intact ecological sites for the REDAA programme will need to consider development proposals to ensure chosen sites will maintain long-term intactness, and so benefit from the programme.
3	**A systems thinking approach is required to tackle the complex and interwoven indirect drivers of biodiversity loss and ecosystem degradation. The REDAA programme must adopt a holistic approach to design –** The impacts on Southeast Asian socio-ecological systems are increasingly driven by demands from a distance, and decisions made through external economic influences, governance systems and institutions. For example, demand for palm oil has resulted in more plantations, leading to negative impacts of palm oil plantations in Malaysia on local neighbouring communities' socio, economic livelihood and poverty deterioration. The REDAA programme will need to develop projects which consider this interconnectedness, to ensure the spotlight of inquiry and actions is broadened, being more focused on intact ecosystems and connections, as well as being interdisciplinary and socially inclusive. The outcomes from the REDAA programme will benefit through

	the inclusion of a wider society into developing new knowledge and spurring effective projects. Systems mapping could be a useful first step for REDAA research. REDAA projects in the SEA region should include a strong focus on socio-ecological interactions and governance. Such projects will provide a strong focus on human-nature connections and interactions, the inclusion of diverse knowledge systems, and the multiple concepts of the value of nature and its contributions to people, considering formal and informal governance and institutional systems.
4	**The REDAA programme should seek to develop inclusive vertically and horizontally integrated governance systems –** Overcoming governance challenges is a key aspect for successful land management approaches for the REDAA programme. The evidence suggests that a key success factor in overcoming this challenge is the ability to effectively develop multi-scale and/or multi-sector governance systems that successfully engage different actors, organisations and institutions, all working for the same end. For REDAA, governance approaches need to be developed to specifically suit the individual project and be designed by the local communities.
5	**REDAA must secure inclusion of marginalised groups, especially women, and Indigenous and poor communities, in land management approaches and forest restoration efforts -** This will help ensure sustainable management of ecosystems over time, as well as help to abate any further marginalisation. Traditional ways of being with and protecting nature demonstrated by Indigenous people can provide founding bases for the development of all REDAA projects regardless of the ecosystem type or geography in which they are developed. Projects that have been led and implemented by Indigenous peoples in the SEA region have been highly successful, and the Asia Indigenous Peoples Pact (AIPP) – a regional organisation committed to the cause of promoting and defending Indigenous peoples' rights and human rights and articulating issues of relevance to Indigenous peoples – may provide a valuable forum for inclusion and coordination. Indeed, the AIPP has a strong Environment Programme and works with many Indigenous Peoples and their organisations, aid programmes and other donors on projects across Southeast Asia and coordinates the recently established Indigenous Knowledge and Peoples of Asia (IKPA). The most effective investments and outcomes for delivery of the objectives of the REDAA programme are working with Indigenous and local communities to alleviate poverty while also maintaining biodiversity.
6	**Consider and ensure land tenure, prevention of land conflicts and vested interests do not impact on the REDAA programme, and the inclusion of traditional knowledge and women's active leadership occurs in decision making -** Despite the significant role Indigenous women play in sustainable forest management through support of their family and community, they also face serious challenges, which REDAA should address. The scoping research suggests that across Southeast Asia, Indigenous women face serious challenges such as insecurity of land tenure and land conflicts with private companies and the government; non-recognition and weakening of the role of women and traditional knowledge in forest management; heavy workloads; the absence of women's participation in decision making; and forest degradation due to logging activities, economic trade-offs and land concessions.

3.1.1. Institutional context

The ASEAN institutional context and structures, particularly those related to Biodiversity through the ASEAN Centre for Biodiversity, provide a key enabling mechanism to enhance REDAA project implementation.

The Association of Southeast Asian Nations, or ASEAN, was established in 1967 with the signing of the ASEAN Declaration (Bangkok Declaration) by the Founding Fathers of ASEAN: Indonesia, Malaysia, the Philippines, Singapore and Thailand. Brunei Darussalam joined ASEAN on 7 January 1984, followed by Viet Nam on 28 July 1995, Laos and Myanmar on 23 July 1997, and Cambodia on 30 April 1999, making up what is today the ten Member States of ASEAN.

Since 1977, ASEAN has cooperated in promoting environmental cooperation among its Member States for sustainable development and regional integration, including coordinated actions at national, regional and global levels. The ASEAN Member States (AMS) have developed and committed to the ASEAN 2025 Forging Ahead Together (The ASEAN Secretariat, 2015b), which outlines the policy framework for ASEAN Cooperation to 2025,

guided by the ASEAN Socio-Cultural and Political Community Blueprints 2025 (ASEAN, 2015a; The ASEAN Secretariat, 2016b). The ASCC Blueprint 2025 (ASEAN, 2015a) outlines the AMS's need to create and implement an enabling policy framework to avert biodiversity loss and species extinction.

The AMS envision an ASEAN Community that engages in an inclusive, sustainable, resilient, and dynamic manner while benefiting people. The importance of the environment is further emphasised through the ASEAN Declaration on Environmental Sustainability and Climate Change in 2015 and ongoing declarations on climate change since 2009 (ASEAN, 2009, 2012, 2015b; ASEAN Member States, 2017). Likewise, at the UK COP26 meeting, a further united and strong declaration on climate change was presented by the ASEAN Member States (ASEAN, 2021). AMS have provided updated National Determined Contributions (NDCs) aligned with the Paris Agreement to the UNFCCC. Of the ASEAN Member States, Brunei Darussalam, Cambodia, Malaysia, the Philippines, Singapore and Thailand all refer to biodiversity within their NDCs, while Indonesia, Laos, Myanmar and Thailand all refer to forestry and other related activities relevant to biodiversity (Government of Malaysia, 2016; Brunei Darussalam, 2020; Government of Singapore, 2020; Government of the Socialist Republic of Viet Nam, 2020; Ministry of Environment Kingdom of Cambodia, 2020; Thailand Office of Natural Resources and Environmental Policy, 2020; Ministry of environment and forestry - Directorate General Climate Change, 2021; People, 2021; Republic of the Philippines, 2021; Republic of the Union of Myanmar, 2021).

The ASEAN Strategic Plan on the Environment (ASPEN) 2016-2025 (ASEAN Secretariat, 2017) translates the relevant key areas of the ASEAN 2025 Forging Ahead Together and ASCC Blueprint 2025 into a detailed plan of actions to promote ASEAN cooperation on the environment. ASPEN's Strategic Priority 1, Nature Conservation and Biodiversity, and Strategic Priority 2, Coastal and Marine Environment, are both relevant to the REDAA programme. ASPEN provides a forward-looking plan to promote concerted actions through cooperation and joint actions across AMS that would allow for addressing the drivers of nature and biodiversity loss, while fostering a sustainable economy.

The institutional framework of ASEAN cooperation on the environment includes ASEAN Ministerial Meetings on the Environment (AMME), ASEAN Senior Officials on the Environment (ASOEN), with three subsidiary bodies which work specifically on the environment:

1) ASEAN Working Group on Climate Change (AWGCC)
2) ASEAN Working Group on Coastal and Marine Environment (AWGCME)
3) ASEAN Working Group on Nature Conservation and Biodiversity (AWGNCB)

The AWGNCB, with the support of the ASEAN Centre for Biodiversity (ACB), is the main body responsible for the implementation of the programmes and activities of the Strategic Priority Area of "Conservation of key terrestrial biodiversity areas including Protected Areas", and potentially provide key linkages and knowledge to support the delivery of the UK REDAA programme in Southeast Asia.

3.1.2. ASEAN Centre for Biodiversity

The ACB was established in 2005 and is hosted by the Philippines (ASEAN, 2005). The ACB's role is to facilitate cooperation and coordination among the AMS with relevant national government, regional and international organisations. They are focused on the conservation and sustainable use of biological diversity and the fair and equitable sharing of benefits, arising from the use of biodiversity in the ASEAN region. The ACB is a key body for the REDAA programme to align with. The ACB works closely to support the AWGNCB, which provides technical guidance to the ACB by recommending key focus areas of work across ASEAN for biodiversity, while undertaking concrete actions to ensure the region's rich biological diversity is protected, conserved and sustainably-managed (Phanith and Sarne, 2019). Key areas of relevance to the REDAA programme are reflected in ASEAN documents (ASEAN, 2012; The ASEAN Secretariat, 2015a, 2016b, 2016a; ASEAN Centre for Biodiversity, 2017b; ASEAN Member States, 2018; Akenji and Bengtsson, 2019), which encourage the Member States to become involved in programmes such as REDAA. The AMS have provided initial consultations to the CBD Post 2020 Global Biodiversity Framework (ASEAN Centre for Biodiversity, 2020).

AMS have acknowledged the findings of the IPBES reports (ASEAN Member States, 2018), including the IPBES Asia Pacific Regional Assessment (IPBES, 2018f) and the IPBES Land Degradation and Restoration Assessment (IPBES, 2018e) and the 2019 IPBES Global Assessment on Biodiversity (IPBES, 2019a), in identifying rapid social, technological, economic, and environmental changes occurring across the ASEAN region (ASEAN Member States, 2018). Ongoing and future initiatives and key policy contexts for ASEAN are supported by the EU Larger Than Tigers Report (European Commission, 2018). Through the ACB, the AMS have engaged in workshops to aid their

considerations on the implementation of the findings of the Das Gupta Review into the Economics of Biodiversity (Das Gupta, 2021a).

3.1.3. ASEAN Heritage Parks

The REDAA programme research objectives may also be advanced through association with the 40 ASEAN Heritage Parks (AHP) (Appendix 3), as the AHP Programme provides a mechanism to contribute to the security of ASEAN's unique biodiversity, while enhancing ecological recovery of ecosystems, and species, across the ASEAN region (Figure 11). AHPs are "protected areas in the ASEAN region which are known for their unique biodiversity and ecosystems, wilderness and outstanding values", and are given the highest recognition because of their importance as conservation areas (Steeman, 2019). The AMS are currently renewing the AHP Regional Action Plan (2016-2020) following recommendations based on an extensive review of the AHP Programme (J. L. Fisher, 2022).

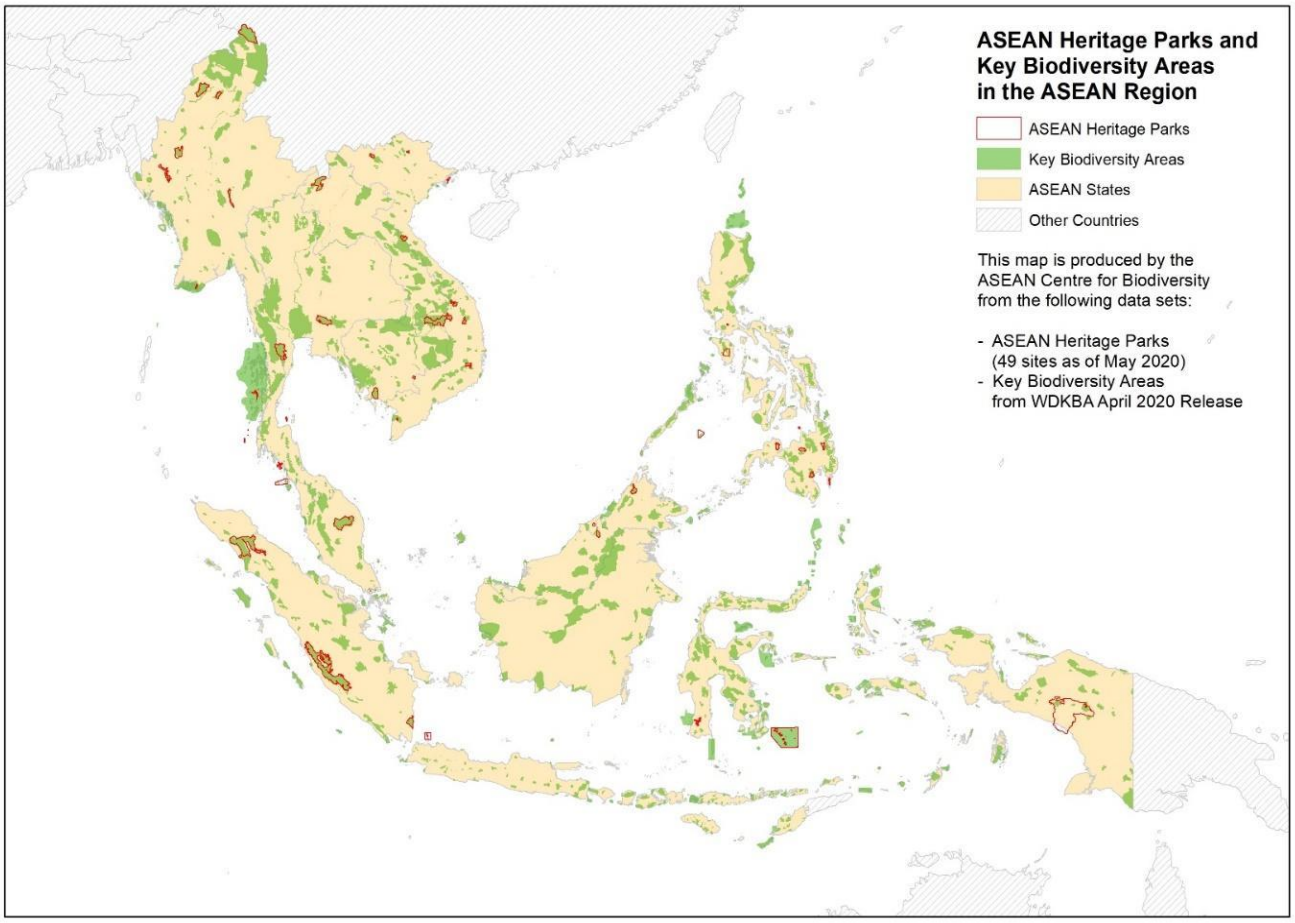


Figure 11: Locations of the ASEAN Heritage Parks and their relationship to Key Biodiversity Areas; ASEAN Centre for Biodiversity

Both Figure 11 and Figure 12 provide data to determine intact locations which may be suitable for restoration aspects of the REDAA programme. Figure 12 identifies critically imperilled habitats taken from published lists of 'Evolutionary Distinctiveness' associated with good phylogenies, and IUCN red list assessments of the corresponding species. The sum of the tabled Evolutionary Distinctiveness values of the threatened species within a given taxonomic group approximates its total threatened or "imperilled" status, based on phylogenetic diversity (an estimate of the expected loss of phylogenetic diversity and corresponding loss of maintenance of options) (IPBES, 2018f).

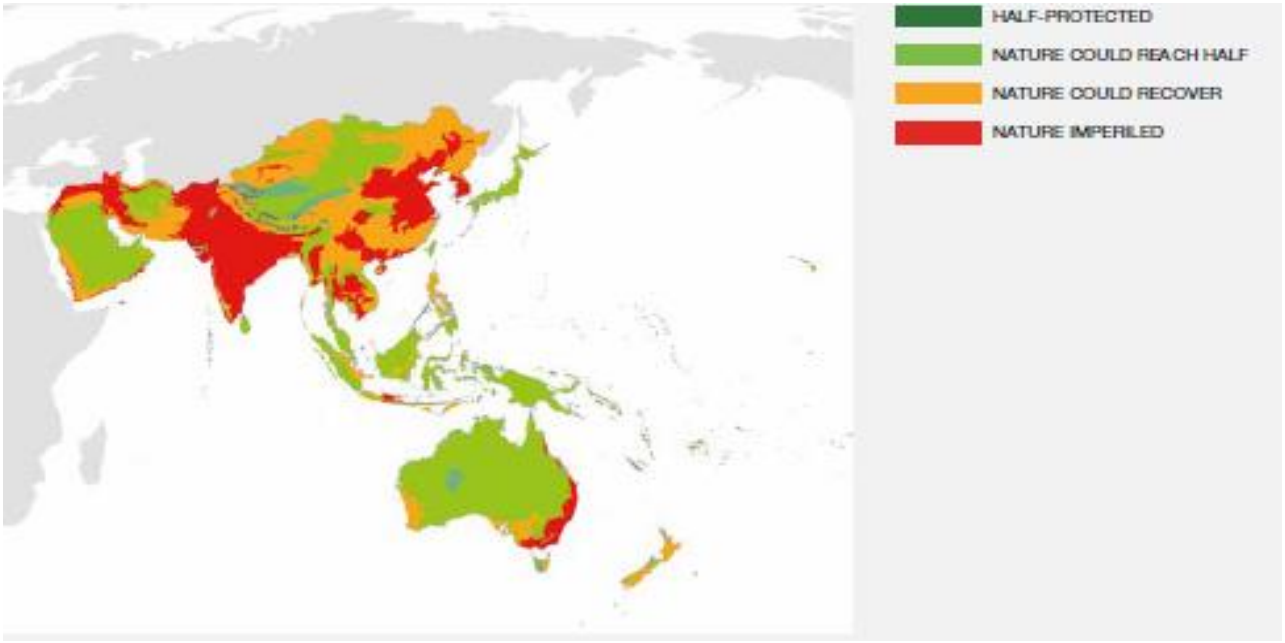


Figure 12: Protection status of ecoregions in the Asia-Pacific Region (Olson et al., 2001; Dinerstein et al., 2017; IPBES, 2018f)

3.2. Implementing a multifunctional 'scape approach – evidence review

This section provides an evidence review of the current ecological knowledge to make informed decisions on those intact ecosystems which are most appropriate for the implementation of the REDAA programme, using a multifunctional 'scape approach.

The key ecosystem types across Southeast Asia are set out in Figure 13. These are[8]:

- Forests
- Inland freshwater – lakes
- Rivers and streams
- Peatlands
- Limestone karsts
- Coasts
- Mangroves
- Marine and coral reefs

These are discussed in further detail in the subsections below.

[8] For the purposes of the REDAA programme marine and coral reef ecosystems will not be considered.

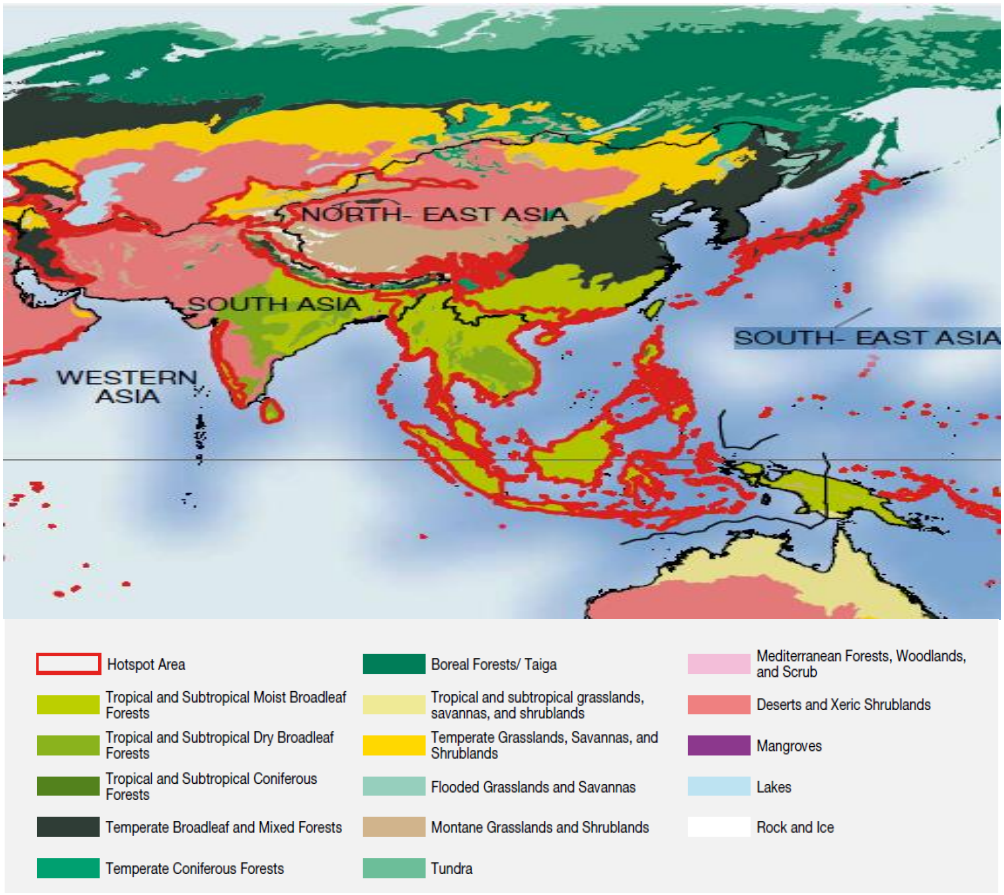


Figure 13: Major ecoregions in the Southeast Asia, South Asia and Northeast Asia geographical sub-regions as defined by IPBES (IPBES, 2018a)[9]

3.2.1 Forest

Intact forest ecosystems store and sequester more carbon than degraded ones (Watson *et al.*, 2018). The 'Heart of Borneo' is the only remaining place in Southeast Asia that still holds huge tracts of pristine forest. Borneo accounts for just 1% of the world's land yet holds approximately 6% of global biodiversity in its rich, tropical forests. Borneo's forests are home to 221 species of mammals, 620 species of birds, and more than 150 species of dipterocarp trees with 1,000 insect species per tree. Thirty-five per cent of its 15,000 plant species are not found anywhere else in the world. To date, Borneo has lost more than half of its forests. The declaration on the Heart of Borneo Initiative (HoB) was signed in 2007 by Indonesia, Malaysia and Brunei to ensure the shared responsibility for protecting this ecosystem. HoB provides ecosystem services for at least 11 million Borneans, and a million Indigenous Dayaks (IPBES, 2018f)[10].

3.2.2 Inland freshwater – lakes

In Southeast Asia, the Indo-Burma sub-region and Indonesia have a particularly rich freshwater fish fauna (Tickner *et al.*, 2020). Indonesia harbours a high diversity of freshwater fish. Currently 1,230 known species (Froese & Pauly, 2014). However, the freshwater fish fauna is still poorly documented. The individual conservation status of all the species of the mega-diverse fish fauna of Indonesia remains to be assessed (Darwall and Freyhof, 2015).

3.2.3. Inland freshwater and wetlands

Many freshwater finfish across Southeast Asia are vulnerable. *Platytropius siamensis*, the Siamese flat-barbelled catfish, is the only fish species from the region considered extinct. The impacts of invasive fishes have been a strong driver of the Indonesian government, among others, to develop a National Strategy on Invasive Alien Species. The

[9] Data source: biomes data from (Olson et al., 2001), and hotspots from (Conservation Synthesis - Center for Applied Biodiversity Science at and International., 2004) and (Mittermeier et al., 2004).
[10] Please see https://wwf.panda.org/discover/knowledge_hub/where_we_work/borneo_forests/ and http://www.heartofborneo.org/ for supplementary information.

amphibian fauna of the Southeast Asian archipelagos is also diverse; eg. there are 112 species recorded in the Philippines, 94 (84%) are endemic. The same applies to insular Southeast Asia, where land conversion into oil palm plantation is a major threat. Ponds in converted landscapes are reported to support only anuran communities of mainly wide-spread and common taxa (IPBES, 2018f).

Alpine wetlands are found in the mountainous regions of the Qinghai-Tibetan Plateau, China, Yunnan Region of China, northern India, and the upper Yarkund Valley, Pakistan. However, they are hydrologically significant as major rivers in Southeast Asia originate from these wetlands.

3.2.4. Rivers and streams

The Southeast Asian countries of Cambodia, Laos, Myanmar, Thailand and Viet Nam are part of the Mekong Region , along with China. The Mekong Region is a relatively pristine river ecosystem and is the major and longest watercourse in Southeast Asia, shared by six countries. There is a rush, by riparian states, to acquire sources of alternative energy and other benefits to meet growing demands for water and energy (Darwall and Freyhof, 2015). The Mekong Region shares 110 international rivers and lakes, and is home to most of Asia's great rivers that flow into 18 downstream countries (He *et al.*, 2014). China's total transboundary water resources are (approx.) 800 billion m^3 with most originating in the southwest of China (Figure 14).

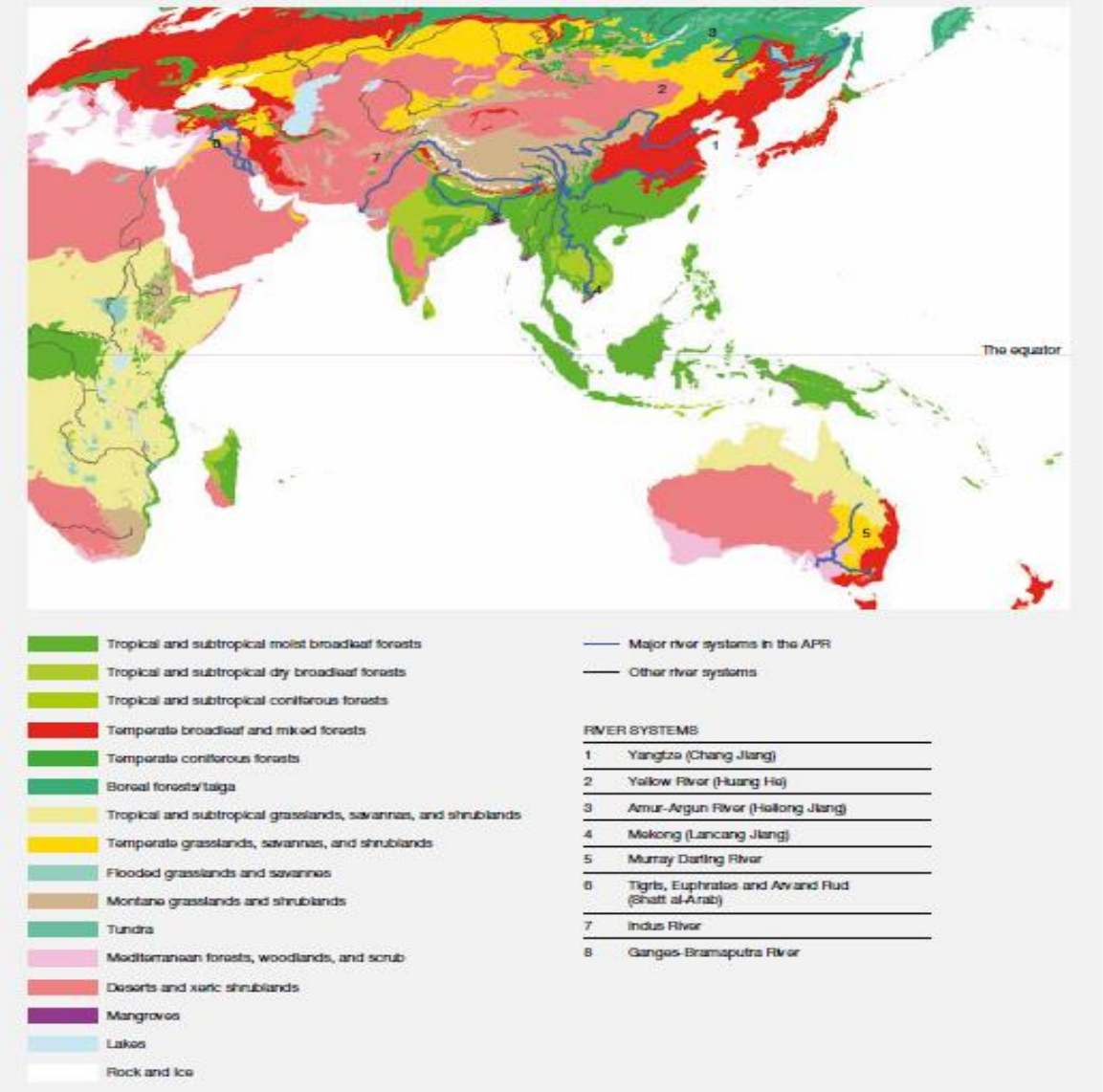


Figure 14: Main river systems in the Asia-Pacific Region (Olson et al., 2001)

3.2.5. Peatlands

Globally, peatlands comprise the largest natural terrestrial store of carbon, harbouring more than 450 gigatonnes of carbon, which is more than 40% of all soil carbon (Joosten, 2010). Peatlands sequester annually, lowering the risks of 0.4 billion tons of CO2 each year, while regulating water flow and quality, lowering the risks of flooding and the effects of droughts, preventing sea-water intrusion, and offering habitat for numerous forms of wildlife**.** Since 1999, conversion of peatlands to agriculture has been an important source of atmospheric carbon through peat oxidisation leading to irreversible changes in peat systems (Hooijer *et al.*, 2010; Dommain *et al.*, 2014; Mishra *et al.*, 2021; Ribeiro *et al.*, 2021).

Not only do peatlands store considerable amounts of carbon (Couwenberg, Dommain and Joosten, 2010; Dommain *et al.*, 2014), they also provide habitat for flora and fauna, including vulnerable taxa such as the false gharial (*Tomistoma schlegelii*) (Thornton *et al.*, 2018). Wetlands of the Philippines (eg. Naujan Lake, Mindoro; Candava Swamp, Luzon; Agusan Marsh, Mindanao) are important resting and wintering areas for migratory and domestic bird populations (Republic of the Philippines, 2014).

Peat swamp forests (PSFs) are occupied by highly unique and endemic fish and insect fauna, adapted to the acidic blackwater, with a unique soil biodiversity (Liu *et al.*, 2020). However, PSFs are deforested at a higher rate (-3.7% per year) than other forests, with the highest rates of loss in Sarawak (-8.1% per year) and Sumatra (-5.2% per year). Only 36% of the original PSF area has remained in Southeast Asia. Conversion of lowland swamp forests into banana and oil palm plantations in Peninsular Malaysia is a major concern. If current rates of peat swamp forest conversion continue in Sundaland (Sumatra, Java, and Borneo), it is projected that by 2050, 16% of PSF fish species are likely to go extinct. Recommendations have been made that Indonesian peatlands be managed and protected under post-Kyoto framework, to help conservation of endangered vertebrates. The extant peatlands which are still intact in these areas are likely to be logged and drained in the next few decades (Yule, 2010; Posa, 2011; Dohong, Aziz and Dargusch, 2017; Suwarno *et al.*, 2018; Cole, Willis and Bhagwat, 2021; Ribeiro *et al.*, 2021). An overall 1%/yr decline in forest cover occurred in insular Southeast Asia between 2000 and 2010. The rate of loss exceeded 5%/yr in the Sumatran lowlands and the peatlands of Sarawak, Malaysian Borneo, with half the forest cover lost between 2000 and 2010. Approximately 35% of Indonesia's remaining forests are located within industrial concessions, and are therefore vulnerable to future loss (IPBES, 2018f).

Local people harvest peatland to grow and obtain food, fibre and other local products (Das Gupta, 2021a). Climate change in Southeast Asia is leading to decreased dry season precipitation and longer dry seasons which are predicted to lower water tables and increase fire risk, key drivers of biodiversity loss for peatlands.

3.2.6. Limestone karsts

Limestone karsts are widespread in the Asia-Pacific region, with 408,000km^2 in Southeast Asia and approximately 13% or 52,650km^2 of karsts protected. Karsts are mostly found in Indonesia, Thailand and Viet Nam (Clements *et al.*, 2006). Their complex structures, distinctive chemistry and isolation from a non-karst matrix have resulted in unique flora and fauna, with high endemism. In Peninsular Malaysia alone, nearly 21% of 1,216 karst-associated plant species are endemic to limestone hills. Caves sustain unique subterranean ecosystems including groundwater animals. Caves also contribute to people, by providing water, guano as fertiliser, home to cave-roosting bats which are important pollinators of crops, as well as being cultural and religious sites (IPBES, 2018f). Maintaining limestone karsts can also help attract pollinators for agricultural areas (Smith, Morley and Louys, 2020; Grismer *et al.*, 2021; Tang *et al.*, 2021).

The importance of limestone karsts for bats cannot be underestimated including for pest control of rice fields (Struebig *et al.*, 2009; Kiernan, 2010; Cajaiba *et al.*, 2021). Until recently, the biodiversity of limestone karsts in the Asia-Pacific region had been protected by their low suitability for agriculture or by being located within the boundaries of protected areas such as national parks, or because they have been accredited World Heritage status (Liew, Price and Clements, 2016).

3.2.7. Mangroves

Mangroves are a unique coastal ecosystem which support a rich biodiversity and provide a range of nature's contribution to people including provisioning, regulating, and supporting mechanisms, crucial for the sustenance of local communities. Southeast Asian mangroves are among the most diverse species in the world, with 268 plant species including 52 taxa which grow exclusively in mangrove habitats. Recent changes in land use, primarily for aquaculture, has led to the transformation of mangroves, by up to 75% in the last three decades (IPBES, 2018f).

Among endemics, the highest extinction risk occurs in South Asia (best estimate of 46% threatened) and Northeast Asia (36% threatened). However, the extinction risk for endemic species could be as high as 49% threatened (Southeast Asia) and 59% threatened (South Asia and Northeast Asia). If all endemic data-deficient (DD) species are threatened, Southeast Asia has the largest number of threatened species (1,182, including CR, EN and VU), and threatened endemic species (748).

Globally, mangroves are disappearing at an alarming rate of 1 to 2% per year (Duke et al., 2007), with the rate being particularly disturbing in Southeast Asia. Hamilton & Casey (2016) reported that despite a growing awareness and recent slow-down in global mangrove deforestation, Southeast Asia continues to lose mangroves with deforestation rates varying between 3.58% and 8.08% every year. Agricultural expansion into existing mangrove habitat accounted for the bulk of the mangrove loss in Southeast Asia and an exponential rise in brackish water aquaculture.

3.2.8. Coastal regions

Sunda Shelf is a stable continental shelf and a southward extension of mainland Southeast Asia. A relatively warm and humid 'core', roughly centred on the islands of Borneo and Sumatra and the southernmost tip of the Malay Peninsula, characterises the Sunda Shelf. More than 20 centres of high plant biodiversity occur in associated ecosystem types. At least two thirds of all known butterfly species occur in a relatively small area of the associated forest. This area of forest is consistent with a zone of overlapping bird, columbine and plant biodiversity hotspots (IPBES, 2018f).

3.2.9. Transboundary matters

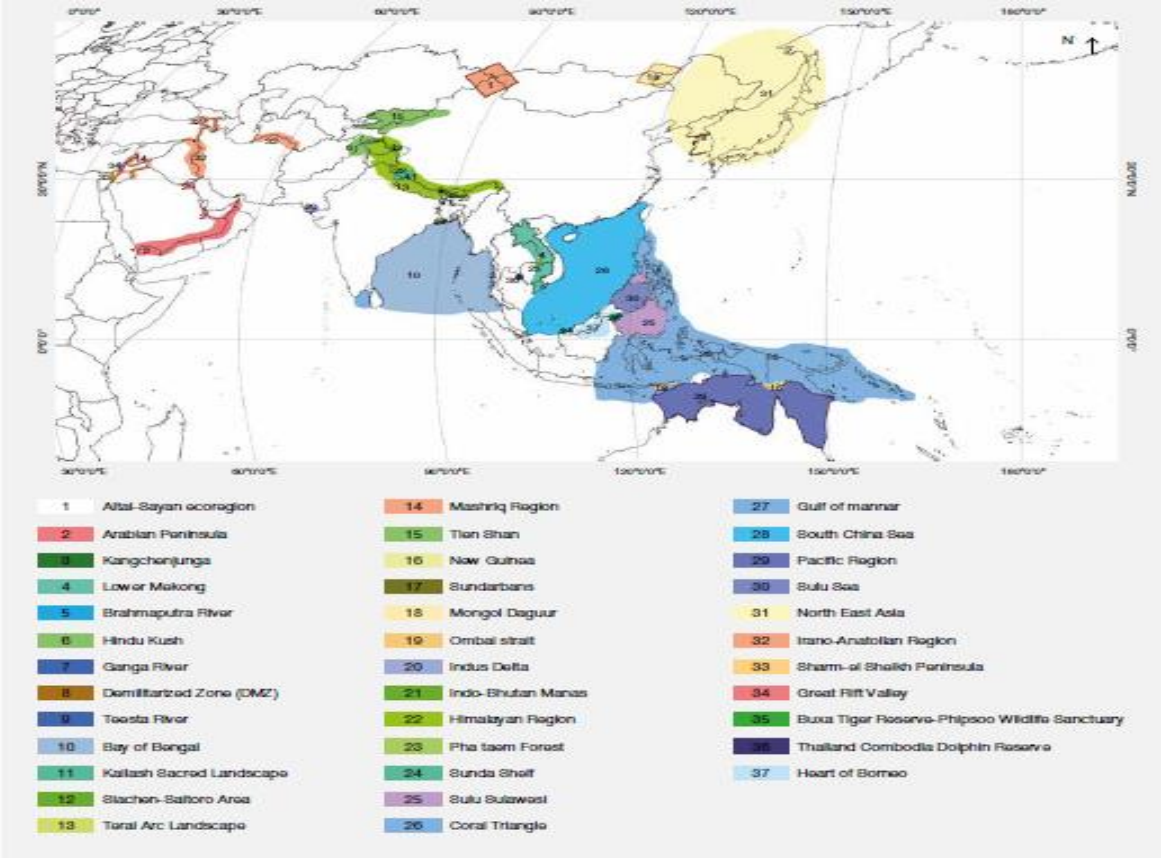


Figure 15: Important transboundary conservation areas (protected areas, conservation landscapes/seascapes, conservation migration area and Peace Parks) in different ecosystems and sub-regions of the Asia-Pacific region (IPBES, 2018f)

Wildlife and plant species are rarely confined within national boundaries, especially across the Southeast Asian region, where spatial mismatches and flows occur when species, with complex movement dynamics, cross national boundaries. As a result, transboundary approaches are required to deliver effective outcomes to counteract poverty alleviation and biodiversity loss (Figure 15) (IPBES, 2018f). Especially where the 'downstream' communities do not fall under the jurisdiction of those in control of 'upstream' governance and actions, particularly in large scale

transboundary river basins where hydroelectric development impacts biodiversity in Southeast Asia. Issues and challenges in the food, air, water, and energy sectors are interwoven in many complex ways and cannot be managed effectively without cross-sectoral and transboundary integration. Hotspots for economic water scarcity in the Southeast Asian countries include Viet Nam, Laos and Myanmar. The six countries in the Mekong River Basin (China, Myanmar, Thailand, Laos, Cambodia and Viet Nam) collaborate in the management of transboundary water and associated biodiversity and ecosystem resources, through the Mekong River Commission.

3.3. Drivers of environmental degradation

Predicted biodiversity loss in terms of mean species abundance under different scenarios is presented in Figure 17. Southeast Asian countries have the greatest number of threatened species, and the fastest increase in extinction risk in the Asia-Pacific region, resulting in a loss of unique Southeast Asian natural and cultural heritage (Figure 17). The Asia-Pacific region has species extinction rates higher than the global average (IPBES, 2018d). The Second Edition of the ASEAN Biodiversity Outlook projected Southeast Asia would lose 70% to 90% of habitats and 13% to 42% of species by 2100, with crop production having the biggest influence on future biodiversity losses.

Assessments of forest ecosystems indicate an average annual rate of loss of 1.26% from 2000 to 2010. The collective actions of the ASEAN Member States have caused this rate to decline to 0.26% between 2010 and 2015 (ASEAN Centre for Biodiversity, 2017a). Consumption change and global technology are predicted to be the key causes of biodiversity change in Southeast Asia up to 2050 (Figure 16).

Southeast Asia has some of the highest deforestation rates globally, the highest rate of mining in the tropics, the greatest number of hydropower dams and reservoirs under construction, and high consumption of species for traditional medicines including hunting and trade for food, medicine, and ornamentation. One of the most imminent threats to biodiversity are tree plantations and deforestation. The development of roads and other infrastructure fragment the landscape (Sloan *et al.*, 2018). Drainage of wetlands, fire, pollution, invasive species and climate change are all contributing to the loss and degradation of biodiversity (Figure 16) (Hughes, 2017; IPBES, 2018f). The number of threatened species in Southeast Asia is double that in South Asia and six times the figure for Western Asia. Similarly, the absolute number of threatened endemic species in Southeast Asia is more than double that of South Asia, even though the latter has the highest percentage extinction risk for endemic species in the Asia-Pacific region (Figure 17). Selection of intact ecological sites for the REDAA programme will need to consider development proposals to ensure chosen sites will maintain long term intactness, and so benefit from the programme.

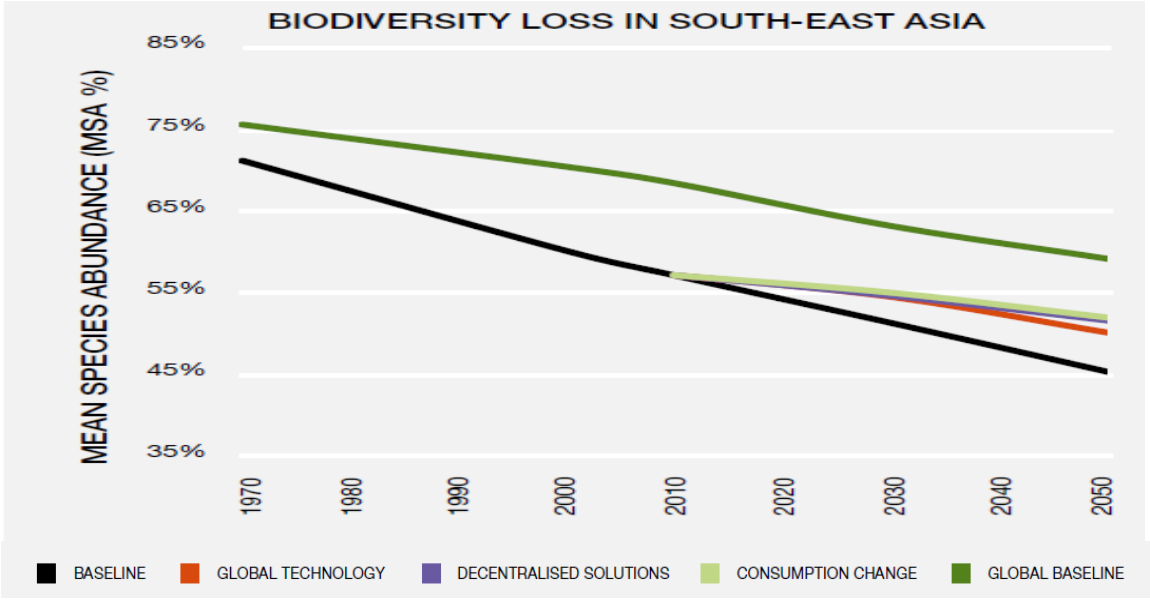


Figure 16: Predicted biodiversity loss under different scenarios in terms of mean species abundance. Data source: (PBL Netherlands Environmental Agency, 2012; Secretariat of the Convention on Biological Diversity, 2014) (IPBES, 2018d)

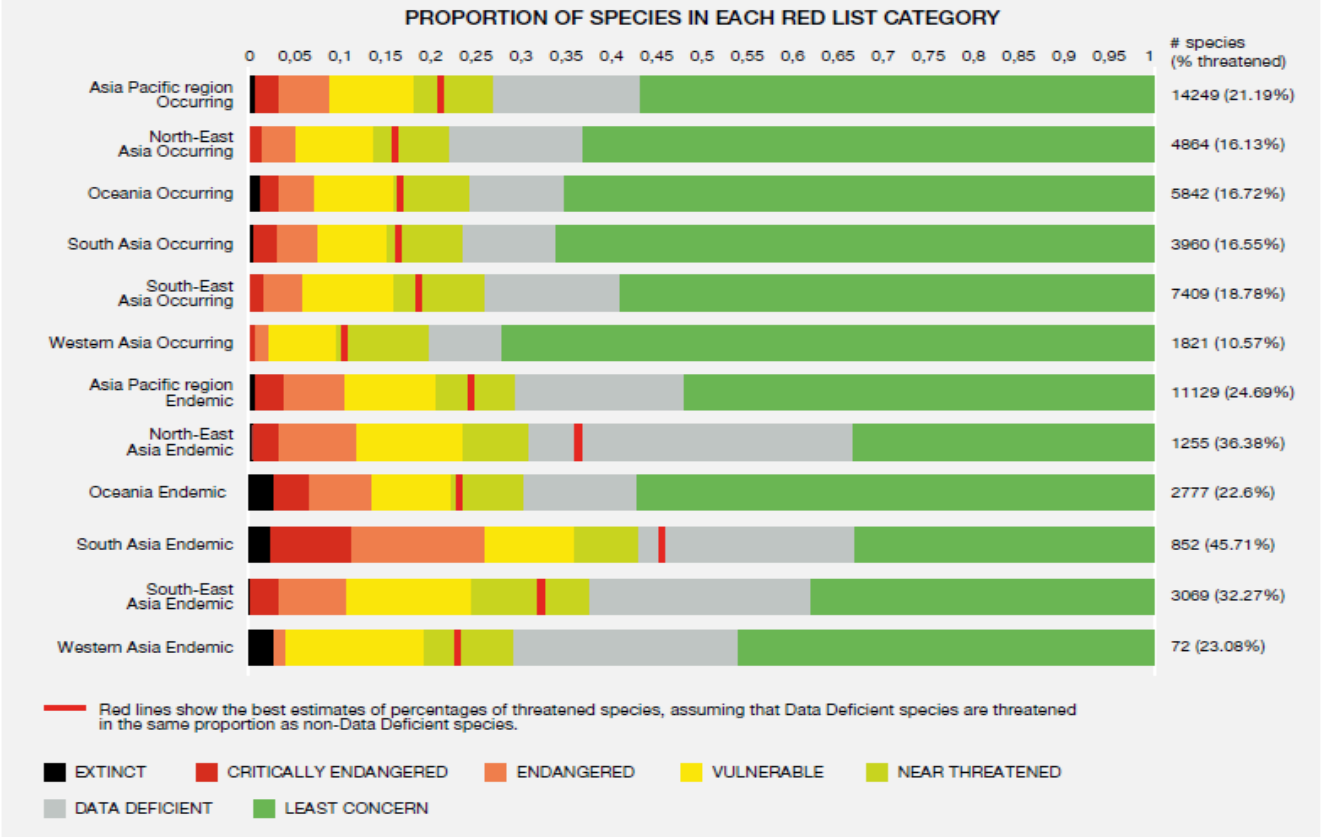
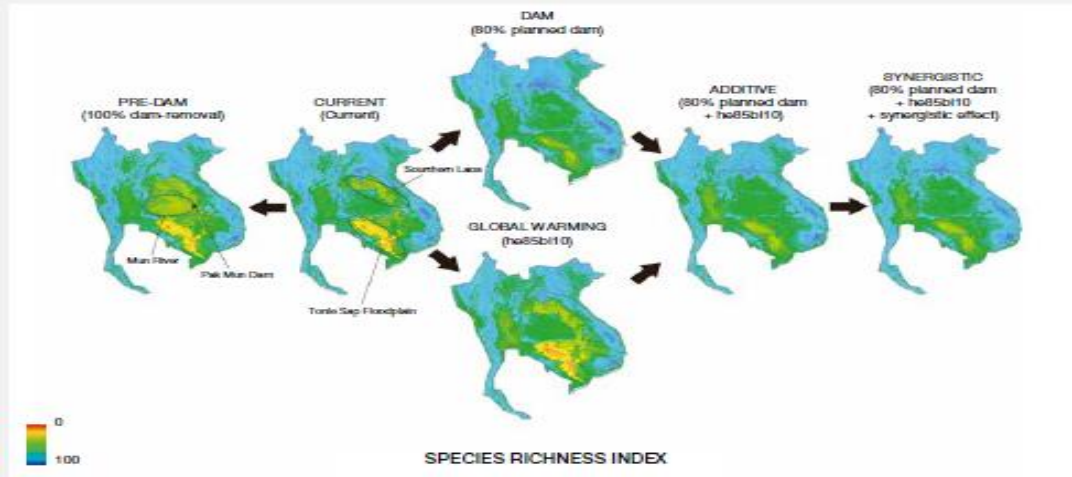


Figure 17: Overall extinction risk of species in the Asia-Pacific region. Data from the IUCN Red List of Threatened Species (IPBES, 2018c)

Transboundary pressures compound the cumulative impacts of biodiversity loss with several degrading drivers interacting. For example, as illustrated in Figure 18 for freshwater fish across the Mekong Basin, located in the Southeast Asian countries of Cambodia, Laos, Myanmar, Thailand and Viet Nam, as well as China. The merging impacts of dam construction and global warming have reduced the mean habitable area, and species richness for freshwater fish, a key livelihood produce, also increasing the proportion of threatened fish species (Figure 18).



Fish biodiversity index	PRE-DAM	CURRENT	DAM	GLOBAL WARMING	ADDITIVE	SYNERGISTIC
Mean species richness index	39.6	37.3	32.8	41.1	36.1	34.2
Mean habitable area index (km²)	637,097	613,626	564,744	586,091	548,480	511,394
Proportion of threatened species	0.0%	4.7%	16.0%	35.0%	39.7%	40.5%

Figure 18: Cumulative impacts of various drivers on freshwater fish in the Mekong Basin with red being the most highly impacted and purple the least (Kano et al., 2016)

3.3.1. Interactions between causes or drivers of biodiversity change and degradation of lands

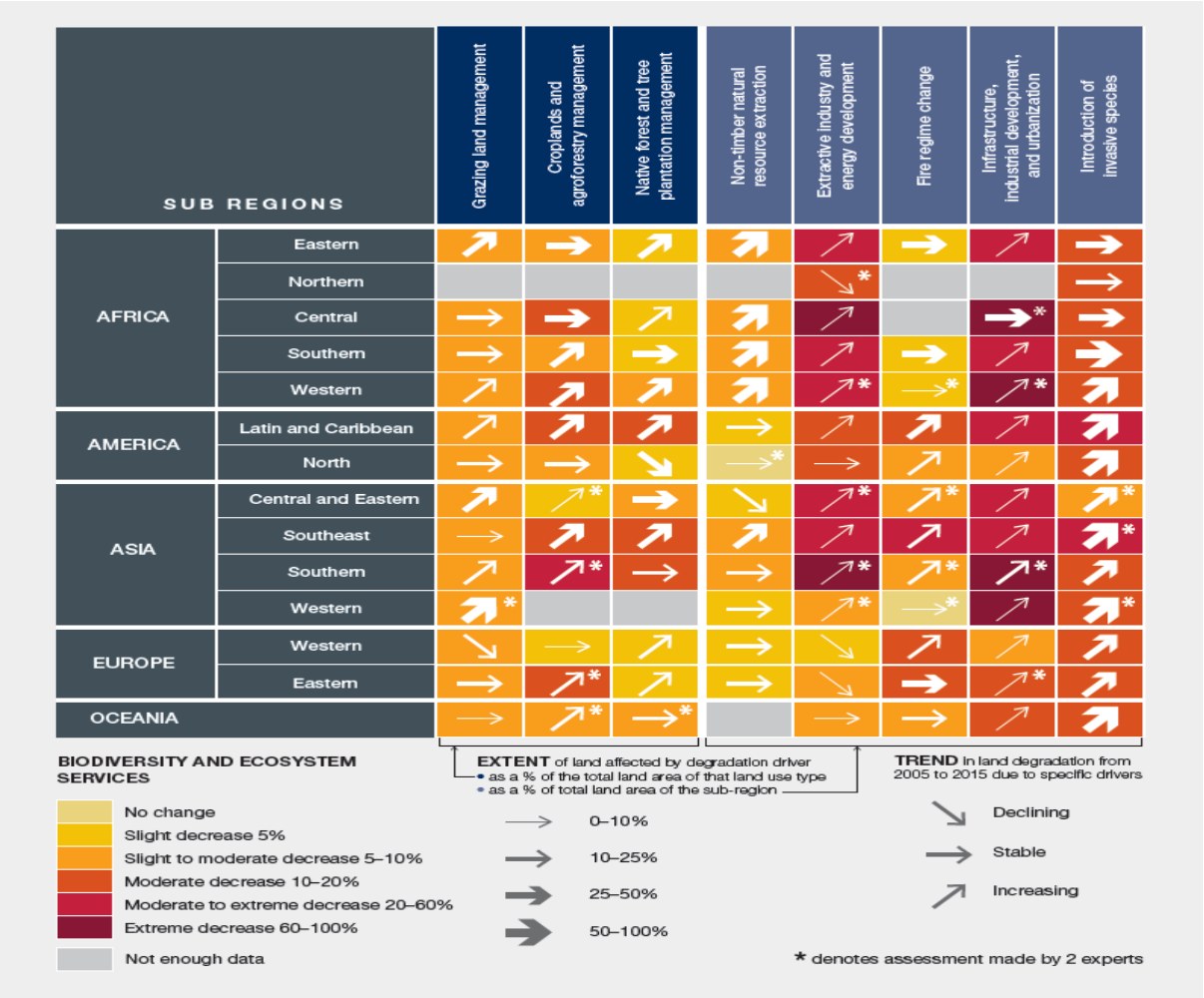


Figure 19: Drivers of degradation, focusing on Southeast Asia (IPBES, 2018b)

The Southeast Asian key drivers of land degradation and the extent of land affected are all increasing, apart from grazing impacts, which remain steady (Figure 19). Habitat loss, degradation and fragmentation are placing habitats and species under pressure, along with unsustainable offtakes from poaching, illegal trafficking and trade, expansion of commercial agriculture, infrastructure, and energy projects. Hence, without urgent attention, many species within Southeast Asia could become extinct in the next few decades. The overall extinction risk for the Southeast Asian region, including comparisons with South Asia and other surrounding regions, is represented in Figure 17 (IPBES, 2018d).

Population growth, economic development and gaps in governance are the main drivers of environmental change led by energy, transport, urbanisation and globalisation, which continue to pose significant pressure on socio-economic systems and the environment. The total population of the Southeast Asian countries in 2015 was 629 million, the third largest after China and India (South Asian country), with almost 50% living in urban areas. The Southeast Asian population is projected to rise to 740 million by 2035, with more than half living in urban areas. In the period of 2010 to 2015, the economy in the Southeast Asian region grew by almost 5% (The ASEAN Secretariat, 2017). From 1990 to 2015, Southeast Asia showed a reduction in forest cover by 12.9%, largely due to an increase in timber extraction, large-scale bio-fuel plantations and the expansion of intensive agriculture and shrimp farms (IPBES, 2018f).

3.3.2. Interactions between key causes or drivers of biodiversity change and degradation by ecosystem type

This subsection sets out evidence at the ecosystem level and elaborates causes of ecosystem decline and their impacts for specific ecosystem types, including forests, limestone karsts, peatlands and mangroves. This background information provides evidence to understand the potential impacts and their causes which may influence the

effectiveness of REDAA ecological projects, and to advance decision making on the most appropriate ecosystems to incorporate into the REDAA programme.

Between 1990 and 2015, forest cover was reduced by 12.9%. If this rate continues in the lowland forests of Sundaland, it is projected that 29% of bird species and 24% of mammals are likely to become extinct. Large areas of tropical rainforests have been replaced by monoculture plantations of oil palm, rubber, and trees grown for pulp or timber. Tree plantations and deforestation are one of the most imminent threats in Southeast Asia, with the Philippines and Indonesia having lost more than 50% of their original forest cover. Biofuel expansion continues to dominate the conversion of forested areas in Southeast Asia. Reservoir construction, wetland drainage, fires, pollution, invasive species, disease and climate change all contribute to the cumulative impacts of forest degradation (McMorrow and Talip, 2001; Sodhi *et al.*, 2010; Margono *et al.*, 2014; Hughes, 2017; Zeng, Gower and Wood, 2018; Erbaugh and Nurrochmat, 2019).

Hunting and trade are a significant threat. Poaching and illegal wildlife trade is rampant in Southeast Asia, which is a key supplier and transit point for the global illicit wildlife trade. This trade often leads to the overexploitation of rare species and the destruction of important habitats (ASEAN Ministers for CITES and Wildlife Enforcement, 2019; SAMM-IWT, 2019; ASEAN Post Team, 2020; Cardoso *et al.*, 2021; Laudari, Pariyar and Maraseni, 2021).

There has been an exponential increase in the demand for cement and marble products in recent decades. Limestone and minerals are exported from mining activities, requiring the development of roads which fragment the landscape. In Southeast Asia, limestone karsts are often found in areas near development and support remnants of ecosystems which previously had wider distributions but have since been lost to development. The major threat to the survival of karst-associated species is quarrying. A conservative figure of globally threatened karst-associated species listed by IUCN as critically endangered, endangered, or vulnerable stood at 143 species and of these, 31 species, approximately 21%, occur in Southeast Asia. In some Southeast Asian countries, karst protection is minimal or non-existent eg. Myanmar and Cambodia, while in Malaysia the majority of the limestone hills are classified as State Forest Land, but do not have protected area status (Clements *et al.*, 2006; Hughes, 2017).

Nearly 80% of natural peatlands in the Southeast Asian region have been deforested and drained, with the majority under plantation and agriculture. Misguided land use policies have resulted in widespread peatland degradation during the past 20 years. Logging, conversion to industrial plantations, drainage, and recurrent fires are the principal causes of peatland degradation in Southeast Asia. These drivers are compounded by a complex mix of indirect socio-economic, policy and climate-change-related factors. Processes leading to peatland development involve modification of both above-ground and below-ground subsystems, an integrated approach that explicitly recognises both subsystems and their interactions as a key to successful tropical peatland management and restoration (Dohong, Aziz and Dargusch, 2017; Mishra *et al.*, 2021). These are critical understandings for REDAA peatland ecosystem projects (Section 5.6).

Most of Southeast Asia's mangroves have suffered from rapid urbanisation, especially in the Philippines, Thailand and Viet Nam. In other areas, anthropogenic pressures and changing climate continue to impact mangroves. Between 2000 and 2012, Southeast Asia lost its mangrove forests at an average rate of 0.18% per year. Harvesting of timber, climate change including rising sea levels, and habitat conversion including for agriculture and urbanisation, have been key drivers of mangrove decline (Jusoff, 2013; Nguyen, 2014; Sidik *et al.*, 2018; Lucas *et al.*, 2021; Phong and Luom, 2021).

3.3.3. Interactions between direct causes and underlying or indirect causes of change

The direct causes of biodiversity loss are interconnected with other underlying causes. This makes for a complex mix of interacting factors to consider when selecting sites for implementation of the REDAA programme in intact ecosystems and with Indigenous peoples and local communities.

Underlying or indirect causes of change include policy, governance systems, institutions and economic influences. As well as biophysical impacts, they have strong negative interactions and impacts on the complex and deep connections which communities have with the living world (Díaz, 2022). Impacts on Southeast Asian socio-ecological systems are increasingly driven by demands from a distance, and decisions made through external economic influencers, governance systems and institutions (Figure 20). Hanafiah et al. (2021) describe the impacts of palm oil plantations in Malaysia on local neighbouring communities' socio, economic, livelihood and poverty deterioration (Mohd Hanafiah *et al.*, 2021).

The REDAA programme will need to develop projects that consider the living world as a connected fabric, to ensure the spotlight of inquiry and actions is broadened, being more focused on intact ecosystems and connections, as well

as being interdisciplinary and socially-inclusive. The outcomes from the REDAA programme will benefit from the inclusion of a wider society into developing new knowledge and spurring effective projects.

Socio-economic and demographic changes are the major contributors to the loss of biodiversity and of nature's contributions to people. Interventions through environmental governance and targeted policies linked to REDAA projects can help to bring an increasing focus to reduce the role that socio-economic changes have in biodiversity loss and ecosystem change. The more critical underlying causes of sociocultural change, such as changes in food preference, behaviour and norms, are leading to the loss of Indigenous and local knowledge and weak governance systems, which in turn are indirectly contributing to the loss of biodiversity. Figure 21 shows the limited impact socio-cultural drivers are currently having on the interactions which are driving biodiversity loss and poverty alleviation across Southeast Asia. Therefore, it is important to deliver REDAA projects in the region that have a strong focus on socio-ecological interactions and governance to work towards overcoming this gap. Such projects will provide a strong focus on human-nature connections and interactions, the inclusion of diverse knowledge systems, and the multiple concepts of the value of nature and its contributions to people, considering formal and informal governance and institutional systems.

Figure 20: Level of influence of direct and indirect drivers on ecosystem services supply in the Southeast Asian Region

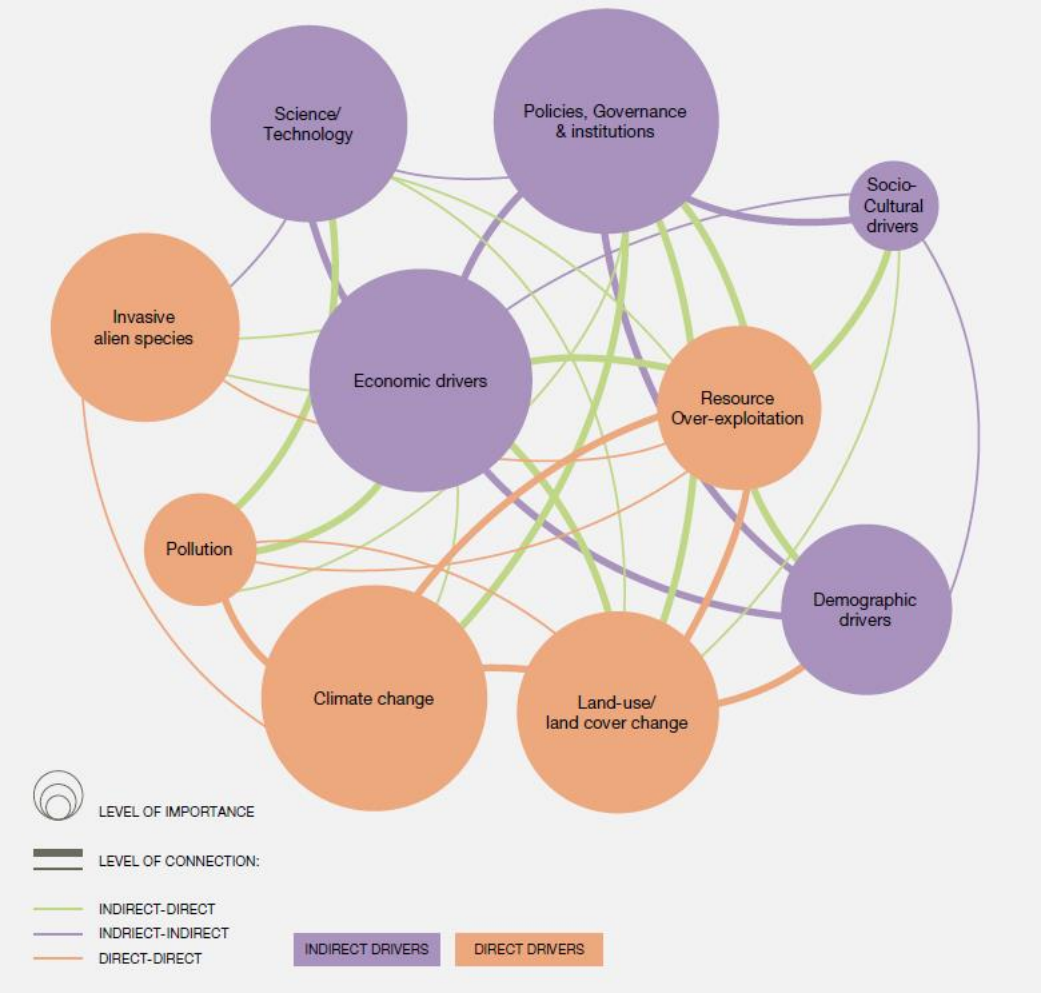


Figure 21: Interactions and relative importance among direct and indirect drivers in Asia

3.3.4. Governance

Many countries in the SEA region have witnessed substantial changes in forest management policies and approaches over the last five decades. During the 1960s and 1970s, policymaking efforts in most countries across the region were oriented towards the national control of forests through stringent laws and the expansion of forest bureaucracy. This approach generally failed, as evidenced by widespread deforestation and forest degradation in many countries during the 1960s through to the 1980s. The negative outcomes of centralisation paved the way for the devolution of forest management responsibility and authority to lower levels of decision making. This resulted in positive outcomes in the conservation of forest ecosystems and has enhanced benefits to the local people in many countries.

Numerous transboundary initiatives have been conducted with mixed success, with the main challenges being a lack of coordination and mistrust between governments, economic, legal and administrative disparities, including different perspectives and expectations on conservation, as well as different capacities (The ASEAN Secretariat, 2016a, 2019).

Improvements to forest and land governance are critical to improving the state of ecosystems and the underlying drivers of degradation across Southeast Asia (Riggs, Langston and Sayer, 2018; Fischer, Giessen and Günter, 2020; Toumbourou, 2020; Sayer *et al.*, 2021).

Actions in different ecosystem types have used differing governance approaches (Loch and Riechers, 2021; Mursyid *et al.*, 2021). While at the national level countries include governance approaches as part of their Convention on Biological Diversity (CBD) National Biodiversity Strategies and Action Plans (NBSAP) (IUCN, 2011; Ministry of Natural Resources and Environment, 2013; Biodiversity Research and Innnovation Centre and Ministry of Industry and Primary Resources, 2015; Ministry of Natural Resources Malaysia, 2016; National Council for Sustainable Development, 2016).

In 2018, Indonesia issued a three-year moratorium on clearing primary forests and peatlands for palm oil plantations and logging. In 2019 this was made permanent. This moratorium is expected to reduce certain business activities, which will have implications for financial institutions directly or indirectly exposed to investments in those activities (McCraine *et al.*, 2019).

Overcoming governance challenges is a key aspect for successful land management approaches for the REDAA programme. Key to solving this challenge is the ability to effectively develop multi-scale and/or multi-sector governance systems which successfully engage different actors, organisations and institutions, all working for the same end.

3.3.5. Land management options and ecosystem restoration

Many land management approaches in Southeast Asia have demonstrated pervasive inequalities related to poverty, gender and exclusion of local and Indigenous communities. The inclusion of marginalised groups, especially women and Indigenous and poor communities, will be particularly critical for effective REDAA projects across Southeast Asia to ensure sustainable management of ecosystems. Projects working with communities who have secure land tenure, will advance opportunities to deliver the desired outcomes of the REDAA programme.

Existing institutional, technical and managerial capacity is often fragmented, uncoordinated, incoherent and differs across countries. Though many packages, case studies on best practice, manuals and guidelines have been developed, their accessibility is limited, and for the REDAA programme this raises concerns about the benefits of developing such approaches. There is also a weakness in mobilising private sector finance for land management actions.

Since the early 1980s, restoration and regeneration of degraded forestlands has been a crucial issue. Forest landscape restoration (FLR) projects have been active across Southeast Asia as they have been in Sub-Saharan Africa. In the 1990s, Viet Nam began two large restoration programmes (Greening the Barren Hills Program and the 5 Million Hectares Reforestation Programme) which resulted in the increase of forest cover from 35.6% in 2000 to 47.6% in 2015 (Food and Agriculture Organisation of the United Nation and RECOFTC Centre for People and Forest, 2016).

There are many and varied approaches to restoration across Southeast Asia, including for differing ecosystem types. Many Southeast Asia restoration projects are large scale, using a top-down approach, with commentary often focused on the development of frameworks to implement effective restoration projects. The focus on frameworks has resulted from misguided land use policy and poor governance (Biswas *et al.*, 2009; Dohong, Aziz and Dargusch, 2017; Budiharta *et al.*, 2018; Begemann *et al.*, 2021; Mishra *et al.*, 2021; Sayer *et al.*, 2021). A case study from Sabah shows how easily concerns on restoration and NBS can be misused for economic gain without the consideration of Indigenous peoples and their land tenure (Box 1).

Box 1: Restoration for Carbon Offsets and nature-based solutions in Sabah, Malaysian State on Borneo

On Oct 28 2021, state authorities signed a 'nature conservation agreement' with a Singaporean firm, Hoch Standard Pty. Ltd., and involving an Australian management consultancy called Tierra Australia.

- *Leaders in Sabah, a Malaysian state on the island of Borneo, signed a nature conservation agreement on Oct 30 with a group of foreign companies for the rights to carbon and other natural capital — apparently without the meaningful participation of Indigenous communities*
- *The agreement, with the consultancy Tierra Australia and a private equity-backed funder from Singapore, calls for the marketing of carbon and other ecosystem services to companies looking, for example, to buy credits to offset their emissions*
- *The deal involves more than 2 million ha (4.9 million acres) of forest, which would be restored and protected from mining, logging and industrial agriculture for the next 100-200 years*
- *But land rights experts have raised concerns about the lack of consultation with communities living in and around these forests in the negotiations to this point*
- *Indigenous and civil society groups have called for more transparency*
- *In response to the public reaction to news of the agreement, its primary proponent, Deputy Chief Minister Jeffrey Kitingan, held a public meeting but has declined to make the agreement public yet.*

Update Feb 10, 2022: *Sabah's attorney general says the consent of Indigenous communities is required for this agreement to move forward.*

> *The Sarawak government is willing to engage with Lun Bawang landowners affected by the proposed Ulu Trusan Protected Forest (UTPF) in Lawas, says Ba'Kelalan assemblyman Baru Bian. The Parti Sarawak Bersatu (PSB) lawmaker said Chief Minister Tan Sri Abang Johari Tun Openg indicated the government's willingness to consult the people to determine the areas that needed to be excised and preserved as well as their native customary rights (NCR) over land.*
>
> *"This is a welcome move and I assured the Chief Minister of my willingness to coordinate a dialogue and consultation between the government and the people of Ba'Kelalan.*
>
> *"This engagement with the landowners is what should have been done before the proposal was made, but it is not too late to do so now, and I wish to thank the Chief Minister for his openness in this matter," he said in a statement after presenting a petition objecting to the UTPF to Abang Johari on Friday (Feb 18).*
>
> *Baru was accompanied by Sarawak Lun Bawang Association president Robin Lusong to hand over the petition, which was signed by more than 1,000 members of the Lun Bawang community whose land would be affected by the UTPF.*
>
> *Also present were state Natural Resources and Urban Development Ministry permanent secretary Datuk Zaidi Mahdi and state Forest Department director Datuk Hamden Mohammad.*
>
> *"Both were amenable to the proposal to engage with the people and I am looking forward to liaising with them on the arrangements," Baru said.*
>
> *Earlier this month, Baru said the proposed UTPF involving an area of 118,163ha would affect about 36 Lun Bawang villages. He estimated that two-thirds of the Lun Bawang community would lose their NCR land if the proposal went ahead.*

https://news.mongabay.com/2021/11/details-emerge-around-closed-door-carbon-deal-in-malaysian-borneo/
https://www.thestar.com.my/news/nation/2022/02/18/baru-bian-sarawak-govt-open-to-discussing-proposed-protected-forest-with-lun-bawang-landowners

The REDD+ Programme has been important in Southeast Asian countries. REDD+ is a framework created by the UNFCCC Conference of the Parties (COP) to guide activities in the forest sector to reduce emissions from deforestation and forest degradation. The programme also works on sustainable management of forests and the conservation and enhancement of forest carbon stocks in developing countries (Mulyani and Jepson, 2013; van Noordwijk *et al.*, 2014; Ituarte-Lima, McDermott and Mulyani, 2014; Bayrak and Marafa, 2016; Kim *et al.*, 2016; Pasgaard *et al.*, 2016; Duchelle *et al.*, 2018; Myers *et al.*, 2018; Cerullo and Edwards, 2019, 2019; Pham Thu *et al.*, 2020; Fischer, Giessen and Günter, 2020). Many of these projects have worked with communities, but many with a focus on policy and land management approaches designed to counteract climate impacts from deforestation and forest degradation, rather than land management itself.

The REDD+ Programme has worked with Indigenous peoples to advance the role of women, reduce poverty and also by training Indigenous peoples to advance their desires, while also advancing justice and equality. (Putz and Romero, 2012; Mahanty and McDermott, 2013; Asia Indigenous Peoples Pact, 2014; Indigenous Peoples Pact and IWGIA, 2014; Bayrak and Marafa, 2016; Bastakoti and Davidsen, 2017; UN-REDD Programme, 2018; Birrell and Godden, 2018; Schroeder and González P., 2019; Sanders *et al.*, 2020; Ken *et al.*, 2020; Poudyal *et al.*, 2020; Soliev *et al.*, 2021; Ramcilovic-Suominen *et al.*, 2021).

Projects implementing NBS in Southeast Asia have not been numerous. However, there is now a growing interest in incorporating NBS into projects across the region (Zeng *et al.*, 2020; Mishra *et al.*, 2021, 2021; Yao *et al.*, 2021). But it's worth noting, as identified in Section 1, Indigenous peoples have concerns about the use of NBS.

3.3.6. Working with Indigenous peoples and local actors

The scoping research has further indicated that projects led and implemented by Indigenous peoples in the SEA region have been highly successful. The Asia Indigenous Peoples Pact (AIPP) is a regional organisation founded in 1992 by Indigenous peoples' movements. AIPP is committed to the cause of promoting and defending Indigenous peoples' rights and human rights, and articulating issues of relevance to Indigenous peoples. The AIPP has 46 members from 14 countries in Asia with 18 Indigenous peoples' national alliances/networks (national formations), and 30 local and sub-national organisations. Of these, 16 are ethnic-based organisations, six focus on Indigenous women, four are Indigenous youth organisations and one is an organisation of Indigenous persons with disabilities[11]. The AIPP has a strong Environment Programme and works with many Indigenous peoples and their organisations, aid programmes and other donors on projects across Southeast Asia and coordinates the recently established Indigenous Knowledge and Peoples of Asia (IKPA). Examples of projects that have had a strong focus on climate change, climate mitigation, including REDD+ projects and women's advancement and justice are included here (Indigenous and Pact, no date; Indigenous *et al.*, no date; Ministry of Rural Development Royal Government of Cambodia, 2010; AIPP, 2012, 2015c; Asia Indigenous Peoples Pact, 2013, 2015b, 2015a, 2020, 2021, no date; AIPP, 2015b, 2015a; Asia Indigenous Peoples Pact, 2012; UN Women, Asia Indigenous People's Pact and European Union, 2013; Asia Indigenous Peoples Pact and European Union, 2014; Asia Indigenous People's Pact and European Union, 2014; Asia Indigenous Peoples Pact and IWGIA, 2015; Indigenous People's Pact, 2015; Pact and IWGIA, 2015; Asia Indigenous People's Pact and IWGIA, 2015; Asia Indigenous People's Pact, 2018, no date; Asia Indigenous People's Pact and Oxfam, 2018; Knapman and Leth, 2020; Back, 2021; Network of Indigenous Women in Asia and Asia Indigenous People's Pact, 2021; Sverige and Asia Indigenous People's Pact, 2021). These projects have all been highly successful, with a key ingredient for their success being that they have been led and implemented by Indigenous peoples from across the region.

[11] Please see https://aippnet.org/ for more information.

Figure 22: Working with Indigenous women in the forests of Myanmar to advance their equality, livelihoods and financial independence, alleviate poverty and advance their independence Photo: Judy Fisher

An AIPP-led project worked with women and forest management teams in both Viet Nam and Myanmar to advance Indigenous peoples' rights in REDD+ and strengthen Indigenous peoples' forest management and livelihoods (Figure 22). This project, led by local Indigenous communities, demonstrated outstanding achievements as the communities gained influence and understanding of forest management. Women gained financial independence and self-confidence, as well as respect from men, as they learned about their rights, forest management and collaboration with government forest departments. Poverty levels were reduced significantly through the financial independence of women, which they did not have prior to the project (Fisher, 2019). These findings on the important role of women has been advanced by the International Working Group on Indigenous Affairs Report on the significant role women can play in Myanmar as leaders in climate change solutions (Knapman and Leth, 2020).

Several community-based land management projects have also been implemented across Southeast Asia, specifically in forests. Many have taken socio-economic approaches, working with local communities and Indigenous peoples. The Satoyama Initiative is well aligned with the focus for REDAA project implementation. Dealing with socio-ecological approaches across land and seascapes, the project uses multiple approaches, and aims to advance traditional knowledge, collaborative governance, local contexts, integration of biodiversity, multi-stakeholder platforms and empowerment of local communities. While the focus of Satoyama projects may not be the same as the REDAA programme, they use similar approaches. Examples of Satoyama projects in Thailand and other Southeast Asian countries may be relevant for consideration in developing REDAA project design (GEF-Satoyama Project, 2018; Wekesa and Ndalilo, 2018).

In a comparison of community-based management projects in Myanmar, Bhutan (South Asia), Nepal (South Asia) and India (South Asia), effective governance was seen to be particularly important to the success of these projects. Each project used different governance approaches, with Myanmar and Bhutan projects rated highly on local governance, but not so well at higher levels. The importance of good governance for successful outcomes cannot be underestimated (Mutoko, Hein and Shisanya, 2015; Maraseni *et al.*, 2019). Socio-ecological approaches are an important aspect of community-based forestry management, with local communities being in control and having ownership over such projects (Nhem, Lee and Phin, 2018; Nhem and Lee, 2019).

Despite the significant role Indigenous women play in sustainable forest management through support of their family and community, they also face serious challenges. Outcomes on the investigation of Indigenous women's roles in regions across the Mekong countries of Cambodia, Viet Nam and Myanmar found Indigenous women face serious challenges such as insecurity of land tenure and land conflicts with private companies and the government; non-

recognition and weakening of the role of women and traditional knowledge in forest management; heavy workloads; the absence of women's participation in decision making; and forest degradation due to logging activities and economic trade-offs and land concessions (Asia Indigenous People's Pact, 2013).

The tradition of Indigenous and Community Conserved Areas (ICCAs) — managed and guided by traditional knowledge, belief systems and local customary laws — has contributed significantly to conservation and livelihood promotion in Southeast Asia. By incorporating local communities and traditional knowledge into the development of techniques and approaches, steps taken to reduce degradation and improve livelihoods are far more likely to have long-term benefits. This is when accompanied by scientific evidence bases incorporated into social and environmental costs/benefits analysis of proposed solutions, compared with conventional approaches.

In the Philippines archipelago, the ICCAs complement the formal protected area network as an instrument for conserving the nation's key biodiversity areas. The value of such networks was evident in the aftermath of December 2011's cyclone. In Mindanao, the watersheds protected by the heavily forested ancestral domains of the Indigenous peoples in the Mount Kalatungan range were impacted far less than the developed watersheds, which experienced huge mudslides, with villages destroyed and hundreds killed (IPBES, 2018f).

3.3.7. Cultural practices

Value systems are strong and vary across Southeast Asia. It is very important to understand the value systems of participants when developing projects for the REDAA programme. Some prioritise individual rights while others prioritise collective and/or community functions (Díaz *et al.*, 2015). Likewise, the ways in which value orientations and beliefs influence people's perceived benefits and actual behaviours vary across different cultural contexts.

In Thailand, the Karen people's reverence and connection with the forests is expressed by tying the umbilical cord of a newborn baby to a tree to establish a mutual connection between them and nature. It is prohibited to cut down that tree, resulting in the protection of some of the village's trees. These forest-centred values are represented in their local saying, 'No forest, no life', which demonstrates recognition that their life depends on the ecosystem functions and services of the forests.

In Indonesia, the 'Dayak Jalai' people have coexisted in harmony with nature for thousands of years, in the forbidden rainforests (Tana Olen) of East Kalimantan, Borneo. They believe that the entire universe is ruled by God, who has a soul and spirit that must be maintained and respected. Therefore, human beings are required to request permission from God for the use of nature. This approach has helped to maintain the relationship between people and nature, resulting in people rarely selling their land.

In the Philippines, a large population follows the Catholic religion. Pope Francis's Laudato Si (2015) refers to the earth as a common home like our sister and our mother. The text says harming the environment is equal to damaging familial relationships, while forgetting our interconnectedness with the earth (Davies, K. et al, 2018).

The concept of 'living in harmony with nature' has, throughout history, been fundamental to the culture and livelihoods of Indigenous peoples. 'Animism' is an integral worldview of many Indigenous peoples, where it is believed that 'soul' or 'spirit' is attributed to all things. Animism emphasises that humans, nature and the supernatural comprise a functional, spiritual, and moral unity through their interconnectedness and interdependence. People hold respect, reverence and reciprocity with nature, as expressed in symbols, myths, and rituals (Davies, K. et al, 2018).

In ancient Hindu scriptures and seers, a Hindu way of life allows the use of natural resources but does not support control or dominion over nature and its elements, and so the exploitation of nature for selfish gain is considered sacrilegious. Living in harmony and respect for nature is therefore ingrained in the society through traditional values and religious belief systems that helped shape peoples' attitudes towards nature (Davies, K. et al, 2018).

For the REDAA programme, it is important to be aware of and consider the differing cultures and values of the communities with which the programme works and incorporate these into best practice socio-economic approaches to working with people.

3.3.8. Economics value of biodiversity in SEA

A number of economic valuations have been conducted by local researchers across the SEA region, with some recent examples provided here (Kyophilavong and Sarne, 2019; Nabangchang and Sarne, 2019; Phanith and Sarne, 2019; Shahwahid and Sarne, 2019). Figure 23 identifies nature contributions to people by ecosystem type for Southeast Asia (IPBES, 2018f).

Subregion	Country	Type of nature's contributions	Ecosystem type/Biome	Value Type
North-East Asia	Japan	Non-material benefits (Cultural)	Shinto Shrines and Satoyama Landscapes	Socio-economic
	China	Material and non-material benefits	All ecosystems	Economic
South-East Asia	Indonesia	Material and non-material benefits	Forests	Economic and socio-cultural
	Singapore	Material and non-material benefits	Coastal	Relational
	Philippines	Non-material (traditional)	All ecosystems	Socio-economic
	Vietnam	Material and non-material benefits	Forest, crop	Socio-economic
Western Asia	Jordan	Material and non-material benefits	Forests and Oases	Economic
		Regulating water flows	Range	Economic
South Asia	India	Material and non-material benefits	Lakes	Biophysical and socio-cultural
	Bhutan	Material and non-material benefits	All ecosystems	Economic

Figure 23: Nature's contributions to people by ecosystem type in Southeast Asia (IPBES, 2018f)

A study has been conducted into the potential size of financing gaps for protected area management across the ASEAN Member States (AMS). The gaps vary between AMS and protected area sites. Annual funding gaps for AHPs in Cambodia, Laos and Myanmar were estimated to be on average US$1.4 million, US$800,000 and US$1.25 million respectively, for the next ten years. In these three AMS, the current government spending on protected areas is far from being able to meet these needs, amounting to only US$16.4, US$1.5 and US$41 per km^2/year in Cambodia, Laos and Myanmar, respectively.

Between 2015 and 2019, multi-lateral and bilateral government donors, foundations and funds, and others, invested around US$700 million in biodiversity-related projects in Cambodia, Laos, Myanmar, Thailand and Viet Nam. Viet Nam and Laos received the most — US$230 million and US$160 million respectively — while US$200 million was spent on regional initiatives, with the other countries each receiving less than US$100 million. However, of this total investment, only US$72 million (approximately 10%) was invested directly in protected areas (Mather, 2021). There is a key problem stemming from the use of funds at higher and administrative levels and not reaching the on-ground ecologies and people for which they were originally intended.

3.3.9. Least developed and low- and middle-income countries

Southeast Asia is made up of 11 countries: Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste, and Viet Nam. Of these, all except Brunei Darussalam are eligible ODA countries.

Table 6: Least developed countries and their income levels in SEA

Region	Least developed countries	Lower-middle income countries	Upper-middle income Countries
Southeast Asia	Cambodia	Indonesia	Malaysia
	Laos (LM)	the Philippines	Thailand
	Myanmar (LM)	Viet Nam	
	Timor-Leste (LM)		

4. South Asia

4.1. Introduction

The Intergovernmental Science Policy Assessment of Asia and the Pacific (IPBES) recognises the South Asian (SA) countries as Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan and Sri Lanka. South Asia houses approximately 15.5% and 12% of the world's flora and fauna respectively. South Asia covers 5 million km^2 and is bounded by the Indian Ocean in the south and the Himalayan mountain range in the north (Patra *et al.*, 2013). The faunal diversity of the region consists of 933 species of mammals, 4,494 birds, 923 reptiles, 332 amphibians and 342 freshwater fishes. Endemic species in some sub-regions face an extinction risk as high as 46% of endemic species in South Asia. The status of the fauna and flora of the region has not been assessed comprehensively in the last decade, so there is limited knowledge of the biodiversity across the region (IPBES, 2018f). Of the 25 biodiversity hotspots identified by Myers *et al* in 2000, one is in the South Asia, the Western Ghats/Sri Lanka, which is also one of eight of the hottest hot spots in terms of all the factors combined (Table 7) (Myers *et al.*, 2000).

Table 7: Details on the South Asian biodiversity hotspot - Western Ghats/Sri Lanka (Myers *et al.*, 2000)

Hotspot	Original extent of primary vegetation (km2)	Remaining primary vegetation (km2) % of original extent	Area protected (km2) % of hotspot	Plant species	Endemic plants % of global plants (300,000)	Vertebrate species	Endemic vertebrates % of global vertebrates (27,298)
Western Ghats/Sri Lanka	182,500	12,450 (6.8)	12,450 (100.0)	4,780	2,180 (0.7%)	1,073	355 (1.3%)

More than 40% of the world's poor live in South Asian countries and 51% of the population is food-energy deficient (Ahmed *et al.*, 2007). More than 20% of the people live in extreme poverty, including those countries with large populations — Bangladesh, India and Pakistan — and Nepal, which has a smaller population. South Asia is highly vulnerable to climate-related disasters, which have most affected poor and vulnerable communities who have least capacity to adapt to these changing conditions (IPBES, 2018d). Likewise, South Asia is one of the most water-stressed areas across the Asia-Pacific region and has the highest annual water withdrawal of the world's regions. Geographic scale and population size, coupled with extensive irrigation practices are responsible for the high demand on water in South Asia. India has had a decline in the per capita availability of water as a whole from 5,177 m^3/year in 1951, to 1,588 m^3/year in 2010 (CWC, 2010).

Economic drivers in South Asia, particularly changing lifestyles and consumption patterns, expansion of biofuels, increasing demands for biofuel, palm oil and agriculture products due to expanding urban population, are likely to further intensify competition for land in South Asia. Alongside land competition, the quality of water is expected to continue to deteriorate across the major river basins in South Asia, impacting freshwater biodiversity (IPBES, 2018f).

South Asia has had an increase in forest cover of 5.8% through policies and instruments such as joint participatory management, payment for ecosystem services, and the restoration of degraded forests. This positive change in forest cover is attributed to the enabling policies of governments reducing deforestation and promoting afforestation and restoration. Despite this increase in forest cover, biodiversity is still at risk (IPBES, 2018f).

Table 8 below sets out the specific recommendations for REDAA for SA based on the scoping:

Table 8: Region-specific recommendations: SA

South Asia: key recommendations for REDAA	
1	**The SAARC Cultural Centre provides a useful entry point for REDAA coordination in the region -** Based in Sri Lanka, the Centre is relevant to the REDAA programme and stands for strengthening

South Asia: key recommendations for REDAA	
	regional cooperation and understanding by evoking “Unity through Cultural Integration and intellectual dialogue” (Charter for SAARC) while restoring, preserving, promoting and appreciating the value of art and culture to generate Cultural Identity.
2	**To effectively implement REDAA restoration projects it is important to understand the causes of degradation at the site level –** REDAA programming must focus on developing this understanding across SA to ensure successful projects. This is particularly true given the great variety in the different types of ecosystems.
3	**For restoration projects, an intersectional adaptive governance lens that includes the perspectives of local actors is recommended across the project cycle** – Restoration projects must include consideration of the local context, centre local people in formulating, designing and implementing landscape restoration projects. The inclusion of intersectional overlays of caste, class, and gender influence how decisions are made, and are important to include in the development phases of projects. Other important factors for consideration include justice, attending to power, politics and equity. The weighting of importance and their exact configuration within a REDAA project will be contingent on the context of the project.
4	**The REDAA programme should develop projects that are led and consented to by Indigenous peoples** - Indigenous peoples have twin vulnerabilities to the impacts and potential solutions to climate change. For this reason, if the REDAA programme were to develop local scale nature-based solutions projects, it will be important to establish a co-designed methodology. This should determine on whose territories projects are conducted, the desired outcomes — particularly in terms of the project’s ability to implement climate change policy — and with the rights of Indigenous peoples at the core of the decision making and implementation. Land management approaches with strong local governance arrangements, such as co-management and collaborative governance, will bear high relevance for SA where decentralised solutions are projected to secure the best possible future for biodiversity.

4.1.1. Institutional context

South Asia has a regional co-operative body called The South Asian Association for Regional Cooperation (SAARC), which was established with the signing of the SAARC Charter in Dhaka on 8 December 1985. SAARC comprises eight Member States: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The Secretariat of the Association was set up in Kathmandu on 17 January 1987.

The SAARC has several areas of co-operation, with the environment, climate change and natural disasters being those relevant to the REDAA programme. This is supported by a Technical Committee on the Environment with its mandate being environment, climate change, forestry and natural disasters. The Technical Committee follows up on the implementation of decisions taken by SAARC Charter Bodies and the SAARC Environment Ministers. A number of plans have been developed by this Technical Committee (SAARC Environment Ministers, 1998, 2007, 2009, 2010; SAARC Ministerial Meeting on Climate Change, 2008; Member states of the South Asian Association for Regional Cooperation, 2010).

The SAARC Cultural Centre based in Sri Lanka is relevant to the REDAA programme and stands for strengthening the regional cooperation and understanding by evoking “Unity through Cultural Integration and intellectual dialogue” (Charter for SAARC) while restoring, preserving, promoting and appreciating the value of art and culture to generate Cultural Identity[12].

[12] See http://saarcculture.org/2020/05/25/directors-message-2/

4.2. Implementing a multifunctional ‘scape approach – evidence review

This section provides an evidence review of the current ecological knowledge to make informed decisions on those intact ecosystems which are most appropriate for the implementation of the REDAA programme, using a multifunctional ‘scape approach.

South Asia experiences dry seasons, with no rainfall during autumn, winter and spring, whereas the region receives about 70% of total annual precipitation during summer (June to September) (Patra *et al.*, 2013). Climatic conditions vary from arid in the west to humid in the east, and temperate in the north to tropical in the south. Elevation ranges from sea level in peninsular south India to 8,500m in the Himalayas. Elevation gradients are associated with steep temperature gradients and a variety of soil types and topographies. South Asia's topography consists of mountain ranges, plateaus, dry regions, river basins and humid regions.

This complexity of environmental conditions has resulted in a rich diversity of ecosystems (Ramankutty *et al.*, 2010) (Figure 24), including deserts and grasslands in the northwest, savannas on the Indian peninsula, tropical deciduous and evergreen forest in the Western Ghats and eastern India, and lowland and montane forests in the lower Himalayas. The region hosts five of the 14 major ecological regions of the world. These regions harbour different ecosystem types, which are the result of unique combinations of abiotic factors including climate, geology, soil and diverse topography. The forest ecosystems include tropical and subtropical wet broadleaf forests, tropical moist deciduous forests, tropical rain forests, tropical wet evergreen forests, tropical moist forests, tropical dry forests and tropical thorn forests (Roy, Behera and Murthy, 2015).

Due to the complexity of these natural ecosystem, and often limited information, it is challenging to provide information for each ecosystem type. Determining ecosystem boundaries is difficult due to strong climatic gradients which juxtapose different ecosystems (Roy S. S., 1977; Olson and Dinerstein, 1998; Roy and Tomar, 2000; Olson, Dinerstein and Wikramanayake, 2001; Agrawal *et al.*, 2003; Roy, Padalia and Chauhan, 2005; Roy, Joshi and Singh, 2006).

Non-forested areas like grassland, savanna, barren and shrubland account for 0.35 million km^2, 0.22 million km^2, 1.5 million km^2 and 0.89 million km^2, respectively. Forested areas are classified as broadleaf evergreen, broadleaf deciduous and mixed coniferous and account for 0.11 million km^2, 0.10 million km^2 and 0.05 million km^2, respectively (Patra *et al.*, 2013).

About 18.6% of the total land area is still covered by forest, which accounts for 1.98% of the total forest area in the world (http://www.fao.org/docrep/004/y1997e/y1997e0s.htm#fn39). In India, 21% of the area is classified as forest (Forest Survey of India, 2017) with tropical forests accounting for approximately 86% of the forested area (Singh and Singh, 1988).

Due to these complexities, and limited knowledge in many areas, this section covers the main ecosystem types of South Asia, which provide consistency with the SSA and SEA regions[13].

[13] For the purposes of the REDAA programme, mangrove, marine and coral reef ecosystems will not be considered. Although mangrove and coastal ecosystems are important in delivering the aims and objectives of the REDAA programme, they will not be included in the programme as significant investments are currently occurring in these ecosystems.

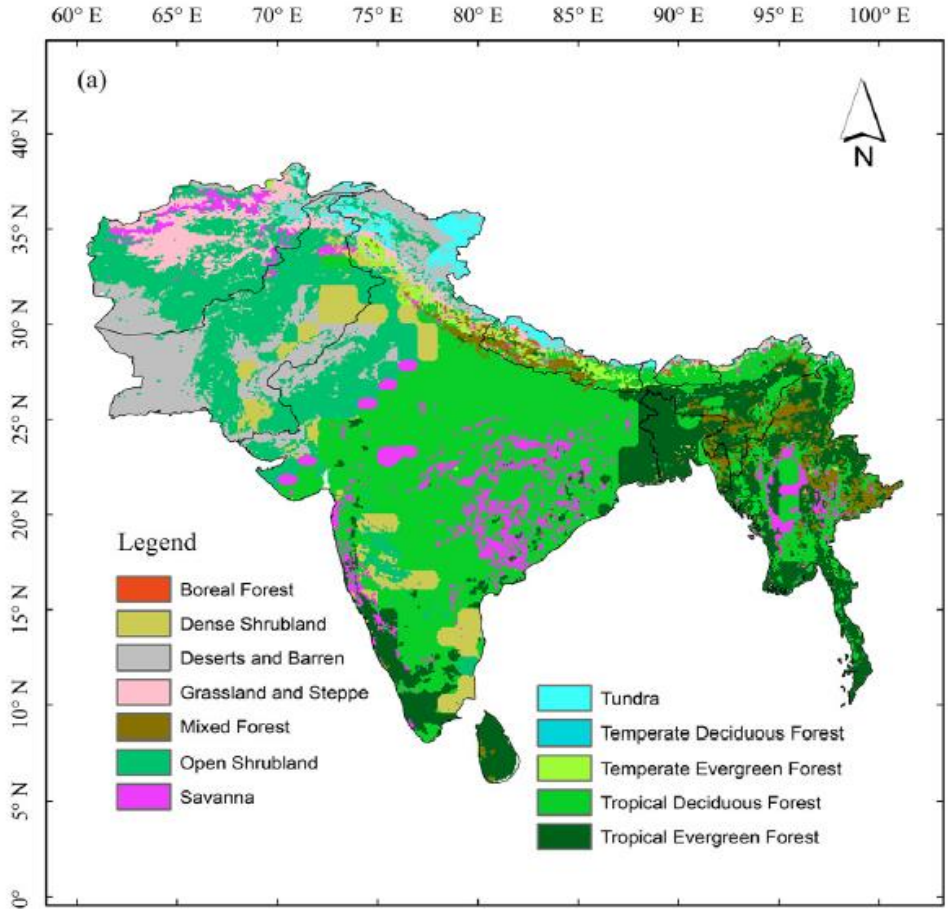


Figure 24: Major ecosystem types of South Asia (ISLSCP-II, Ramankutty et al., 2010)

4.2.1. Tropical deciduous forests

Tropical deciduous forests cover the major portion of South Asia's forested area and comprise both dry and moist deciduous forest (Figure 24). These forests are found in southern India (Deccan region), Western Himalayas and along the Western Ghats. Tropical dry deciduous forests occupy 34.8% and tropical moist deciduous forests occupy 33.19% of the total forest cover in India (Reddy *et al.*, 2015). Dry and moist deciduous forests have different successional strategies in response to water and light availability (Lohbeck *et al.*, 2015).

4.2.2. Tropical evergreen forest

Tropical evergreen forest is found in the northeast of India, Western Ghats, Tamil Nadu coast, Lakshadweep, Andaman and Nicobar, Bangladesh and the lower foothills of Nepal (Figure 24). Indian tropical evergreen forests are divided into wet and dry evergreen forest. Dry evergreen forests receive less rainfall (< 2,000mm) than wet evergreen forests (< 2,000mm). Tropical dry evergreen forests occur as patches and are short-statured and largely three layered with a sparse and patchy understorey (Joshi *et al.*, 2006; Reddy *et al.*, 2015).

4.2.3. Temperate montane forests

Temperate montane forests are found in the Himalayas at altitudes ranging from 1,800 to 4,000m where humidity and temperature are low. Himalayan ecosystems are projected to be extremely sensitive to future climate change (Chaturvedi *et al.*, 2011). Temperate forest has been broadly classified into moist temperate and dry temperate forest. In Himalayan moist temperate forest, annual rainfall varies from 1,500mm to 2,500mm. Due to the high elevation, the Himalayan region experiences an alpine and tundra-like climate which is suitable for sub-alpine forests. Sub-alpine forests are found throughout the Himalayas from Ladakh in the west to Arunachal Pradesh in the east at the altitude

from 2,800m to 3,800m. These forests receive < 650mm mean annual precipitation (Joshi *et al.*, 2006; Reddy *et al.*, 2015).

4.2.4. Thickets and thorny forest

Thickets and thorny forests are open forests dominated by thorny, hardwood species. They are mostly found in arid regions in the north-west of South Asia extending into Pakistan and Deccan where the mean annual rainfall is <700mm. Acacias, palms, euphorbias and invasive cacti are common in these areas. Trees are scattered, do not grow beyond 10m and have deep roots in order to access moisture in deep soil layers (Kumar and Scheiter, 2019).

4.2.5. Savanna

Savannas are mixed tree-grass systems with a discontinuous tree layer in a continuous grass layer (Scholes and Archer, 1997). Savannas are often maintained through herbivory and frequent burning, which leads to the formation of savanna mosaics. Small differences in soil, topography and climate can determine whether savanna or dry forest occurs in a particular area (Kumar and Scheiter, 2019).

4.2.6. Shrubland

Shrubs form an important component of various vegetation formations in South Asia. Shrublands are found in the semi-arid regions, especially in Afghanistan, Pakistan, the western and southern part of India. The distribution of rainfall patterns is the most important factor that determines shrub cover, although shrublands occupy different geological formations and soil types (Dakshini, 1989).

4.2.7. Grassland

Grasslands occupy nearly 24% of the area of South Asia in several biogeographical regions. Grasses predominate, along with forbs with a wide range of ecological characteristics. Woody plants are either absent or present in low densities. Grasslands dominate in the areas of low to moderate annual precipitation, drought, extreme temperature fluctuations, relatively shallow soil, fire and grazing (White *et al.*, 2000; Kumar and Scheiter, 2019). Grasslands occur in a wide range of eco-climatic conditions, such as flood plains of Gangetic and Brahmaputra in India and Nepal (Peet *et al.*, 1999).

4.2.8. Bamboos

There are approximately 1,500 known species of bamboo worldwide. In India, bamboo forests cover about 14 million ha of land, with 125 indigenous and 11 exotic bamboo species. Bamboos are widely distributed in temperate and tropical regions of South Asia. It is one of the fastest growing plants with a daily growth rate of 30 to 120cm. Bamboos are an important carbon sink and have high carbon sequestration potential (Kumar and Scheiter, 2019).

4.2.9. Alpine ecosystems

Alpine ecosystems include alpine moist and dry meadows, moist and dry scrub, and steppes of Iran, Pamir, Hindu Kush Himalayan region, Hengduan, Tian Shan and Altai. Besides the outstandingly rich biodiversity and endemism in the Himalayan alpines, especially in its eastern part as shown for vascular plants, plant diversity of the upper vegetation belts is often composed of a high degree of locally endemic species in other areas, such as the mountains of Iran. Most alpine areas are intimately linked with local culture and tradition and provide bio-cultural services. Many sacred mountains are found in the alpine regions. However, especially in the Himalayan region, the alpine habitats are rapidly changing due to anthropogenic and climatic drivers (IPBES, 2018f).

4.2.10. River systems and wetlands

South Asian river systems are important (Figure 14). The Himalayan mountain ranges are characterised by glacier-fed river systems. Biodiversity across freshwater ecosystems of the Eastern Himalaya region is especially diverse and important to local communities. There is a lack of readily available information on the status and distribution of freshwater biodiversity, its ecological significance and connections to human health and wellbeing. The eastern Himalaya and adjacent flood plains including Ganges–Brahmaputra, Chinwin–Irrawaddy and Kaladan/Kolodyne catchments represent freshwater turtle diversity hotspots, and freshwater fish (Allen, Molur and Daniel, 2010). The centres of richness are the Tista, Kameng, Dikrong, Subansiri and Siang basins of the Ganges–Brahmaputra system.

The critically endangered sawfishes are primarily threatened through overfishing. Further critically endangered species are snow trouts (Schizothorax spp.), endemic to Lake Rara in Nepal, where they are threatened by overfishing, pollution and siltation (Darwall and Freyhof, 2015). India has a distinct freshwater fish fauna. In Iran (and probably in surrounding countries too), the endemism rate of freshwater fish is relatively high, roughly 30%, due to the isolated character of several freshwater basins (IPBES, 2018f). Wetlands occur across South Asia, and as in many places, are not given the due attention they deserve for the enormous benefits they can provide to biodiversity and nature's contributions to people.

4.2.11. Deserts

Deserts make up a significant area within South Asia, particularly in India (Figure 25). They are often impacted by overgrazing of domestic livestock and the introduction of fast-growing invasive species, which impact listed biodiversity species and medicinal plants (IPBES, 2018f).

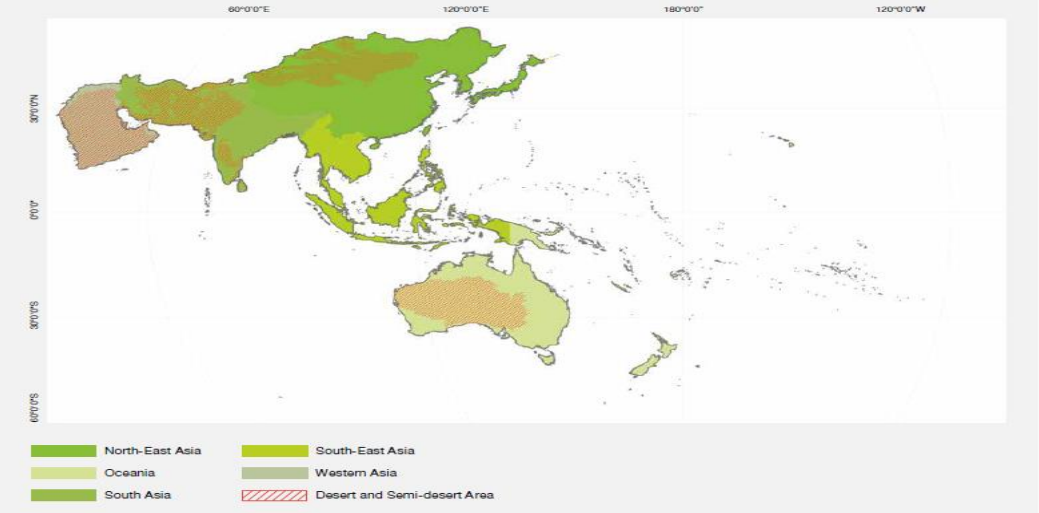


Figure 25: Desert and semi-desert areas within South Asia (Olson et al., 2001)

4.2.12. Transboundary matters

The International Centre for Integrated Mountain Development is facilitating transboundary conservation and development programmes in the Hindu Kush Himalayan region with cooperation from its regional member countries. Seven landscapes are considered; the Wakhan, Karakorum-Pamir, Kailash Sacred Landscape, Everest, Kangchenjunga, the Far Eastern Landscape and Cherrapunjee-Chittagong have been identified across west to east extent of the Hindu Kush Himalayas. Of these, Karakorum-Pamir, Kailash, Kangchenjunga and Far Eastern Landscape are in various stages of implementation by member countries through regional cooperation frameworks, with a strong focus on developing a knowledge base for informed management and policy decisions on landscape conservation and development. These initiatives are expected to enhance strong regional cooperation for economic development and environmental conservation, and provide science-based evidence to policy and practice forums at national and regional levels (IPBES, 2018f).

4.3. Causes or drivers of biodiversity change

Predicted biodiversity loss in terms of mean species abundance under different scenarios is represented in Figure 26. Irreversible biodiversity loss in terms of mean species abundance (MSA) is anticipated in South Asia. South Asian countries have the greatest number of threatened species and the fastest increase in extinction risk in the Asia-Pacific region, resulting in a loss of unique South Asian natural and cultural heritage (Figure 27). South Asia has the highest number of critically endangered species and 46% threatened endemic species of all regions, and the smallest number of species falling in the species of least concern category (Figure 27).

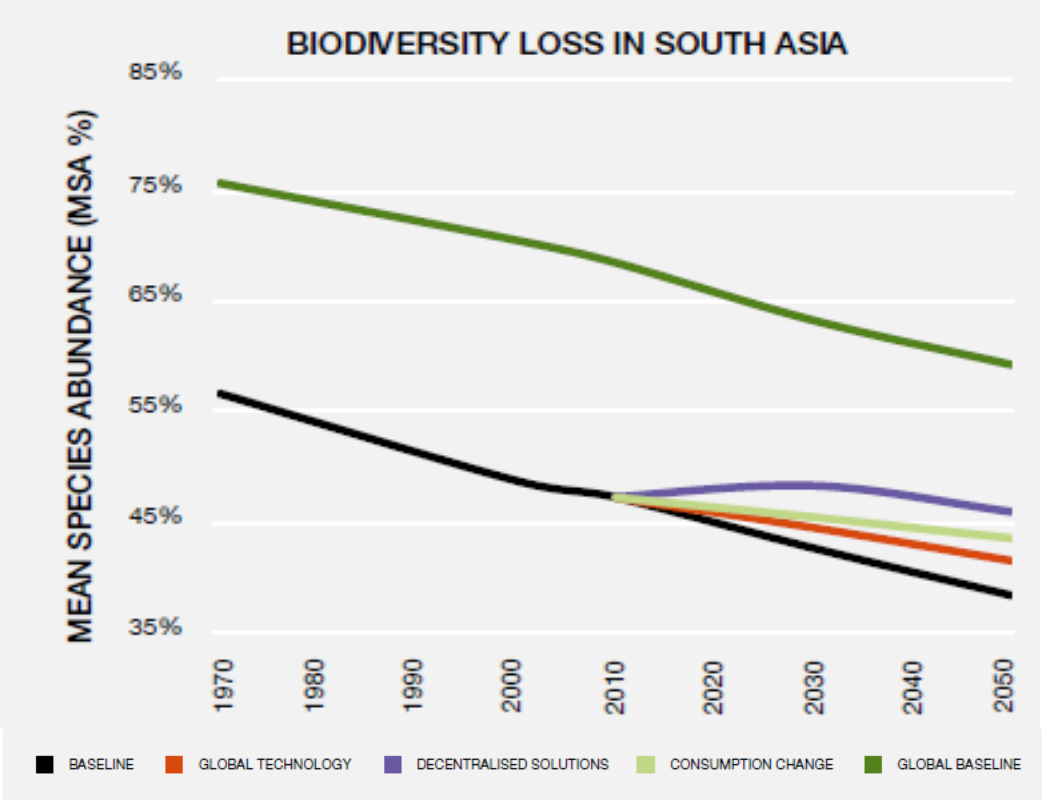


Figure 26: Predicted biodiversity loss for South Asia under different scenarios in terms of mean species abundance. Data source: (PBL Netherlands Environmental Agency, 2012; Secretariat of the Convention on Biological Diversity, 2014) (IPBES, 2018d)

Biodiversity loss is predicted to be lowest under the 'Decentralised Solution' scenario in South Asia. The most significant pressure driving biodiversity loss is crop production in South Asia (Figure 26). Decentralised solutions involve local and /or regional initiatives for biodiversity protection, energy, agriculture production with environmental consideration and policy interventions which support equitable access.

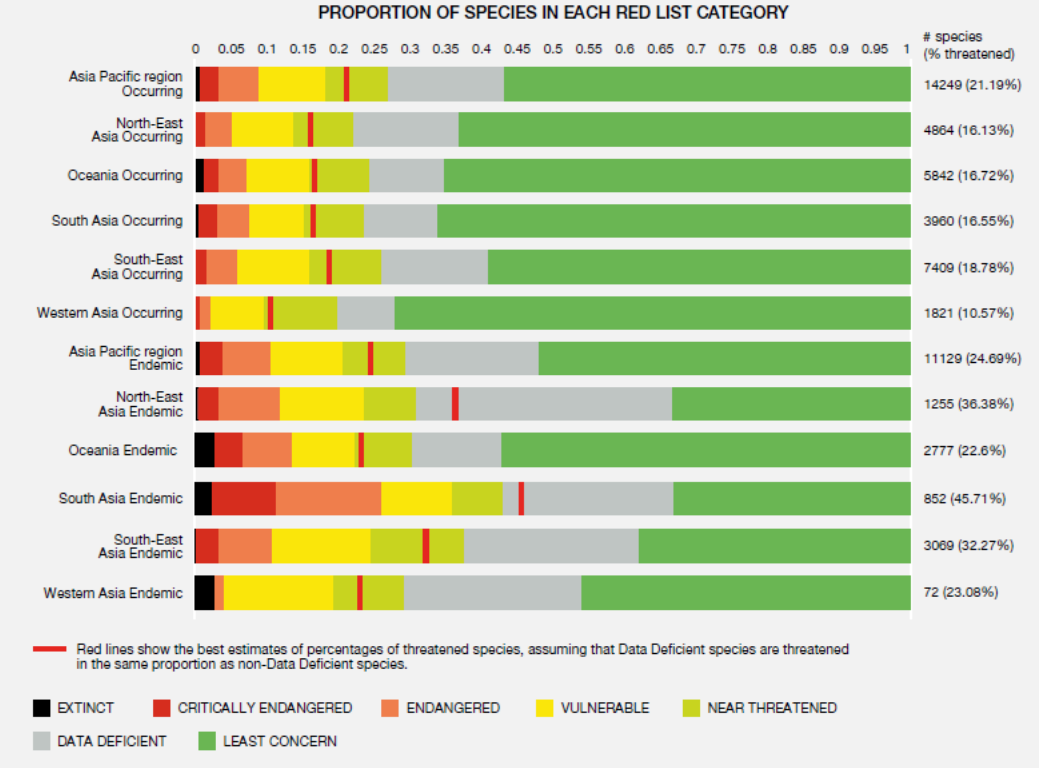


Figure 27: Overall extinction risk of species in the Asia-Pacific region. Data from the IUCN Red List of Threatened Species (IPBES, 2018c)

The Western Ghats, a biodiversity hotspot, is considered a centre of species diversity, endemism and threatened species, with the highest number (seven) of critically endangered species, all of which are restricted to Kerela State. Of the 96 threatened species endemic to the Indian peninsula, 50 are endemic to the Western Ghats region.

About 17% of the Iranian freshwater fish are threatened (IUCN Red List, 2017). A high diversity of 405 amphibian species is reported in India, almost half of which have only been described since 2000 from the Western Ghats (Dinesh et al., 2017). Of those, 75 have been assessed as threatened, with most of them experiencing declines in populations. Out of 24 species in Pakistan, one fourth are restricted to altitudes above 2,000m, 22 species are reported in Iran, of which six are endemic and three critically endangered (Safaei-Mahroo et al., 2015).

4.3.1. Interactions between causes or drivers of biodiversity change and degraded lands

To effectively implement REDAA restoration projects it is important to understand the causes of degradation at the site level. Across South Asia, cropland and agroforestry management have contributed to moderate to extreme decreases in biodiversity, with increasing trends in degradation across 10-25% of each land use type. There has been an extreme decrease in biodiversity and ecosystem services from infrastructure development, industrialisation and urbanisation. Extractive industries and energy production, as well as infrastructure, industrial development and urbanisation are responsible for an extreme decrease in biodiversity and ecosystem services across 60-100% of lands (Figure 28) (IPBES, 2018b).

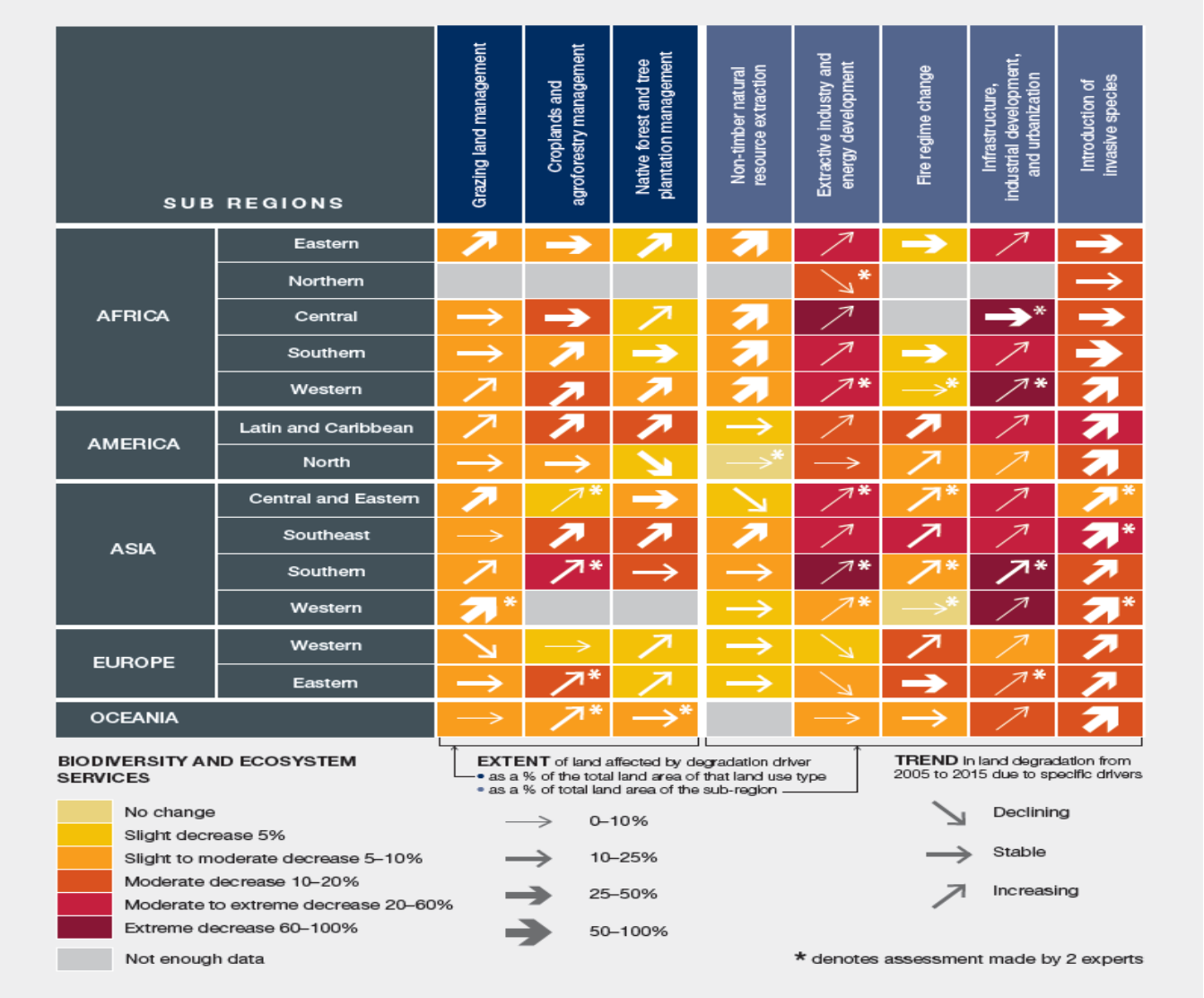


Figure 28: Drivers of degradation focusing on South Asia (IPBES, 2018b)

4.3.2. Interactions between key causes or drivers of biodiversity change and degradation by ecosystem type

A common activity in South Asian forests is slash and burn or shifting cultivation. Cutting and burning forests alters the natural fire regime and inhibits recovery time, which further degrades ecosystems and increases carbon emissions. Such degrading processes are intimately linked with poverty, as people seek livelihood incomes and food. In addition, forests are also removed for plantations, infrastructure, dam construction and other development activities (Barbier and Hochard, 2018) (Figure 28). Policies and instruments such as joint participatory management, payment for ecosystem services, and the restoration of degraded forests has seen an increase in forest cover of 5.8% (IPBES, 2018d). Figure 29 shows the amount of forest land in public ownership, while Figure 30 shows the limited primary forest remaining in South Asia, and the amounts of naturally generating forest and planted forest.

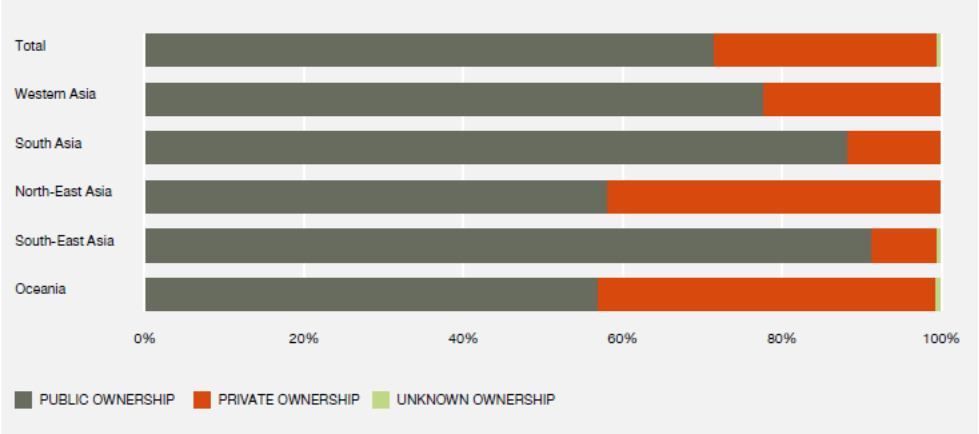


Figure 29: South Asia has a high level of publically-owned forests

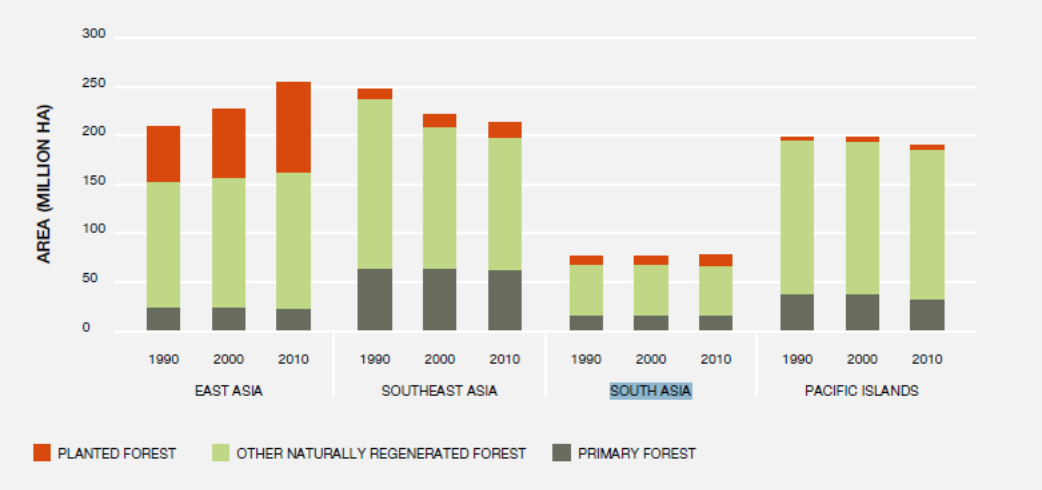


Figure 30: Observed trend in forest category shows a growing inclination to planted forest, both by public and private sector, to meet industrial and commercial demand in South Asia. Source: FAO (2010)

Degradation is occurring mostly from land use change, resource overexploitation, increased fire frequency and invasive species (Figure 28).

Land use, land cover change, pollution, resource exploitation and climate change are all increasing and making a strong contribution to all water-related ecosystems (Figure 33). In India, the freshwater systems of the Western Ghats, such as the Periyar Lake-Stream System and small lakes in Maharashtra have been negatively impacted. Impacts come from household and agricultural effluents, tourism, fisheries, and particularly introduced and invasive fish species (Raghavan & Ali, 2013).

Especially in the Himalayan region, the alpine habitats are rapidly changing due to anthropogenic and climatic drivers. Numerous studies, simulation, experimental and empirical evidence all show that rising temperatures and extreme climatic events are altering vegetation structure, ecosystem processes affecting ecosystem services including hydrology and local livelihoods. A study in alpine regions of Sikkim, India, has revealed that the plant assemblages of endemic species have been affected by ongoing global warming and species range shifts, These are likely to result in species extinction, particularly at mountaintops (IPBES, 2018f).

Climate change impacts in the Himalayan Mountain Region are more intense than many other places in the world. The Himalaya is one of the biodiversity hotspot regions, and providers ecosystem services to billions of people. The major direct impacts are related to water resources/glacier retreat, followed by agriculture and forests/biodiversity. Increasing temperature, frequent drought spells, erratic rainfall and declining snowfall are commonly reported indicators of climate change, which are also causing socio-economic impacts (Negi *et al.*, 2021).

Increased rates of glacial recession in the Greater Himalaya and degradation of permafrost will affect mountain hydrology and water discharge in much of the Hindu Kush Himalayan region and downstream areas. This will have direct implications for alpine biodiversity, especially the endemics. Studies in parts of the Himalaya have predicted considerable loss of endemic plant species habitats. Also, trends of expansion of shrublands at the cost of alpine meadows are evident both in Himalayan and Tibetan plateau. Growing evidence from multiple pilot sites in the Himalaya and Tibetan plateau has suggested that species are responding to increasing temperature by extending their range towards higher altitudes. Studies reveal that tropical and sub-tropical grasslands, savannahs and shrublands are specifically vulnerable to shifts. They predict a considerably large potential reduction in their size. These changes will have subsequent impacts on local communities and their knowledge (Chakraborty *et al.*, 2021).

Desert ecosystems are very fragile due to highly variable and low rainfall, very dry air and intense solar and terrestrial radiation. For these reasons they are very fragile to external disturbance and may take decades to recover from degradation in whatever form it takes. Climate change is one of the main drivers of change. In addition, overgrazing and uprooting of woody species for use as fuel, tillage, and the mismanagement of water resources are principle causes for desert deterioration in South Asia (IPBES, 2018f).

Figure 31: Level of influence of direct and indirect drivers on ecosystem services supply in the SA region

The key indirect causes of biodiversity loss and degradation in South Asia are economic and policy, governance systems and institutions (Figure 31 and Figure 32). Across South Asia, cropland and agroforestry management have contributed to a moderate to extreme decrease in biodiversity and its influence is increasing. Fire regime change has resulted in a slight to moderate decrease in biodiversity and ecosystem services. However, its influence is increasing. There has been an extreme decrease in biodiversity and ecosystem services from infrastructure development, industrialisation and urbanisation (Figure 31).

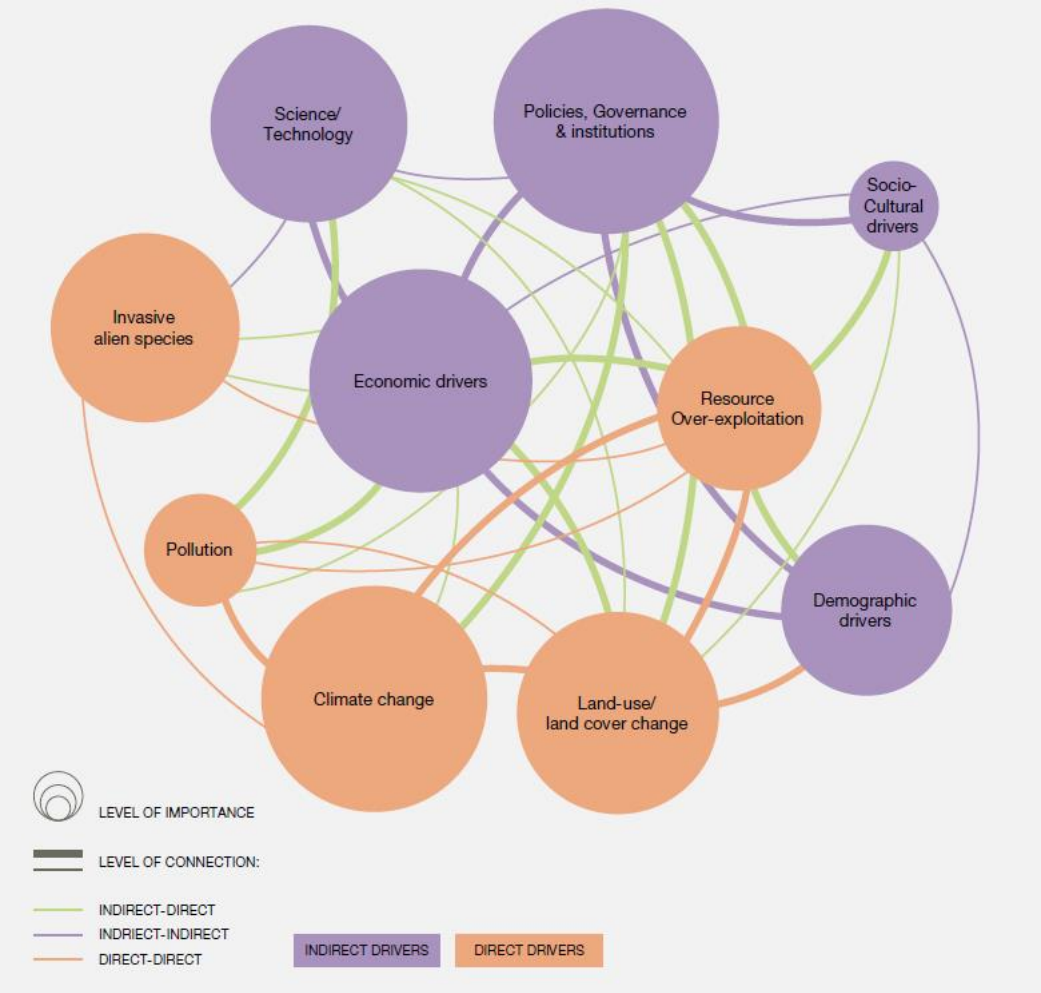


Figure 32: Interactions and relative importance among direct and indirect drivers in Asia

4.3.3. Governance

In South Asia, the options for improving governance incorporate human-rights-based approaches and particularly consider the rights of Indigenous people and local communities. Traditional institutions are unique to a country or sub-region, with a remarkable diversity of traditional governance institutions in Bangladesh, India and Nepal. All South Asian counties have umbrella environmental protection or conservation laws, which include clauses on the conservation of biodiversity. India passed the Environment (Protection) Act in 1986, National Environment Policy in 2006 and more recently the National Green Tribunal Act in 2010 (United Nations Environment Programme, 2016) (UNEP, 2016). In 1983, Pakistan introduced Environment Protection Ordinance and Maldives introduced Environmental Protection and Preservation Act in 1993. Similarly, Sri Lanka, Nepal, Bangladesh and Bhutan introduced National Environment Act in 1980, Environment Protection Act in 1997, Environment Conservation Act in 1995 (replacing Environment Pollution Control Ordinance, 1977) and Environment Assessment Act in 2000, respectively (UNEP-SACEP, 2002). Iran's Constitution, Article 50 (1979) is particularly relevant to the preservation of the environment, and Oman introduced its first major piece of environmental legislation controlling pollution in 1982.

4.3.4. Land management options and ecosystem restoration

As with Sub-Saharan Africa and Southeast Asia, governance plays a critical role in delivering effective land management, particularly when the desired outcomes are poverty alleviation, preventing the loss of biodiversity and reducing the degradation of landscapes. Differing approaches to land management across South Asia, which are presented below, provide important understandings for the REDAA programme design and implementation.

The biodiversity-rich Hindu Kush Himalayan region provides a myriad of ecosystem services but is experiencing rapid biodiversity loss and habitat degradation under the influence of climate change and other drivers of change. The International Centre for Integrated Mountain Development is contributing to the management of biodiversity and ecosystems in eight countries (Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan) and has pioneered transboundary landscape conservation and development initiatives. The Centre implements the landscape approach and aims to enhance ecological integrity and sociocultural resilience for transboundary cooperation. Key approaches use evidence, collaboration, inclusive partnerships, ownership, cross-border learning, influencing joint policy, and systemic thinking (Kotru *et al.*, 2020). India launched the Social Forestry Programme in 1980, followed by the more participatory Joint Forest Management (JFM) Programme, to recover degraded forests and meet biomass demands for village communities (Bhat et al., 2001). Similarly, in Nepal, large areas of degraded forest land were handed over to community forest user groups for reforestation and supply of basic forest products to local communities (Kanel & Shrestha, 2001; Scheyvens et al., 2007). Policy instruments focused on land use and land cover changes have become common, including national forest restoration programmes. This focus has become increasingly important in the face of exacerbating natural disaster risks, especially as the role of sustainable forest management and agroforestry in mitigating mitigate flood risks becomes more widely understood. This approach aims to measure the impacts on future provisioning and regulating of ecosystem services (Gomes *et al.*, 2021).

To develop an effective institutional framework, and mechanisms for greater involvement of local communities in the management of forest resources, several participatory forest management approaches have emerged in different countries in South Asia. These include community forestry, joint forest management, and forest user groups, which differ in their institutional, tenurial, decision making, and benefit-sharing arrangements (Ramakrishnan *et al.*, 2012).

The Terai Arc Landscape (TAL) initiative is a long-term vision (50 years) encompassing 49,500km^2 from the Bagmati River in Nepal to the Yamuna River in India. It is a biologically-diverse habitat with 86 species of mammals, 550 species of birds, 47 species of herpetofauna, 126 species of fish and more than 2,100 species of flowering plants. The TAL is not only a critical habitat for biodiversity, but it is also home to 6.5 million people who are dependent on forest resources for their livelihoods (Food and Agriculture Organisation of the United Nations and RECOFTC Centre for People and Forest, 2016).

To promote wetland restoration, almost all South Asian countries have formulated policies and plans for wetlands. The National Wetlands Conservation Strategy and Action Plan of Iran is built around five goals, namely; prevention of wetland loss by removing threats, sustainable economic use, linking within sectoral plans, ensuring national and international commitments, and adaptation of wetlands to climate change. Part of Afghanistan's national strategy bestows protection to wetlands for the conservation of migratory waterbirds.

In Sri Lanka, the main objectives of its national wetland policy and strategies, issued in 2006, are; to protect and conserve wetlands, prevent illegal use of wetlands, restore and maintain the biological diversity and productivity of wetlands, enhance ecosystem services from wetland habitats and to assure sustainable use of wetlands and traditional practices by local communities. This is all while meeting national commitments as a signatory to the Ramsar Convention on Wetlands.

The National Environment Policy of India provides specific elements for wetlands, which include integration in river basin and coastal zone management, prudent use strategies and poverty eradication strategies. In 2017, a national regulatory framework for wetlands was put in place in the form of Wetlands (Conservation and Management) Rules, which prohibits wetland conversion, and institutes state-level wetland authorities as regulating and management agencies. In line with Ramsar Convention's wise use commitment, the state government instituted the Chilika Development Authority in 1991 as the agency to undertake measure for ecological restoration.

The national policy of Pakistan, drafted but not formally accepted, is built around the objectives of removing threats to wetlands, creating and implementing a regulatory framework, inter-agency collaboration, promoting research, capacity development, and securing financing. In line with sectoral policies on water and fisheries, a community-based management approach characterises the wetland policy of Bangladesh. Nepal has specific national policy for wetlands, which emphasises science-based management of these ecosystems, while ensuring community

participation. There has been a recent and strong call for the incorporation of socio-economic approaches to wetlands restoration (Joshi *et al.*, 2021).

Restoration programmes that place local communities at the centre of projects — not only as participants but particularly as decision makers in the initial stages of the programme — and developed with the local context in mind, are important for effective restoration projects (Singh *et al.*, 2021). Singh et al analysed the implementation of the Restoration Opportunity Assessment Methodology (ROAM), which worked to restore land by growing trees or protecting forests with the economically poor, yet resource-rich Sidhi District of Madhya Pradesh in India. The study used an intersectional adaptive governance lens and included the perspectives of people and the multiple benefits the restoration projects can have. Following analysis of the ROAM project, Singh et al. provided key recommendations for restoration projects, including modifying the ROAM approach. These suggestions, which align well with the recommendations in this Scoping Report for the REDAA programme, include considering the local context, and centring local people in formulating, designing and implementing landscape restoration projects. The inclusion of intersectional overlays of caste, class, and gender influence on how decisions are made, are important to include in the development phases of projects (Singh *et al.*, 2021). Others have also, in more recent papers, highlighted the importance of justice, attending to power, politics and equity dependent on different situations in different places (Osborne *et al.*, 2021).

Experiences from India have highlighted that women and marginalised communities should not be overlooked in restoration projects. Not only do they have much to give and receive but also have knowledge and experiences which can be lost to projects by their exclusion. Their vulnerabilities to climate change are enhanced by poverty, gender inequality, insecure land rights, social marginalisation, a meagre asset base and exclusion from decision-making processes (Yadav and Lal, 2018; Marlène Elias, Joshi and Meinzen-Dick, 2021). (Specific restoration examples are provided in Section 5.)

NBS have been implemented in Bangladesh, however, there is a gap in understanding the effectiveness of their implementation, particularly away from urban areas. Like many other large-scale projects, they were found to have short-term trade-offs with local needs often ignored. Smith et al. have suggested a need for the inclusion of NBS in government policies, to ensure stakeholders are involved along with participatory delivery, strong and transparent governance, with secure finance and land tenure, and more consistent monitoring of outcomes (Smith *et al.*, 2021). The importance of incorporating Indigenous peoples into NBS cannot be overlooked.

The REDAA programme provides the opportunity to develop nature-based solution projects, led and consented to by Indigenous peoples. Indigenous peoples have twin vulnerabilities to the impacts and potential solutions to climate change. For this reason, if the REDAA programme was to develop local scale NBS projects, it would be important to establish a co-designed methodology which determines on whose territories projects are conducted, the desired outcomes — particularly in terms of the project's ability to implement climate change policy — with the rights of Indigenous peoples at the core of decision making and implementation (Townsend, Moola and Craig, 2020; Indigenous Peoples Forum on Climate Change IIPFCC and Indigenous Peoples Major Group, 2021). Human rights-based approaches can be an important approach to strengthen shared and community governance with opportunities for rights holders to negotiate fair outcomes, while also ensuring the protection of the rights of vulnerable communities and groups (IPBES, 2018f).

Land management approaches with strong governance options, such as co-management and collaborative governance will bear high relevance for South Asia where decentralised solutions are projected to secure the best possible future for biodiversity (Figure 26). Collaborative forest management with joint forest management between government and community has been implemented in Nepal. The programme has however benefitted those living at a distance from the forest, at the cost of local forest communities, with rich and male-headed households receiving disproportionally high benefits (Rai *et al.*, 2017). The Community Forests (CF) Programme has been considered an important approach for managing forests, conserving biodiversity and reducing poverty. An analysis of the CF programme in the west Himalayan part of India (referred as Van Panchayat) over nine decades, has shown that the programme has not achieved its desired goals due to mismatched policy and practice priorities, and recommended the programme needs to be more relevant for local people (Pathak *et al.*, 2021).

There is a disconnect between projects that use an integrative approach to maintain biodiverse places along with considering the impacts of climate change (Darjee *et al.*, 2021). The REDAA programme provides the opportunity to implement innovative programmes with the local community as the driver of the programme, and the key beneficiaries, driven by local knowledge while preventing biodiversity loss and providing solutions to climatic changes. These programmes will need to be adaptive to the local situation as one-size-does-not-fit-all (James Cook University and State of the Tropics Leadership Group, 2014).

4.3.5. Working with Indigenous peoples and local actors

Various types of ICCAs are prevalent across South Asia. They are managed and guided by traditional knowledge, belief systems and local customary laws, and contribute significantly to enhancing livelihoods while maintaining biodiversity. The tradition of CCAs, managed and guided by traditional knowledge, belief systems and local customary laws, has contributed significantly to conservation and livelihoods promotion (Bhatt *et al.*, 2012).

The Kailash Sacred Landscape Conservation and Development Initiative, a transboundary cooperative initiative, incorporates the value of sacredness in maintaining bio-physical diversity, particularly surrounding Mt Kailash, and spans adjacent areas of three countries China, India and Nepal (Rawal, Gairola and Dhar, 2012).

Religious beliefs that involve worshiping the sacred lands, animals or trees are popular and a traditional way of protecting nature for ethnic people. Sacred natural sites are distributed throughout the state of Uttarakhand in northern India and their value cannot be underestimated for management of sites (Negi, 2010).

These traditional ways of being with and protecting nature demonstrated by Indigenous people across South Asia can provide founding bases for the REDAA programme (EACDS and FCDO, 2021). By incorporating local communities and traditional knowledge into the development of techniques and approaches, their potential for reducing degradation and improving livelihoods is far more likely to have long term benefits, accompanied by scientific evidence bases incorporated into social and environmental costs/benefits analysis of proposed solutions, compared with conventional approaches.

4.3.6. Culture and economic values

The values systems across South Asia are wide and varied. One desired outcome of REDAA is to develop innovative landscape management regimes and NBS tailored to the socio-economic and environmental contexts mirrors well with the diverse cultures and traditions from the South Asian region. The concept of people living in harmony with nature is well founded across the region. For example, the Indian Vedic philosophy emphasises the human connection with nature. Vedism is a way of life based on scriptures called Aranyakas, or forest books, written by sages who lived in the forest. The Indian philosophic tradition of the ‘Prakriti-Purus’ concept dates back approximately 3,500 years, to the days of the Upanishads, with texts which describe how nature and man are complementary and one is incomplete without the other. In ancient Hindu scriptures and seers, a Hindu way of life allows the use of natural resources but does not support control, or dominion, over nature and its elements, and so the exploitation of nature for selfish gain is considered sacrilegious. Thus, living in harmony with and having respect for nature is ingrained in the society through traditional values and religious belief systems, helping to shape peoples’ attitudes towards nature (Davies *et al.*, 2018).

Likewise in Iran, traditional Iranians lived in harmony with nature by showing holy respect. For example, traditional local people respected water and peacefully collaborated on irrigation and farming. They selected a Mirab (who managed water) to distribute the amount of available water to all areas. Beneath Iran’s arid desert lies a network of ancient water tunnels, known as ‘Qanat’, an ingenious system for tapping underground water invented in Iran (approx.) 3,000 years ago. This ancient water infrastructure was developed in response to the prevalent arid and semi-arid conditions, and consists of underground channels that use gravity to transfer extra water from underground reservoirs located in the highlands to the plains (Davies *et al.*, 2018).

There are estimated to be more than 100,000 sacred groves in India (Ormsby and Bhagwat, 2010) and more than 25% of the Tibetan plateau falls under sacred land (Shen et al., 2015). Although local people may benefit from resources provided by these sites, such as the availability of medicinal plants, this is not usually the main motivation for their protection and, in most cases, direct exploitation is rather restricted. As a result, sacred sites often preserve plants and animals that have disappeared from the surrounding landscapes (Ormsby and Bhagwat, 2010; Shen *et al.*, 2015).

This is particularly the case where sacred forests are the only forest left in a human-dominated landscape. Although often assumed to be remnants of earliest continuous forest cover, there is limited evidence for this and at least some sacred groves and fengshui woods were apparently established in deforested areas. Sacred natural sites may be the earliest form of habitat protection, but most are not part of formal protected area systems. As a consequence, their continued protection depends on the continuation of local beliefs and local control over their fates. Recent threats include loss of customary rights, encroachment by cash crops, demand for timber and other forest resources, social and religious change, generational change, cultural assimilation, immigration and urbanisation (Ormsby and Bhagwat, 2010).

Nature and its manifestations are a part of the Sanatana Dharma belief system. The importance of flora in Hindu religion is reflected through tree worship, water as the media of purification and the source of energy, and rivers as holy mothers. The prohibition of eating meat resonates with the idea of non-violence towards domesticated and protected animals. Different wild animals are considered as the companions of Hindu gods and goddesses which signify their values. For example, the tiger, white swan, rat and snake are the companions of Goddess Durga, Goddess Saraswati, God Ganesh, and Lord Shiva, respectively. The Indian Vedic philosophy emphasises the role of women's organisations, known as 'Vareh', that connect with nature, with women's organisations also distributed across Iran (Davies *et al.*, 2018).

Very few economic valuations have been conducted across South Asia. Of those that have, most are in temperate forests, with a small number also conducted in productive coastal and freshwater systems. Figure 33 shows the types of contributions to people from ecosystem types. However, for South Asia there has been a limited amount of valuation work.

Subregion	Country	Type of nature's contributions	Ecosystem type/Biome	Value Type
North-East Asia	Japan	Non-material benefits (Cultural)	Shinto Shrines and Satoyama Landscapes	Socio-economic
	China	Material and non-material benefits	All ecosystems	Economic
South-East Asia	Indonesia	Material and non-material benefits	Forests	Economic and socio-cultural
	Singapore	Material and non-material benefits	Coastal	Relational
	Philippines	Non-material (traditional)	All ecosystems	Socio-economic
	Vietnam	Material and non-material benefits	Forest, crop	Socio-economic
Western Asia	Jordan	Material and non-material benefits	Forests and Oases	Economic
		Regulating water flows	Range	Economic
South Asia	India	Material and non-material benefits	Lakes	Biophysical and socio-cultural
	Bhutan	Material and non-material benefits	All ecosystems	Economic

Figure 33: Nature's contributions to people by ecosystem type in South Asia (IPBES, 2018f)

4.3.7. Least developed and low- and middle-income countries

Afghanistan is a least developed country with low income.

Bangladesh and Nepal are LDCs with low middle incomes.

India and Pakistan are lower income countries which are not LDCs.

Iran is an upper income country which is not an LDC.

5. Findings and recommendations

The following section draws together the specific findings from the scoping research across the target geographies and sets out the recommendations to inform the design of future REDAA programming. The first sub-section sets out an overview of the general findings from the research, which links with the design principles outlined in Section 1. This is then followed by specific recommendations.

5.1. Findings

5.1.1. Governance

The consideration of the intersectionality within governance arrangements and approaches for REDAA will be critical to success for the programming.

Integrating key aspects of customary law, marginalised peoples, justice, equality, poverty, power, land tenure, women, youth, disability, the spiritual customary and sacred dimensions of ancestral lands, values and world views into the design will help achieve successful outcomes. Providing a leading role to Indigenous peoples and local communities will be essential to solving this challenge, allowing for a governance structure that is tailored to the context of each REDAA project, while also effectively developing multi-scale and/or multi-sector governance systems that ensure all involved are working for the same end.

This finding is underscored by the analysis of land management projects in Southeast Asia (3.2.7). This found that pervasive inequalities related to poverty, gender, and exclusion of local and Indigenous communities frequently occur. The inclusion of marginalised groups, especially women, and Indigenous and poor communities, will be particularly critical for effective REDAA projects across Southeast Asia to ensure sustainable management of ecosystems. To enable their inclusion in the REDAA programme projects, working with communities who have secure land tenure will advance the opportunities for effective projects to deliver the desired outcomes of the REDAA programme.

For the SSA, SEA and SA regions, existing institutional, technical and managerial capacity is often fragmented, uncoordinated, incoherent and differs across countries. Though many case studies on best practice, manuals, packages, and guidelines have been developed, their accessibility is limited, which raises concerns for the REDAA programme if it were to follow that approach. Targeting research investment in collaboration with Indigenous and local communities and for ground actions, will provide greater outcomes for REDAA investments.

5.1.2. Multifunctional ‘scape approach

Adopt a multifunctional ‘scape approach. As global, regional and local knowledge bases are expanded, the evidence is clear that maintaining and restoring biodiverse places not only reduces the impacts of changing climate on landscapes and people, but also alleviates poverty. The most successful outcomes will be achieved at the local level through collaboration with Indigenous peoples.

The overall findings from the analysis of the scientific and grey literature, across the three geographies; SSA, SEA and SA, are consistent. There has been a significant focus over recent decades on restoring degraded lands to reduce the impacts of further degradation of landscapes, poverty and livelihoods. Approaches by international bodies such as the UNCCD and the UNFCCC have resulted in the development of large-scale initiatives, mostly focused on forest restoration, aimed at alleviating and preventing further deforestation. Such large-scale restoration and deforestation prevention programmes have been implemented across all three geographies.

The results of the evidence review indicate that the most successful outcomes will be achieved through collaboration with Indigenous peoples who have secure tenure rights and are also located in intact biodiverse places.

Complementing local traditional knowledge with ecological research, the REDAA programme will help advance ecological knowledge between stakeholders. This will aid restorative actions to enhance the function and resilience of intact landscapes, as well as livelihood benefits, while engaging with and advancing marginalised communities. Despite different economic, political and social ecologies, the overall findings suggest that a collaborative approach will be appropriate across the three geographies.

The findings of the evidence review indicate that small locally-based, owned and directed projects provide a far greater potential to achieve successful outcomes. There is significant literature that demonstrates the importance of

Indigenous knowledge, particularly with respect to the identification and implementation of climate adaptation activities (Soanes, et al, 2021). Some of the most biodiverse places on the planet intersect with Indigenous lands, and it follows that the participation of local communities will be vital for their effective management.

While the evidence review indicates the multifunctional approach that includes local actors is likely to be successful, there was sparce evidence uncovered in the scoping research of successful projects that are achieving or have achieved the outcomes desired for the REDAA programme. It is therefore concluded this approach can be considered innovative.

5.1.3. Focus on ecosystems

Evidence from the three target regions suggest that the REDAA programme will achieve more effective ecological outcomes through a focus on preventing biodiversity loss, and working to restore and maintain intact landscapes at the local ecosystem level, especially peatland ecosystems (Africa and Asia) and wetlands (Asia).

The evidence is clear that large programmes and resources are being invested directly into forest regeneration, forest landscape restoration and forest plantation, with a focus on reducing degradation and deforestation. The REDAA programme will achieve more effective ecological outcomes through a focus on preventing biodiversity loss and working to restore and maintain intact landscapes at the local ecosystem level.

Peatlands are recommended to be the highest priority ecosystem for REDAA project implementation[14]. Globally, peatlands comprise the largest natural terrestrial store of carbon, harbouring more than 450 gigatonnes of carbon, which is more than 40% of all soil carbon. Peatlands sequester annually, lowering the risks of 0.4 billion tonnes of CO2 annually, while regulating water flow and quality, lowering the risks of flooding and the effects of droughts, preventing sea-water intrusion, and offering habitat for wildlife. Therefore, a focus on peatland ecosystems is recommended. Areas of particular focus are across Southeast Asia and the Congo Basin as they will provide benefits for carbon mitigation, as well as restoration, improvement to water management, livelihoods, poverty alleviation, and the inclusion of women, youth and the disabled through intersectional justice approaches for marginalised communities.

In line with the intersectoral approach recommended for the REDAA programme, cross section findings provide strong evidence for the focus on peatland ecosystems to deliver a multifunctional ‘scape approach. Across Sub-Saharan Africa and Southeast Asia, peatlands intersect with forests, wetlands, rivers and coastal mangroves. South Asia is not well endowed with peatlands, excluding the Kerala biodiversity hotspot. For the South Asia region ecosystems, the most limited ecological research are wetland ecosystems. A focus on wetlands in South Asia can enable cross-linkages with peatland research in Sub-Saharan Africa and Southeast Asia, maintaining a water focus, which is critical for peatland restoration. Peatlands and wetlands provide excellent opportunities for poverty alleviation, as for example, across the Cuvette Centrale local communities rely in part on peat forest resources for their livelihoods (Dargie, 2017).

A focus on peatland ecosystems also provides opportunities for the REDAA programme to conduct research across interconnecting ecosystem types, which will further advance ecological knowledge, appropriate for a wide number of ecological systems. The individual sites chosen will dictate the specific research to be conducted, however the focus will be around water, due to the very nature of peatlands. Peatlands located close to the coastline provide opportunities to expand into adjoining ecosystems such as mangroves.

Peatlands are prevalent in the Congo Basin, and the relatively recent publication of the first spatially explicit map of peatlands in the Cuvette Centrale, central Congo Basin, reveals it to be the most extensive tropical peatland complex, at ca. 145,500km^2 (Darvie. 2017). Peatlands are extensive across Southeast Asia. Water quality is a critical pressing issue across targeted geographies and is critical for the stabilisation of peatlands. External to the REDAA programme, numerous projects work across the SSA, SEA and SA regions to enhance water quality and provision which could in the longer term become associated and linked to REDAA projects.

Due to the limited number of peatlands in South Asia, excluding Kerala, South India, wetlands are considered a key ecosystem focus for the SA REDAA programme. The natural linkage of mangroves with peatlands provides opportunities to expand the restoration focus, alleviating impacts on coastal regions from changing climates, providing livelihood resources where in many places a lack of ecological knowledge has led to single species mangrove

[14] Evidence is provided on peatland ecosystems in Section 1 (1.8), Section 2 SSA (2.2.1, 2.2.1.2, 2.2.1.3, 2.2.5, 2.2.7.1, 2.2.8), Section 3 SEA (3.1, 3.2, 3.3.1, 3.2.1.5, 3.2.4.13), Section 4 SA (3.3.6) and Section 5 (5.1.2, 5.1.3, 5.1.3.5.7).

restoration, akin to plantation forestry. The REDAA programme can advance ecological knowledge on mangrove restoration and NBS[15].

Wetland restoration, including Ramsar Sites, provides the most effective combined benefits for poverty alleviation due to significant livelihood associations with fish as a staple for many communities. However, invasive species are one of the direct causes of wetland degradation, reducing livelihood opportunities. Wetlands across South Asia are not given adequate attention by policymakers due to a lack of understanding of the enormous benefits they provide to biodiversity and ecosystem services. Wetlands are important resting and wintering areas for migratory and native bird populations[16]. Without places to stop, their migratory habitat is lost.

Knowledge gaps have been identified for wetlands restoration. Ramsar-designated wetlands often intersect with peatlands. Ramsar-designated wetlands are important for South Asian countries[17] and Sub-Saharan Africa (2.2.6, 2.2.1). The Ramsar Convention recently identified gaps and a lack of focus on socio-ecological approaches to the use and management of wetlands. The need for a renewed focus on poverty, the cultural significance of wetlands, particularly for Indigenous communities, and for gender equality have been highlighted by the Ramsar Convention. Through a multifunctional 'scape approach that works with Indigenous communities, REDAA can provide the needed socio-ecological framework to wetland management and restoration, while also providing a cross-sectoral ecological approach to peatland restoration (Joshi *et al.*, 2021).

Lake Wular belongs to the largest freshwater lakes in India and lies in the Kashmir Valley. At 189km^2, Wular Lake is one of the largest freshwater lakes in Asia. The lake lies at an altitude of 1,580m. Its maximum depth is 14m, it has a length of 16km and a breadth of 10km. As an example of the multifunctional 'scape approach, Wular Lake plays a significant role in the hydrographic system of the Kashmir Valley, acting as an absorption basin for annual floodwater. The lake and its surrounding extensive marshes have important natural wildlife. The rivers Bohnar, Madamati and Erin from the mountain ranges and the rivers Vetasta (Jhelum) and the Ningal from the south bring silt into the lake. Siltation, human encroachments, pollution from fertilisers, animals and human wastes, along with the conversion across the catchment for agriculture land and hunting pressure on waterfowl and migratory birds, are the key drivers of change in the lake.

In 1986, in recognition of its biological, hydrological and socio-economic values, the lake was included as a Wetland of National Importance under the Wetlands Programme of the Ministry of Environment and Forests, Government of India, for intensive conservation and management purposes. In 1990, it was designated as a Wetland of International Importance under the Ramsar Convention. Wular Lake is a sustainable wintering site for several migratory waterfowl species. Many terrestrial bird species are also observed around the lake. Wular Lake is an important habitat for fish and contributes about 60% of the fish yield of the Kashmir Valley. More than 8,000 fisherfolk earn their livelihood from Wular Lake. The South Asian Voluntary Association of Environmentalists (SAVE) is a joint initiative of individuals with the aim to protect the ecology and to conserve biodiversity at Wular Lake (https://www.globalnature.org/en/living-lakes/asia/wular-lake).

5.1.4. Restoration findings

The REDAA programme provides an opportunity to fill the identified gap of lack of cohesion and interaction between restoration and climate while alleviating the key barriers and gaps. It can also incorporate a much-needed interdisciplinary focus on interactions, and place local people at front and centre as leaders in overcoming the negative impacts of climate change, biodiversity loss and poverty inequities.

There is an urgent need to strengthen restoration initiatives at the grassroot levels. Large initiatives promote the need for restoration and attract significant funding, however it is doubtful that that funding and the implementation are directed to the right places and people to achieve the desired outcomes.

Robust biological knowledge at the ecosystem level is lacking, and knowledge on the interacting factors which enable ecosystems to function should be considered for REDAA programming.

For this Scoping Report, an assessment of different land management approaches has been explored for SSA, SEA and SA. Findings indicate several similar ecosystem types and overlapping international obligations and international approaches to restoration, which are being incorporated across the three geographies.

[15] Further evidence is provided in Section 3 SEA (3.2.1, 3.2.1.7, 3.2.4.1.4) and on mangrove restoration in Section 5 (5.1.3.5.6, 5.1.3.5.7).
[16] Supportive evidence on the ecological and livelihood benefits of including wetlands can be found in Section 1 (1.8), Section 2 SSA (2.2.1, 2.2.3, 2.2.4), Section 3 SEA (3.2.1.3, 3.2.1.5, 3.2.3, 3.2.4.1.1) and Section 4 SA (4.2.1.2.10, 4.2.5.3, 4.3.7.2).
[17] See Sections 4.3.7.2, 4.2.1.2.10

Climate and climate change are rarely mentioned as key factors relevant to restoration (Driscoll *et al.*, 2012; Locatelli *et al.*, 2015; Griscom *et al.*, 2017; Brahma *et al.*, 2018; Strassburg *et al.*, 2020). The UNFCCC Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD Programme) and REDD+ Programmes, place a limited focus on restoration, although the programmes specifically relate to controlling emissions. Along with the implementation of the REDD+ Programme, other private sector initiatives have arisen, such as the deforestation-free supply chain (DFSC) initiatives. However, through targeted coordination, the political consensus from the REDD+ Initiative could have benefited the private sector DFSC initiative. Likewise, initiatives on non-timber forest products could have been further advanced if the REDD+ and Bonn Challenge programmes had been aligned and linked to achieve collaborative outcomes (Cerullo and Edwards, 2019; Hargita, Giessen and Günter, 2020). The 2015 Bonn Challenge for Forest Landscape Restoration (FLR) committed to restore approximately 350 million ha of forest globally by 2030.

The UN Assembly formally adopted a resolution to celebrate 2021-2030 as the UN Decade on Ecosystem Restoration, for preventing, halting and reversing degradation of ecosystems worldwide. Based on the work conducted to date, to achieve the desired outcomes at different scales and levels will require a paradigm shift in existing restoration approaches (Abhilash, 2021). This includes making strong links to existing restoration initiatives such as the Bonn Challenge, FLR Programmes, Sustainable Development Goals (SDG) and the final CBD Global Biodiversity Framework (GBF) (Convention on Biological Diversity, 2020; CBD Executuve Secretary, 2021; IIED, 2021a).

Of the three geographies, Africa has collectively made strong commitments on restoration. In the Agenda 2063 (Africa Union, 2013), the African continent committed to ecosystem restoration by protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, and combating desertification. The African Forest Landscape Restoration Initiative (AFR100) was launched in 2015 to restore 100 million ha by 2030 (World Resources Initiative, 2019). Supported by more than 40 technical and financial partners, in its first five years the initiative has focused on mobilising countries and partners, piloting activities, building capacities, and creating a strong international standing and recognition. Restoration assessments have been completed in 18 partner countries using the ROAM tool developed by the World Resources Institute (WRI) and the International Union for Conservation of Nature (IUCN). WRI's Global Restoration Initiative has also trained and supported a cohort of young African restoration entrepreneurs through its Land Accelerator programme (Pasiecznik and Reij, 2020). A further commitment through the Pan-African Agenda on Ecosystem Restoration for building resilience has led to commitments to restore 200 million ha (UN Biodiversity Conference COP 14, 2018). This Pan-African Action Agenda on Ecosystem Restoration aims to increase resilience and proposes policy measures, strategic actions, cooperation mechanisms and on-the-ground actions to advance land and ecosystem restoration in Africa (Auda-Nepad and Food and Agriculture Organisation, 2021). In 2007, the Great Green Wall (GGW) Initiative for the Sahara and Sahel led to a commitment of restoring 100 million ha of degraded lands (Food and Agriculture Organisation, 2016). A wide range of actors and stakeholders in African countries north and south of the Sahara are involved, and many international organisations are lending their support. Countries have made land restoration a priority in the GGW regional harmonised strategy, as well as in their national strategies and action plans. Early results show that degraded lands can be restored, but these achievements pale in comparison with what is needed (Brasser *et al.*, 2015).

The rapidly-growing momentum on restoring degraded lands, and restoration more widely, has resulted in the development of many guidelines and methodologies outlining approaches and frameworks to implement restoration programmes. These include:

- Restoring degraded forests and landscapes in dryland areas (Food and Agriculture Organization of the United Nations, 2015)
- Legal frameworks (Chaves *et al.*, 2015)
- Planning guidelines (Borda-Niño, Hernández-Muciño and Ceccon, 2017)
- Principles, concepts and practices for FLR (César *et al.*, 2021)
- Biodiversity guidelines for the forest landscape restoration opportunities assessment (ROAM) (Beatty, Cox and Kuzee, 2018)
- International principles and standards for restoration by the Society for Ecological Restoration (SER) (Gann *et al.*, 2019)
- Principles to guide the United Nations decade on ecosystem restoration (Food and Agriculture Organisation of the United Nations, IUCN Commission on Ecosystem Management and Society for Ecological Restoration, 2021), and

- The restoration project information sharing framework (Gann *et al.*, 2022).

While there are an enormous number of approaches, frameworks and guidelines, the ability to navigate these and identify how best they can be used for local level projects is very limited. Such frameworks tend to be led by large organisations and research bodies, and as the REDAA programme delivers local low-level projects there is limited use of these resources.

The financial investments, and investment of time to develop, deliver and implement such frameworks are high, and based on the evidence from this review, their ability to direct the delivery of on-ground effective, science-based solutions at the local and ecosystem level is doubtful. Their complexities make them less useful for restoration at the local scale[18].

A number of approaches have been developed to measure and understand the success of restoration outcomes. One integrated approach, developed as part of the IPBES Land Degradation and Restoration Assessment, has been used in Sub-Saharan Africa and South Asia (Fisher, Montanarella and Scholes, 2018b).

Identifying restoration projects that have delivered on desired restoration outcomes provides insights on successful models for future investment. Understanding if a restoration project has been effective depends on the initial objectives of the project, however there is a key gap in measuring ecological outcomes of restoration projects at the more local and ecosystem level. The evidence from this literature review demonstrates there has been a strong focus on and investment in FLR.

A review of the FLR in Africa (2021) highlighted the magnitude of degradation and concluded that restoration progress had been slow, with the key challenges to tackling restoration at such a large scale being both biophysical and societal. The sectoral approaches that have been adopted across Africa in restoration have provided barriers to effective outcomes. The evidence points to better integrated policies which jointly address poverty, land degradation and greenhouse gas emissions. The findings, relevant to the REDAA programme, based mostly on interviews are: (Auda-Nepad and Food and Agriculture Organisation, 2021)

- Engagement of key stakeholders on the ground, and stakeholders living in the landscape should be prioritised and actively engaged
- Restoration projects must have true local ownership; restoration will happen at the local level, no matter what high-level statements are made. Effective local ownership starts at the planning stage and continues through to implementation and monitoring.
- Large funding is invested at higher levels due to the complexity of large-scale projects, with limited funding reaching the local communities and enabling local people to use it to develop and establish income generating activities for local people actively engaged in restoration processes, and
- Promoting integration across sectors, and development priorities is necessary when seeking to restore landscapes.

A wider review of FLR across Asia, Africa and Latin America elicited similar findings. Key gaps were found in local involvement in restoration projects often leading to failure of these projects. The evidence aligned with other reviews on the critical importance of understanding and operating within the demands and opportunities of the local context. This required incorporating local knowledge and involvement of local people in the design, planning and ongoing implementation of programmes.

Reforestation programmes to restore forests across South Korea, Viet Nam and China also found that effectiveness was often influenced by variables including biophysical conditions, local community attributes, and local state and federal rules (Choi, Jeong and Kim, 2019).

A review of five restoration case studies from Africa (Burkina Faso, two from Ghana, Senegal and Tanzania) found that methods used for the initial planning and implementation of restoration had mixed outcomes. In all five cases, some restoration was achieved, however in four of the cases, there were negative social consequences. In the fifth case, the project was implemented with respect for local knowledge and in ways that local stakeholders intended, and negative social outcomes were avoided (Walters *et al.*, 2021). However, in all cases only a small degree of effectiveness occurred in the restoration itself.

[18] Demonstrated the findings across the three regions (SSA 2.2.6.2, 2.2.6.3, 2.2.6.4; SEA 3.2.7.4,3.2.7.5,3.2.7.8; SA 4.2.7.1,4.2.7.2, 4.2.7.3,4.2.7.4).

An analysis of restoration projects in Nepal found an integrated multisector approach led to effective restoration outcomes. This identifies the need for the scientific community and decision makers to pay greater attention to cultural, social, technical and political dimensions which do influence restoration outcomes (Pandit *et al.*, 2020).

An analysis of the restoration of water quality along the river Ganges, using a systematic approach to understand the relationships between population, poverty, pollution, precipitation, plantation and periodicity, found that the involvement of interlinked water working groups enhanced the effectiveness of restoration, once again highlighting the importance of the integration of actors and actions for restoration, whether it be in forests or rivers (Mariya *et al.*, 2019).

5.1.5. Ecological understanding across target geographies

Ensure that at least 80% of the investment delivered through the REDAA programme over five years is directly invested into local community leadership, involvement and ecological research. This is to understand ecosystem functioning and to provide a sound evidence base for the ecosystem restoration led by local communities. Furthermore, a holistic approach to restoration for the REDAA programme would benefit by incorporating an economic valuation into all projects, including economic benefits post-restoration.

This section sets out key insights for restoration across all the target geographies:

The Great Green Wall: ecological considerations for restoration success (SSA) - There is very little knowledge about whether the strategy behind the Great Green Wall (GGW), a project building a wall of trees to slow desert encroachment, can work. The limited ecological considerations behind the planning for the GGW project may be a barrier to achieving its goals. The lack of understanding, use of ecological knowledge, and inclusion in project design have been key barriers for effective outcomes and wise use of investments for many large-scale restoration projects. For the GGW project, there has been limited consideration of the climate envelope, which sets boundaries on locations where forest-water and land-atmosphere interactions are feasible for forest growth. Ellison *et al.* have identified a need for a re-think of the GGW project strategy to ensure ecological understandings are included in project design, with a focus on forest-water and land-atmosphere interactions. The importance of incorporating and understanding biophysical conditions into restoration cannot be underestimated. In addition, a stronger focus on improved tree, shrub and forest cover will promote infiltration, groundwater recharge, could potentially trigger rainfall and land surface cooling, and promote landscape resilience, providing more successful restoration outcomes than those which currently occur (Ellison and Ifejika Speranza, 2020).

Miombo and Acacia Woodland long-term restoration in Shinyanga, Tanzania (SSA) - Miombo and Acacia woodlands restoration began in 1985, after the woodlands had been completely degraded. By 2004, more than 300,000 ha of woodland had been restored across the 833 villages of the region, with an economic value of US$14 per person per month. The underlying reasons for the success of this woodland restoration project were a combination of technical and socio-political aspects including power dynamics, enabling policy, decentralised and participatory governance, gender, traditional knowledge, and institutions at all scales — from family forests to larger village forests. This required ongoing negotiations at the local level for governance and management arrangements. These underlying and ongoing discussions, along with the long-term nature of the project are the key reasons for its success (Barrow, 2014).

Restoration of Mabira Forest Reserve in Uganda (SSA) - The evidence from restoration projects highlights gaps in working with local communities, which provides barriers to further degradation of forests. Locally-proposed restoration in the Mabira Forest Reserve was designed to empower local people and raise their willingness to participate in forest restoration. It aimed to do this by strengthening their capacity and understandings for collaborative forest management, raise their awareness of what restoration is and build their capacity. Continuous monitoring of outcomes has been an important part of the project's success (Galabuzi *et al.*, 2014a).

Smallholder farmers in carbon payment schemes in Sub-Saharan Africa (SSA) - The evidence for effective smallholder farmer participation in land-based carbon payment schemes outlines the importance of incentivising smallholder farmers to adopt agricultural practices that increase carbon storage in soils; such as no-till farming, cover crop planting, agroforestry, and rotational grazing. In turn, this can support climate change mitigation and adaptation efforts and provide co-benefits, including sustainable increases in agricultural productivity. Stimulation and willingness of marginalised smallholder communities to participate can be achieved through their inclusion and flexibility in project design, while working with local people and low-cost soil conservation measures (Tamba, Joseph Wafula, *et al.*, 2021).

Forest in the Aba Gerima watershed, North-West Ethiopia (SSA) - This restoration project provides an example of the importance of the inclusion of ecological knowledge into restoration projects. As a response to persistent forest degradation, exclosures were established in the Aba Gerima watershed, North-Western Ethiopia. Measurements of change in vegetation composition, aboveground biomass and soil properties were conducted in a four-year-old exclosure, and compared with adjacent communal grazing land. Significant increases were found in woody species density, basal area and above ground woody biomass. Most of the woody species are economically important. This example demonstrates how the combination of ecological measurements with simple and inexpensive approaches can reduce the drivers of biodiversity loss, and restore degraded native vegetation and soil properties, while providing economic benefits for the local communities (Mekuria *et al.*, 2018).

Forest restoration in dry afromontane forest landscapes, northern Ethiopia (SSA) - Restoration projects which incorporated natural regeneration rather than tree planting have resulted in higher restoration outcomes, measured by vegetation structure and biodiversity factors. This restoration highlights that greater importance should be given by managers and policymakers to understanding biological factors, while also including a strong socio-economic focus to ensure clear rights, roles and benefit-sharing arrangements occur between different stakeholders and community members (Tamba, Joshua Wafula, *et al.*, 2021).

Peatland restoration (SEA) - A review of ecological aspects of peatlands — particularly biodiversity, carbon storage, hydrology and nutrients, including above-ground and below-ground subsystems — recommended considering the multiple interacting ecological factors in peatland restoration. The involvement and traditional knowledge of local communities who rely on peatlands for their livelihoods is important for successful restoration outcomes. The processes leading to peatland development involve modification of both above-ground and below-ground subsystems. An integrated approach that explicitly recognises both subsystems and their interactions is key to successful tropical peatland management and restoration. These complex relationships highlight the importance of gaining a better understanding of ecological carbon stores and how they change as peatlands degrade. For successful restoration, an in-depth understanding of the biota, nutrient dynamics, hydrology and biotic and abiotic feedbacks, is essential to ensure restoration planning and actions are successful. Once again, key to working with ecological knowledge at the individual site level is taking into account the livelihood and knowledge needs of local people (Mishra *et al.*, 2021).

Formal peat management began in Indonesia in the 1960s. However, inappropriate peat management and increasing degradation prompted the government to issue regulations aimed at improving peat governance. The Peatland Restoration Agency was established in early 2016. The restoration action policy includes the rewetting, revegetation and revitalisation of local livelihood (known as the 3Rs). Today the focus is on sustainability rather than exclusively economic considerations, as in the past. Successful approaches ensure that the intervention is based on site damage characteristics, and drivers of this damage. If, for instance, assisted revegetation is used, the cost and threat of fire need to be considered. Analysis of numerous projects indicates that natural regeneration is the main option for large-scale restoration, which can be conducted at a reasonable cost. Also critical to success is considering community livelihoods as part of the restoration efforts, while ensuring that communities have profitable livelihood options that are compatible with ecosystem restoration. At the local level, more comprehensive restoration activities that emphasise these livelihood benefits are important for encouraging community participation. Yuwati et al. provide further information on what works and has not worked in peatland restoration (Yuwati *et al.*, 2021).

Palaeoecological records from Sungai Buluh provide evidence that peatlands can recover from human disturbance. This demonstrates the need for peatland restoration to mimic ‘resilience-friendly’ human activities, such as selecting rapidly regenerating taxa for cost-and-effort-efficient restoration strategies (Hapsari *et al.*, 2018). The effectiveness of integrating historical knowledge of the environment at the restoration planning stages to achieve successful outcomes is also supported for the restoration of shallow peatlands (Grand-Clement *et al.*, 2015).

The integration of knowledge on the historical environment at the planning stage of restoration is essential, as it enables the effective mitigation of threats to archaeological features and sites. In Exmoor in the UK, the use of bales, commonly employed in upland ecosystems, has been found to be problematic. Instead, ‘leaky dams’ or wood and peat combination dams are more efficient to reduce and divert water flow and are longer lasting than bale dams. However, local differences in peat depth and ditch characteristics (ie. length, depth and width) between sites affect both the feasibility and the cost of restoration. Overall, the restoration of shallow peatlands is shown to be technically viable.

The analysis of both published and unpublished findings on peatland restoration has highlighted the need for an integrated peatland protection and restoration strategy, based on raising water levels in drained peatlands and maintaining them in forested peatlands, which will reduce greenhouse gas emissions. In addition, Applegate *et al.*

highlight the importance of business models that strengthen livelihoods and smallholders to ensure their interest is maintained in sustainably-managing peatlands. For successful projects it is important to ensure that these integrated business models are designed to attract smallholders and investors who work to ensure hydrological rehabilitation of peatlands, which also have relatively low levels of investment risk (Applegate *et al.*, 2021).

A trial in Indonesia that monitored the water and carbon dynamics of peatland restoration, by the Australian Government ACIAR Programme, provided highly successful outcomes. Not only in using eddy covariance flux towers and Chameleon soil water sensor networks, but also in engaging and training local research and field teams, building scientific capacity in members, developing transdisciplinary partnerships and strong relationships with stakeholders through the integration into wider scientific, policy and practice networks. The outcome of this approach for monitoring peatland restoration has been the establishment of a successful methodology, which demonstrates that tropical peatland restoration can feasibly be directly monitored at landscape scale (Grover, 2020).

Others working in peatland restoration have identified the need for greater ecological knowledge on peatland restoration to enhance the success and effectiveness of peatland restoration, while also enabling a greater understanding for local communities through a climate justice lens (Dohong, Aziz and Dargusch, 2017; Merten *et al.*, 2021; Silvianingsih *et al.*, 2021).

Investments in peatland restoration in Indonesia between 2004 and 2015 could have resulted in economic savings of US$8.4 billion. In addition, it's estimated that fires in 2015, the largest in recent years, resulted in economic losses totalling US$28 billion. These economic assessments make peatland restoration a cost-effective strategy to reduce the impacts of peatland fires to the environment, climate and human health. It has also estimated that if restoration had been completed prior to 2015, the area burned in 2015 would have been reduced by 6%, reducing CO2 emissions by 18%, and PM2.5 emissions by 24%, preventing 12,000 premature mortalities (Kiely *et al.*, 2021).

Peatlands in the Cuvette Centrale, central Congo Basin, are one of the most extensive tropical peatland complexes, at ca. 145,500km^2. The evidence above demonstrates that peatlands can be restored. A critical research gap for peatlands is an understanding of the interplay between peat, fauna and flora, and local livelihoods (Dargie *et al.*, 2017).

For Southeast Asia peatlands (Thornton et al.2016), local populations depend heavily on fishing as a key source of protein, and some fishing takes place within the peat swamps themselves. However, we do not know how fish populations in the rivers and swamps are connected, if at all, nor what additional diversity, and/or resource resilience, is supported by peatland habitats within the landscape as a whole. This is just one example of the possible synergies that might exist between carbon, biodiversity and socio-economic motivations for the careful management of Cuvette Centrale peatlands. Future research therefore needs to integrate knowledge from local communities, the natural sciences and social sciences to develop a more holistic understanding of the Cuvette Centrale peatlands and facilitate local communities and their governments to manage and protect this globally-significant region.

Mangrove restoration (SA, SEA) - The Chokoria Sundarbans in Bangladesh provide an example of an effective mangrove restoration programme, based around an integrated approach to the inclusion of social, ecological and economic factors. The restoration programme began with a pilot community-based mangrove restoration project in 2003 with the IUCN Bangladesh (IUCNB). It started with an analysis of the degradation history and an analysis of the area's current biophysical condition. Having learned from previous failed restoration projects, the IUCNB worked to involve and gain community participation from the outset to ensure they had ownership of the project and that the processes were transparent. Representatives from many stakeholders across the community were involved in the design of the restoration plan, which considered existing biophysical and socio-economic conditions of the site. The local community played an active part in the restoration plan's development. Ecological considerations in the restoration plan were based on the established degradation history and the current biophysical condition (Biswas *et al.*, 2009).

A wider analysis on mangrove restoration across Southeast Asia establishes a lack of ecological knowledge to enable effective restoration. Similar reflections have been made in considering the mangrove ecosystems along the Kerala coastline (South Asia), a biodiversity hotspot, where ecological knowledge is also lacking (Sreelekshmi *et al.*, 2021).

Failures in mangrove restoration in Viet Nam have been attributed to a lack of understanding of the variables that contribute to mangrove loss and site hydrology, poor site and species selection, lack of long-term monitoring and management, and lack of incentives to engage local communities in the long-term management of restored areas. Recommendations to improve mangrove restoration include care with species selection, clear protocols for monitoring, reporting and implementing, and using a co-management approach that provides incentives for local communities to benefit from the management of restored mangroves (Hai *et al.*, 2020).

An analysis of mangrove forest restoration in Thailand assessed policies and initiatives using a political ecology lens, and focused on institutional arrangements and power dynamics. A key finding was that formal and informal institutions created by weak actor relations can inhibit long-term success of mangrove restoration (Thompson, 2018).

Restoration governance (SSA, SEA, SA) - Poor governance of restoration and other land management programmes has been highlighted across all geographies as a key barrier to success (Sections 2.2.5, 3.2.6 and 4.2.6). The solution to governance issues is to ensure inclusive and equitable approaches across all levels (Section 5.1). To ensure that restoration strategies do not inadvertently shift ecosystems to a more degraded state, it is critically important to use integrated planning approaches to lead restoration implementation. To be successful, this needs to incorporate effective and inclusive governance structures throughout the restoration process, from planning to implementation and monitoring and evaluation. Governance structures need to include what can often be complex socio-ecological systems at all stages, including, during recurring consultations with local communities and stakeholders (Sapkota, Stahl and Rijal, 2018; Stanturf *et al.*, 2019; Chazdon *et al.*, 2021; Sayer *et al.*, 2021). For effective restoration programmes, such as FLR, higher level institutional governance requires coherence between decision makers at the local, provincial and central governments, and a reduction in competition between sectoral agencies (Sayer *et al.*, 2021). Enhancing community and smallholder tenure rights within governance structures is important for joint environmental and social wellbeing outcomes from restoration (McLain *et al.*, 2021).

Socio-ecological and socio-economic aspects of restoration (SSA, SEA, SA) - Like governance, the findings from this research have elicited key gaps in the social, political, and power dimensions of restoration programmes. Limited inclusion of socio-ecological and socio-economic aspects in restoration programmes has led to a failure to legitimise plural voices, values, equity, justice and situated knowledges. This in turn has led to an alteration in the choices of restoration sites (Budiharta *et al.*, 2016; M. Elias, Joshi and Meinzen-Dick, 2021; Mansourian, 2021; Osborne *et al.*, 2021; Palmer *et al.*, 2022; Qiu *et al.*, 2022).

Indigenous peoples and local knowledge (SSA, SEA, SA) - One of the most significant findings on restoration across all three geographies, and across ecosystem types, has been those related to the inclusion of the traditional knowledge of Indigenous peoples and other local knowledges, and incorporating these knowledges and interconnections with the natural world throughout all aspects of restoration. Indigenous peoples are often the most affected by global environmental change as they directly rely on their local environment for their everyday needs, as do local communities. Inclusion of Indigenous peoples in restoration governance, planning, execution and monitoring provides untapped knowledge to enhance the outcomes. Such approaches provide enabling conditions with short-term direct benefits and provide long-term support for the maintenance of restored areas, while also recognising Indigenous local traditions and customary institutions (Reyes-García *et al.*, 2019b; Long *et al.*, 2020; Long, Goode and Lake, 2020; Brondízio *et al.*, 2021).

Local communities have significant local knowledge about their environment which can improve restoration outcomes through their inclusion in early stages of planning, and ongoing implementation of projects (Galabuzi *et al.*, 2014b; Dawson *et al.*, 2021). An example of including local fisher folk in restoration actions in Bangladesh demonstrates the significant outcomes (Mamun, 2010). There is an ever-growing recognition that incorporating traditional knowledge and scientific knowledge improves restoration outcomes, provided that Indigenous peoples are engaged in their own right and using FPIC (Uprety *et al.*, 2012; Lake *et al.*, 2014).

Restoration scale - A great deal of emphasis has been placed on forest restoration and related forest restoration initiatives in recent years, guided by FLR and delivered in developing countries in Sub-Saharan Africa, Southeast Asia and South Asia. In large areas of rangelands, particularly in Sub-Saharan Africa and South Asia, grassy biomes have been portrayed as “degraded” or “unused” and therefore in greater need of trees. This reflects inappropriate ecological understandings of these landscapes by those implementing and delivering associated programmes. These inappropriate ecological understandings of the ecology of drylands and grassy biomes encourage afforestation, grazing restriction and fire suppression, with negative impacts on hydrology, carbon storage, biodiversity, livestock production and pastoral livelihoods. The target-driven approach requires large-scale afforestation and massive funding to achieve these targets. Nearly half of the area pledged to the Bonn Challenge is destined for forestry and other commercial plantations, which threatens pastoral livelihoods and can cause ecological damage while having very limited potential to mitigate climate change. This provides a large-scale example of unsuccessful restoration activities which the REDAA programme can use to demonstrate the importance of incorporating ecological, social and economic understandings into project activities.

Finance (SSA, SEA, SA) - Governments and international organisations are promoting or drafting programmes to undertake FLR of hundreds of millions of hectares, not only in rangelands but also in degraded tropical landscapes. However, the challenge to recover economic and ecological functionality could be far beyond not only their financial

capacity, but also the needed ecological knowledge to ensure effective methods are used to effectively manage programmes. There will be periods when market signals are not strong enough to initiate changes in traditional land use or farming practices. However, when market signals are strong, it can lead to an overwhelming change to existing land use activities, resulting in transformed and homogenised landscapes (Brancalion *et al.*, 2017).

The Ghana Forest Plantation Development Fund (GFPDF) demonstrates gaps in transparency and accountability in how the funds are used. In this case, there are no mechanisms in place to address stakeholders' information needs about the funds or mechanisms to provide transparency and accountability on how funds are used.

Finance governance (SSA, SEA, SA) - A study into the effectiveness of Ghana's Forest Plantation Development Fund provides insights into how without insistence, transparency and accountability can be lacking in the way such funds are used. The study also found there were no mechanisms in place to address stakeholders' information needs about the fund, which resulted in low awareness and limited accessibility to the fund by its intended beneficiaries. The subsequent weak participation of stakeholders, who were the intended recipients of the fund, resulted in poor outcome performance. These findings identify the need for investments in Sub-Saharan Africa to be accompanied by governance reforms that address barriers to efficient use of climate mitigation investments (Kumeh *et al.*, 2019).

As restoration becomes more and more utilised, the costs and economic benefits and disbenefits need to be assessed. To date, few studies looking at the economics of restoration investigate more than the cost without also assessing the benefits, uncertainty, public goods and markets, economic benefits to communities and investors (Luz, 2021). A holistic approach to restoration for the REDAA programme would benefit by incorporating an economic valuation into all projects, including economic benefits post restoration (J. Fisher, 2022).

Some of the issues noted on finance may be addressed as part of the UN Decade on Restoration through the UN Decade of Restoration Finance Task Force, which is aligned with the UN-D and is consistent with and built on the best current understanding of ecosystem restoration from the perspective of natural and social finance. The Finance Task Force aims to build an enabling environment including financial incentives, socio-economic aspects, criteria, policies, and governance for restoration actions (Finance Task Force, 2021).

An assessment of financial gaps and needs for protected areas and ASEAN Heritage Park management in five Southeast Asian countries found that of the large-scale financial investments by multi-lateral and bilateral government donors, foundations and funds, only 10% across four years was directly invested at the local level in protected areas.

5.1.6. Gaps in knowledge

To enable the REDAA programme to deliver an increased understanding of the processes, functioning and characteristics of peatland and associated ecosystems, key gaps in knowledge not only at the individual-level peatland ecosystem but also the interactions between associated wetland, forest and mangrove ecosystems need to be researched.

Research into ecological knowledge gaps must include Indigenous and local communities. Additionally, the REDAA programme should incorporate multidisciplinary and interdisciplinary actors.

Investment in research using the multifunctional 'scape approach to understand how local context dependencies can deliver on multiple objectives, including habitable climate, self-sustaining biodiversity, and a good quality of life is a key finding from the IPBES and IPCC co-sponsored workshop on Biodiversity and Climate (1.4.1 Figure 2). The findings of this Scoping Report across SSA, SEA and SA, directed by the five research questions have highlighted gaps in ecological knowledge. Responding to these gaps improves process competency and project functionality and characteristics of peatland and associated wetland, forest and mangrove ecosystems. While the land management focii across the regions have been focused on degraded and forest landscapes, advancing understandings of biodiverse ecosystems has continued to be neglected, when the evidence is clear that maintaining their integrity is critical.

The large-scale restoration and other varying land management approaches across the three geographies have essentially failed to advance the limited ecological knowledge on processes, functioning and characteristics of targeted ecosystems. The review of land management approaches has identified many gaps and barriers to effective land management.

Gaps in ecological knowledge make it more difficult to restore functioning ecosystems and provide the livelihood benefits most likely to alleviate poverty. Due to limited ecological knowledge, projects have become focused on using a single or limited number of species resulting in simplified ecosystems, loss of ecosystem integrity, and systems unlikely to deliver resilience to climate impacts, invasive species, and other drivers of ecological change.

The scoping findings indicate that while there is a strong focus on the importance of peatlands, significant gaps exist in ecological functional knowledge, including interactions across and between the associated peatland ecosystem types which interact to maintain peatland processes and function.

While there has been significant awareness raising on the importance of Indigenous knowledge, there are significant knowledge gaps on how to specifically integrate the two knowledge forms to enable and advance ecological understandings, which will advance the function of peatland and associated ecosystems, while advancing the livelihoods of local communities.

Numerous examples have been provided where ecological and socio-ecological principles have not functioned collaboratively, to the detriment of the project outcomes. Though projects often indicate that socio-ecological approaches are being adopted, there is a need to ensure that both streams are integrated and have equal weighting.

5.1.7. Barriers

Based on the findings of this Scoping Report, solutions to meet the objectives of the REDAA programme are most likely to occur through projects which operate in an interconnected manner, providing lead roles to local communities in project design, desired outcomes to build and establish solutions that will work for them.

A research and governance model should be adopted, across all levels of the programme, based on strong participation of Indigenous peoples, and where possible should mirror their governance and law models as these have proven longevity, while enabling communities to maintain and conserve traditional lands. The REDAA programme will need to incorporate governance mechanisms which ensure equality, particularly to reduce poverty while avoiding power dominance that translates across project implementation and outcomes.

Regardless of the governance level of project implementation, without delivery through an integrated, cross-sectoral and equal governance framework, there is a high probability the project will not achieve its desired aims. The most effective way to overcome barriers working with Indigenous communities is to ensure they can lead.

Although the importance of working with Indigenous peoples is well respected and agreed, there is a lack of knowledge and experience in how to do this. Ten key principles — which a group of Indigenous peoples from varying regions have identified — may be useful in this respect. Indeed, there is scope for REDAA researchers to work with Indigenous peoples who can take the role as lead researchers, and use the proposed framework below to inform Indigenous-led approach: see https://www.sfu.ca/sfunews/stories/2022/01/sfu-joins-indigenous-led-research-initiative-tackling-biodiversi.html.

The evidence review has found key barriers exist across all land management and restoration types in bringing all sectors along the same journey, implementing cross-sectoral projects, and overcoming intersectional inequalities, while also preventing biodiversity loss. The majority of land management and restoration projects reviewed[19] have used more traditional approaches to environmental projects by segregating sectors and working in isolation. In many cases, the FLR Programme has been based within forestry sectors, who use different approaches and have different knowledge bases to wildlife or conservation sectors. A sectoral approach may not use the programme effectively to obtain the greatest benefits for alleviating poverty if they are not working in collaboration with local communities. Excellent examples of how this can operate have been conducted in Viet Nam though projects led by the Asian Indigenous Peoples Pact. Through the leadership of Indigenous peoples in project design and implementation, sectoral approaches provided excellent outcomes, not only for improved forestry management but also alleviating poverty, while advancing the rights and incomes of women, as well as justice and equity understandings across all sectors.

The complexities of resulting problems associated with large-scale projects have been demonstrated throughout this review and found to be the most ineffective method of project delivery. They often instigate unhealthy inequalities while providing limited benefits in alleviating poverty. The most effective outcomes across all geographies have been from small-scale local projects, and often led by Indigenous and local communities. Large-scale projects can lead to dispossession of local people, issues around land tenure, and often lack an understanding of local needs and project impacts. They often lead to greenwashing policy trade-offs and offset schemes.

Common barriers include the ‘shifting baseline syndrome’, by which many disagree on how to establish the baseline ecological understandings prior to beginning restoration to gain an understanding of ecosystem change over time. A

[19] SSA 2.2.6, SEA 3.3.7 and SA 4.2.7, 5.1.3

methodology to overcome this problem, which is field-based and uses mapping technology, has been established by the IUCN CEM Ecosystems and Invasive Species Thematic Group to measure ecological, economic, and social effectiveness of restoration over time (J. Fisher, 2022).

Other barriers to restoration projects are the scale of the project, the complexity of the ecological knowledge required, the need for long-term commitments, ongoing and long-term funding requirements, open-ended funding challenges, and most importantly, the ability to work with all stakeholders to establish a long-term vision These barriers can be overcome through stretch goals and backcasting. In an integrated and inclusive manner, stakeholders come together to develop ambitious and creative long-term stretch goals. Backcasting is then used to visualise and develop a pathway to reach the desired end point. This approach allows freedom of thinking to move forward with a vision rather than accepting that future ecosystems are victims of past and present political realities (Lindenmayer, Fischer and Manning, 2006).

The REDAA programme will need to incorporate governance mechanisms which ensure equality particularly to reduce poverty while avoiding power dominance (Mansourian, Walters and Gonzales, 2019; Walters *et al.*, 2021), which translates across project implementation and outcomes. REDAA projects should be implemented to avoid power relations taking control over nature, but rather using the perspectives of people and nature as one (Redvers *et al.*, 2022). REDAA projects would benefit by incorporating equitable and inclusive governance approaches that consider Indigenous peoples' governance arrangements. (Brondizio and Le Tourneau, 2016; Dudgeon and Bray, 2019; Brondízio *et al.*, 2021; Dawson *et al.*, 2021), (Adeyeye, Hagerman and Pelai, 2019; Robinson and Raven, 2020; IUCN, 2021).

Biodiverse environments and local people do not have priority over the distribution of project funds. This has been demonstrated in numerous examples across all geographies and differing land management approaches, including restoration. With significant funds being committed by organisations in association with the UN Decade of Restoration, FLR programmes and others, the findings of this review have demonstrated there needs to be a high level of governance and bi-directional accountability on how funds are used.

A review of the FLR programme across Africa found that large funding amounts are invested at higher levels due to the complexity of large-scale projects, with limited funding reaching the local communities. Due to the lack of funds directed to the local level they have not been able to develop and establish income-generating activities or be actively engaged in restoration processes. A review of PA fundings for SEA found that despite large amounts of funding being committed for protected areas, only 10% was invested at the PA level. The REDAA programme can overcome this barrier by incorporating due diligence and governance structures.

For the purpose of the REDAA programme, the key messages from the Das Gupta Review on the Economics of Biodiversity align well with findings of this Scoping Report (Das Gupta, 2021b). Understanding the value of natural assets refers to 'inclusive wealth' and provides a coherent measure that corresponds directly with poverty alleviation and advancing marginalised communities, as the REDAA programme is designed to do. The findings of the Das Gupta Review align with the multifunctional 'scape approach.

Project locations for the REDAA programme will need to ensure that peatland and associated ecosystems intersect with local communities who can benefit from engagement with programme outputs. Careful intersections of these places will provide the best outcomes aligned with the REDAA programme objectives (Figure 2 and Figure 3), and the desired outcomes of the FCDO (EACDS and FCDO, 2021; Foreign, Commonwealth and Development Office, 2021).

5.2. Research recommendations

The findings of the IPBES and IPCC co-sponsored workshop on Biodiversity and Climate identified a need for investment in research using the multifunctional 'scape approach to better understand how local context dependencies are able to deliver on multiple objectives. This identified ecological knowledge gaps align well with the REDAA research recommendations and is based on findings across SSA, SEA and SA (SSA 2.2.6, SEA 3.2.7, SA 4.2.7).

The following REDAA research recommendations align with the scoping findings. The research recommendations are based on a five-year programme implemented across SSA, SEA and SA.

1) Conduct ecological research to understand peatland function and processes, using a multifunctional 'scape approach, with a key focus on intact peatlands. Site characteristics will determine the ecosystem sub types ie. forest, wetland, coastal or mangrove, to be researched (SSA, SEA, SA).

2) Conduct ecological research to understand the ecological dynamics of wetlands to provide ecological knowledge which will enable restoration based on sound understandings of ecological drivers (SA).
3) Conduct hydrological research in association with 1 and 2.
4) Identify and incorporate data on historical site history, causes of biodiversity change, including potential future risks, into ecological research to understand potential restoration actions, aligned with 1, 2 and 3 above.
5) Conduct research in collaboration with Indigenous peoples on traditional knowledge to guide specific ecological research.
6) Ensure all research places a key focus on knowledge required to restore ecological function and processes which will benefit local livelihoods, while alleviating poverty.
7) Conduct research to design an integrated governance model to lead the REDAA programme, which incorporates best practice socio-ecological and socio-economic methodologies to ensure effective REDAA governance across project design, inclusiveness and leadership of local communities, implementation, measurement and evaluation.

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Appendices

Appendix 1: Impacts on SSA biodiversity from population expansion and development

The African population is projected to nearly double from around one billion in 2010 to almost two billion by 2040 and may well reach 3 billion by 2070. Countries with the highest population growth rate include Zimbabwe (4.36%), South Sudan (4.12%), Malawi (3.3%), Niger (3.28%), Burundi (3.28%) and Uganda (3.24%) (IPBES, 2018g) (Figure 34).

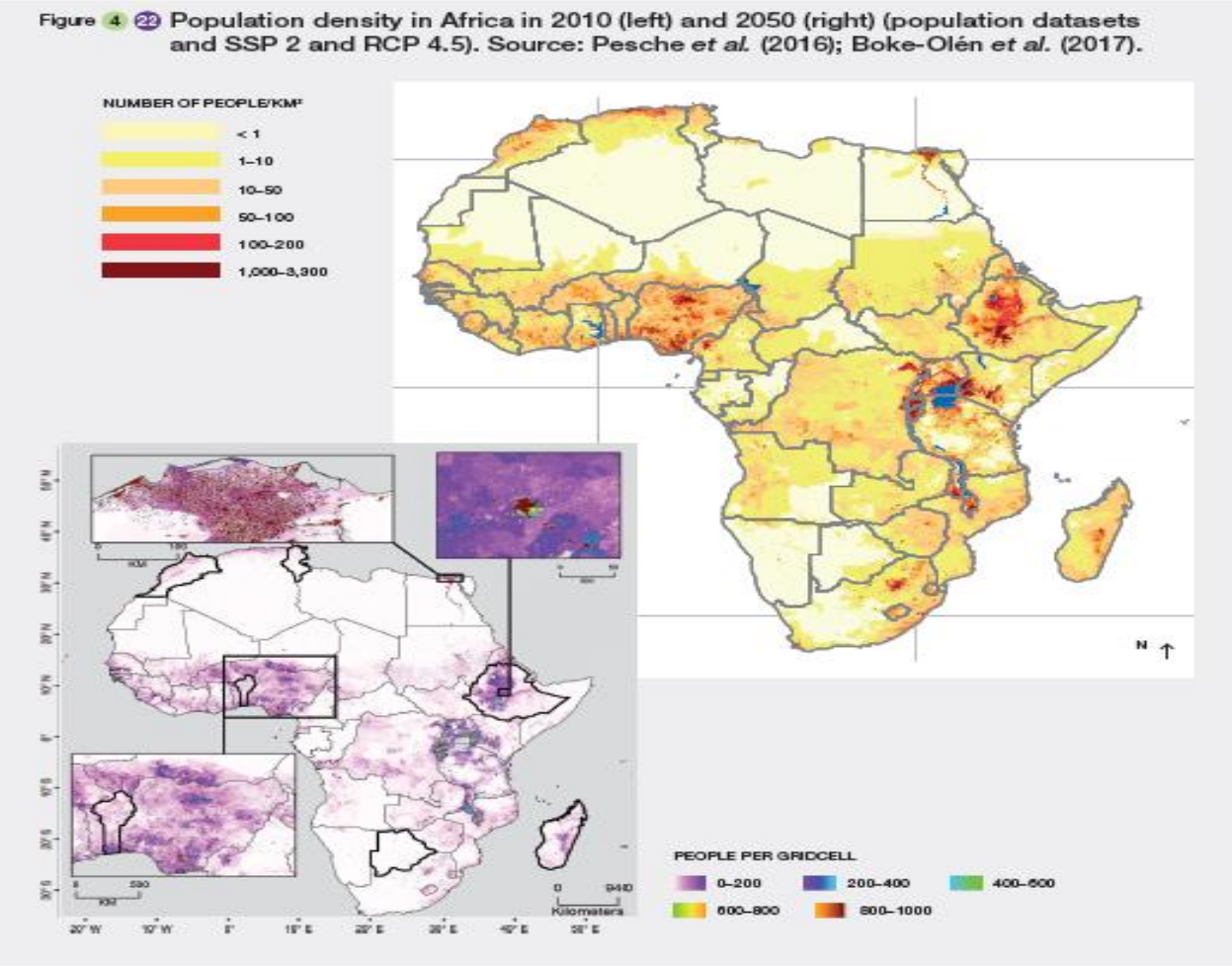

Figure 34: Population density of Africa in purple in 2010 and projected for 2050 in yellow (IPBES, 2018e)

A direct driver of biodiversity loss, and consequent loss in benefits to people, are active and proposed development corridors resulting in largescale expansion of infrastructure (Figure 35 and Figure 36) (Laurance *et al.*, 2015; IPBES, 2018g). Figure 35 demonstrates desirable and undesirable developments which could occur in the corridors of development (Figure 36). The focus of the REDAA programme based on the evidence within this Scoping Report, and for Africa in particular, will be to work with local communities to maintain intact high value habitat that benefits local communities and reduces poverty.

Poverty tends to force people to have greater reliance on the environment, which can itself lead to degradation to meet short-term survival needs. However, wealth is no guarantee that degradation will not take place, especially if policy gaps or perverse policy outcomes allow inappropriate land management practices (ESPA, 2018b; Baloch, Danish, Khan and Ulucak, 2020; Baloch, Danish, Khan, Ulucak, *et al.*, 2020; Ofori *et al.*, 2021; Paul, 2021).

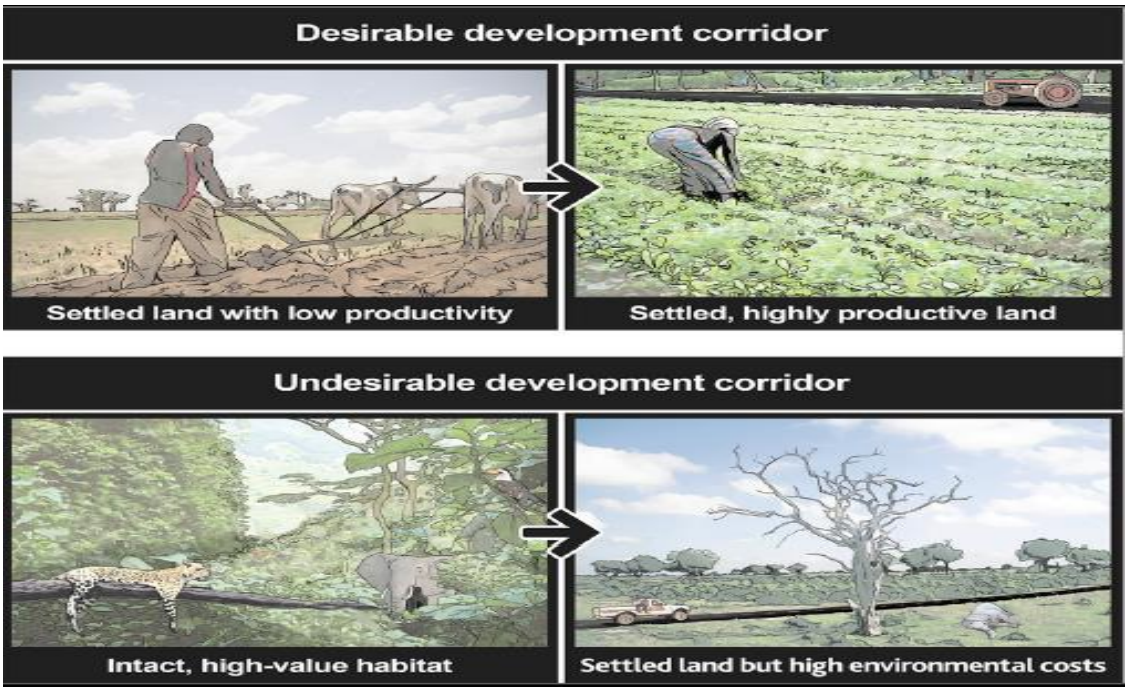

Figure 35: Opportunity cost and risks, desirable and undesirable development corridors (Laurance et al., 2015)

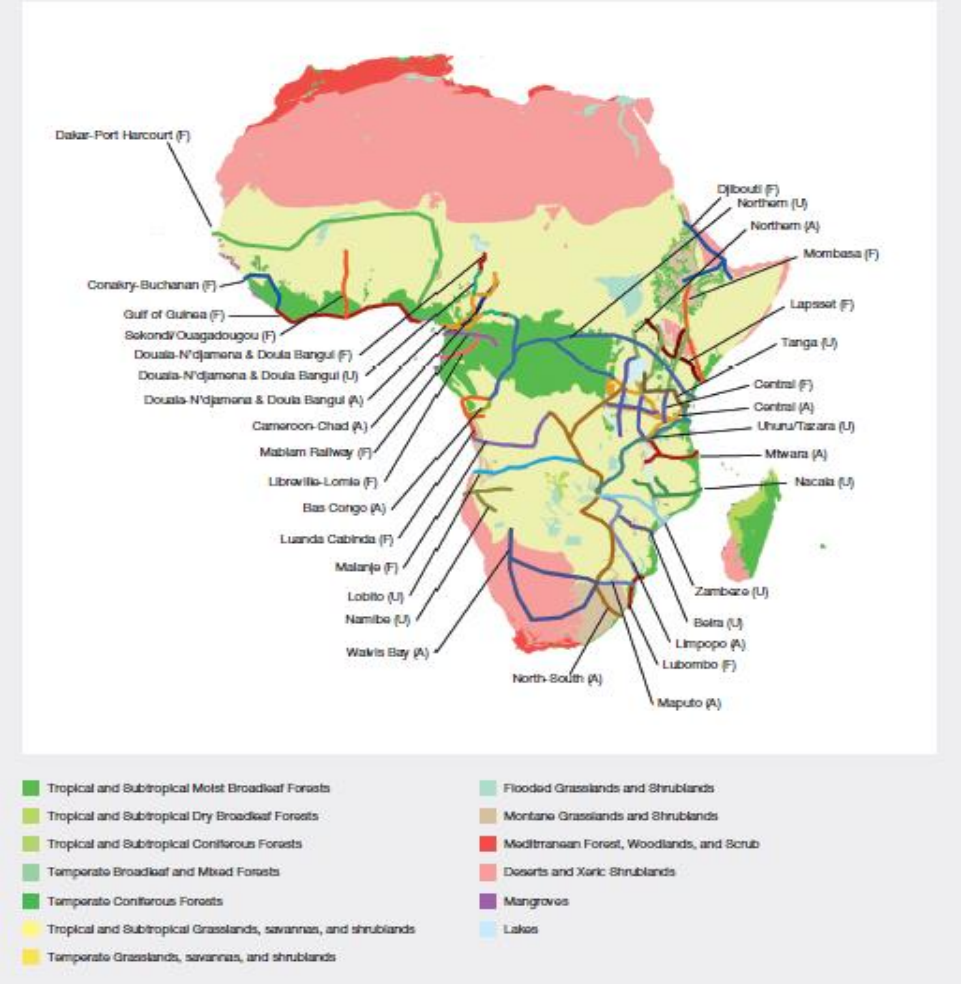

Figure 36: Future development corridors and likely scenarios of development pressure on African ecosystems. Legend: A=already active; F=planned for the future; U=upgrade planned or under way (Laurance et al., 2015)

Appendix 2: Analysis of land management approaches across SSA

Pan African Agenda on ecosystem restoration

The aims of the Pan-African Agenda include the following:

It is hoped that by 2025:

1) All African Union Member States will have in place national ecosystem restoration plans to operationalise the Pan-African Action Agenda
2) National and sub-national ecosystem restoration coordination committees (or similar mechanisms) will be established or strengthened across the region
3) All Member States will have developed policy and legal frameworks, or reformed existing ones to enable or incentivise national ecosystem restoration or create disincentives for activities and processes causing ecosystem degradation, including tenure related drivers
4) At least one large-scale major ecosystem restoration project and programme will have been initiated in each Member State or up scaled with sizeable funding from national budgetary allocation and external financial and technical support from multiple sources and partners
5) IPs and LCs, women and youth will be proactively engaged in the development and implementation of ecosystem restoration policies, projects and programmes in all Member States
6) Relevant tools, technologies and innovative solutions will be developed or mobilised and made available to assist Member States and partners to effectively design, implement, monitor and report on ecosystem restoration initiatives.

It is also expected that, by 2030:

> At least 200 million ha of critically degraded ecosystems of various types will be restored (ie. moved back into a condition of good ecological health, integrity and resilience) with direct benefits to livelihoods (UN Biodiversity Conference COP 14, 2018).

Farmer Managed Natural Regeneration Projects

Farmer Managed Natural Regeneration Projects (FMNRP) are active in Ghana including in SSA (Chomba *et al.*, 2020; Kandel *et al.*, 2021; Kpolita *et al.*, 2022), using incentive-based restoration in Tanzania (Wainaina *et al.*, 2021) and equity-based restoration in Kenya (McLain *et al.*, 2021). A review has been conducted on landscape restoration (Auda-Nepad and Food and Agriculture Organisation, 2021) with examples at the ecosystem level provided in Section 5.

Community-based natural resource management (CBNRM)

Many African countries have used wildlife protection and management as one of the community-based natural resource management goals. Community-based natural resource management passes decision-making authority over biodiversity and ecosystem services to local communities and can drive important institutional reforms and power redistributions (Roe, Nelson and Sandbrook, 2009). Community-based natural resource management also theoretically provides a space for Indigenous and local knowledge to have a greater influence (Gadgil, Berkes and Folke, 1993).

Across Africa there is mixed picture of the success of community-based natural resource management. In Tanzania, community-based forest management is considered most effective as it provides sufficient incentives for communities to participate in long-term forest management. Community-based forest management has improved management of unreserved forests because villagers own the land and retain full rights to benefit from natural resources. Joint forest management initiatives in Tanzania, where central or local governments own land, perform slightly better than exclusive state-managed forests, though their viability remains uncertain. Joint forest management is considered restrictive and the guidelines on benefit sharing are vague, resulting in minimal transfer of benefits to communities and inequitable transfer of management costs to resource managers (Blomley and Iddi, 2009).

Community-based natural resource management has drawn considerable critique (Logan and Moseley, 2002; Frost and Bond, 2008; Shackleton *et al.*, 2010; Pailler *et al.*, 2015). For example, the establishment of new, decentralised committees can sometimes conflict with traditional community governance systems, as found in Benin and Swaziland (Stringer, Twyman and Thomas, 2007; Mongbo, 2008). Conflicts arise due to the need to redistribute power and

authority, but this is opposed by some groups at the local level, particularly if such redistribution challenges traditional structures and processes. These situations can be difficult to manage, particularly if older and younger generations take different positions.

Another example of community-based conservation can be drawn from Namibia, where some nature conservancies cover their operating costs with income derived from trophy hunting and from tourism (Naidoo *et al.*, 2016). The two activities together provide the greatest incentives for conservation on communal lands in Namibia. A singular focus on either hunting or tourism would reduce the value of wildlife as a competitive land-use option and would have grave repercussions for the viability of community-based conservation efforts in Namibia, and possibly other parts of Africa (Naidoo *et al.*, 2016).

Appendix 3: ASEAN Heritage Parks

Halting imminent species extinctions in the ASEAN region is an urgent regional and global priority. The ASEAN Heritage Parks (AHP) Programme provides a mechanism to contribute to the security of ASEAN's unique biodiversity, while enhancing ecological recovery of ecosystems and species, across the ASEAN region. The REDAA programme can be advanced through association with the 40 AHPs (Table 6) which align with seven of the SDGs (**Error! R eference source not found.**).

ASEAN Heritage Parks (AHPs) are "protected areas in the ASEAN region which are known for their unique biodiversity and ecosystems, wilderness and outstanding values", and are given the highest recognition because of their importance as conservation areas (Steeman, 2019). The AMS manage AHPs to maintain ecological processes and life support systems, preserve genetic diversity, ensure sustainable utilisation of species and ecosystems, while maintaining AHPs as wilderness areas with scenic, cultural, educational, research, recreational, and tourism values (Mardiastuti, Kusrini and Buchori, 2013). The AHP Programme has 50 protected areas declared as AHPs, across the 10 ASEAN countries, with more expected to be declared in succeeding years (Table 9, Figure 11).

Table 9: The number of ASEAN Heritage Parks per country

Country	ASEAN Heritage Parks
Brunei Darussalam	1
Cambodia	2
Indonesia	7
Laos	1
Malaysia	3
Myanmar	8
the Philippines	9
Singapore	2
Thailand	7
Viet Nam	10

Appendix 4: Restoration literature analysed for Section 5

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Appendix 5: REDD+ literature analysed for Section 5

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