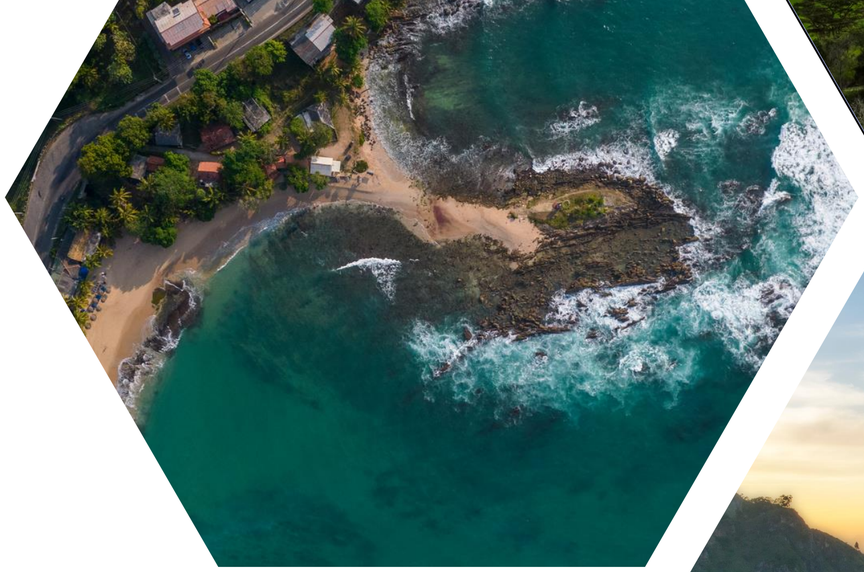
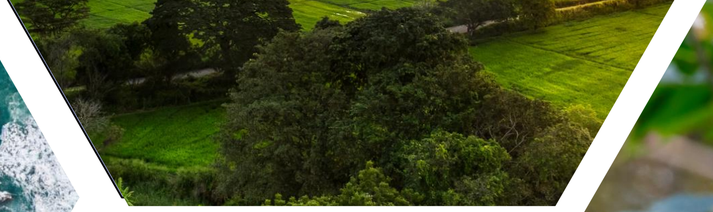






Project Based Levers for Climate Change Adaptation Action

How Policy and Governance can be translated to implementable actions in the Ground.

THE WORLD BANK

Outline of Session

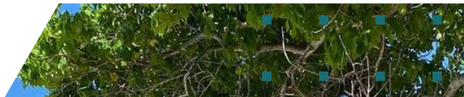
- Climate Smart Agriculture in Sri Lanka
  - Snapshot of agriculture in Sri Lanka
  - Nature of climate shocks and potential implications for agriculture
  - Agriculture and GHG emissions
  - Climate Smart Agriculture (CSA)
  - World Bank support to CSA in Sri Lanka
  - Way forward

- The Landscape Approach to Natural Resource Management as a Key Lever
  - The Landscape Approach
  - Natural Capital Accounting
  - Examples from WB Projects

- Investing in Nature for Climate Adaptation Benefits
  - Biodiversity
  - Nature Based Solutions
  - Nature Based Tourism
  - Green and Nature Finance

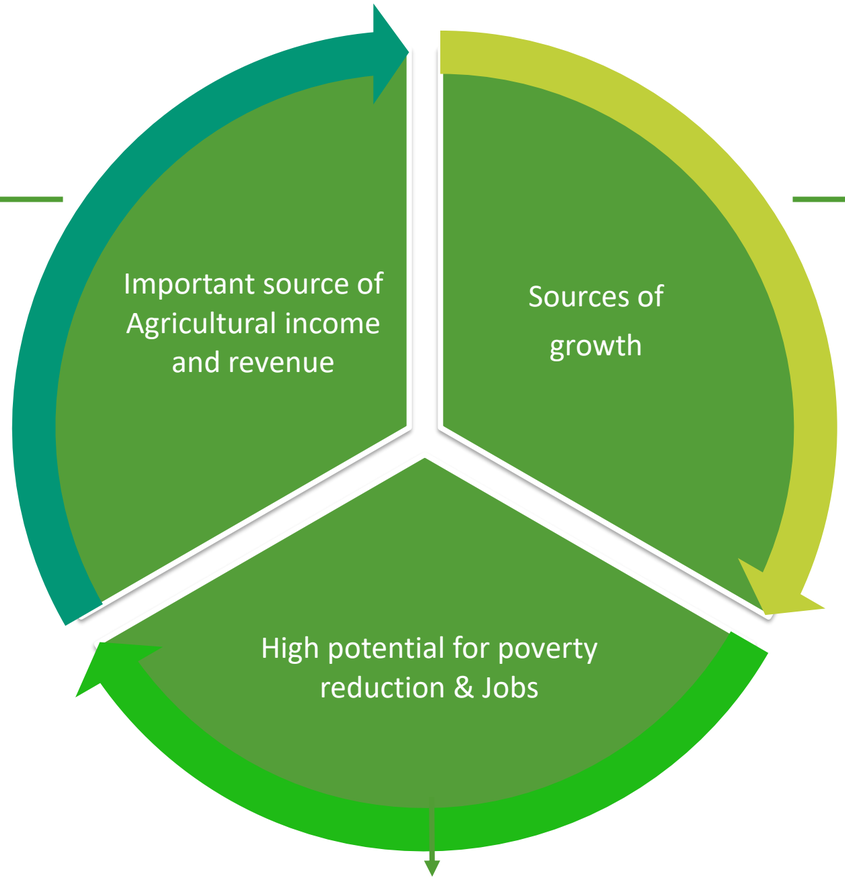
CLIMATE SMART AGRICULTURE IN SRI LANKA

Prof Jeevika Weerahewa



Snapshot of Agriculture in Sri Lanka

Large share of forex earnings and income for about 80 percent of total population



About 7 percent of GDP from primary production; 26 percent with food services and manufacturing

- **Long standing issues:**
  - **Interventionist policy:** focus on paddy self sufficiency at expense of other crops.
  - **Fragmented institutions:** Many institutions with overlapping mandate.
  - **Land fragmentation**: 80 percent of land state owned, poor economies of scale.
  - **Price support:** High tariffs for import substitutes at expense of export potential.
  - **Fertilizer subsidies:** little room for spending on other priorities (R&D, extension, public infrastructure).
  - **Limited involvement of private sector.**

Contributed to Poverty Reduction and Improvement in Food Security'

- **Emerging challenges:**
  - **Macroeconomic crisis:** Debt distress, depleted foreign reserves (needed for fertilizer and other inputs)
  - **Climate change:** Climate disaster and long-term climate change (drought reduced tea yield by 30-year low, rice by 40%).
  - **Other risks:** Future pandemics, bad policy decisions (fertilizer import ban)

Nature of climate shocks and implications for agriculture

- **Widespread changes in rainfall patterns and temperature predicted by several climate projections**
  - Wet areas are becoming wetter, while the dry areas are becoming drier
  - Annual rainfall is expected to increase by a minimum of +57 mm, with up to +121 mm in the WZ, while droughts will be magnified, particularly in the DZ and IZ.
  - Temperature increases will range between +1 and +1.2 °C, with greater impact in DZ and IZ.
  - Frequency and intensity of extreme weather events will increase
  - Shift in climatic zone boundaries – IZ extending into DZ in some areas

Nature of climate shocks and implications for Agriculture

- Agriculture sector is highly vulnerable
  - Increased susceptibility to extended dry spells and warming
    - Growing scarcity of water for agriculture
    - Decline in productivity of crops and livestock
  - Rising incidence of extreme events
    - Losses and damages to crops due to droughts and floods
- Growing risk of climate shocks lead to negative impacts on:
  - Food and nutritional security of the country
  - Income and livelihood of farmers includes most of the country's poor
  - Earnings from agricultural exports

- **Vulnerability intensified by multiple factors**
  - Low adaptive capacity of small holders who are dominant in all subsectors of agriculture
  - High dependence on few major crops (e.g. paddy, tea) with low level of diversification
  - Low technological base of agriculture production

Climate Smart Agriculture

- Climate-smart agriculture (CSA) is an approach for transforming and reorienting agricultural systems to support food security under the new realities of climate change.

- Threat of climate impacts can be reduced by increasing the adaptive capacity of farmers as well as building resilience and improving resource use efficiency in agricultural production systems

- CSA differs from 'business-as-usual' approaches by emphasizing the capacity to implement flexible, context-specific solutions, supported by innovative policy and financing actions.

Climate Smart Agriculture

Overall, CSA aims to attain ‘triple win’ outcomes

Productivity

- Sustainably increase agricultural productivity and incomes. Key concept is ’sustainable intensification’ through adoption of eco-based approaches

Adaptation

- Reduce the exposure of farmers to short-term risks, while also building their resilience by strengthening their capacity to adjust and prosper in the face of shocks and longer-term stresses

Mitigation

- CSA should help reducing GHG from agriculture such that emissions from each calorie or kilo of food, fibre and fuel that we produce is decreased and deforestation due to agriculture is minimized

World Bank Support to CSA in Sri Lanka

- Climate Smart Irrigated Agriculture Project

- US$ 110 million lending operation on CSA
- Designed to improve the productivity and climate resilience of smallholder agriculture in eleven hotspot areas spread across six provinces in the dry zone of Sri Lanka
- The project aims to build the resilience of vulnerable farmers through:
  - promotion of climate-smart agricultural practices and technologies
  - enhancing market access for rural producers
  - rehabilitation of village tank cascade systems
  - improved management of cascade systems through institutional development

World Bank Support to CSA in Sri Lanka

Agriculture Sector Roadmap (ASR)

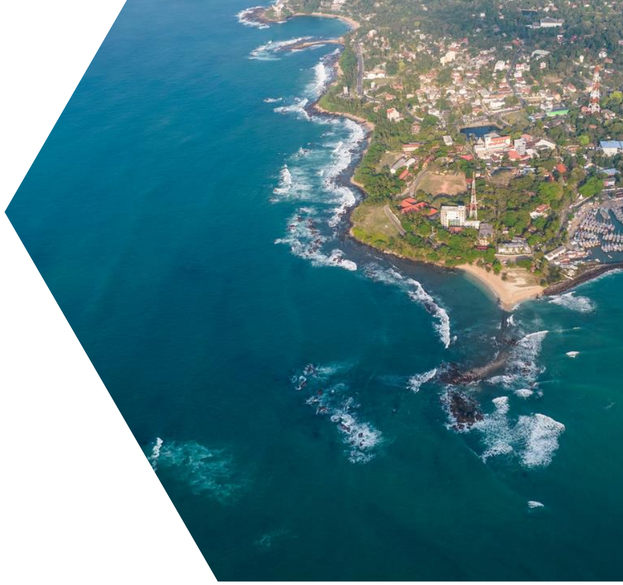
- **Deliverable**: *Climate risk profile of agriculture with loss and damage assessment*
  - Assess the risk profile of key sub-sectors of agriculture
  - Identify strategies to enhance the adaptive capacity of producers and the agri-food system
  - Inform cross-sector solutions needed for food system resilience

PROGREEN: Recovery and resilience in the dry zone production landscapes of Sri Lanka

- Technical assistance supported by the PROGREEN Trust Fund
- Develop understanding on rural vulnerability to climate change and pathways for communities to recover from the impacts
- Build resilience in the production systems and natural landscapes through adoption of sustainable landscape management practices.
- Leverage synergies between agriculture production and restoration of natural capital as a long-term strategy that builds on the landscape approach

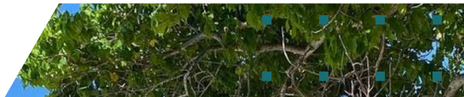
The Way Forward

1. Empower farmers through training and technical assistance to adopt innovative technologies
2. Establish early warning systems, risk mitigation measures (weather indexed insurance) and payment for eco-system services
3. Promote CSA among all stakeholders of agriculture value chains
4. Build institutional capacity for supporting CSA and increase coordination among institutions
5. Mainstream CSA in national agriculture policy



THE LANDSCAPE APPROACH TO NATURAL RESOURCE MANAGEMENT AS A KEY LEVER

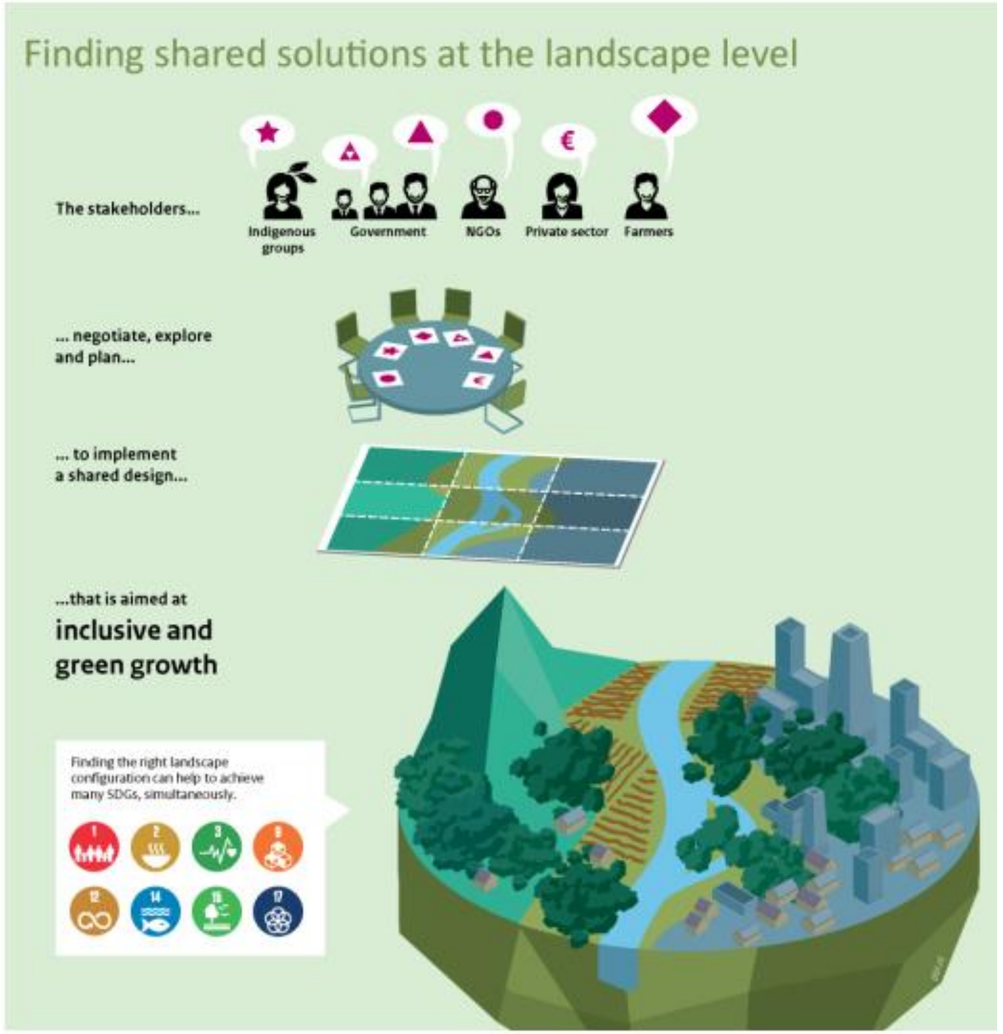
Nadeera Rajapakse



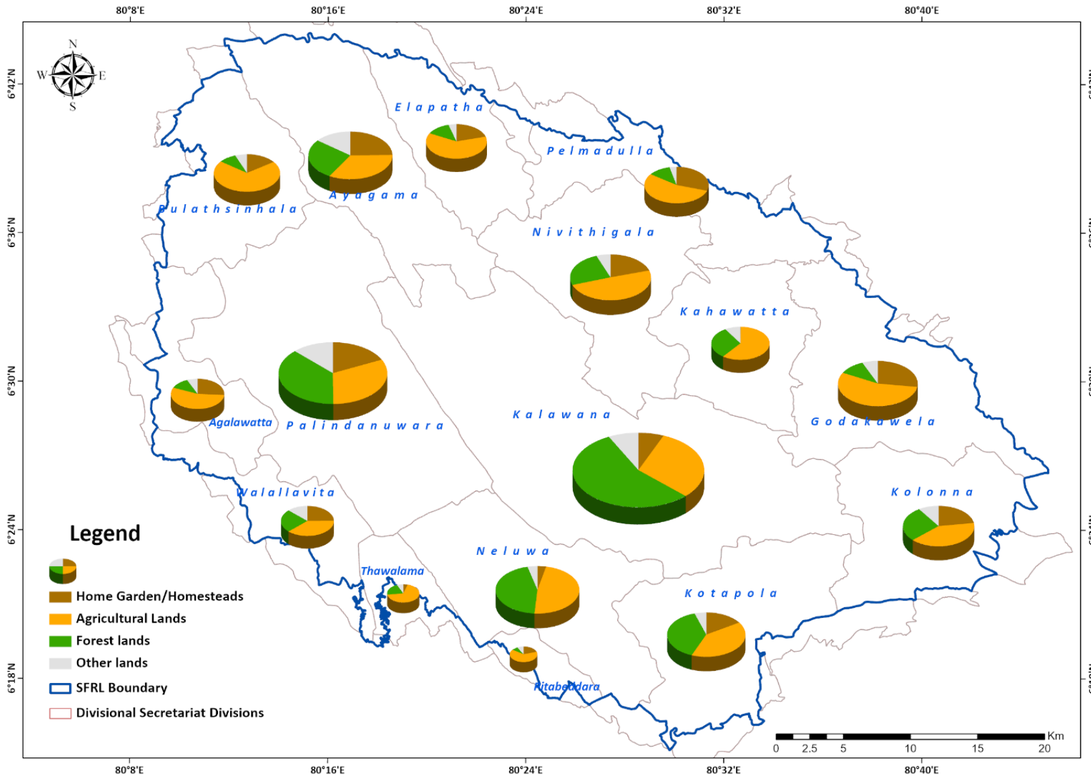
Application of the landscape approach as a powerful lever for reducing greenhouse gas emissions and improving resilience to climate change

The Problem

- Climate change, land degradation, food security !
- Land use change has had the largest negative impacts on nature; Conversion of natural land and water to agriculture and aquaculture is a leading cause of biodiversity loss.
- Sectoral policy approaches to land use have dominated the resource management field to date.
- They assume particular lands have one priority objective, such as farming or forestry, and that this objective is a ‘trade-off’ against other objectives
- Sectoral approach does not reflect the multi-sectoral nature of most landscapes and is not longer helping us address the problem !
- The ILM framework is developing as an alternative to these conventional sectoral approaches of sectoral land-use planning, governance, and management
- The landscape level is often the best scale for managing interactions, synergies, and trade-offs for the various aspects of natural resource management
- At the landscape level, government can choose development pathways that do not necessarily lead to greater pressure on land, but which rather have the potential to provide multiple co-benefits in the sense of climate change mitigation and adaptation and combating land degradation and food insecurity.
- Conservation of undeveloped land is a vital strategy for reducing greenhouse gases and for protecting ecosystems from the effects of climate change.
- Landscapes are multifunctional by nature , requires a lot of coordination, sound policy and government stewardship are necessary



Ecosystem Conservation and Management Project in SL



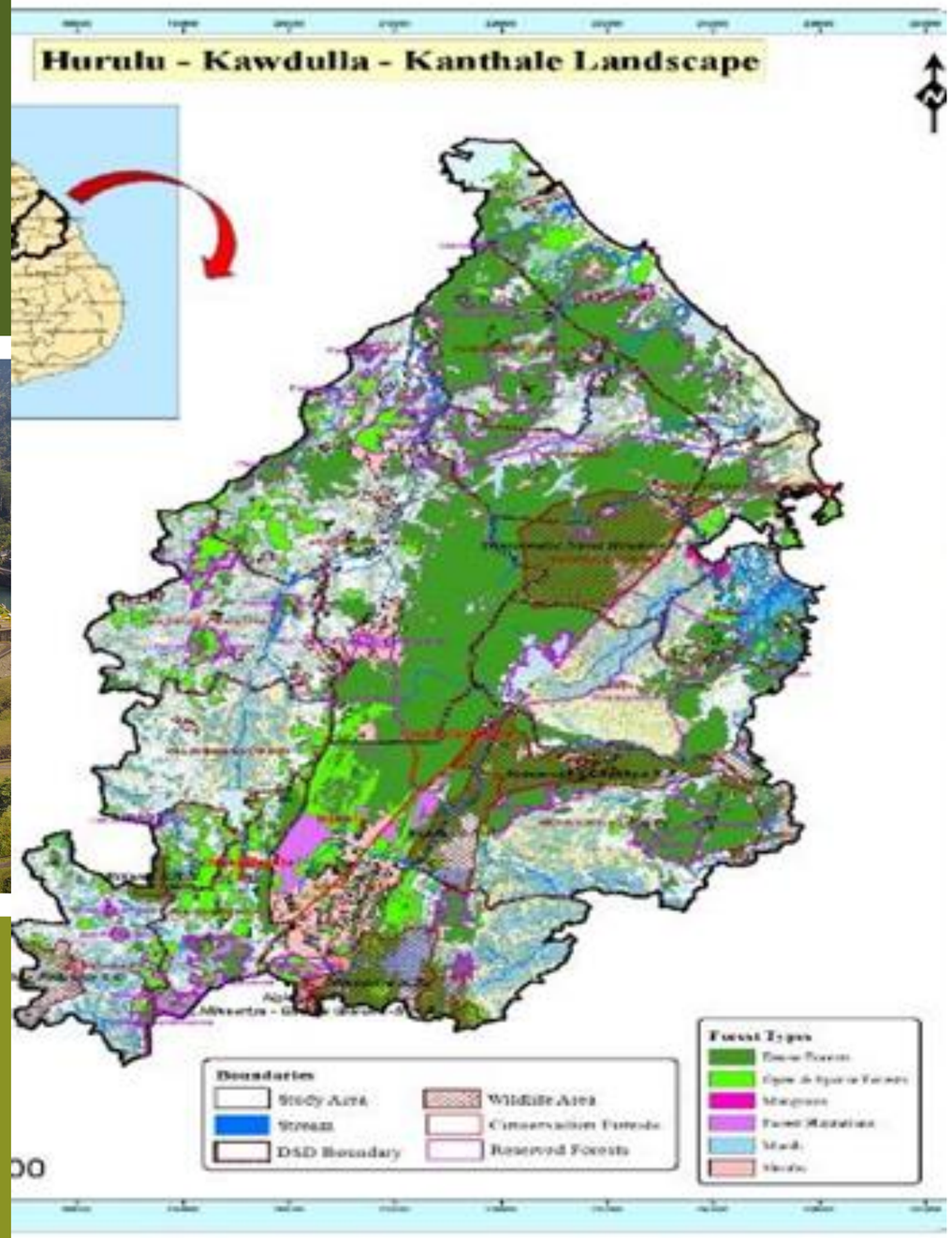
Sinaharaja Forest Range Landscape Management Plan

SFR Landscape Management Plan (10 Yrs)

No	Strategic Themes - 14	SDGs
ST 1	Strengthened management of natural forests in the SFRL for biodiversity conservation, climate change mitigation and enhanced ecosystem services	15
ST 2	Strengthened sustainable management of forest plantations in the SFRL	15
ST 3	Strengthened capacity in FD offices of the SFRL for conservation of forest biodiversity and ecosystem services	15
ST 4	Reduced threats to forests in the SFRL through enhanced law enforcement	15
ST 5	Improved tree cover in non-forested lands (home gardens, urban centers, and private lands) within ecological networks of the SFRL	8,15,12
ST 6	Human–wildlife conflict in the SFRL minimized	15,
ST 7	Species and genetic diversity of wild species and crops in the SFRL conserved through varied approaches	14,15
ST 8	Enhanced landuse planning in the SFRL to conserve biodiversity and preserve ecological integrity and functionality	3,6,9,11
ST 9	Integrated landuse established in the SFRL to achieve conservation and sustainable development goals	11
ST 10	Enhanced protection of watersheds and water resources to enable hydrological balance in the SFRL	6
ST 11	Capacity built to predict, mitigate and address climate change impacts on human wellbeing, agriculture and human settlements in the SFRL	3,13
ST 12	Strengthened capacity to mitigate impacts of natural hazards and climate change on people, agriculture and economic development in the SFRL.	13,11
ST 13	Strengthened resilience and productivity of agricultural systems that simultaneously facilitate sustainable economic development and envt.Cons	2,5,12
ST 14	Enhanced socio-economic development of local people in the SFRL	1,8,10

No of Activities – 147

Estimated Cost – USD 337 million

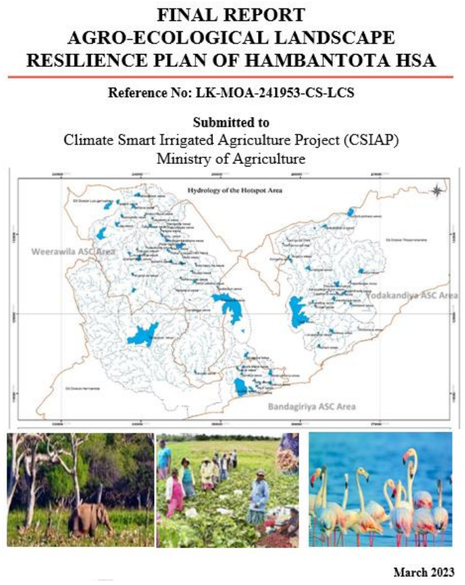


Hurulu-Kawdulla-Kanthale Landscape Management Plan

Strategic Themes (16)

PI1 Restoring the natural ecosystems and Protected Areas
PI2 Scientific and systematic land use
PI3 Conservation of hydrological catchments and water resources
PI4 Restoration of degraded lands and vegetation cover enhancement
PI5 Introduce improved agriculture practices,
PI6 Livestock and inland fishery development
PI7 Community economic and Development
PI8 Ecotourism/Nature based Tourism Development
PI9 Legal and Policy Reforms
PI10 Landscape Planning, Governance and Management
PI11 Economic and infrastructure development
PI12 Rural settlements and housing
PI13 Cultural and religious services
PI14Urban development and marketing
PI15 Energy sector development avenues
PI16 Financial services for conservation

No Activities – 128
Estimated Cost – USD 111 million


FINAL REPORT
AGRO-ECOLOGICAL LANDSCAPE RESILIENCE PLAN OF HAMBANTOTA HSA

Reference No: LK-MOA-241953-CS-LCS

Submitted to
Climate Smart Irrigated Agriculture Project (CSIAP)
Ministry of Agriculture

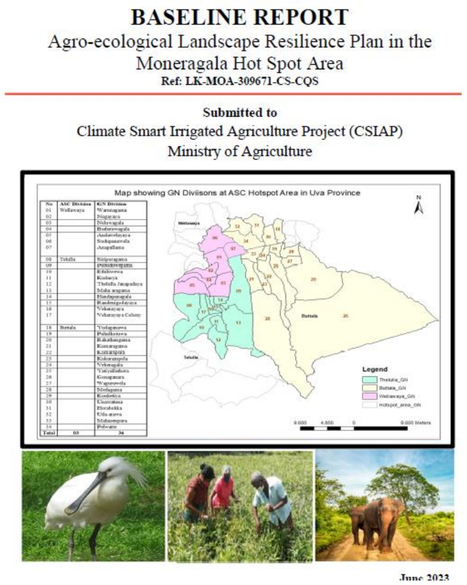
Hydrology of the Hotspot Area

Weerawila ASC Area

Yodakandiya ASC Area

Bandagiriya ASC Area

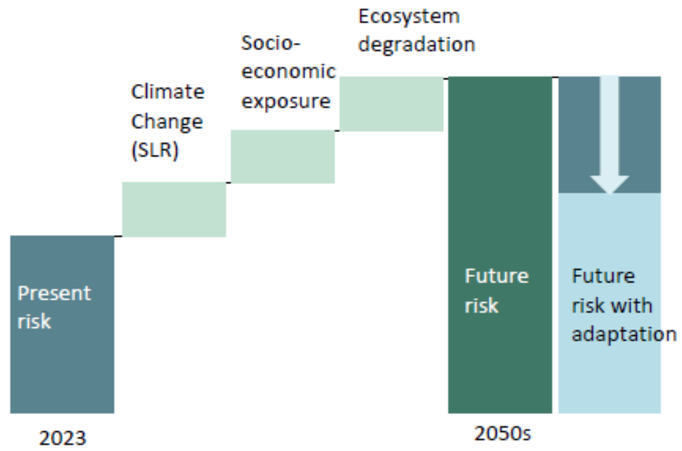
March 2023


BASELINE REPORT
Agro-ecological Landscape Resilience Plan in the Moneragala Hot Spot Area
Ref: LK-MOA-309671-CS-CQS

Submitted to
Climate Smart Irrigated Agriculture Project (CSIAP)
Ministry of Agriculture

Map showing GN Divisons at ASC Hotspot Area in Uva Province

June 2023



Climate Smart Irrigated Agriculture Project in SL

- Agriculture has mainly relied on expansion into new lands and has been the biggest driver of deforestation
- Focusing on agriculture and related land-use change will be critical to reduce emissions and to replenish our forests and reverse biodiversity loss.
- Agricultural soils can capture more carbon; it is a sector that needs to consciously promote low carbon growth
- This study is looking at agro-ecological resilience in two selected paddy dominated landscapes; the project will implement selected interventions




Meghalaya Community Led Landscape Management Project (MCLLMP)

Project Goal

To manage and conserve natural resource through a *Landscape Approach* so that it supports accelerated economic growth and to institutionalise and demonstrate a model for government support (state and central) to "community-led management of natural resources" in the country.

Meghalaya is facing severe crisis of degradation; in last 10 years **275 sq. km.** of forest cover **lost in last 10 years**

Key highlights

- Community led landscape plans for NRM – in 400 critical places
- About 600,000 households across the state likely to benefit
- In 5 years, carbon sequestration would be around 163,000 tons of CO_2 equivalent per years
- Forest management plans for every village
- Payment for ecosystem services – anyone with 2 hectares of forests; commitment to conserve for 30 years
- Catalytic fund to scale up good work for villages performing well
- Using drones for seed bombing and spraying organic fertilizer
- More than 100 agroecological learning centres – more than 580 ha areas under treatment

Natural Capital Accounting

- Landscapes are multifunctional by nature, which requires choices and trade-offs.
- Multiple stakeholders frame objectives differently, hence all stakeholders need to be engaged on landscape level spatial development.
- An important strategic question is: What are the trade offs? how can the values of the natural capital be maintained and sustainably utilized?
- **Problem identification** – Spatially explicit presentation of NCA information is particularly useful for communicating to decision makers where there are problems. The accounts, when coupled with appropriate modelling and analysis, can also be useful for predicting where problems might occur in the future
- **Policy design** – NCA can be used in modelling and scenario analysis to show existing trade-offs at the landscape level. Such information can then feed into the design of new policy instruments, such as payments for ecosystem services and restoration, or for encouraging the finance sector to internalize the broader benefits and risks to investments in major infrastructure projects.
- **Policy implementation** – NCA can be used to identify spatially distinct landscapes and communities that could benefit from a more efficient targeting of existing policies. These could be the poorest communities, or areas either at most risk of degradation or that would witness the greatest benefits from the least investment (i.e. the low hanging fruit).

Ecosystem accounts for low carbon development in Indonesia

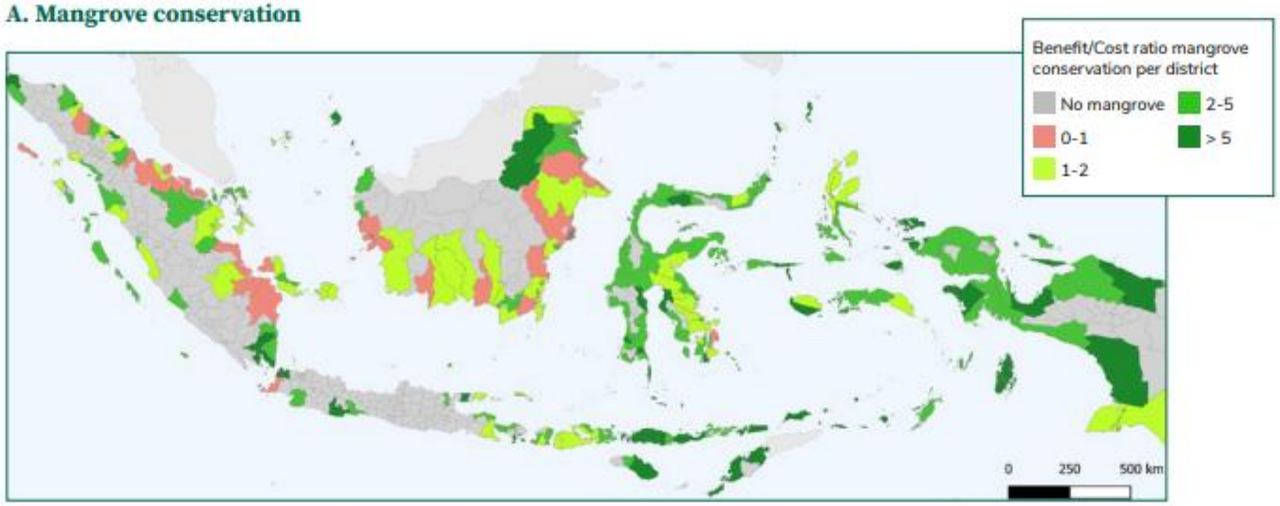
- **Problem** : Indonesia's peats swamps are an important store of carbon (8%) but decades of draining peatlands to provide land for palm oil etc has left vast areas of peatland dried out (22 million ha forest lost 1990 – 2014, carbon emissions 1,454 MtCO2-eq. in 2016);
- It is found that 52% of peat forests in Kalimantan and Sumatra have been converted over a period of 25 years (and the pressure continues)
- **Low carbon growth initiative** : The models analyzed the carrying capacity of the natural systems under different growth scenarios and showed how growth could be constrained by the limits of natural capital to provide ecosystem services.
- Analysis showed that low-carbon growth path can deliver an average GDP growth rate of 6% annually until 2045. By sustainably using natural resources, and by reducing carbon and energy intensity, Indonesia's total GHG emissions could fall by nearly 43% by 2030.
- Ecosystem services account were set up that tracked six main ecosystem services provided by Indonesian peatland, (production of oil palm, biomass for pulp, paddy, timber, CO2 sequestration & biodiversity)
- Carbon account in peatlands : around 31% of above ground carbon stocks in 1990 was lost by 2015 in Indonesia. Meanwhile, the total emissions from net carbon (CO2) flux increased by 74%.
- This represents one of the main contributions of WAVES to Indonesia's policy making, as this work underpins decisions that will be made in the next five-year policy cycle.

Economics of large-scale mangrove conservation in Indonesia

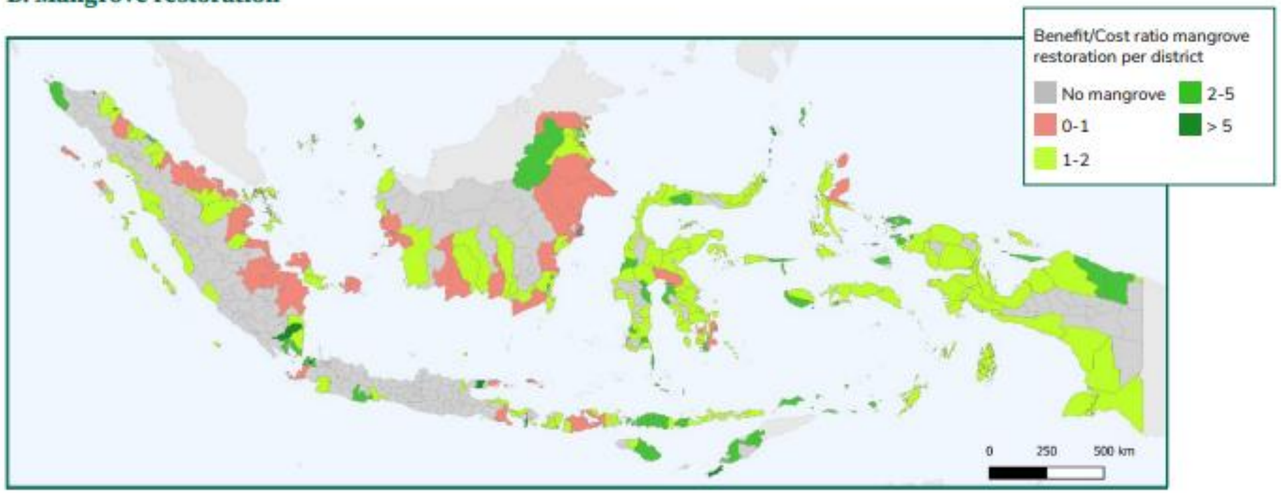
- Loss and degradation of Indonesia's mangroves is jeopardizing decades of economic development
- The GoI is moving in the right direction by setting ambitious strategies for a 'blue economy' including a target to restore 600,000 ha of mangroves by 2024 (equal to total amount of mangroves lost since 1990)
- This study, that used a spatial cost-benefit analysis including estimating of ecosystem services, identified key factors to consider in deriving the best policies in reaching this target.
- Benefit/cost analysis framework informs dialogue and shape alternative scenarios for mangrove management
- The study estimated the value of mangrove related ecosystem services across regions and identified areas where the opportunity cost of conservation/restoration is high and areas where conservation net benefits are high.

Figure 8. Spatial distribution of benefit-cost ratios for mangrove conservation and restoration

A. Mangrove conservation

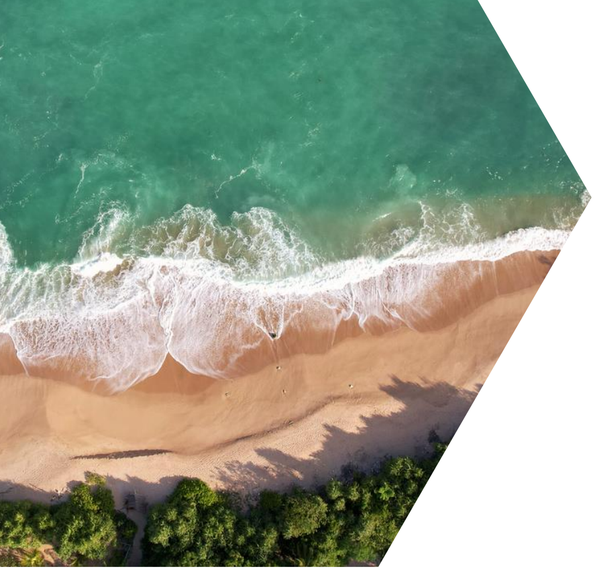


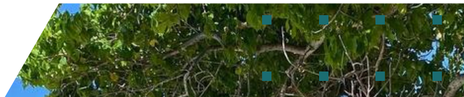
B. Mangrove restoration



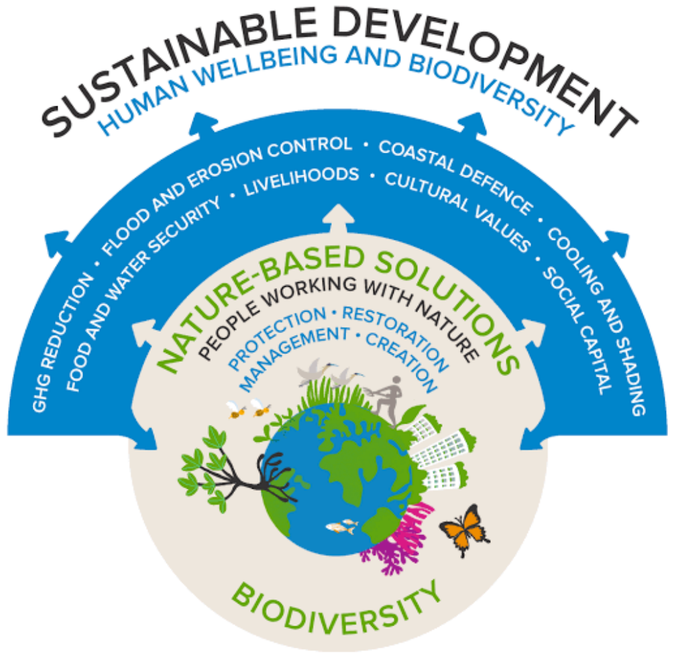
Natural Capital Accounting and Policy in Philippines

- Philipines was one of the first countries to develop and use NCA
- Climate change, urbanization, ono-judicial use of natural resources poses serious risks to sustaining country's economic growth
- The NC account helps the country measure its natural resources and evaluate how these can be used equitably and sustainably by providing scientific evidence and information to assess trade-offs
- **Mangrove accounts** : Asses current state of mangroves and their contribution to economic growth and climate resilience
- **Ecosystem accounts at Laguna lake Basin** : Home to 15/th of country's population who rely on the lake for water, food, livelihoods, energy recreation etc; This account provides decision makers with data and analysis to ensure sustainable development.
  - Deforestation in the upper parts of the watershed has resulted in 20% more sediments in just within 4 years
  - The accounts have been used to simulate what would happen if deforestation in the basin continues, that sedimentation would increase 4 folds.
  - These sediments are changing the overall volume of the lake and its ability to contain floods
  - The accounts are used to target where ecosystem protection and regeneration efforts can create the greatest impacts.
- **Land accounts in Southern Palawan** showed 150% increase in perennial crops and a sharp decline in forest cover for the same period. The Account showed a significant loss of carbon stocks between 2003 and 2010 (6.4 million tons, 41% of the 2003 amount) and a trend of recovery since 2014 due to informed policy and programs.





Investing in Nature for Climate Adaptation Benefits



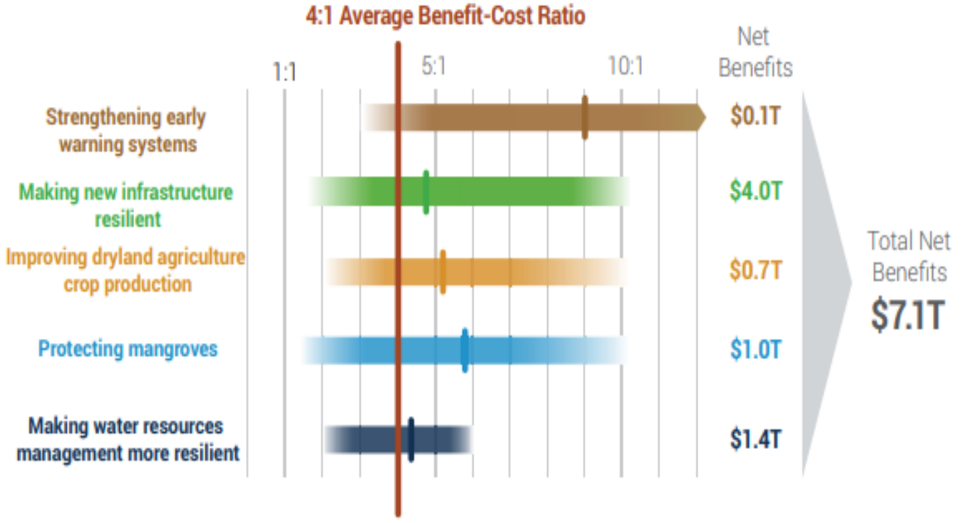
Mokshana Wijeyeratne

Why we need to Invest in Biodiversity and Nature

- The value of biodiversity goes beyond the variety of living organisms,
- It includes the services provided by healthy ecosystems .
  - Carbon sequestration, coastal protection, clean air and water, wild pollination, provision of food from marine fisheries, and timber from native forests.
- To capture this broader concept, we refer to nature, rather than biodiversity alone. Nature and climate are intertwined.
- A significant loss of these systems hinders our ability to mitigate and adapt to climate change.
- Conversely, climate change is one of the five direct drivers of nature loss
  - The impacts of climate change shift and shrink the critical habitats - weaken the resilience of ecosystems to natural shocks and man-made pressures.
- Investing in nature creates opportunities for high-value and greener growth that is climate resilient and enhances our adaptive efforts.
- Leveraging these opportunities and bringing nature into rural an urban development planning is essential for setting economies on a green, resilient, and inclusive development path.

Investing in nature & climate resilience yields multiple benefits for society

USD 1 invested→ USD 4 in net benefits (Hallegatte et al., 2019)



World Bank, 2021

Biodiversity and Nature- The Trends in Sri Lanka

Threatened Biodiversity According to the CBD

59% Reptiles

56% of Mammals

27% of 240 Identified Birds

49% Fresh Water Fish

66% Amphibians

Sri Lanka's flagship keystone species Elephants, has been affected by a population decline in both dry and wet zones (a population of 10,000 at the turn of the century has dwindled to a mere 3,000 today).

Flowering plants, 1,385 species of the 3,154 identified species are classified as threatened, the high majority of which (594) are endemic to Sri Lanka.

The area covered by closed canopy dense natural forests declined markedly over the last decade almost by 40% , costal ecosystems continue to be polluted and degraded, wetlands dredged and filled for development- a rapid loss in ecosystems and in turn the services they offer.

Benefits derived from biodiversity contribute considerably to the Sri Lankan economy.

- Sectors such as fisheries, agriculture and tourism depend highly on the preservation of a high level of biodiversity and the critical
- To maintain our natural ecosystems and ability to naturally adapt to climate challenges we need to invest more in biodiversity and nature.

What can be done

- Addressing climate change and nature loss together will require transformative action, with coordinated responses spanning the global, national, and local levels- Holistic Approach
- An integrated response means exploiting synergies – capturing advantageous win-win investments for nature, climate, and development
- At the same time identifying and minimizing trade-offs.
- The alternatives, a climate- or nature-only approach, would miss opportunities for impact and fiscal efficiency, while compromising long-term development.
- Financing strategies need to be better coordinated, leveraging finance to support interventions that are pro nature.
  - Nature Based Solutions
  - Nature Based Tourism
  - Designing Nature and Climate Finance to Syphon to the above and nature and eco-centric project actions that bring the dual benefit of climate adaptation.
    - Climate Smart and Eco-centric Agriculture, Agroforestry, Conservation and Protected Area Management, Landscape Management, Ecosystem Restoration- Wetland, Mangroves and Peatland, Coastal and Marine Ecosystem Management, Catchment Management

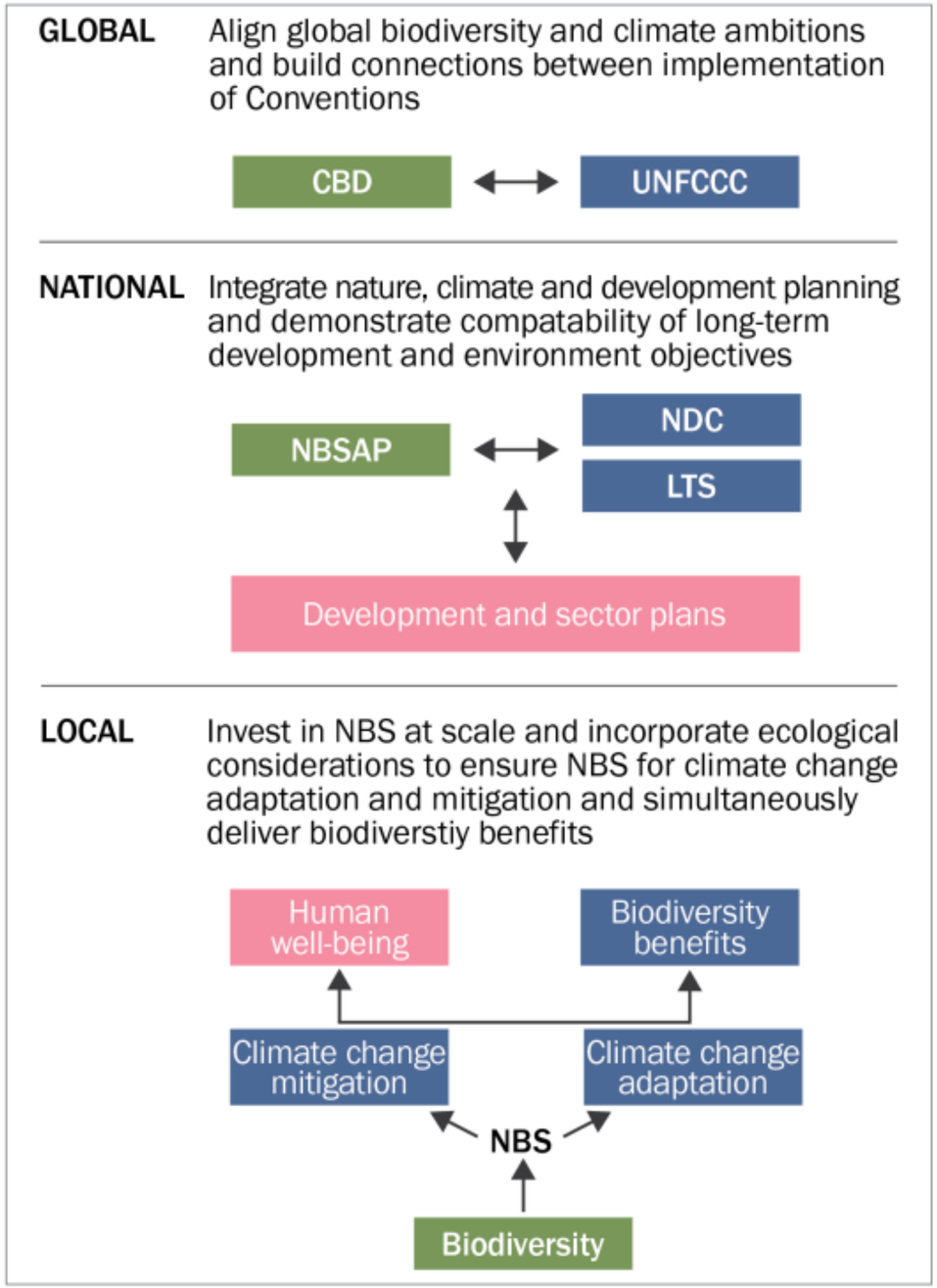


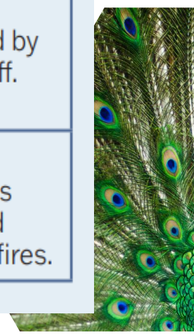
Figure 1: What does a climate- and nature-smart approach look like?

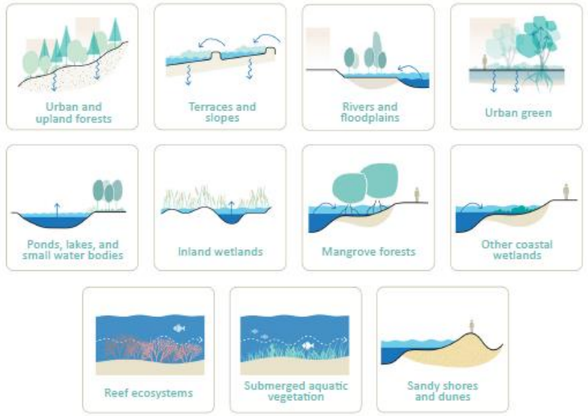
Nature Based Solutions- adapting naturally

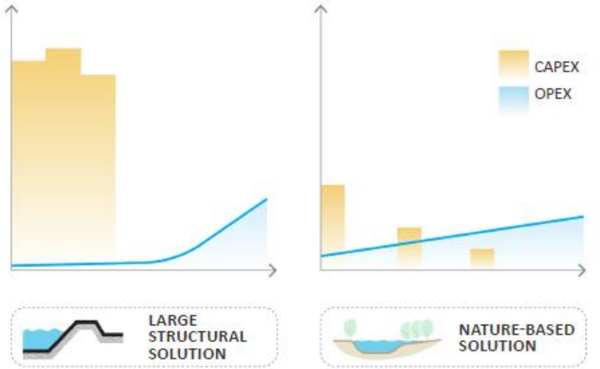
- Nature-based solutions are actions to protect, conserve, restore, sustainably use, and manage natural or modified ecosystems.
- These can be terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively.
- While simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits.
- Investing in nature-based solutions offers many benefits
- For example, green infrastructure involving mangroves, wetlands, and watersheds can enhance the performance of (or even replace) traditional gray infrastructure- for flood protection
    - Additional support water resource management, and the protection of built assets from geohazards.
- Green infrastructure offers long-term benefits for biodiversity and ecosystem services when designed and planned in a way that considers the needs of nature.
- WB Problue Grant FY24- Supporting Sri Lanka on looking at options and opportunities for NBS in coastal landscapes

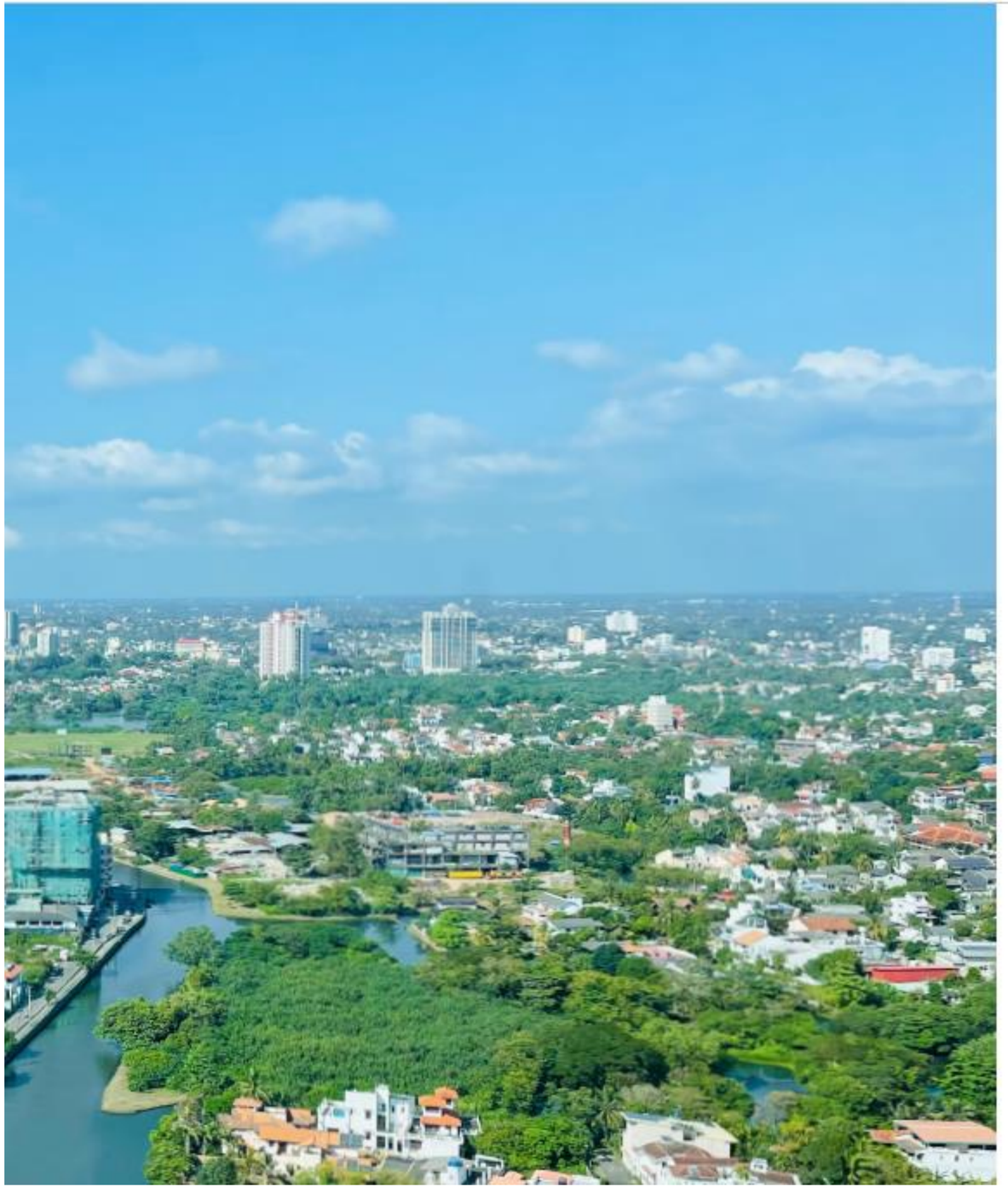
TABLE 1: CLIMATE MITIGATION AND ADAPTATION BENEFITS FROM NATURE

CLIMATE IMPACT	ADAPTATION BENEFITS OF NBS	MITIGATION BENEFITS OF NBS
Increased droughts	Restorative agricultural and forestry practices to increase water retention capacity and mitigate droughts.	Sustainable agricultural practices build soil carbon and improve crop yields.
Heat extremes	Increase green spaces in cities to improve the microclimate and air quality.	Green spaces in cities are also carbon sinks and can reduce energy spent on air conditioning.
Sea level rise	Mangrove conservation and reforestation protect coastal areas against damage from storm surges and ongoing erosion.	Mangroves sequester four times as much carbon as terrestrial forests, mostly through sediments.
River flooding	Maintain and restore wetlands and forestation of water catchments that act as natural buffers against floods and prevent landslides.	Wetland areas sequester carbon through plant photosynthesis and by acting as sediment traps for runoff.
Increased fire risk	Maintain and restore diverse forests, with active management of invasive species, that are more robust against pest attacks and present a lower fire risk.	Forests are natural carbon sinks; however carbon stored in biomass through forests could be released back into the atmosphere by wildfires.









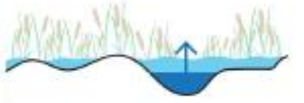
Wetland Conservation in Colombo

Metro Colombo Wetland Conservation: Decision-Making under Uncertainty (Sri Lanka)

Case study profile

NATURE-BASED SOLUTION (NBS) PROFILE

NBS TYPE



Inland wetlands

NBS APPROACH

Protection

PRIMARY RISK REDUCTION BENEFIT (RRB)

Flooding

Erosion

Extreme heat reduction

OTHER BENEFITS

Climate regulation

Tourism and recreation

Wastewater treatment

ECONOMIC STUDY PROFILE

PROJECT CYCLE STAGE

Project identification and preparation / Project implementation and support

ANALYTICAL APPROACH APPLIED (RRB)

Cost-benefit analysis

Decision-making under uncertainty

Avoided damages and costs

SCALE OF PROJECT

City level

STUDIED SITE

Colombo Metropolitan Region (Sri Lanka)

STUDY YEAR

2014–2015

WORLD BANK PROJECT PROFILE

PROJECT NAME

Metro Colombo Urban Development Project (World Bank 2012)

REGION

South Asia

GLOBAL PRACTICE AREA

Urban, Disaster Risk, Resilience and Land

PROJECT REPORTS

Wetlands Conservation and Management: A New Model for Urban Resilience in Colombo (Rozenberg et al. 2015)

Table C7-2. Benefit categories

Benefit	Description	Quantification
Moderation of extreme events	Avoided damage costs were estimated using flood damage data from Greater Colombo Flood Control Project and Environmental Improvement Project (JICA 2009).	**1–1.3% of GDP**
Recreation	Value transfer based on past studies on economic valuation of wetlands in Sri Lanka and other countries (for example, Emerton and Kekulandala 2003).	**5.53 million SL Rs/ha/year**
Reduction of energy costs (mainly electricity cost)	Market-based method using secondary data on use of air conditioners/fans, electricity consumption levels, electricity bills, etc.	**0.03 million SL Rs/ha/year**
Carbon sequestration	Value transfer using carbon benefits estimated Emerton and Kekulandala (2003).	**0.02 million SL Rs/ha/year**
Regulation of water flows (hydrological regimes)	Replacement cost estimated using secondary data on local water users, types of water use, required water-related infrastructure, and costs published by the Department of Census & Statistics, National Water Supply and Drainage Board.	**0.01 million SL Rs/ha/year**
Nutrient retention and wastewater treatment	Replacement cost estimated using secondary data on sources, volume, and treatment costs of wastewater.	**2.03 million SL Rs/ha/year**

Source: Rozenberg et al. 2015.
Note: GDP = gross domestic product; ha = hectare; SL Rs = Sri Lanka rupees.

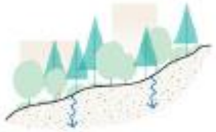
Green Infrastructure for Landslide Risk Reduction

Economic Valuation of Watershed Management Practices for Erosion and Sediment Reduction in the Kali Gandaki Watershed (Nepal)

Case study profile

NATURE-BASED SOLUTION (NBS) PROFILE

NBS TYPE



Urban and upland forests

Terraces and slopes

Rivers and floodplains

NBS APPROACH

Restore

Create

PRIMARY RISK REDUCTION BENEFIT (RRB)

Landslide risk reduction

OTHER BENEFITS

Provisioning of food and raw materials (on-farm benefits and hydropower)

Climate regulation

ECONOMIC STUDY PROFILE

PROJECT CYCLE STAGE

Upstream / Project identification and preparation

ANALYTICAL APPROACH APPLIED (RRB)

Cost-benefit analysis

Avoided lives lost

Avoided damages and costs

SCALE OF PROJECT

Watershed

STUDIED SITE

Kali Gandaki Watershed (Nepal)

STUDY YEAR

2019

WORLD BANK PROJECT PROFILE

PROJECT NAME

Advisory Services and Analytics (ASA) linked to the Forests for Prosperity Project (Nepal) (World Bank 2023b).

REGION

South Asia

GLOBAL PRACTICE AREA

Environment, Natural Resources and the Blue Economy

PROJECT REPORT

Valuing Green Infrastructure: Case Study of Kali Gandaki Watershed, Nepal (World Bank 2019b)

Table CS4-1. Estimation of NBS cost data

Modeled intervention (Implementation locations)	NBS practices	Estimated average gross cost and range (US$/ha)
Hill terrace improvement Croplands > 5% slope	Slope correction on existing terraces, planting nitrogen-fixing hedgerow species along the terrace margins in single or multiple rows, agroforestry	$2,230 ($50–$8,750)
Soil and water conservation practices Croplands ≤ 5% slope	Hedgerows, hedgerow inter-cropping, crop residues, mulches, cover crops, no tillage, reduced tillage, minimum tillage, windbreaks/ shelterbelts, buffer strips/greenbelts, conservation trenching, agroforestry	$1,100 ($140–$2,200)
Landslide mitigation (class I) Areas with high risk of landslide failure at a depth of <1.5 m and in the topsoil only	Revegetating denuded slopes and/or bioengineering for slope stability	$3,850 ($1,260–$8,030)
Landslide mitigation (class II) Areas with high risk of landslide failure at a depth of >1.5 m, but deeper than topsoil and with failure plane in the range of deep rooting trees	Revegetating denuded slopes, bioengineering for slope stabilization, slope correction, and/or excavation of sub-soil drains	$3,850 ($1,260–$8,030)
Landslide mitigation (class III) Areas with high risk of landslide failure in the bedrock (that is, below rooting depth), but with a failure plane < 3 m deep	Bioengineering for slope stabilization, revegetating denuded slopes, sub-soil drainage, and/or retaining walls *Green-gray integrated solutions are reflected in the higher costs for class III*	$39,480 ($19,450–$59,520)
Reclamation/rehabilitation of degraded land (forest) Degraded forest lands (defined using data from Hansen et al. 2013)	Planting fuel and fodder tree species, conservation trenching, eyebrow pits, revegetation, hedgerow planting across the slope to regenerate degraded areas	$1,690 ($1,080–$2,310)
Reclamation/rehabilitation of degraded land (grasslands) Grasslands	Greenbelts, buffer strips, rotational grazing, fodder planting, silvopasture improvement	$880 ($730–$1,030)

Sources: Cost data for modeled interventions have been compiled from the WOCAT Sustainable Land Management Database (https://qcat.wocat.net/en/wocat/) and Dahal and Dahal 2017; Das and Bauer 2012; Devkota et al. 2015; FAO 2005.

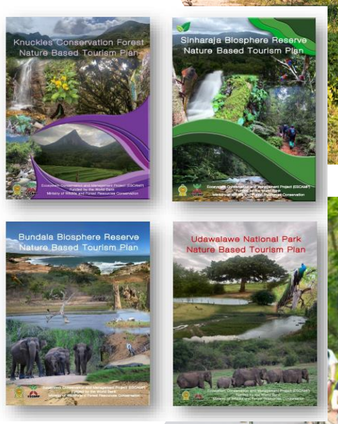
Table CS4-3. Values of investment in watershed management and benefit-cost ratios for portfolio budgets

Budget (US$, millions) [a]	Values to hydro-power from sediment reduction to KGA (US$, thousands)	VALUE OF LANDSLIDE REDUCTION						On-site benefits based on % cost-share (US$, thousands)	Carbon value based on social cost of carbon (US$, thousands)	TOTAL VALUE	
		Avoided costs of replacement and repair				Avoided lives lost, mean per year	Value of avoided lives lost (VSL, US$ millions)				
		Avoided structures at risk *(n)*	Avoided loss of structures value (US$, thousands)	Avoided roads at risk (km)	Avoided costs of road repairs (US$, thousands)					US$ (millions)	BCR
$0.5	$76	17	$42	3.3	$189	4.20	$1.4	$420	$12	$2.19	4.38
$3.	$415	40	$126	5.2	$296	9.88	$3.4	$2,500	$75	$6.8	2.28
$10	$1.6	66	$242	6.8	$385	16.54	$5.7	$8,400	$289	$16.6	1.66
$50	$4.4	78	$290	9.4	$530	19.51	$6.7	$42,000	$3,800	$58	1.15

Source: Original table for this publication.
Note: This table provides only a selection of the budget values for illustrative purposes. BCR = benefit-cost ratio; KGA = Kali Gandaki A Hydropower Plant; VSL = value of a statistical life.
a. Budget values were provided at multiple levels from $0.5 million to $50 million.

Nature Based Tourism

- More travelers seek out sustainable and environmentally friendly travel experiences, the importance of eco tourism in mitigating and adapting to the effects of climate change cannot be overstated..
- Additional Benefits for every dollar governments invest in protected areas and support for nature-based tourism, the economic rate of return is at least six-times the original investment.
- The report, "*Banking on Protected Areas: Promoting sustainable nature-based tourism to benefit local communities*"
- Nature Based Tourism Revenue-can loop back to local communities that will be most affected by climate change's impacts to helping to conserve the natural habitats of endangered wildlife.
- For example the Maldives Charges a Green Tax of US$ 6 per bed per night from tourists- this money is then used to finance green projects and pumped back also to PA management.
- Nature Based Tourism also promoted actions in reducing emissions, energy efficiency and management of natural resources and reducing impact via pollution and waste- which are also linked to environmental degradation and the climate.
- Banking on a more NBT, Eco Tourism approach via ensuring Policy and Governance, promoting PPP models for conservation based tourism and education, transparent looping back of tourist taxes and fees to nature based actions provide bankable adaptation projects.
- For Sri Lanka 7 Nature Based Tourism Plans done- that focus on ensure biodiversity conservation and climate adaptive actions while promoting and managing tourism have been prepared- with analytical backing and seek investment- DWLC and FD



Unlocking Finance for Nature and Climate

- **Financing Green**
  - investments in projects and programs that contribute to conservation, restoration, and the sustainable use of green and blue biodiversity and ecosystem services.
  - There are opportunities to use concessional finance to de-risk and scale private investment and pilot financial solutions.
  - EX-fixed income products linked to forestry, non-timber forest products, wildlife, and fishing, which can channel financing from the capital markets.
  - There are also opportunities to use domestic public finance more efficiently, for example through investments in protected areas and nature-based solutions that generate nature co-benefits while meeting other development objectives.
- **Greening Finance**
  - Directs financial flows away from projects and programs that negatively impact green and blue biodiversity and ecosystem services
  - To investments that mitigate negative impacts or deliver positive environmental co-benefits.
  - This approach aims to mobilize funds by driving better risk management.
  - Ex-include incorporating nature-related risks into investment decisions, financing projects that reduce pollution, or repurposing biodiversity harmful incentives.

GOVERNMENTS

Dedicate sufficient and predictable domestic **public expenditure to conservation** of critical ecosystems

Support **green public finance** - repurpose harmful subsidies and incentives driving degradation of nature; green budget tagging

Create **enabling conditions** to catalyze private investment through policy and regulations that level playing field for sustainable practices

Develop **environmental markets** that allow private sector to monetize ecosystem services

Promote nature-related **data, standards, labels, and disclosure** to encourage market transparency and integration of nature-related risks in financial decision-making

PRIVATE SECTOR

Corporates: Improve **management and disclosure of nature-related risks** across operations and supply chains

Financial sector: Integrate nature into models and decision tools to channel **capital flows towards more sustainable activities** and away from those that are detrimental; **structure green investment** opportunities

Engage in multi-stakeholder coalitions to increase use of tools, standards, and reporting to **mainstream nature-related risks and oppportunities into investment decisions**

DEVELOPMENT PARTNERS

Invest in **global public goods** through provision of grants and concessional finance to support capital and operational expenditures that preserve natural capital

Catalyze **additional finance** for nature-positive investments by supporting development of innovative financial instruments and scaling up new models that increase participation of corporate and institutional investors

Support project **pipeline development** via grants, catalytic, and blended finance that pilot nature-friendly business models

Provide **decision-support tools, analytics, and technical assistance** to inform decisions of governments, private sector, and communities related to managing - and sharing benefits from - natural capital

Sample Nature and Climate Finance Instruments

Type	Instrument
Policy	Fiscal and financial reform, taxes, fees, fines, penalties
Debt	MDB Concessional loans
	MDB Non-Concessional loans
	MDB Guarantees/ risk transfers
	Green, Social and Sustainability (GSS) Bonds
	Sustainability-linked Bonds (KPIs linked Bond)
	Sustainability-linked loans
	Debt for Climate and Nature (DFCN) Project Swap
	DFCN programmatic swap
	Asset based securities (ABS)
Non-Debt	Grants
	Structured bonds (not issued by sovereign)
	Insurance: Catastrophe bonds
	Biodiversity offsets
	Carbon offsets
	Green commodity private equity fund
	Natural Asset Companies (NACs)
	Private Sector Green Value-chain Initiatives

Value of (GSS) Bond Market

$3.5 T

Green, Social, SLI bond market (Sept. 2022)

Green Bond Issuances

64%

% Green bonds issuances of total thematic bond issuances

Emerging Market Issuers

$182B

Thematic bond issuances tripled in value in 2021 compared to 2020

2022 GSS Issuances

$130B

GSS bond issuances in 2022 doubled that in 2020

Sustainability-linked bonds (SLB)

- SLBs are designed to promote sustainability while providing general-use liquidity to the issuer (unlike “green bonds” or “use of proceeds” bonds)
- SLB terms and conditions are linked to Key Performance Indicators (KPIs) and Sustainability Performance Targets (SPTs)

CIF CLIMATE INVESTMENT FUNDS

GREEN CLIMATE FUND

gef

ADAPTATION FUND

InsuResilience GlobalPartnership

Examples of Nature and Climate Financing Projects

MOZAMBIQUE-US$200 million

- leveraged a portfolio of financial solutions to increase investments in nature action.
- The two-phase World Bank Mozambique Conservation Areas for Biodiversity and Development (MozBio Phase I and II) IDA project10 supported five co-management agreements between the government and nonprofits, as well as private organizations
- To manage five conservation areas and to finance anti-poaching activities.
- The PPP structure blends private investments in commercial nature-based activities with public and philanthropic investments in conservation, totaling a combined US$200 million.
- The model is being replicated across the country to attract investment in rural areas, develop the tourism sector, and conserve nature.
- The Sustenta Bio Matching Grant mechanism piloted by MozBio Phase II is also supporting the establishment of 108 small and medium-size nature friendly businesses in conservation area buffer zones.
- The matching grant mechanism has mobilized about US$2 million of private finance from the supported businesses, benefitting around 4000 individuals.

SOUTH AFRICA-US150 million

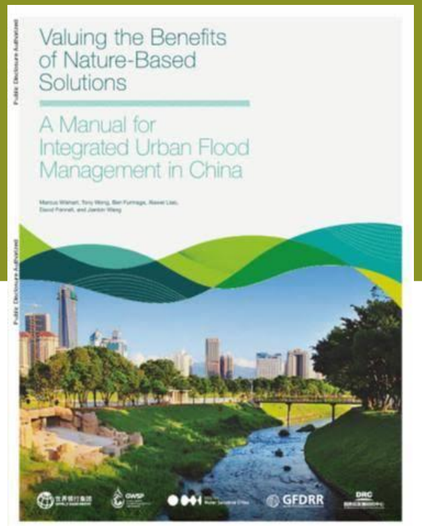
- This five-year US$150 million outcome bond, issued by the World Bank, will contribute to protecting and increasing black rhino populations in two protected areas in South Africa.
- The WB structured and issued a market-based financial instrument that blends private capital and funding from the GEF into a structured bond to generate funding for the WCB operation.
- In a sector that has historically been dominated by donors and philanthropic investors, this creates an opportunity for private investment in conservation to which South African parks would otherwise not have access.
- The WCB is a first-of-its kind bond for the conservation of a species, linking the investment return under a bond issuance to conservation performance.
- Investors accept project outcome risk in return for a potential payout if the project is successful, therefore transferring project risk from a donor to private investors. An advanced conservation monitoring and verification system is in place to track the key performance indicator.
- The WCB can be replicated to generate additional investments for other species and ecosystem services, such as provision of water or disaster risk reduction through green infrastructure.

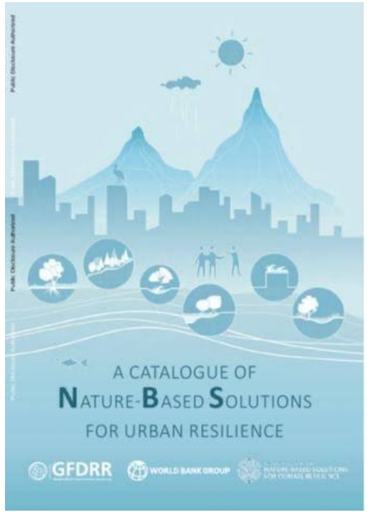
What is Needed for Project Based Levers to Work

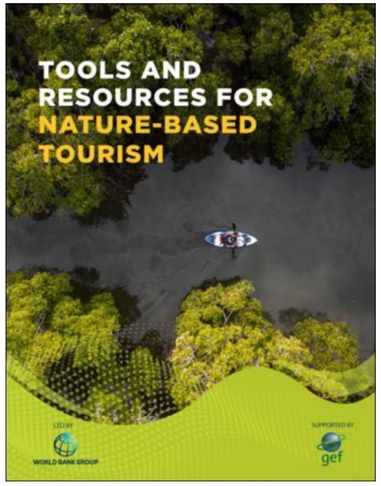
1. Commitment- At the highest level and at implementor level. Commitment to national targets, project targets- policy and governance.
2. Transparency and Accountability- for financing instrument this is critical- if money is syphoned from various sources- trust is critical that we can and will implement
3. Capacity- Building institutional capacity across public and private actors on how these instruments work to ensure success
4. Data- Sri Lanka has a huge challenge of data scarcity and sporadically spread data and a lack of time series data- consolidating existing data, digitizing data and setting up data platforms for continuous flow is critical- this is also critical to measure success
5. Analytics- An analytic base for options and what will work in the context of Sri Lanka has to be established- more money needs to go in to implementing recommendations from studies and support data driven decision making.
6. Monitoring and Evaluating-To show success we must report both qualitatively and quantitatively- Robustly the positive and negative outcomes of these interventions
7. Looping Back Lessons- learn by doing and looping back lessons from experience of projects

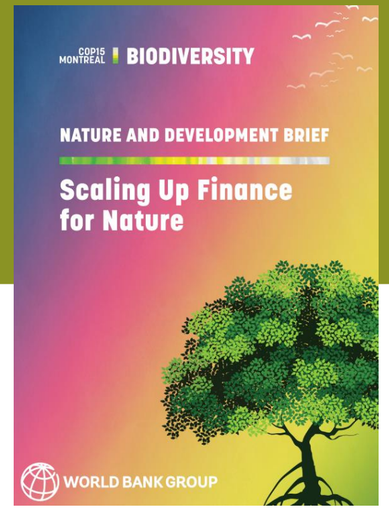
Investing in nature is never a Quick Win as nature has its own pace but the impacts are bankable and results far more rewarding.

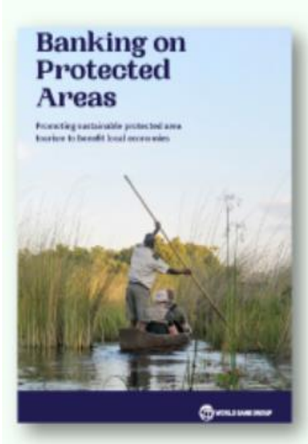
Additional Resources

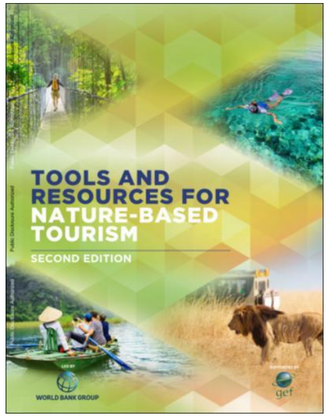


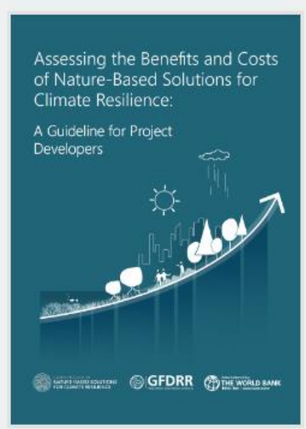


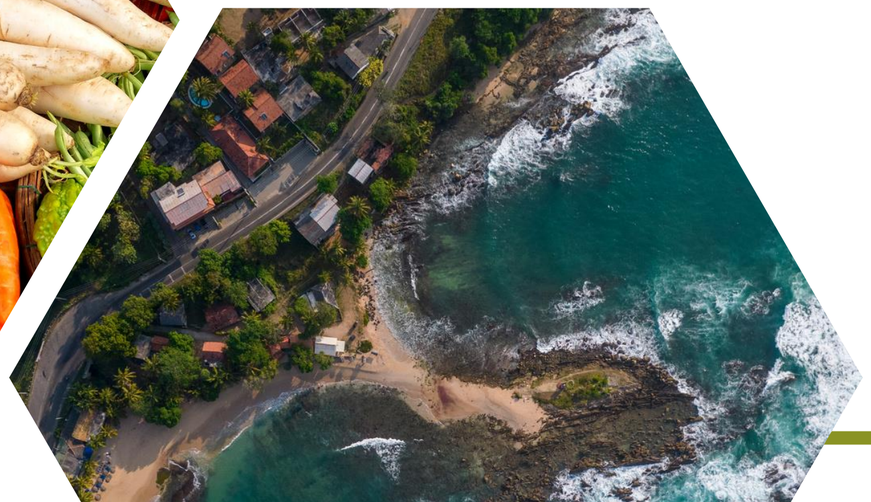












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