WEBINAR: ECONOMIC VALUATION

- NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE -

UN environment programme WCMC

BESNet
Biodiversity and Ecosystem Services Network

Supported by:
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
based on a decision of the German Bundestag

Workshop Agenda

- Economic Valuation: meeting the triple planetary crisis – Dr Salman Hussain
- Integrating economic values into the NEA: Mozambique Case Study Application - Dr. Steven King
- Integrating economic values into the NEA: Useful tools for quantifying ecosystem services – Megan Critchley
- Panel Discussion

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Economic Valuation: Meeting the triple planetary crisis

Dr Salman Hussain

Coordinator, The Economics of Ecosystems and Biodiversity (TEEB)
UN Environment Programme (UNEP)

NEA NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

The Economics of Ecosystems and Biodiversity

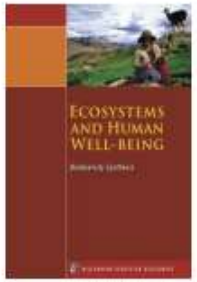
The zero draft Post 2020 Biodiversity Framework Milestone:

"B.2 *Nature is valued through green investments, ecosystem service valuation in national accounts, and public and private sector financial disclosures*."

https://www.cbd.int/doc/c/3064/749a/0f65ac7f9def86707f4eaefa/post2020-prep-02-01-en.pdf

The Economics of Ecosystems and Biodiversity

TEEB
The Economics of Ecosystems & Biodiversity



Ecol./Env. Economics literature

G8+5
Potsdam
2007

"Potsdam Initiative – Biological Diversity 2010"

The economic significance of the global loss of biological diversity….

Importance of recognising, demonstrating & responding to values of nature…

Interim Report

CBD COP 9
Bonn 2008

Climate Issues Update

Input to UNFCCC
2009

TEEB End User Reports Brussels 2009, London 2010

India, Brazil, Belgium, Japan & South Africa
Sept. 2010

TEEB Synthesis

TEEB Books

BD COP 10 Nagoya, Oct 2010

CBD COP11 India

National TEEB Work

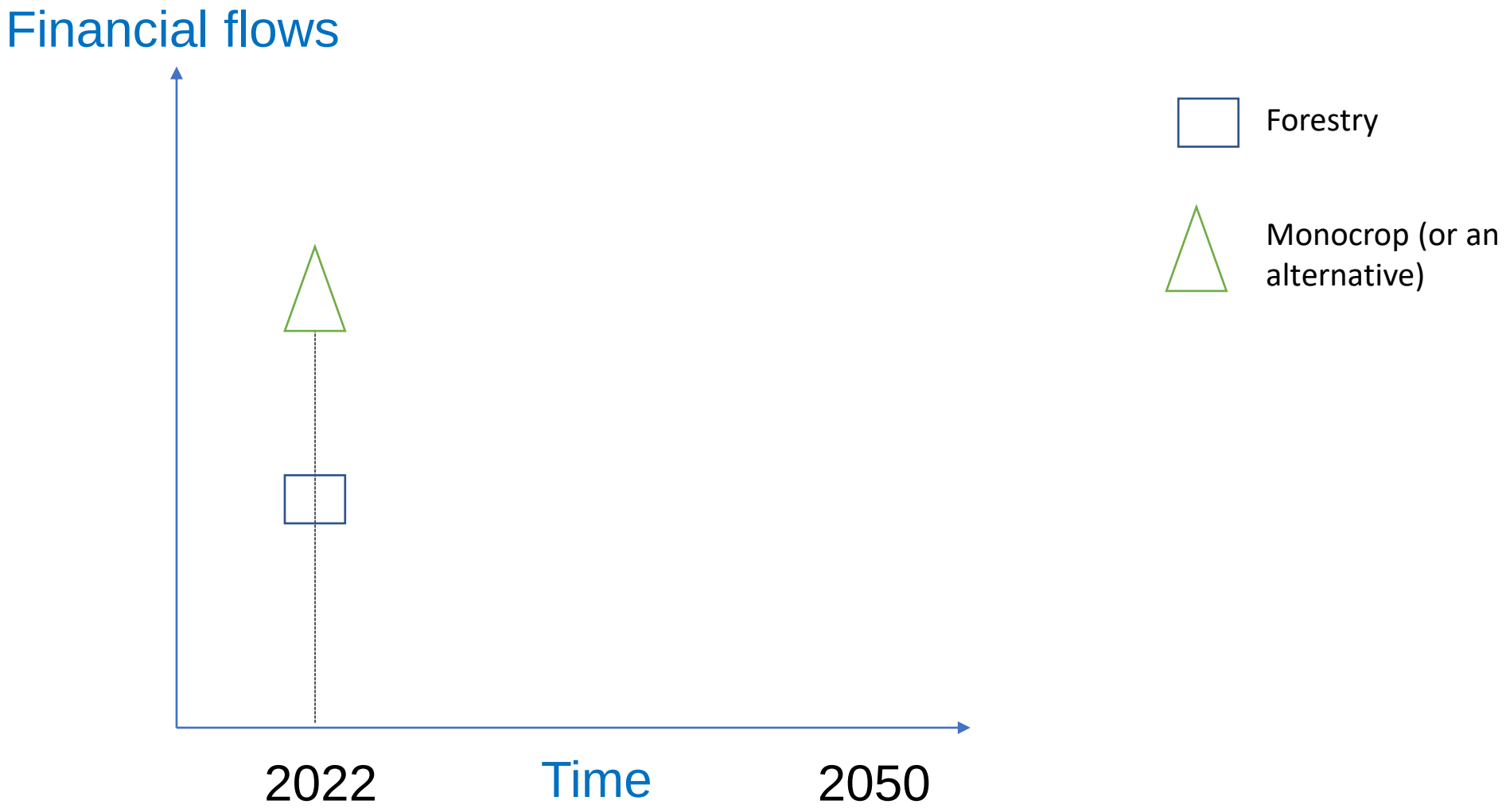
Sectoral TEEB Work

Business Externalities Work

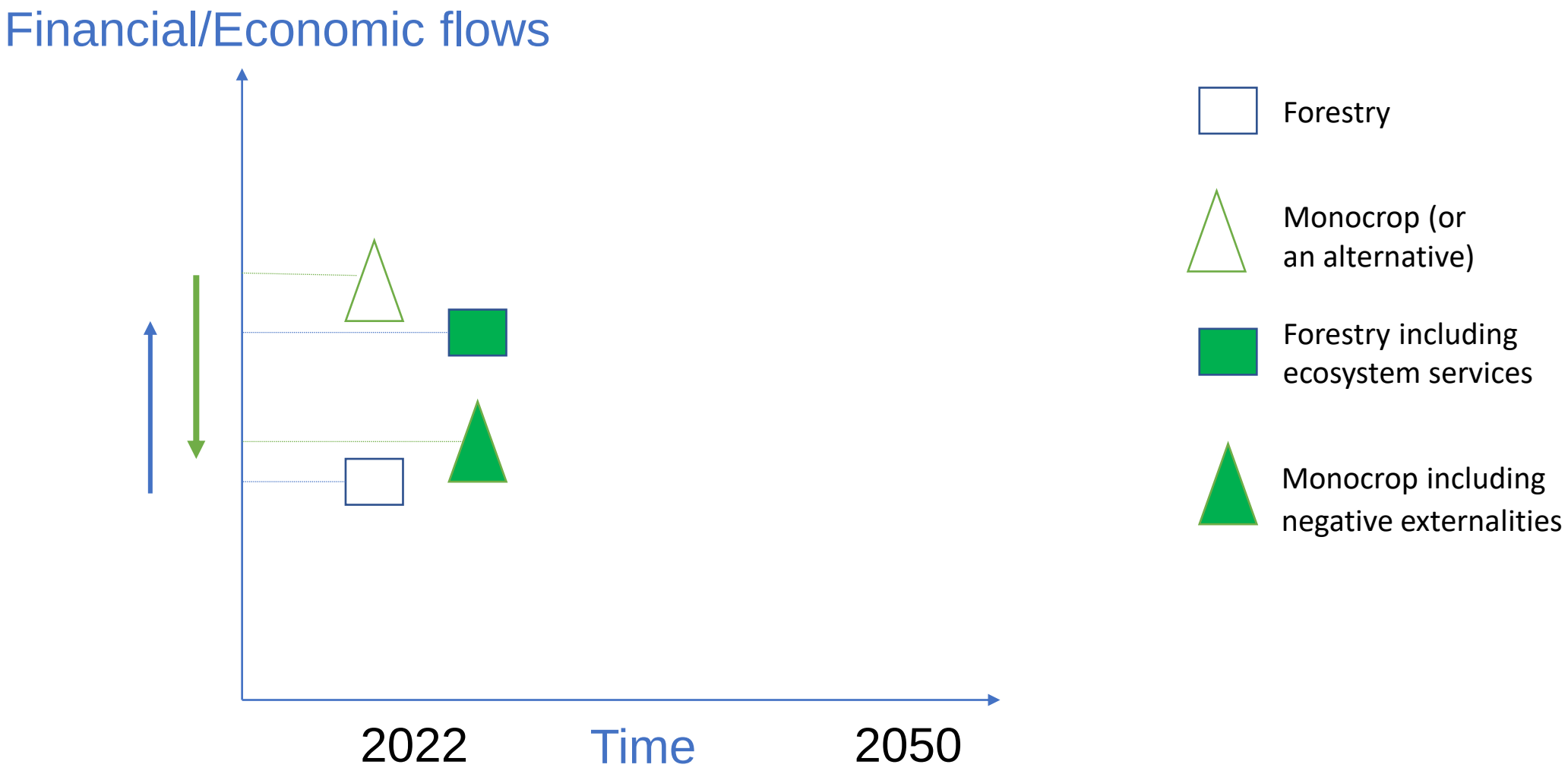
Rio+20 Brazil

The core hypothesis

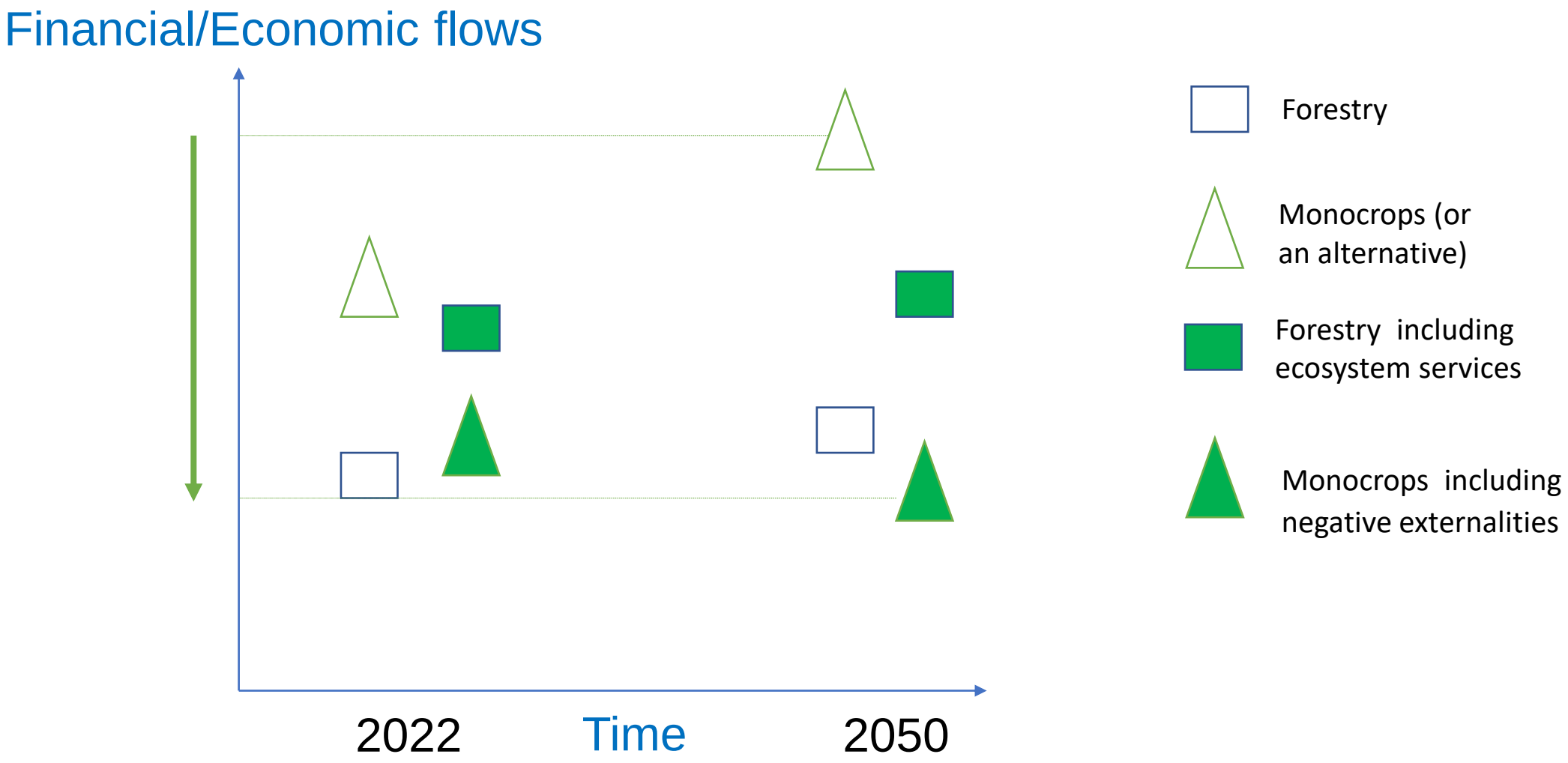
Forestry versus monoculture: current assumption



Forestry versus monocrop: 2022 including ecosystem services



Forestry versus monocrops: 2050 projections

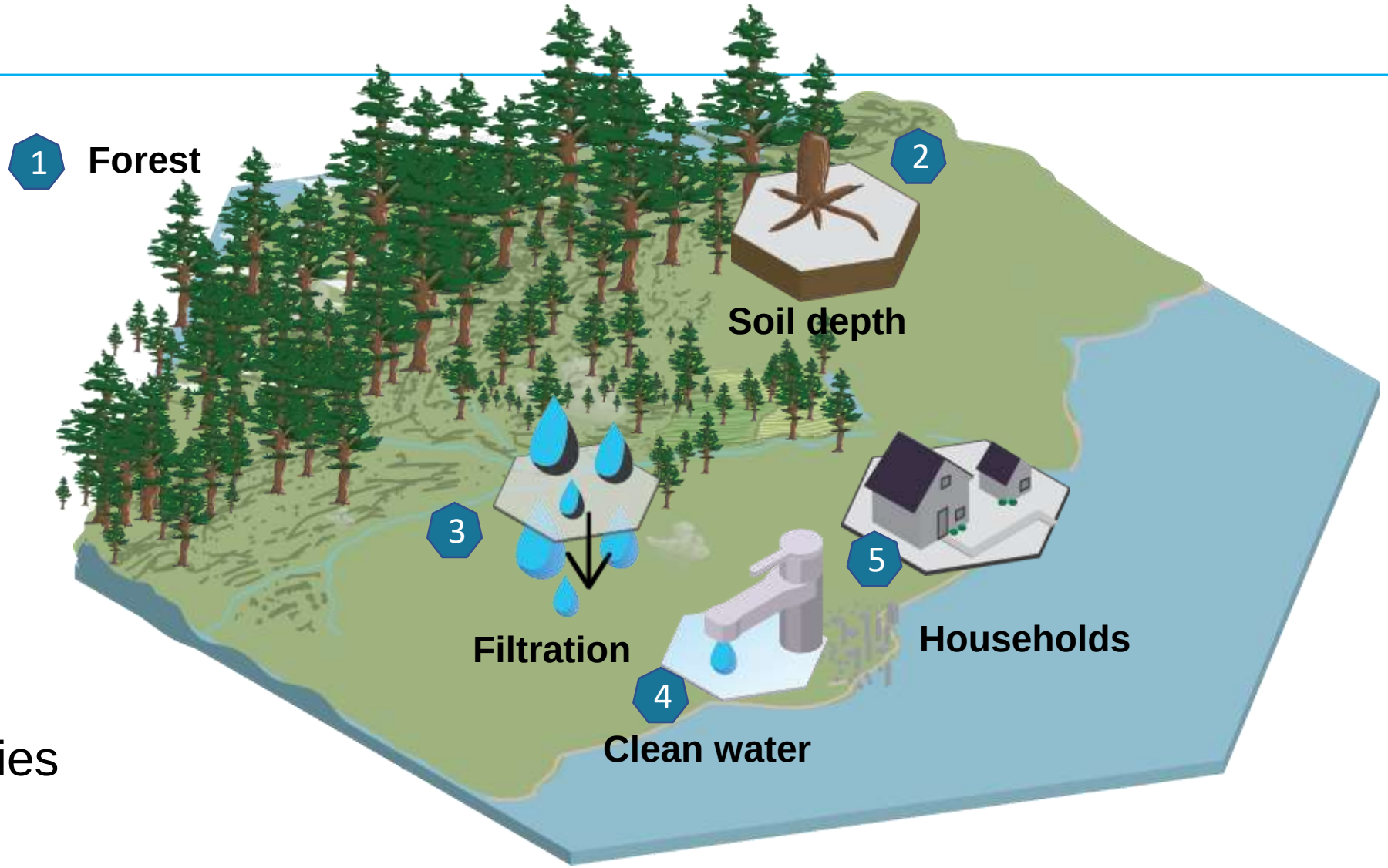


Measuring and valuing – linking NEAs to SEEA-EA

System of Environmental Economic Accounting - Ecosystem Accounting

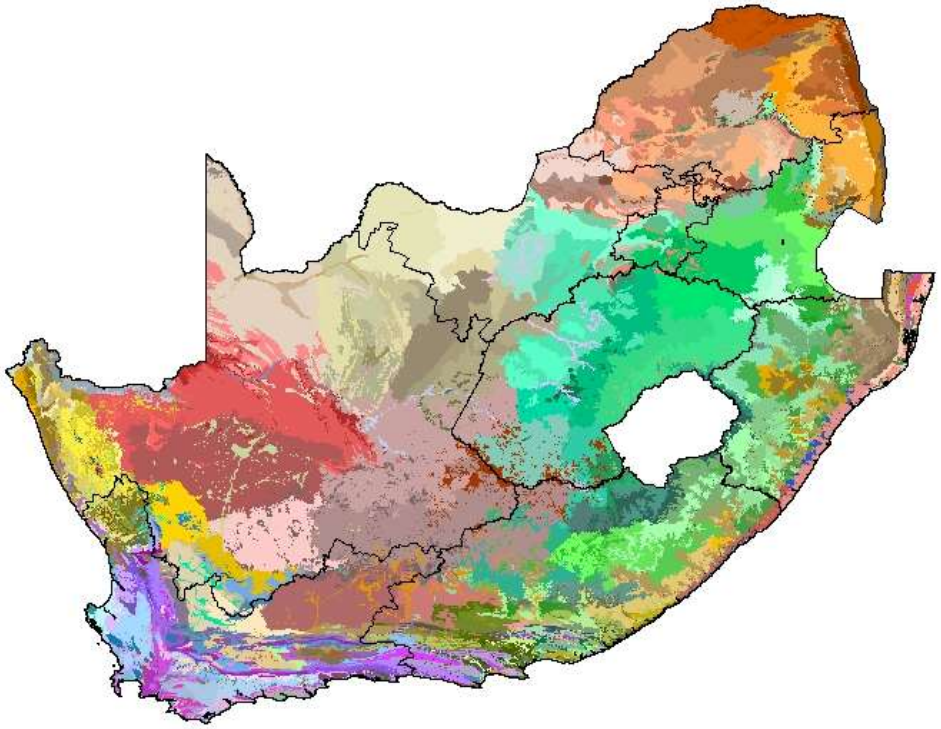
SEEA EA Framework – Illustrative Example

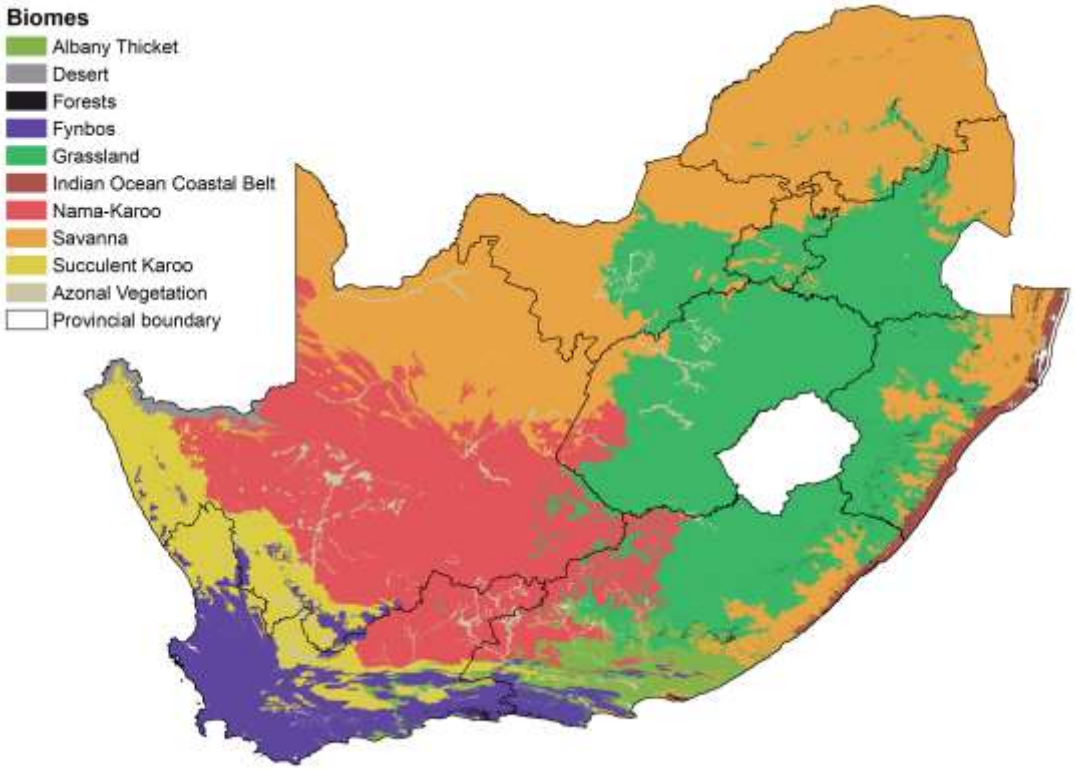
1. Asset
2. Condition
3. Service
4. Benefit
5. Beneficiaries



Terrestrial ecosystem extent accounts – South Africa

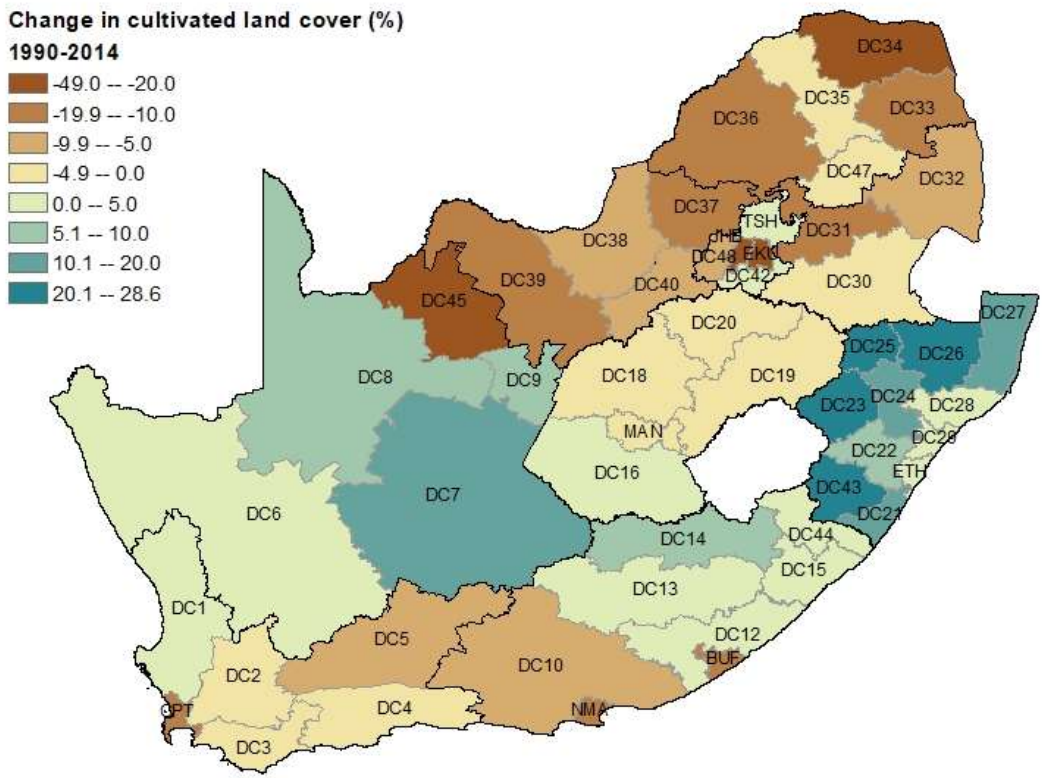
Mapping of terrestrial ecosystem types are
(a) 458 vegetation types,(b) which are aggregated into 9 biomes.

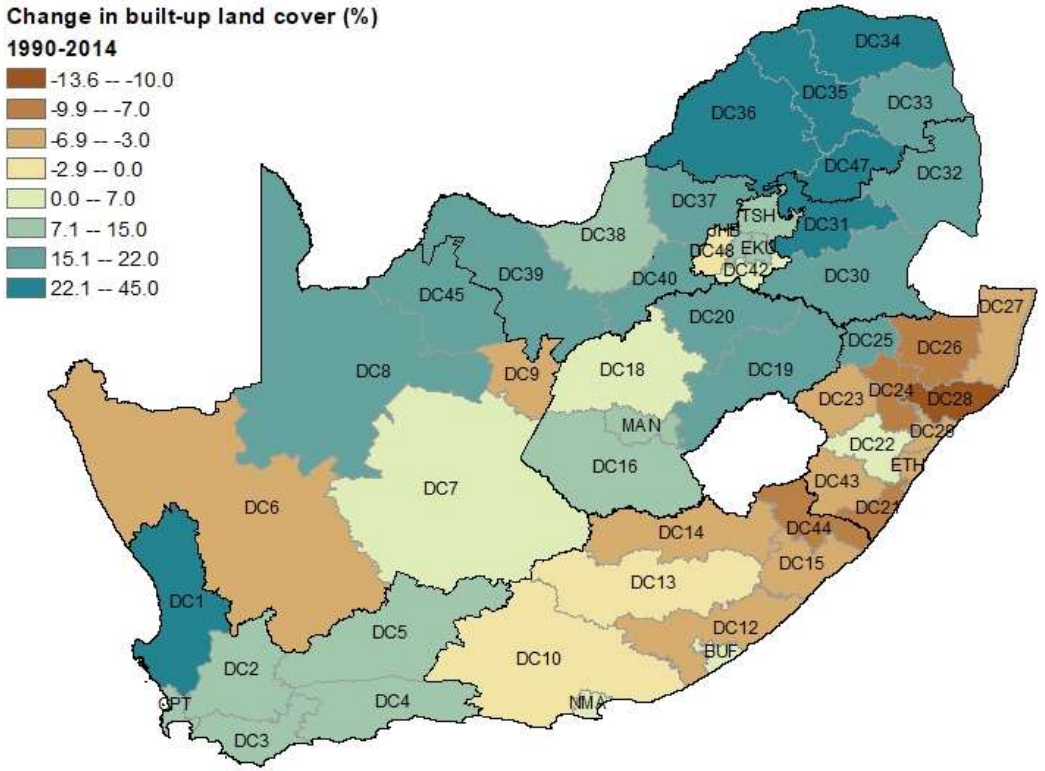




Land accounts – South Africa

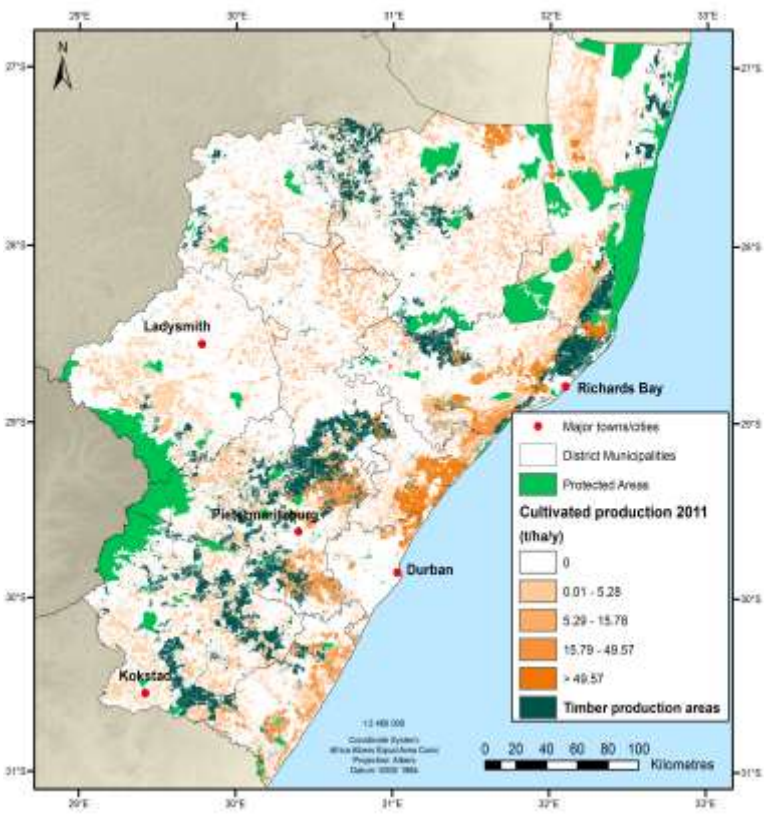
Changes over time in land cover classes (here comparing cultivated areas (LHS) to built-up areas (RHS))Provides spatial evidence of agricultural and urban expansion and contraction .

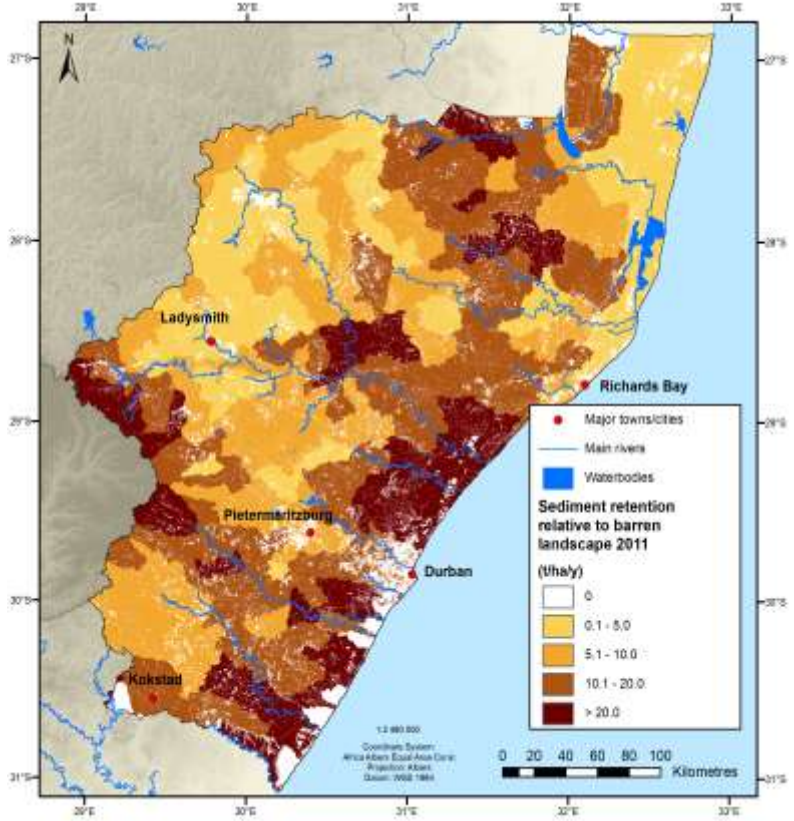


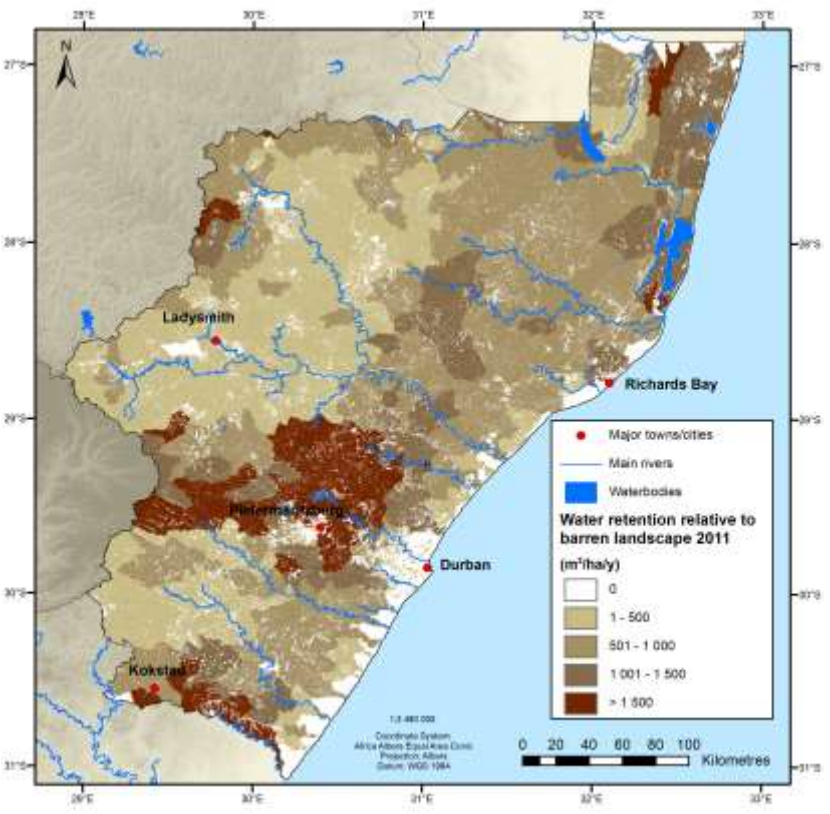


Ecosystem services accounts (biophysical) – KwaZulu Natal South Africa

Spatially-explicit data on provision of ecosystem services – water retention, crop provisioning, and sediment retention shown here, but results for a suite of eleven ecosystem services

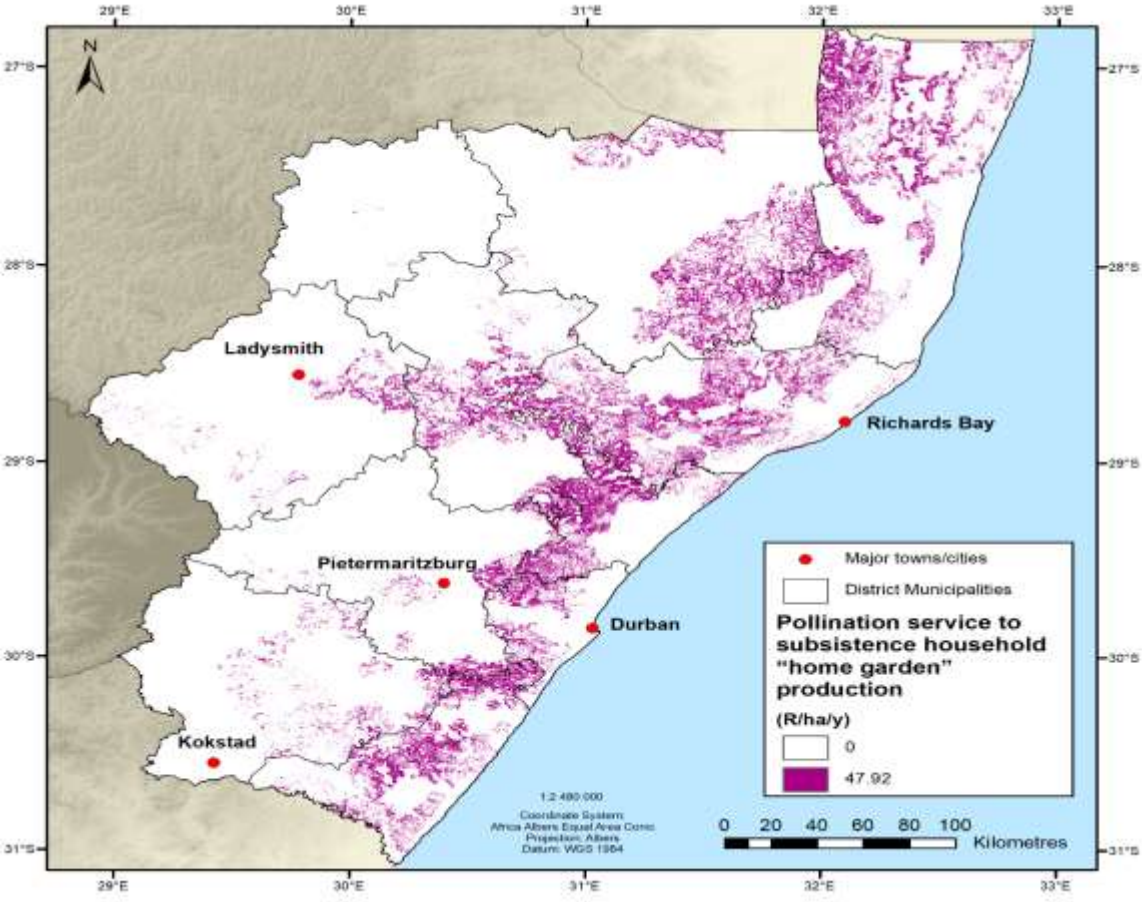






Ecosystem services accounts (monetary) – KwaZulu Natal South Africa

Spatially-explicit data on value of ecosystem services, and trends over time



Class	Ecosystem service	2005		2011	
		Annual flow	Asset value	Annual flow	Asset value
		R millions	R millions	R millions	R millions
Provisioning	Wild resources	3 722.16	32 032.23	3 180.25	28 440.48
	Animal production	1 672.99	27 100.67	1 472.87	23 859.03
	Cultivation	6 456.70	104 591.91	7 535.43	122 066.22
Cultural	Nature-based tourism	532.83	8 631.31	798.83	12 940.22
	Property	1 164.97	18 871.27	1 327.78	21 508.60
Regulating	Carbon storage (global value)	29 922.56	484 745.42	34 579.34	560 185.33
	Pollination	51.26	830.33	47.69	772.50
	Flow regulation	3 247.87	52 612.12	3 166.78	51 298.55
	Flood attenuation	31.02	502.49	23.50	380.68
	Sediment retention	435.79	7 059.28	330.40	5 352.18
	Water quality amelioration	20.40	330.46	16.03	259.67
Total		**47 258.53**	**737 307.48**	**52 478.90**	**827 063.46**
Value of flows and asset values in 2005 and 2011 when using national carbon values					
Regulating	Carbon storage (national)	236.39	3 829.49	273.18	4 425.46
Total		**17 572.38**	**256 391.56**	**18 172.74**	**271 303.59**

TEEB
The Economics of Ecosystems & Biodiversity

Ecosystem Accounts show there is a problem.

What can we do?

TEEB 6 step approach

STEP 1: Refine the objectives of a TEEB study by specifying and agreeing on the *key policy issues with stakeholders*

STEP 2: Identify the most relevant ecosystem services

STEP 3: Define information needs and select appropriate methods

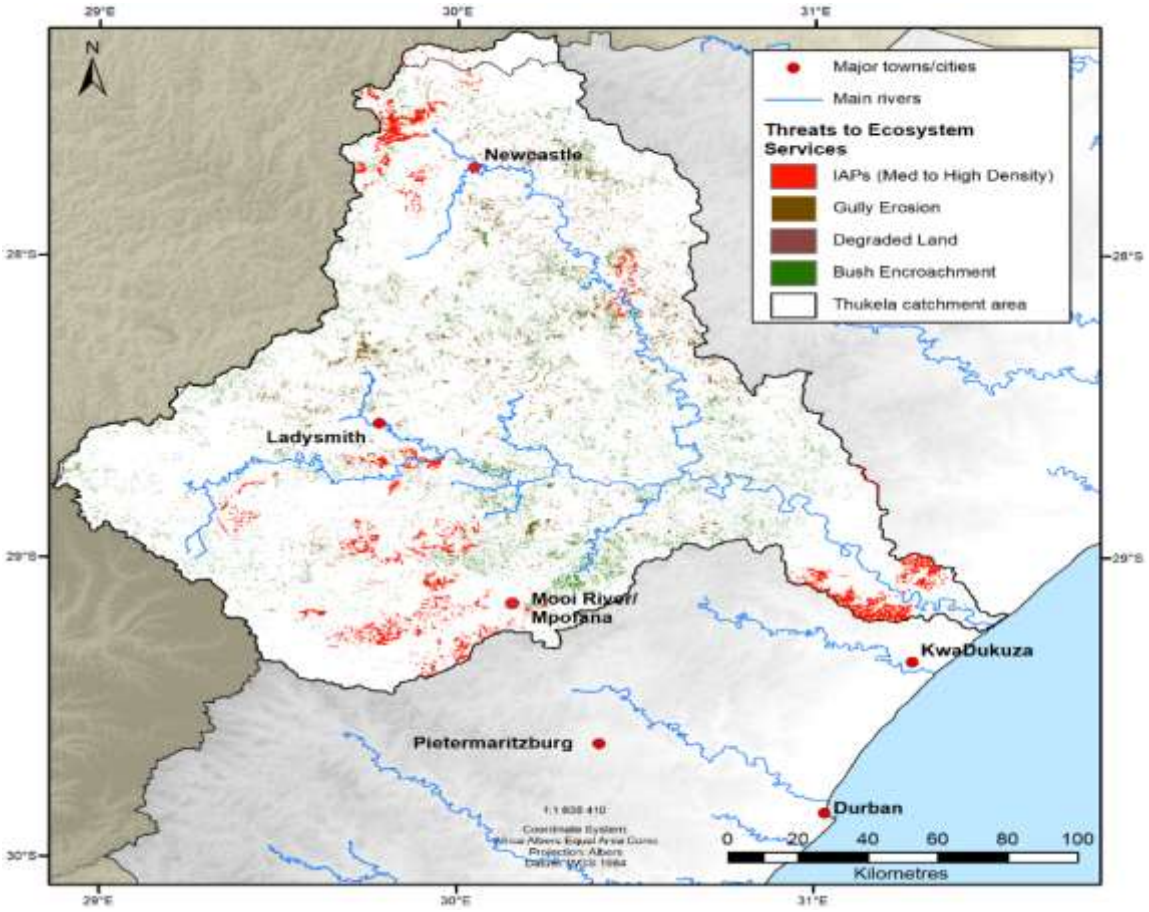
STEP 4: Assess and value ecosystem services

STEP 5: Identify and outline the pros and cons of policy options, including distributional impacts

STEP 6: Review, refine and report

Policy application 1: Ecosystem restoration in South Africa – KwaZulu Natal South Africa

Cost-benefit analysis of ecosystem restoration programmes in Thukela river basin, KwaZulu Natal



Policies:

Extension services

Betterment schemes

Natural Resource Management Programmes

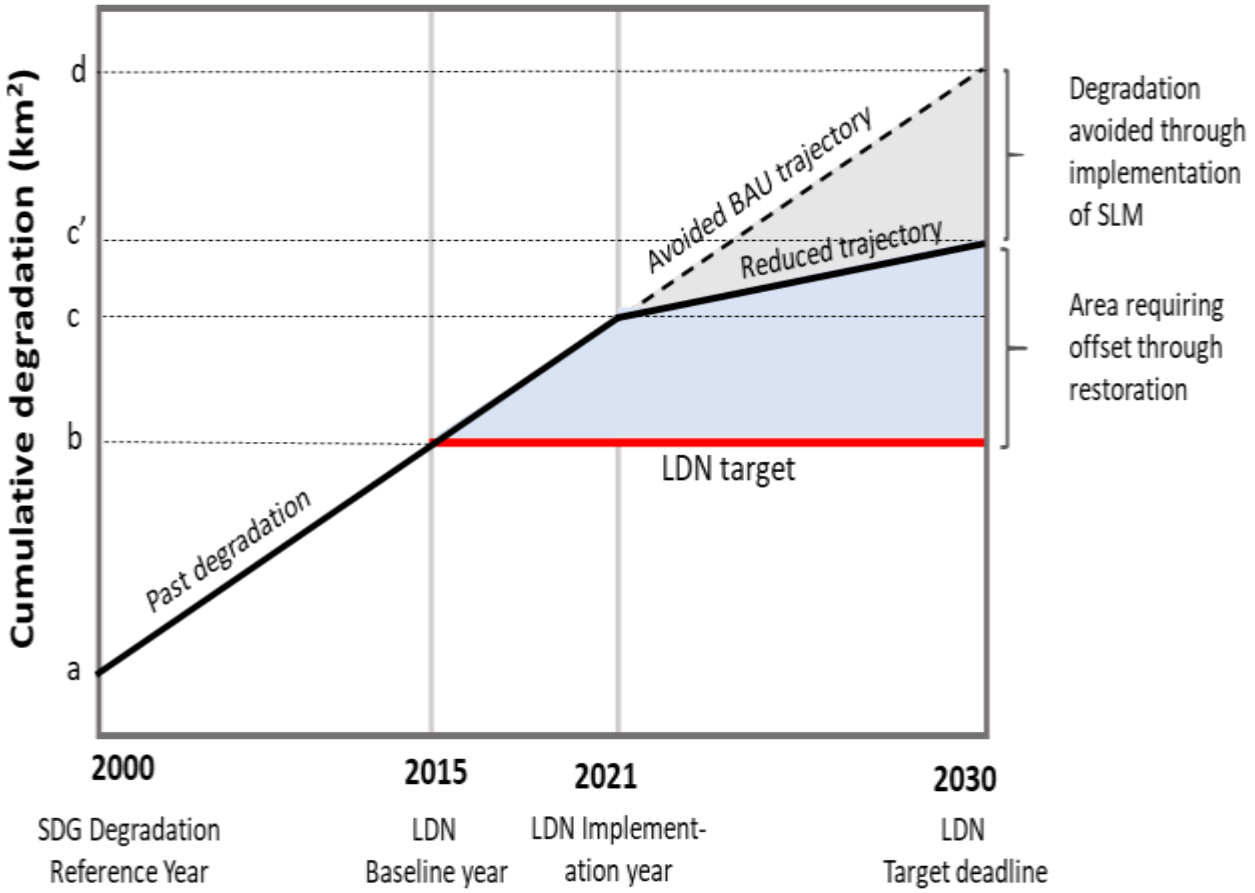
e.g. 'Working for Water'

2030 Land Degradation Neutrality target, UNCCD and SDGs

Policy application 1: Ecosystem restoration in South Africa

Cost-benefit analysis of ecosystem restoration programmes in Thukela river basin, KwaZulu Natal

Business-as-usual (BAU) – continued degradation, projected based on past rates
Optimistic LDN - degradation at 2021 relative to 2015 is reversed and sustainable land management SLM measures stop any further degradation.
Pessimistic LDN - assumes SLM ineffective, thus requiring restoration of an area equivalent to all projected degradation from 2015-2030.
Full restoration - restores <u>all</u> degraded areas as at 2021 to healthy condition. Assumes SLM would stem further degradation.



Policy application 1: Ecosystem restoration in South Africa

Cost-benefit analysis of ecosystem restoration programmes in Thukela river basin, KwaZulu Natal

	Present value (R millions) base estimate	
Costs	**LDN Optimistic**	**Full restoration**
Clearing IAPs	514.4	2 355.2
Addressing Bush Encroachment	237.6	691.1
Active restoration of grasslands, erosion	-	-
Sustainable land management	1 981.02	6 093.62
Total present value of costs	**2 733.09**	**9 139.98**
Benefits		
Water supply	2 591.4	10 757.2
Sediment retention	38.9	63.1
Tourism	121.8	243.6
Carbon storage (avoided national cost)	-274.91	597.5
Harvested resources	70.6	2 391.3
Livestock production	620.7	1 476.9
Total present value of benefits	**3 168.6**	**15 529.6**
Net Present Value	**435.5**	**6 389.6**
BCR	**1.2**	**1.7**

Policy application 2:
Eco-compensation schemes in China

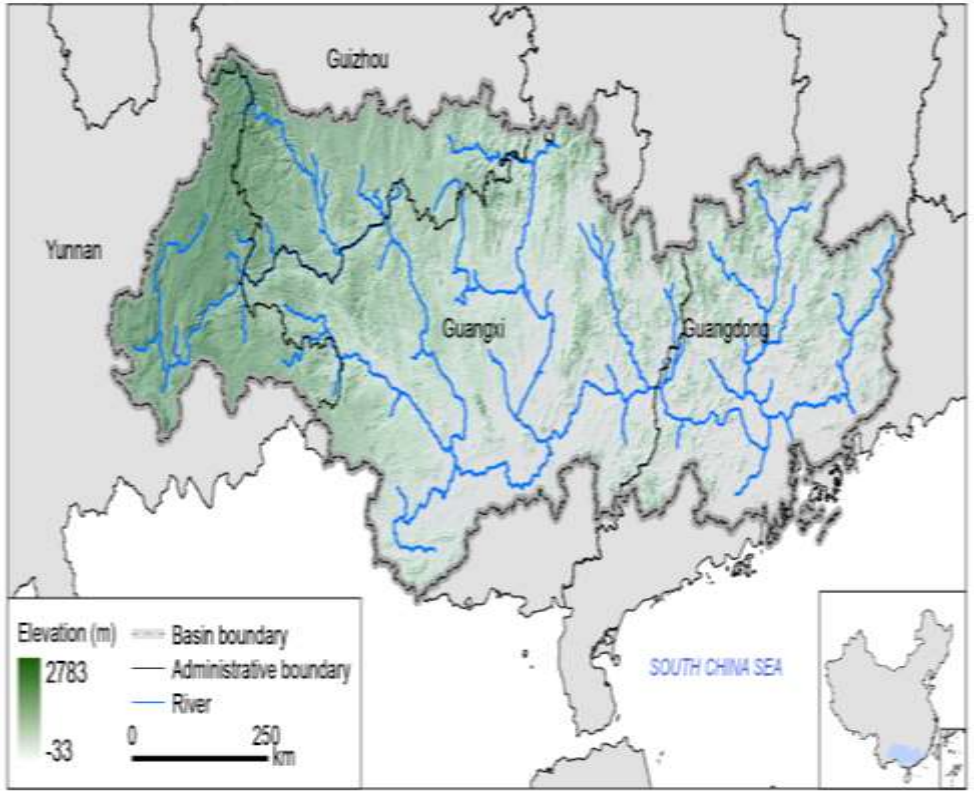
"We will improve systems for regeneration of croplands, grasslands, forests, rivers, and lakes, and set up diversified market-based mechanisms for ecological compensation."
President Xi's speech to 19th National Congress of the Communist Party of China

- Various pilot schemes for eco-compensation trailed (grain-for-green, sloping land conversion, grassland restoration etc.).
- A central question remains: how much should 'users' of ecosystem services compensate 'providers'?

→ Role for SEEA EA to map and value ecosystem services to calibrate compensation

Policy application 2: Eco-compensation schemes in China

Inter-provincial compensation Xijiang River Basin – Guangxi, Guizhou, Yunnan, Guangdong



RCP8.5

A high pathway in which radiative forcing reaches greater than 8.5 W m^{-2} by 2100.

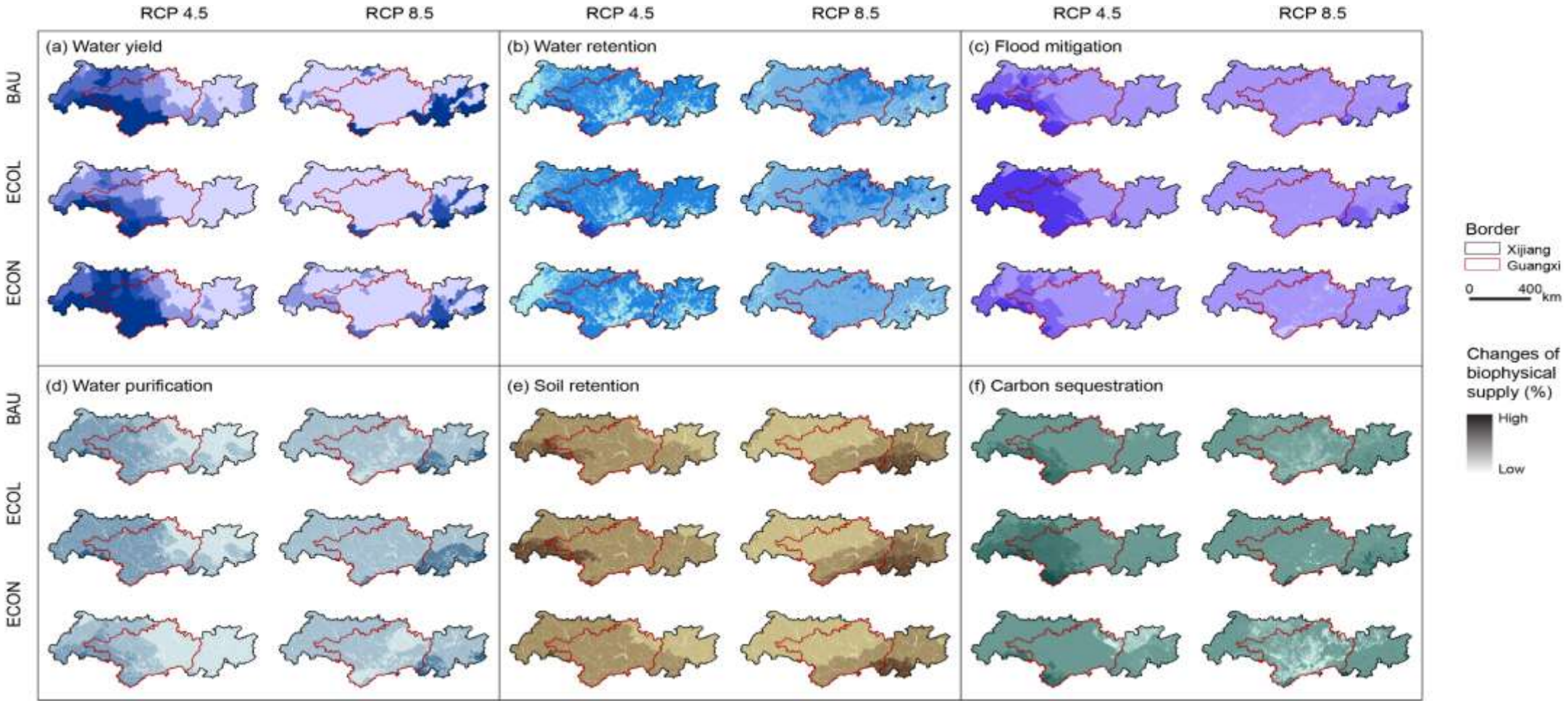
RCP4.5

A stabilization pathway in which radiative forcing is stabilized at ~ 4.5 W m^{-2} after 2100.

Greenhouse gas emission \ Strength of human disturbances	Ecological Protection Priority	Business As Usual	Economic Development Priority
RCP8.5	RCP8.5 – ECOL: Enhanced protection and restoration of ecological lands with a high emission goal.	RCP8.5 – BAU: Baseline: continued historical trend of land use changes over next years with a high emission goal.	RCP8.5 – ECON: Increased expansion of urban land with a high emission goal.
RCP4.5	RCP4.5 – ECOL: Enhanced protection and restoration of ecological lands with a low emission goal.	RCP4.5 – BAU: Baseline: continued historical trend of land use changes over next years with a low emission goal.	RCP4.5 – ECON: Increased expansion of urban land with a low emission goal.

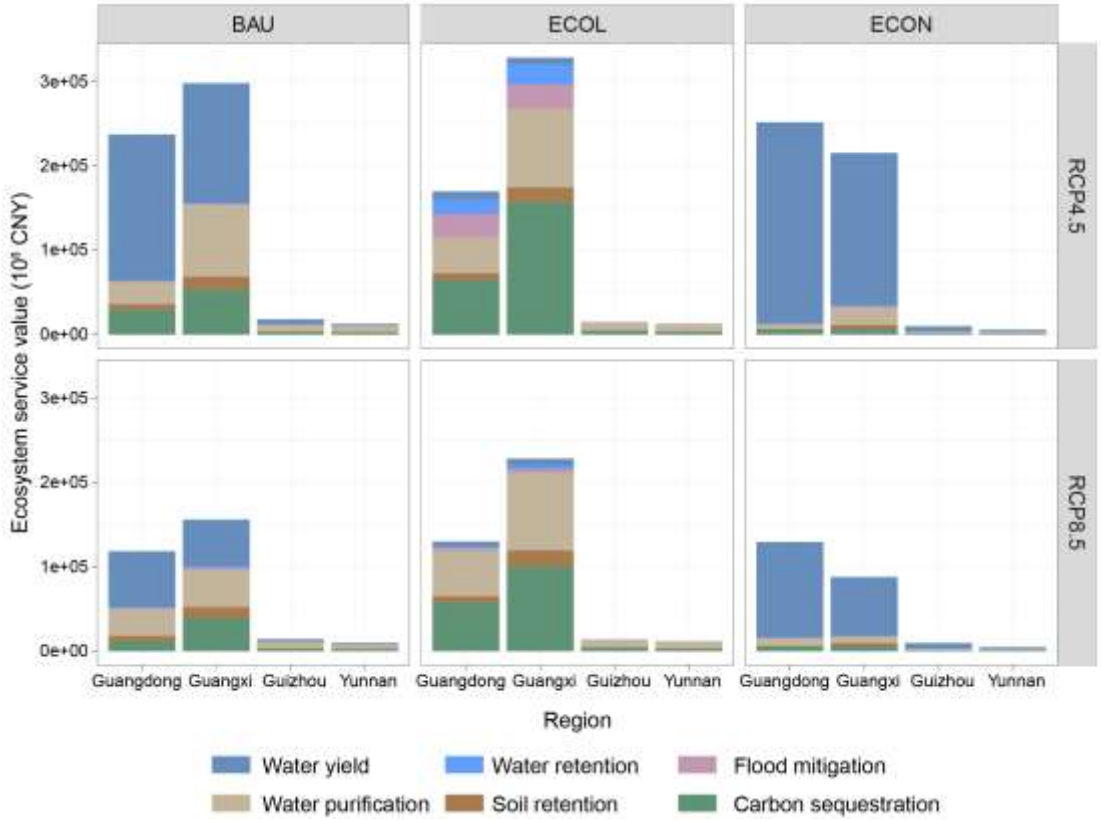
Policy application 2: Eco-compensation schemes in China

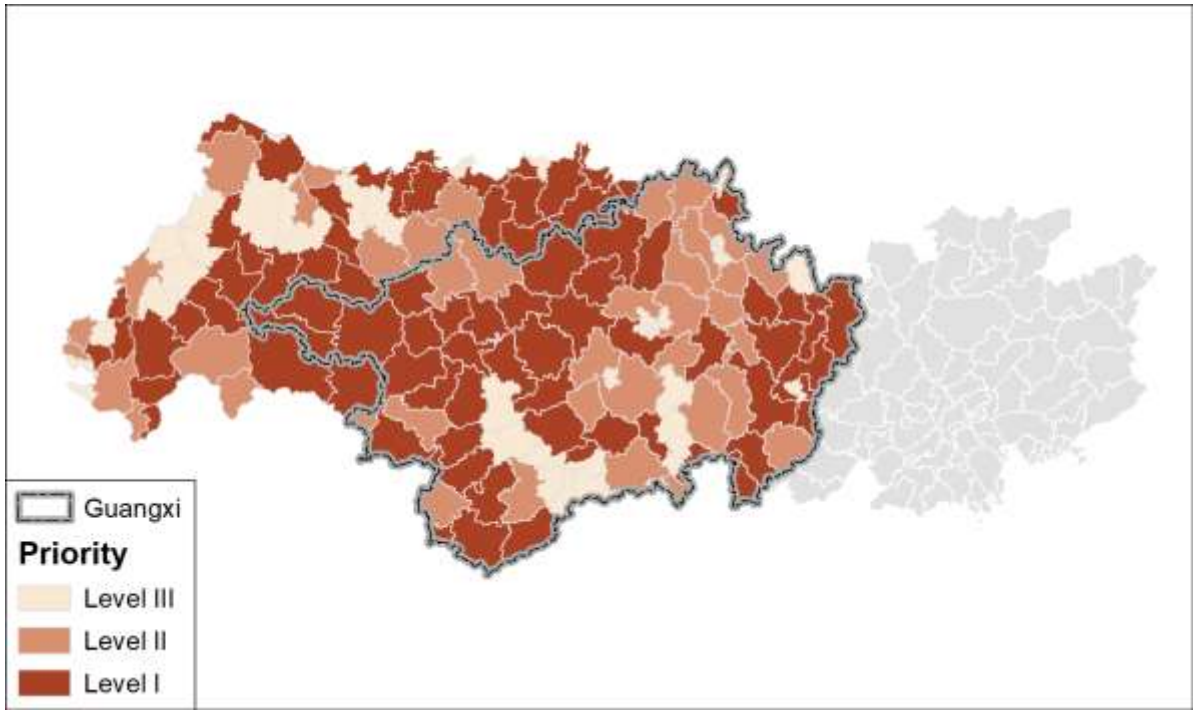
Changes in the spatial distribution of the biophysical supply of ecosystem services for 2035 under different climate and land cover scenarios



Policy application 2: Eco-compensation schemes in China

Ecosystem service values for different regions of Xijiang basin under different climate and land cover scenarios in 2035 is used to map priority areas for ecological compensation, to more accurately calibrate the scheme.





Impacts of using valuation - TEEB

1. In **Indonesia**, the TEEBAgriFood assessment was sent to the President's Office and was used to support the inclusion (for the first time) of agroforestry goals in the Medium-Term Development Plan (Executive Order 18/2020)
2. In **Brazil, Sao Paulo State policies** were strengthened to include urban and peri-urban agriculture modalities in June 2021.
3. In the **Philippines**, there was a moratorium on land reclamation in Manila Bay in 2019, with arguments from the TEEB analysis being used by the Biodiversity Management Bureau in their submissions.
   https://www.youtube.com/watch?v=jD2ufFKW4hk&t=140s
4. In **Bhutan**, planned hydropower projects in Bhutan have been down-sized and targeted up-stream sustainable land-use management programs ensure regular and reliable water flow and deliver benefits to local communities.
   https://www.youtube.com/watch?v=ypuFYnLb4J4
5. In **Ecuador**, the TEEB process catalyzed the institutionalization of ecosystem service valuation within the Ministry of Environment, including the development of Ministry-led support tools and the development of a guide for economic valuation of ecosystem services.

THANK YOU
FOR LISTENING

For more information, please visit www.teebweb.org or feel free to ask any questions during our Q&A at the end of the presentation.

Dr. Salman Hussain

Geneva, Switzerland

Coordinator, The Economics of Ecosystems and Biodiversity (TEEB) Head a.i., Economics of Nature Unit

Biodiversity and Land Branch, Ecosystems Division, UN Environment Programme (UNEP)

salman.hussain@un.org

(+41) 229178200

WWW.TEEBWEB.ORG

Integrating economic values into the NEA: Mozambique Case Study Application

Dr. Steven King

Environmental Economist
UNEP-WCMC

Policy Entry Point

- Ecosystems services are critical to the resilience of communities, businesses and livelihoods, particularly in the face of climate change
- Mozambique's Natural Capital Programme is a key initiative of the National Green Economy Action Plan to secure these services
- Improved understanding of ecosystems and the services they deliver is critical in developing the Governments 5-yearly action plans

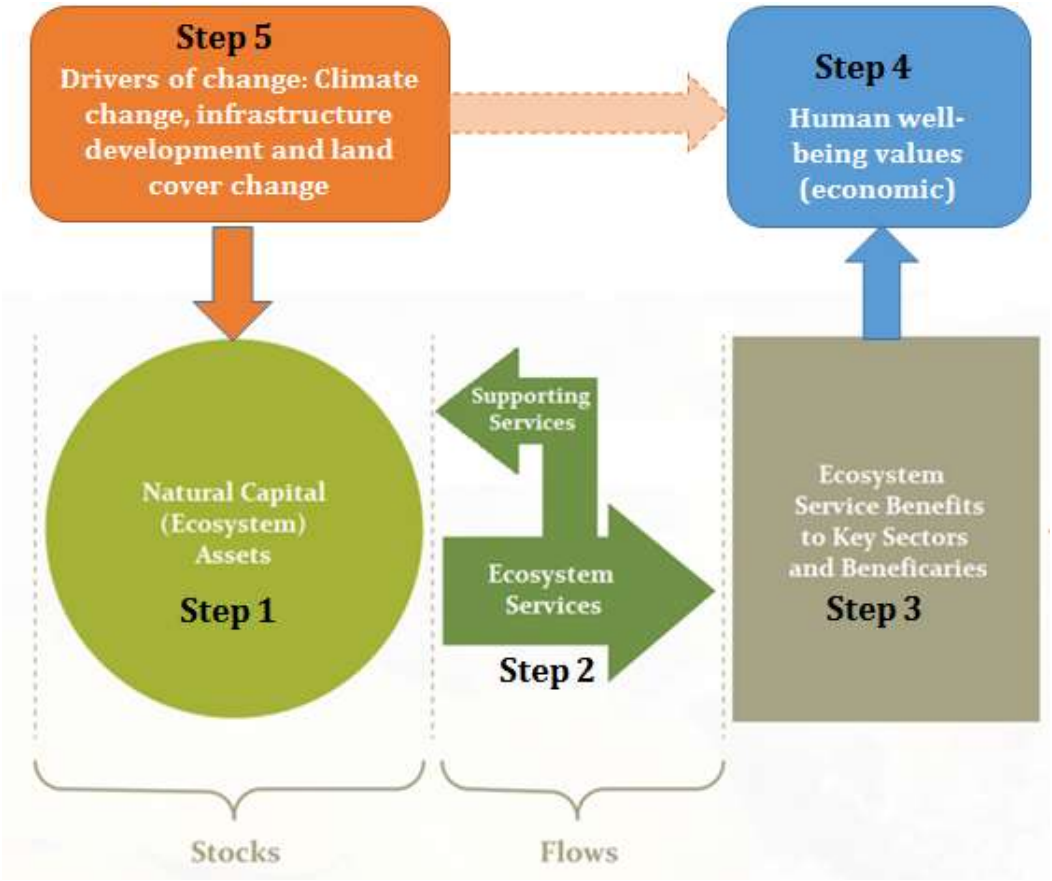
NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Analytical objective

- As such an ecosystem assessment was undertaken to:
  1. Establish the location of key ecosystem assets across Mozambique
  2. Quantify the services provided by these ecosystems in physical and monetary terms
  3. Evaluate how these ecosystem services may change under different climate change and development scenarios

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

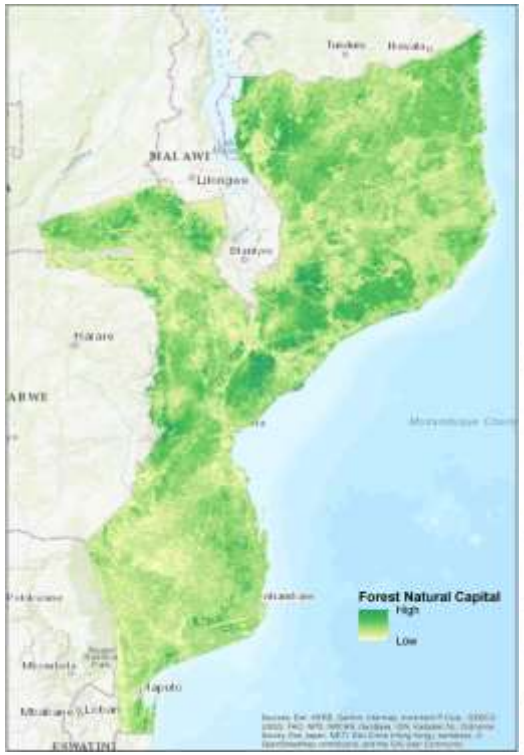
Conceptual Framework



- Step 1: Identify key ecosystem assets
- Step 2: Link ecosystems assets to ecosystem services
- Step 3: Quantify ecosystem service flows
- Step 4: Monetary valuation of ecosystem service flows
- Step 5: Scenario analysis

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 1: Key Ecosystems Assets

Forests	Mangroves	Freshwater	Coral reefs
			

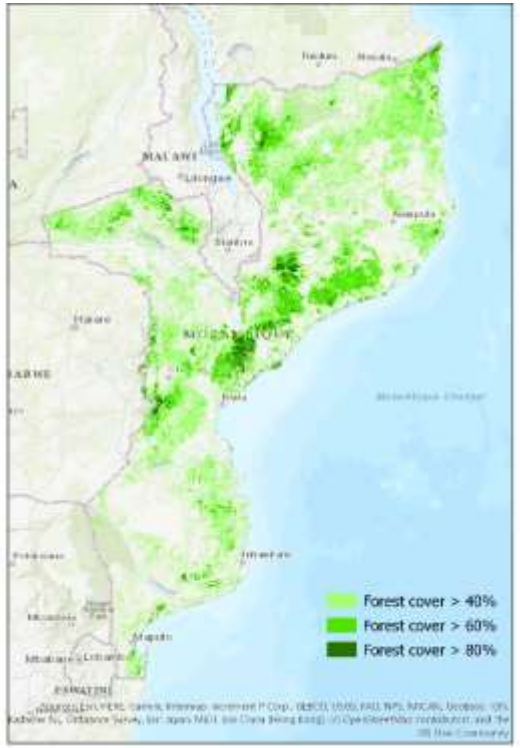
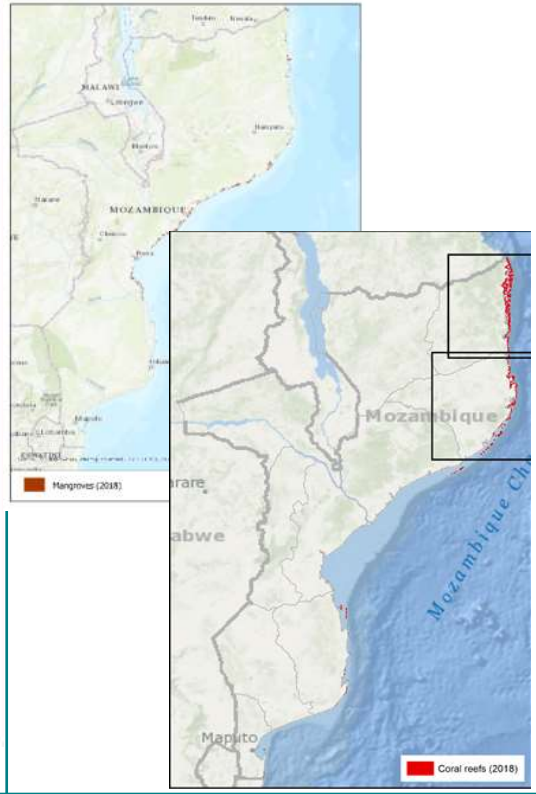
NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 2: Ecosystem Services Matrix

Ecosystem Services / Ecosystem Assets	Freshwater provision	Food provision	Carbon sequestration and storage	Energy (hydropower)	Fuelwood / Construction materials	Commercial Timber	Tourism	Nursery habitat	Storm protection	Supporting services
Rivers and Lakes	X (drinking and agriculture)	X (Inland fisheries)		X						
Forests		X (NTFPs)	X	X (sediment stabilisation)	X	X	X			
Coral reef							X	X	X	
Mangroves		X (NTFPS – Oysters / Crabs)	X		X		X	X	X	
Seagrass			X					X	X	
Biodiversity							X			Proxy
Cropland (Soil suitability)		X								
Marine (fish stocks)		X								

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 3 and 4: Forests Example

Step 3: Sustainable timber harvesting	Step 3: Sustainable wood fuel	Step 3: Coastal storm protection	Step 3: Inland fisheries production
			
Step 4: US 71 Million / yr	Step 4:US 24 Million / yr	Step 4:US 2.4 Million / yr	Step 4: US 62 Million / yr

Step 3 and 4: Aggregate Analysis

Ecosystem Service	Total production	Value (Millions USD/yr)
Inland waters fish provisioning service	34,348 (tonnes fish / yr)	68.71
Timber provisioning services	648,790 (m3 timber / yr)	71.37
Wood fuel provisioning services	1,672,400 (m3 / yr)	24.38
Crop provisioning services	5,259,546 tonnes crops / year	651.52
Storm protection service	N/A	2.42
Marine fish nursery and provisioning service (Mangroves, coral reefs and seagrass)	36,723 tonnes fish / year	73.45
Marine fish provisioning (Other ecosystems)	~140,000 tonnes / year	194.55
Nature Based Tourism	-	28.75
Total	**N/A**	**1,115.15**
Global climate regulation (carbon storage)	~5 Billion tonnes CO_2e	>100 Billion (Total social costs)

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 5: Scenario Analysis

Current deforestation trends to 2050 will:

- Reduce hydropower efficiency due to sedimentation
- Reduce sustainable wood fuel supply
- Increase climate change (Social costs = US 23 billion)

Projected climate change by 2050 will:

- Reduce crop provisioning services (- US Million 31.5/yr)
- Impact on coral reef, seagrass and mangrove ecosystems services related to storm protection and fish provisioning
- Increase flood risk in the north of the country (ecosystem service can help adapt to this)

- Further economic analysis of these marginal changes can make the economic case for addressing deforestation and investing in ecosystem based adaptation.

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Integrating economic values into the NEA: Useful tools for quantifying ecosystem services

Megan Critchley

Programme Officer

UNEP-WCMC

Step 1: Identify key ecosystem assets

- Stakeholder consultations
- Review available datasets
- Review available models
- Assessment of capacity/ time availability

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 1: Spatially map key ecosystem assets

Map Ecosystem Assets/ Land Cover through remote sensing

Identify relevant and available national land cover maps

Identify relevant and available regional/global cover maps

Global Spatial Datasets

Global Spatial Datasets

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 1 & 2: Spatially map key ecosystem assets

Example Asset	Importance for..	Example source(s)
Dams and rivers	Water supply, energy	HydroSHEDS, NaturalEarth, Global Dam Watch, Global Lakes and Wetlands Database
Protected areas and national parks	Tourism or conservation value	National databases, World Database on Protected Areas (UNEP-WCMC and IUCN)
Forest, mining and agricultural concessions	Timber products, supply chains	National databases and planning, Global Forest Watch
Non-terrestrial assets (mangroves, seagrasses, coral reefs, fisheries)	Coastal protection, fisheries, carbon storage, harvested timber and non-timber forest productions and cultural services	Global Mangrove Watch, Global Distribution of Coral Reefs, remote sensing

NEA NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 2: Identify relevant ecosystem services

Provisioning Services

- Crop production
- Fresh water provisioning
- Fibre
- Genetic resources
- Harvested timber and non-timber products

Regulating Services

- Climate regulation
- Hazard regulation
- Disease and pest control
- Regulating water, air and soil quality

Cultural Services

- Spiritual or religious enrichment
- Cultural heritage and maintaining traditional knowledge
- Recreation and tourism
- Aesthetic experience
- Scientific research and education

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 3 & 4: Quantify ecosystem service flows

Spatial Datasets

GLOBAL MANGROVE WATCH

planet.

NATURE MAP EXPLORER

esa

NASA

Copernicus

GLOBAL FOREST WATCH

Analysis tools and platforms

WaterWorld supported by: espa earthH2Observe

R

InVEST integrated valuation of ecosystem services and tradeoffs

SoLVES

Google Earth Engine

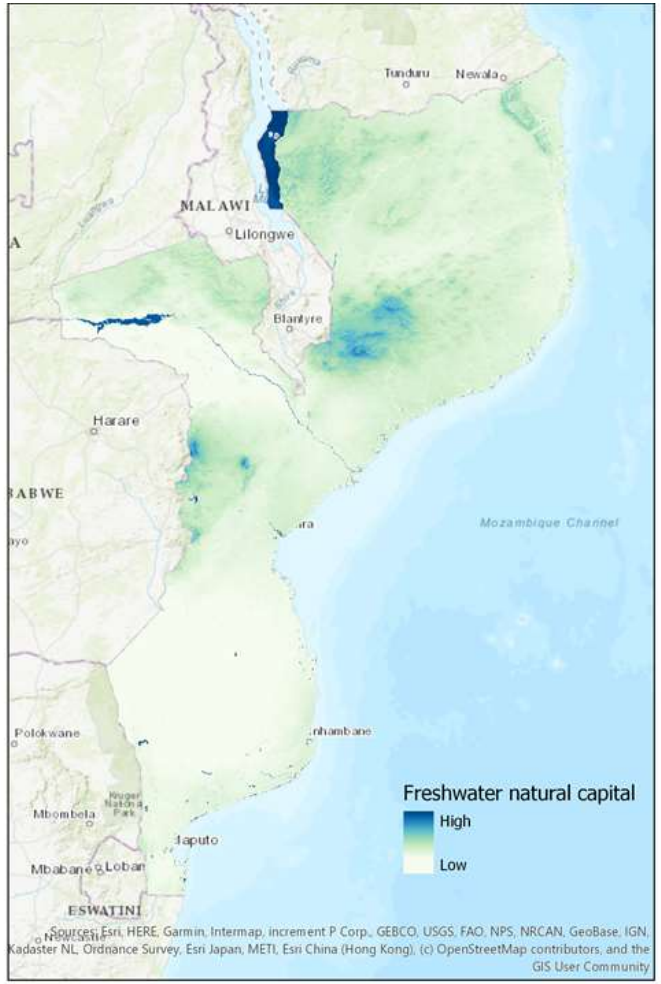
Co$ting Nature UN environment WCMC

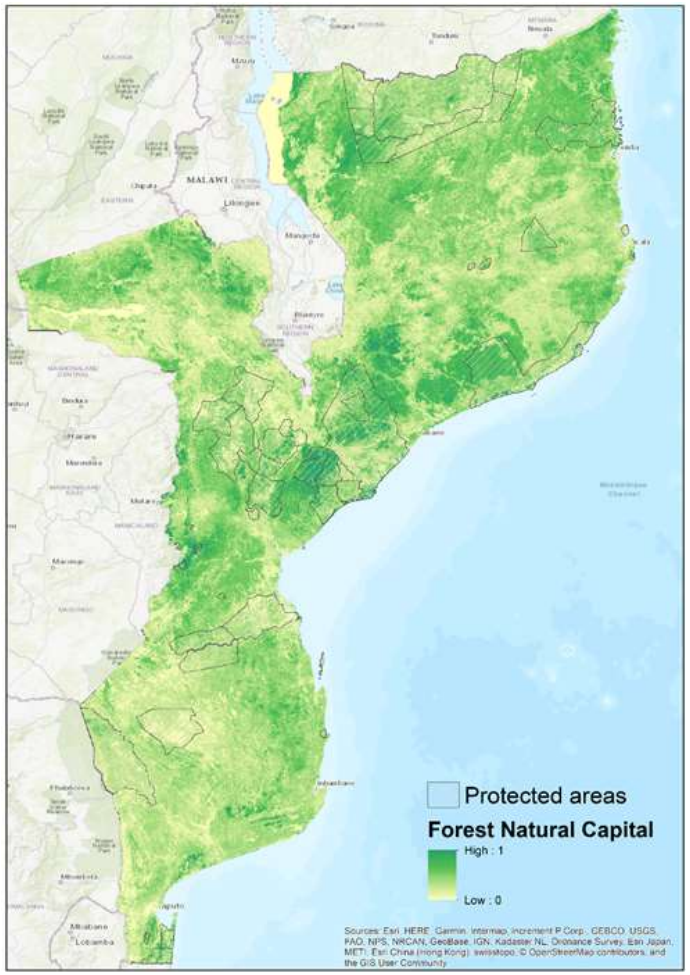
TRENDS.EARTH tracking land change from Conservation International

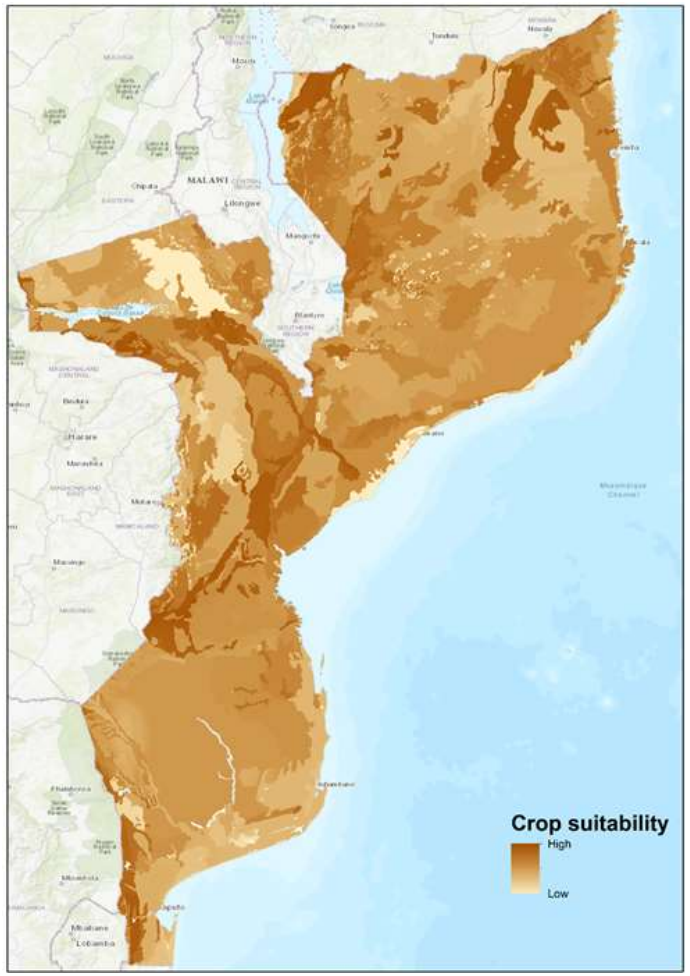
ARIES

NEA NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 3 & 4: Quantify ecosystem service flows







NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 4: Using existing valuation data to support assessment

Table 1: Some rules of thumb for choosing between value transfer approaches

Selection Criteria	*A selection of possible policy good and study good 'matches'*							
i). The good	✓	✓	✓	✓	✓	✓	×	✓
ii). The change	✓	✓	✓	✓	×	✓	n/a	✓
iii). The location	✓	✓	✓	×	×	✓	n/a	✓
iv). The affected populations (characteristics)	✓	×	✓	×	×	× or ✓	n/a	✓
v). The number and quality of substitutes	✓	✓	×	×	×	× or ✓	n/a	✓
vi). The market constructs	✓	✓	✓	✓	✓	×	n/a	✓
Study quality	✓	✓	✓	✓	✓	✓	n/a	×
Rules of thumb:								
Unit value transfer:	👍	👎	👎	👎	👎	👎	👎	👎
Adjusted unit value transfer:	👍	👍	👍	?	?	?	👎	👎
Function transfer:	👍	👍	👍	👍	👍	?	👎	👎

Value Transfer Guidelines developed for the UK government:

https://www.gov.uk/government/publications/valuing-environmental-impacts-guidelines-for-the-use-of-value-transfer

Ecosystem Service Valuation Database

https://www.esvd.info/

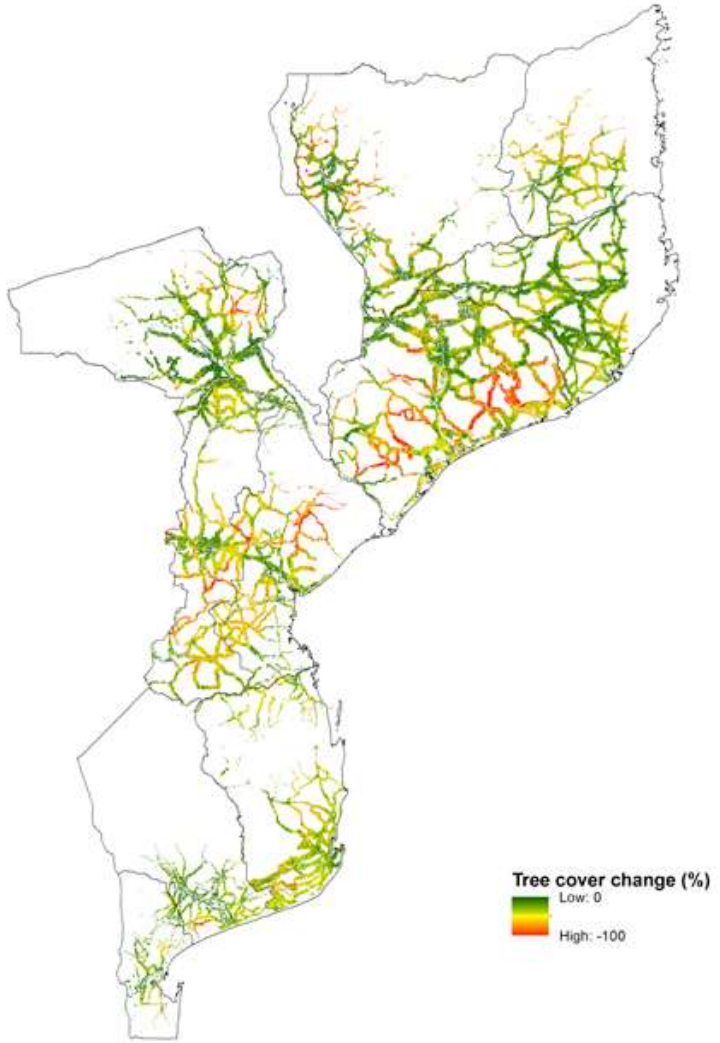
NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

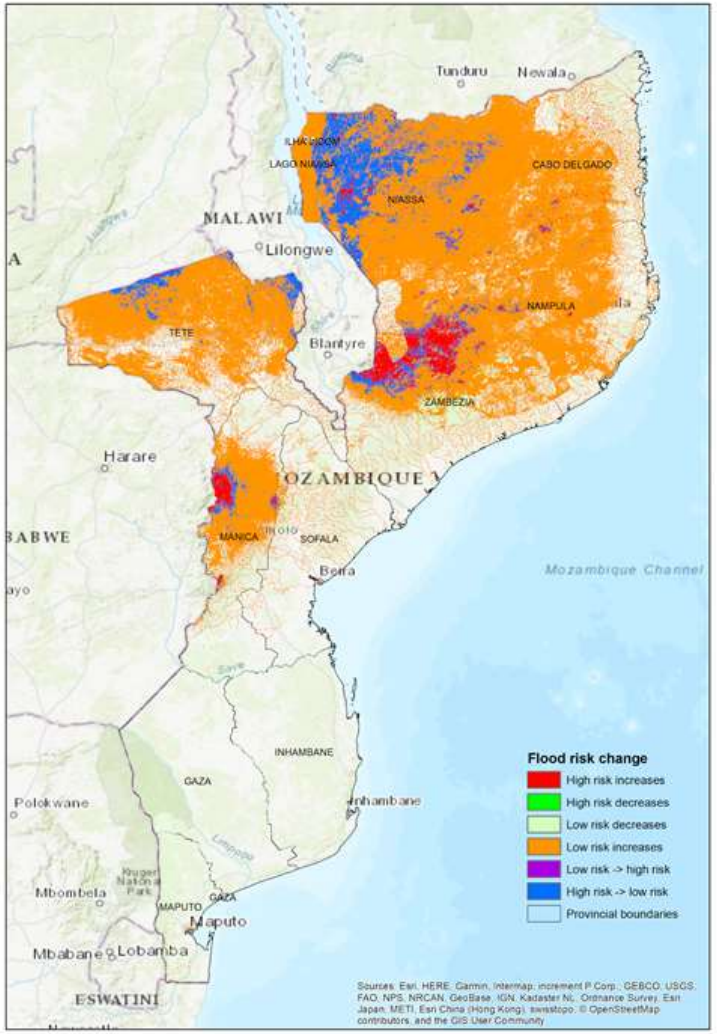
Step 5: Scenario Analysis

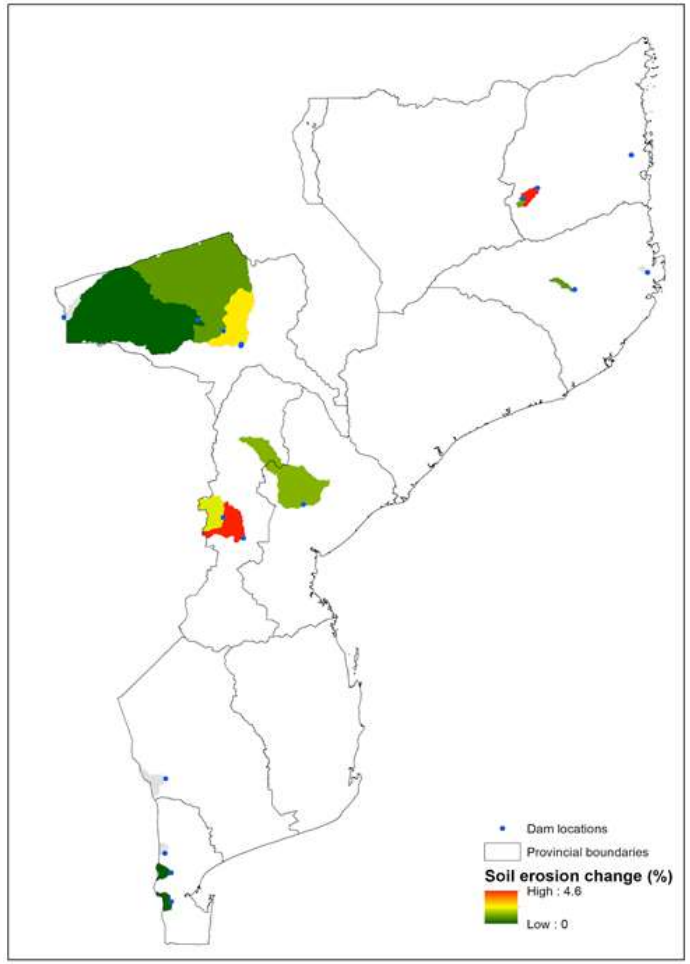
- What if?
- Baseline or “Business as Usual” scenario
- Development scenarios (e.g. best case, worst case, sustainable development)
- Climate change scenarios

NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Step 5: Scenario Analysis







NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE

Panel Discussion

What’s next?

Monday 24th of January 2022
13:00 to 14:30 (GMT)

Webinar: Scenarios and Policy

Thank you!

www.unep-wcmc.org

Facebook: @unepwcmc
Twitter: @unepwcmc
LinkedIn: UNEP-WCMC
Youtube: UNEP-WCMC Communications

NEA NATIONAL ECOSYSTEM ASSESSMENT INITIATIVE