SEEA Ecosystem Accounting and Climate Change

Sokol Vako
United Nations Statistical Institute for Asia and the Pacific

13 April 2023

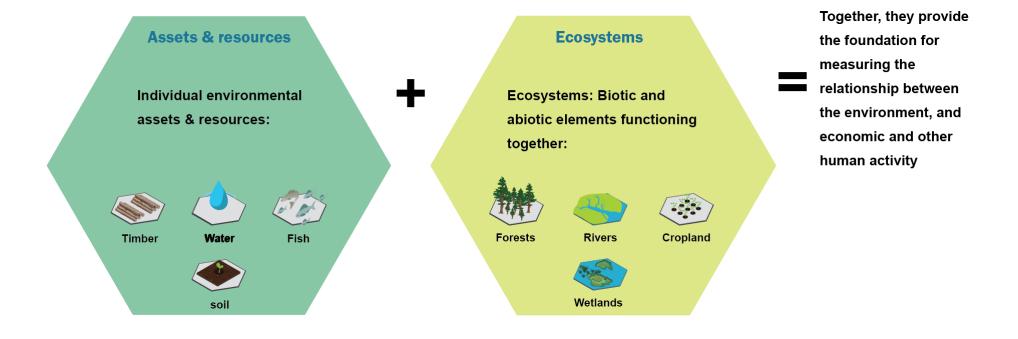


Outline

- * Introduction to SEEA EA
- * Some details around <u>extent</u> accounts and links to climate change (bulk of presentation will focus on this)
- * Some details around condition accounts and links to climate change
- * Some details around services accounts and links to climate change
- * Some potential indicators (focused on extent)
- * An exercise on ecosystem extent (mainly)
- * Presentation based on inputs from Sjoerd Schenau (CBS), Joachim Maes (EU) and Alessandra LaNotte (also EU)
- * Will not cover thematic accounts here

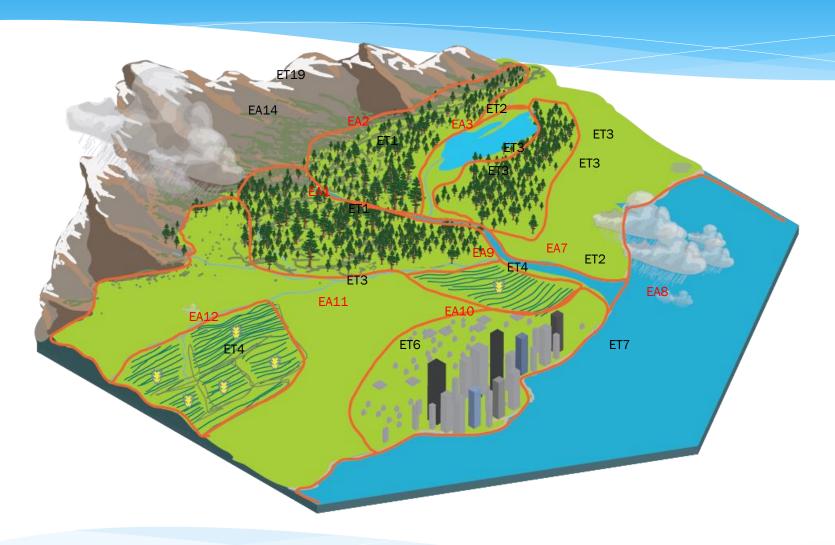


The economic contributions of nature



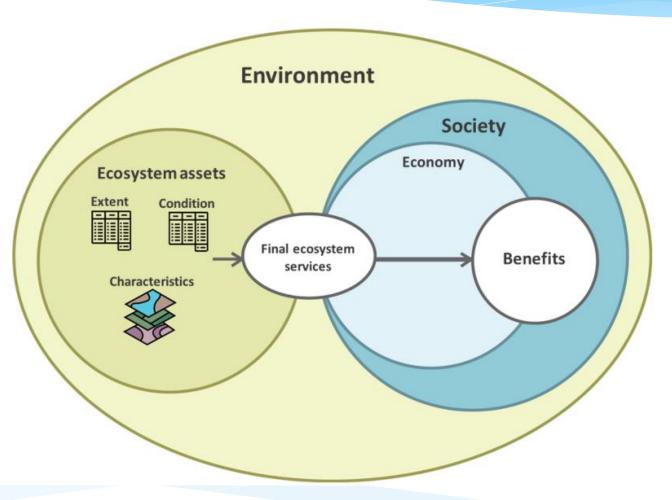


Ecosystem accounting approach



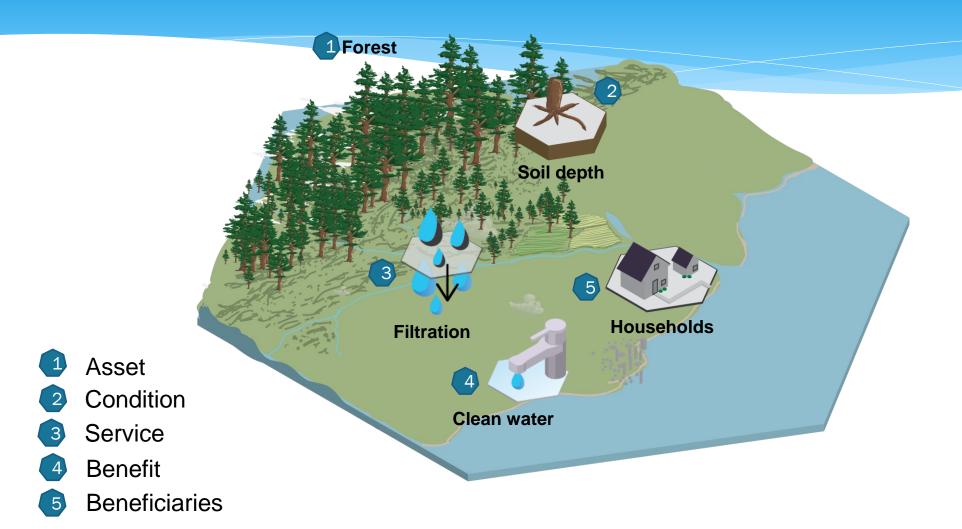


Ecosystem accounting framework

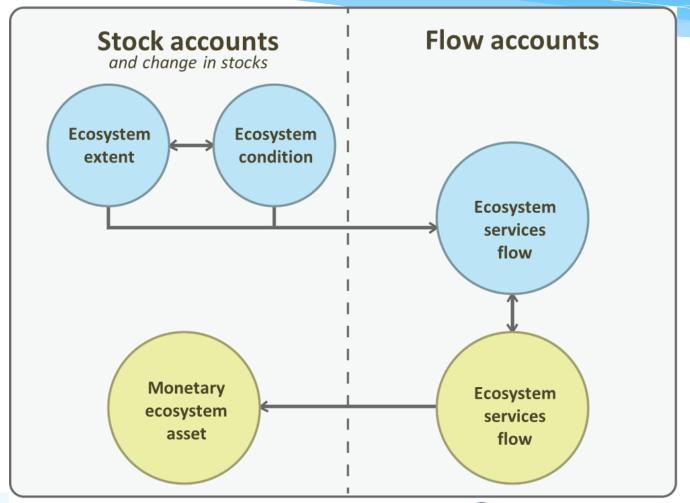


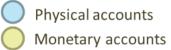


Illustration











Extent accounts (in some detail)



SEEA EA extent account - overview

System of Environmental-Economic Accounting Ecosystem Accounting White cover publication, pre-edited text subject to official editing

What?

- Starting point for ecosystem accounting
- Records the areas of different ecosystems, and changes in the areas
- National coverage of terrestrial, freshwater, coastal and marine areas
- Mutually exclusive and exhaustive coverage

Why?

- Input for land management, conservation policies
- Supports the derivation of coherent indicators of deforestation, desertification, agricultural conversion, urbanization, ecosystem diversity etc.
- Spatial foundation for other accounts
- → basis for allocating macro data to spatial units

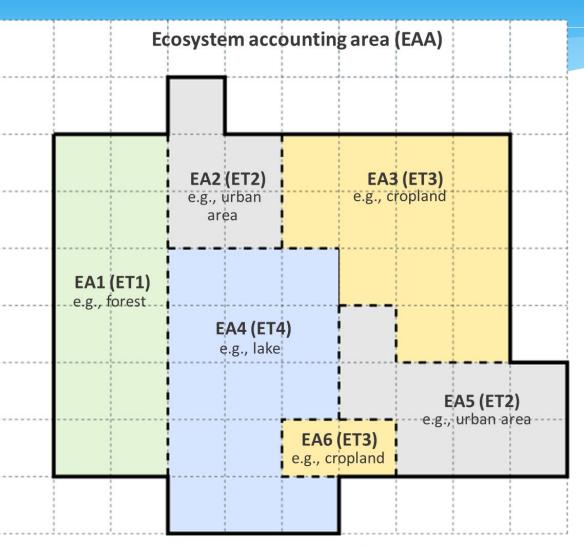


Spatial units in SEEA EA

 General approach for delineation of ecosystem assets well established

Three types of units:

- Basic spatial units (BSU)
- Ecosystem Accounting Area (EAA)
- Ecosystem asset (EA)



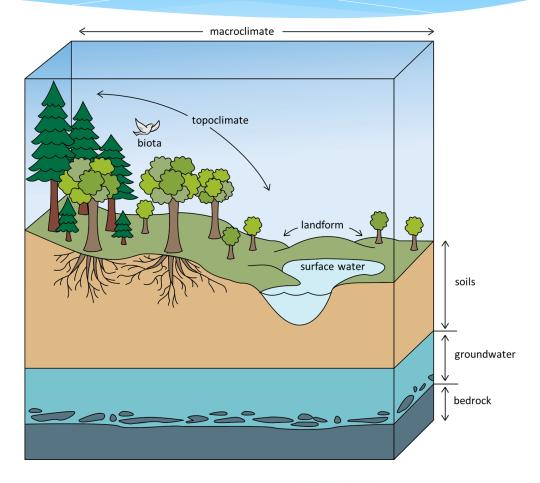


I

Ecosystem assets

Ecosystem assets (EAs) are contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components and their interactions

Ecosystem assets are classified by **ecosystem type (ET)**





)

Principles of ecosystem asset delineation

Ecosystem assets should represent ecosystems

Alignment with CBD ecosystem definition

consideration of organisms, their environmental setting and ecosystem processes.

Keep it realistic: perfect is the enemy of good

Ecosystem assets should be capable of being mapped.

Location; size; shape

Ecosystem assets should be geographically and conceptually exhaustive across ecological realms.

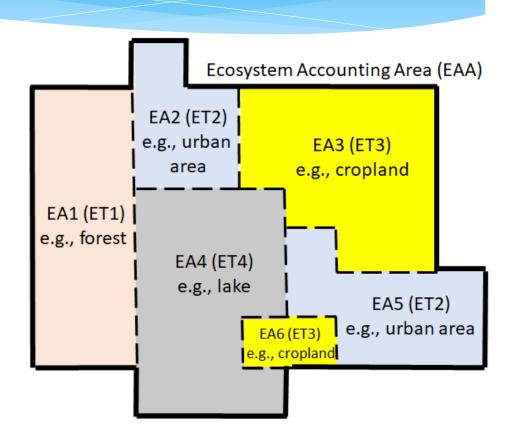
Spatially comprehensive (no gaps)

Conceptually comprehensive

Ecosystem assets should be mutually exclusive

Conceptually (single ecosystem type)

Geographically (no overlaps between e.g. land and ocean).





3

Common forms of EAA

- National jurisdictions / groups of countries
- Subnational administrative areas
 - (e.g., state, province);
- Environmentally defined areas within a country
 - (e.g., water catchments, ecoregions)
- or across countries
 - (e.g., regions defined by river systems such as the Amazon, the Mekong and the Nile);
- Other areas of policy or analytical interest such as
 - protected areas
 - areas owned by specific industries or sectors, e.g., government-owned land
 - or areas outside national jurisdiction, e.g., open oceans and high seas

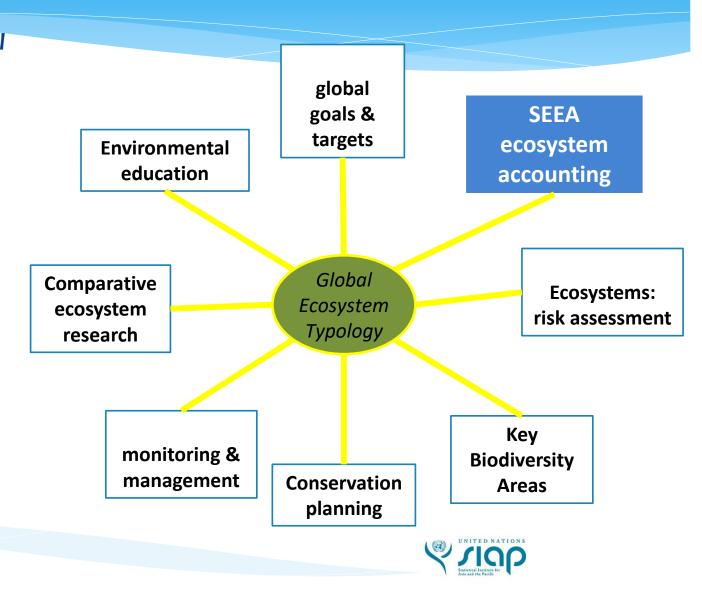
7

An ecosystem type classification for SEEA EA

- A classification describing the ecosystem types and a map are essential components of ecosystem accounting
- It is expected that countries will use their national ecosystem maps and classifications as the basis for SEEA ecosystem accounting.
- However, for international comparability, these classifications should be linked to a <u>reference classification</u>.
- A key revision issue for SEEA EA was to develop a proposal for a reference classification that better represents the concept and coverage of ecosystems
- SEEA EA endorses the IUCN GET as the international reference classification

IUCN Global Ecosystem Typology

- Ecosystems are defined by their biotic and physical components and the ecological processes that sustain them
- * Ecosystem accounts require assets that reflect:
 - * Ecological functions (the basis for ecosystem services)
 - Biological composition (biodiversity)
- * IUCN Ecosystem Typology
 - * A hierarchical framework combining both components



Three ways to to compile ecosystem type maps

- 1) Use existing national ecosystem classification / maps
 - → cross walk to IUCN classification
- 2) Use existing global maps
 - → ARIES, WES, IUCN, etc.
- 3) Construct your own ecosystem classification / maps



The SEEA extent account

						Selecte	d ecos	ystem 1	types (Ł	oased o	n Leve	1 3 - EFC	G of the	IUCN	Global	Ecosyst	em Typ	ology)				
	Realm			T	errestri	ial			Fr	eshwat	ter		Mai	rine				Tran	sitional			
	Selected Ecosystem Functional Group (EFG)	Tropical-subtropical lowland rainforests	Boreal and temperate montane forests and woodlands	Seasonally dry tropical shrublands	Trophic savannas	Semi-desert steppes	Ice sheets, glaciers and perennial snowfields	Croplands	Permanent upland streams	Large permanent freshwater lakes	Large reservoirs	Seagrass meadows	Epipelagic ocean waters	Continental and island slopes	Submerged artificial structures	Tropical flooded forests and peat forests	Deepwater coastal inlets	Rocky shores	Coastal shrublands and grasslands	Artificial shores	Coastal river deltas	TOTAL
		T1.1	T2.1	T3.1	T4.1	T5.1	T6.1	T7.1	F1.1	F2.1	F3.1	M1.1	M2.1	M3.1	M4.1	TF1.1	FM1.1	MT1.1	MT2.1	MT3.1	MFT1.1	
Openi	ng extent																					
۸d	ditions to extent																					
Aut	Expansions																					
	Managed expansion																					
	Natural expansion																					
	Upward reappraisals																					
Rec	ductions in extent																					
	Regressions																					
	Managed regression																					
	Natural regression																					
	Downward reappraisals																					
Ne	change in extent																					
Closin	g extent																					

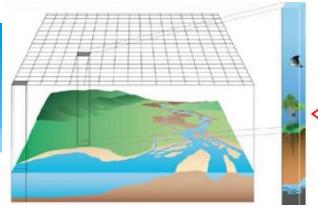


General principles

- Ecosystem extent is the size of an ecosystem asset.
- It is usually measured in terms of spatial area but may also be measured in terms of length or volume
- Provide an overview of the composition (mix/combination) of, and changes in, ecosystem types within an EEA.

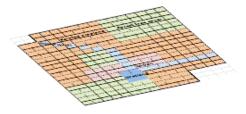


Extent account



- Vegetation
- Hydrology
- Pedology
- Elevation
- Bio-climate
- Etc.

Maps



Ecosystem type

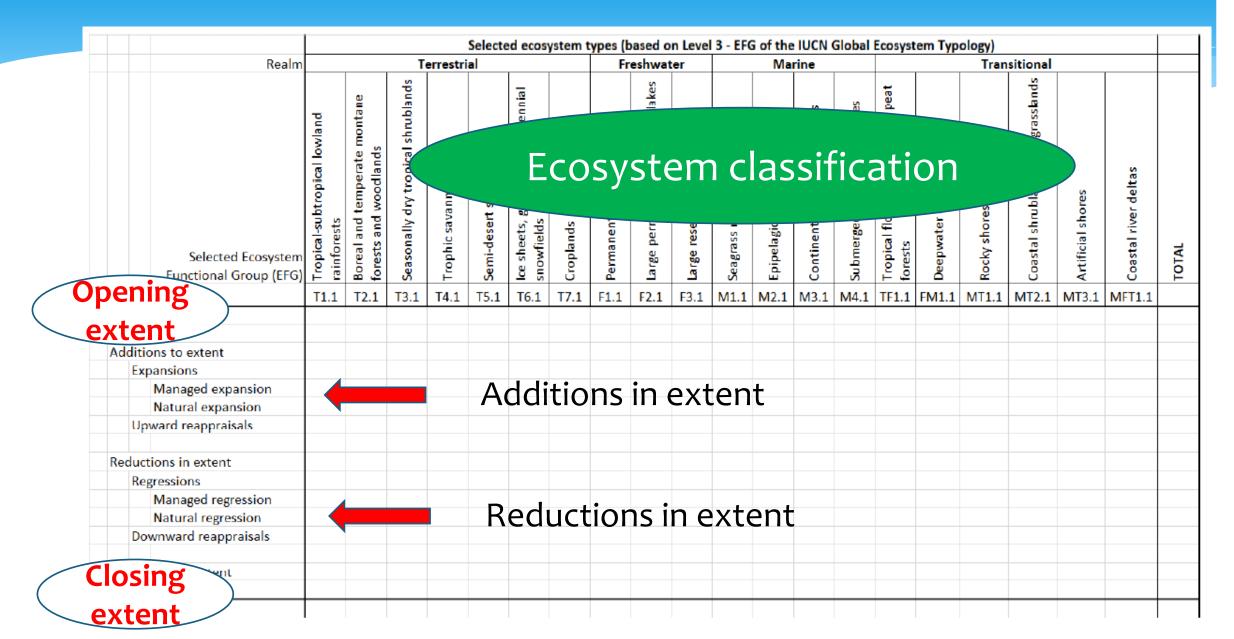


Spatial units Classifications



					Selecte	ed ecos	vstem	types (l	pased o	n Leve	3 - EF0	G of the	IUCN	Global	Ecosyst	em Typ	ology)				
Realm			Т	errestri			,		reshwa				rine					sitional			
Selected Ecosystem Functional Group (EFG)		Boreal and temperate montane forests and woodlands	Seasonally dry tropical shrublands	Trophic savannas	Semi-desert steppes	Ice sheets, glaciers and perennial snowfields	Croplands	Permanent upland streams	Large permanent freshwater lakes	Large reservoirs	Seagrass meadows	Epipelagic ocean waters	Continental and island slopes	Submerged artificial structures	Tropical flooded forests and peat forests	Deepwater coastal inlets	Rocky shores	Coastal shrublands and grasslands	Artificial shores	Coastal river deltas	TOTAL
	T1.1	T2.1	T3.1	T4.1	T5.1	T6.1	T7.1	F1.1	F2.1	F3.1	M1.1	M2.1	M3.1	M4.1		FM1.1	MT1.1	MT2.1	MT3.1	MFT1.1	
Opening extent																					
Additions to extent																					
Expansions																					
Managed expansion																					
Natural expansion																					
Upward reappraisals																					
Reductions in extent																					
Regressions																					
Managed regression																					
Natural regression																					
Downward reappraisals																					
Net change in extent																					
Closing extent																					

Extent account - structure



ET change matrix

The ET change matrix shows:

- the area of different ecosystem types at the beginning of the accounting period;
- the increases and decreases in this area according to the ecosystem type it was converted from or to;
- the area covered by different ecosystem types at the end of the accounting period.

							5	Selecte	d ecosy	stem ty	pes (ba	sed on	Level 3	B - EFG (of the II	JCN Glo	bal Eco	systen	n Typolo	egy)			
	1				<u> </u>								Closi	ng Exter	nt		_						-
Real	m								T3 T		estrial	£					F	reshwat	er		Marine		-
	В	lome			T1 Tro	pical-sub	tropical	forests	T2 Temperate-boreal forests and woodlands				-		7	F1	-	FM1	M1		MFT1		
			Selected Ecosystem Functional Group (EFG)		Tropical-subtropical lowland rainforests	Tropical-subtropical dry forests and scrubs	Tropical-subtropical montane in rainforests	Tropical heath forests	Boreal and temperate high montane forests and woodlands	Deciduous temperate forests		Temperate pyric sderophyll forests on and woodlands	1			Derivied semi-natural pastures and old fields	Permanent upland streams		Intermittently dosed and open lakes and lagoons	swopeau sseziees 11		Coastal saltmarshes and reedbeds	Opening
$\overline{}$	+				14.4	14.4	11.3	12.7	12.1	12.2		12.0	-			17.5			T WILLS	MA.A		WITTE	۴
		opical	Tropical-subtropical lowland rainforests	T1.1																			
		ical-subtr forests	Tropical-subtropical dry forests and scrubs	T1.2																			
ASO DO		T.1 Tropical-subtropical forests	Tropical-subtropical montane rainforests	T1.3																			
		ī	Tropical heath forests	T1.4																			
redeba	1	bnds	Boreal and temperate high montane forests and woodlands	T2.1																			
	Terrestrial	d wood	Deciduous temperate forests	T2.2																			
5	Ter	T2 Temperate-boreal forests and woodlands		_																			
u t		قِ ت	Temperate pyric sclerophyll forests and woodlands	T2.6																			
Opening Extent		1		_																			
Openi	L		400	_																			
Serence ecosystem types (used on tevers - tra on the focus stood topology)		11		_																			
	1		Derivied semi-natural pastures and old fields	T7.5																			L
	- ster	Œ	Permanent upland streams	F1.1																			
tes	Freshwater	1																					L
	_	FMI	Intermittently closed and open lakes and lagoons	FM1.3															$ldsymbol{ld}}}}}}$				
		M1	Seagrass meadows	M1.1																			
	Marine	!		-																			
		MFT1	Coastal saltmarshes and reedbeds	MFT1.3																			

2

Ecosystem extent and climate change indicators

 What do you think are some potential indicators/aggregates that can be compiled from the extent account that can inform climate change?



Condition accounts (briefly)



Ecosystem condition: definitions

Ecosystem **condition** is the quality of an ecosystem measured in terms of its **abiotic** and **biotic** characteristics.

Ecosystem **integrity** is the ecosystem's capacity to maintain it characteristic **composition**, **structure**, **functioning** and self-organisation over time within a natural range of variability.



Measuring and reporting ecosystem condition

- 1. Select appropriate ecosystem variables to measure ecosystem condition
- 2. Define a reference condition, reference levels, and rescale ecosystem variables to ecosystem condition indicators
- 3. Aggregate the indicators to a single ecosystem condition index



Table 5.1: The SEEA Ecosystem Condition Typology (ECT)

ECT groups and classes

Group A: Abiotic ecosystem characteristics

Class A1. Physical state characteristics: physical descriptors of the abiotic components of the ecosystem (e.g., soil structure, water availability)

Class A2. Chemical state characteristics: chemical composition of abiotic ecosystem compartments (e.g., soil nutrient levels, water quality, air pollutant concentrations)

Group B: Biotic ecosystem characteristics

Class B1. Compositional state characteristics: composition / diversity of ecological communities at a given location and time (e.g., presence / abundance of key species, diversity of relevant species groups)

Class B2. Structural state characteristics: aggregate properties (e.g., mass, density) of the whole ecosystem or its main biotic components (e.g., total biomass, canopy coverage, annual maximum normalized difference vegetation index (NDVI))

Class B3. Functional state characteristics: summary statistics (e.g., frequency, intensity) of the biological, chemical, and physical interactions between the main ecosystem compartments (e.g., primary productivity, community age, disturbance frequency)

Group C: Landscape level characteristics

Class C1. Landscape and seascape characteristics: metrics describing mosaics of ecosystem types at coarse (landscape, seascape) spatial scales (e.g., landscape diversity, connectivity, fragmentation)



	F	orest (stage 1 conditio	n account)						
SEEA Ecosystem (Condition Typology	Variable descriptor	Measurement	Variable values (observed)					
				Opening	Closing	Change			
Abiotic	Physical state								
characteristics	Chemical state	Soil organic carbon stock	tC/ha	100	95	-5			
Biotic characteristics	Compositional state	Tree species richness	number	6	5	-1			
	Structural state	Tree cover	%	81	75	-6			
	Functional state								
Landscape/									
seascape									
characteristics									

Ecosystem condition and climate change indicators

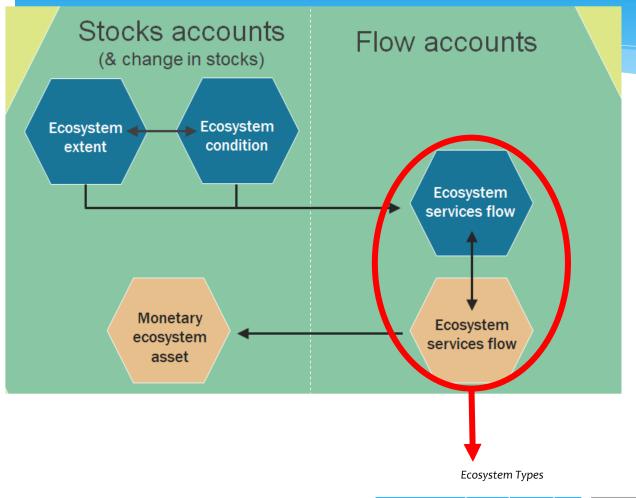
- Will depend on ecosystem type
- Linking condition to climate change impacts
- For the forest example we just had:
 - Stock of organic soil carbon
 - Carbon stock
 - Changes in tree cover
 - Link to services, including climate regulation services



Services accounts (not as briefly)



What are Ecosystem Services in accounting terms?



the flow of ecosystem services is a "transaction" between Ecosystem Types and Economic Units

Economic Units





What do we need to know about Ecosystem Services?

- *meaning of ecosystem services
- *classification of ecosystem services
- *relationship between the "supply" and "actual flow" (use) of ecosystem services



Meaning of ecosystem services

			Main service-types				
			PROVISIONING SERVICES	Section	Division		Group
		1	Food (e.g. fish, game, fruit)	Provisioning	Nutrition		Biomass
		2	Water (e.g. for drinking, irrigation, cooling)				Water
ECOSYSTE	M SERVICES	3	Raw materials (e.g. fiber, timber, fuel wood, fodder,		Materials		Biomass, Fibre
	Provisioning	4	Genetic resources (e.g. for crop improvement and me		Energy		Water Biomass-based energy sources
	FRESH WATER	5	Medicinal resources (e.g. biochemical products, mod		Lifeigy		Mechanical energy
	- WOOD AND FIE	6	Ornamental resources (e.g. artisan work, decorative	Regulation &	Mediation of waste, toxics and other nuisances		Mediation by biota
	= FUEL		REGULATING SERVICES	Maintenance			Mediation by ecosystems
		7	Air quality regulation (e.g. capturing (fine)dust, che				, ,
Supporting	Regulating	8	Climate regulation (incl. C-sequestration, influence			VS	Mass flows
- NUTRIENT CYCLING	- CLIMATE PEOL	9	Moderation of extreme events (e.g. storm protection				Liquid flows
= SOIL FORMATION = PRIMARY PRODUCTION:	# FLOOD REGUL # DISEASE REGU	10	Regulation of water flows (e.g. natural drainage, irri		Maintananas af m	husiaal ahaasiaal hislaasiaal	Gaseous / air flows
	» WATER PURIF	11	Waste treatment (especially water purification)		conditions	hysical, chemical, biological	Lifecycle maintenance, habitat and gene pool protection
		12	Erosion prevention				Pest and disease control
	Cultural	13	Maintenance of soil fertility (incl. soil formation)				Soil formation and composition
	* AESTHETIC * SMRITUAL	14	Pollination				Water conditions
	# EDUCATIONAL # RECREATIONA	15	Biological control (e.g. seed dispersal, pest and disea				Atmospheric composition and climate regulation
	HEGHEATEURA		HABITAT SERVICES	Cultural	•		Physical and experiential interactions
		16	Maintenance of life cycles of migratory species (inc		ecosystems and I	•	
		17	Maintenance of genetic diversity (especially gene po		[environmental s	ettings]	Intellectual and representational interactions
			CULTURAL SERVICES		Sniritual symboli	c and other interactions with	Intellectual and representational interactions Spiritual and/or emblematic
		18	Aesthetic information		ecosystems and l		
		19	Opportunities for recreation & tourism		environmental s	ettings]	
		20	Inspiration for culture, art and design				Other cultural outputs
		21	Spiritual experience				
		22	Information for cognitive development				

...from «benefit» to «ecosystem contribution»



Cascade model and complexity Biophysical structure **Functions** Services Benefits one by one holistic perspective Low High

Examples

Provisioning services

Selected ecosystem services (refer	rence list)
Provisioning services	
Biomass provisioning	Crop provisioning
	Grazed biomass provisioning
	Livestock provisioning services
	Aquaculture provisioning services
	Wood provisioning services
	Wild fish and other natural aquatic biomass provisioning services
	Wild animals, plants and other biomass provisioning services
Genetic material services	
Water supply	
Other provisioning service	es



Biomass



cultivated plants



wild plants and animals

reared animals



Genetic material



from plants

from animals



Regulating and maintenance services

Examples

Regulat	ing and maintenance services
	Global climate regulation services
	Rainfall pattern regulation services
	Local (micro and meso) climate regulation services
	Air filtration services
	Soil quality regulation services
	Soil and sediment retention services
	Solid waste remediation services
	Water purification services
	Water flow regulation services
	Flood control services
	Storm mitigation services
	Noise attentuation services
	Pollination services
	Biological control services
	Nursery population & habitat maintenance services
	Other regulating and maintenance services

mediation of wastes



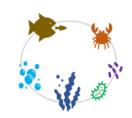
Transformation of biochemical (and physical) inputs to ecosystems



regulation of flows



Regulation of baseline flows and extreme events



Lifecycle maintenance, gene pool protection



Cultural services

Examples

Cult	ural services
	Recreation-related services
	Visual amenity services
	Education, scientific and research services
	Spiritual, artistic and symbolic services
	Other cultural services

Direct, in-situ interactions with living systems



5

Physical and experiential interactions

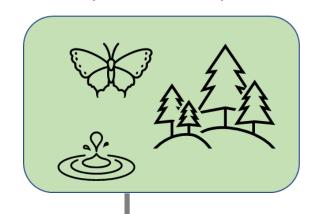
Intellectual and representative interactions

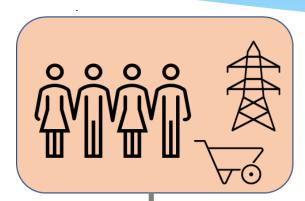


Ecosystem «supply» and ecosystem «actual flow»

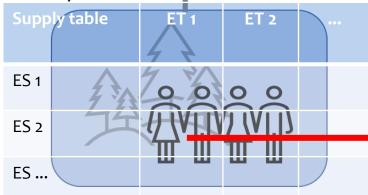
what ecosystems can provide

what humans (economy and society) need







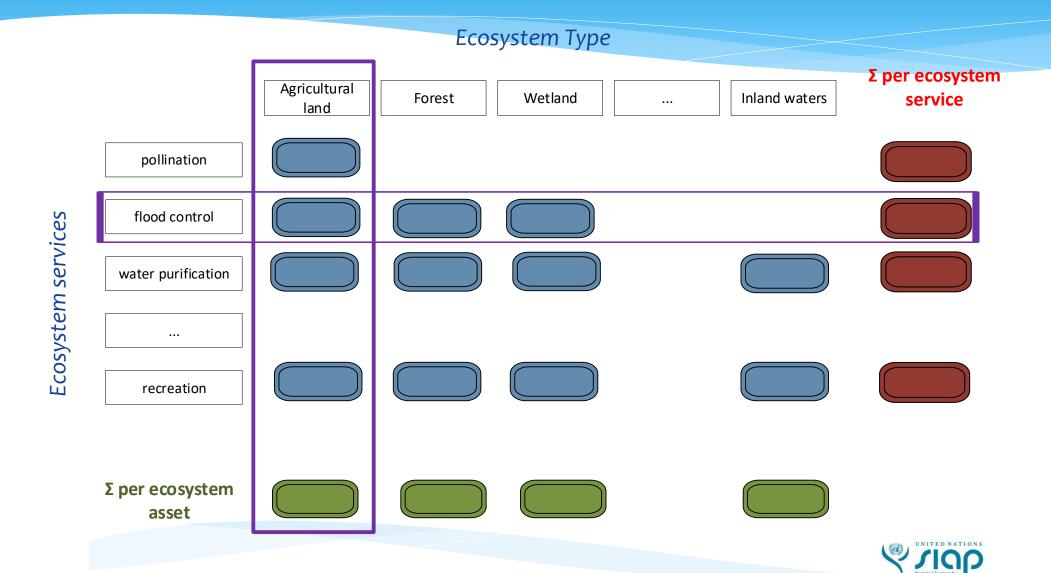




Use table	Economic units	•••
ES 1	1	
FS 2		
ES		



Ecosystem Types and Ecosystem Services



							-												
				Provision	oning services														
					Biomass provisioning	Crop provisioning													
						Grazed biomass provisioning													
						Livestock provisioning services	1												
						Aquaculture provisioning services													
						Wood provisioning services	EFG	of the	IUCN GI						\Box		ם	\Box	-
							T-	\neg	_		Freshwa			Marine			ا م		
			-			Wild fish and other natural aquatic	I_{\top}	+	77	F1	-	FM1	M1		MFT1		assets - Imports		
						biomass provisioning services	+1		\$			agoon							
						Wild animals, plants and other biomass provisioning services			and old fields			lakes and lag			*	em assets	Supply from non-resident ecosystem	8	
					Genetic material services		II		astures	s m		and open t			reedbec	ecosystem	sident	otal Supply ecosystem services	
					Water supply		11		tural	d stree		28	2		es and	ent	ou-re	stem	
					Other provisioning service	es			mi-nat	uplan		thy clo	wopea		marshes	Total Supply resident	٤	scos	
							TL		8	anent		mitten	rassm		tal salt	plyr	ply fr	yldo	
				Regulat	ing and maintenance servic	a c	$^{\dagger \perp}$	1	8	Pern	-	Inter	Sea	1	S	Sug	Sup	Sug	
		UNITS OF MEASURE		- Negulat			$\pm \bot$		T7.5	F1.1	_	FM1.3	M1.1		MFT1.3	Tota	\perp	Tota	
elected ecosystem services (refere	nœ list)				Global climate regulation		++-	-									-	-	
-	Crop provisioning				Rainfall pattern regulation	services	+±												
	Grazed biomass provisioning				Local (micro and meso) cli	mate regulation services	\perp	_	-								-		_
	Livestock provisioning services Aquaculture provisioning services				Air filtration services		T +	_									+	-	
	Wood provisioning services				Soil quality regulation ser	vices	1	-	-								-	=	_
l l	Wild fish and other natural aquat biomass provisioning services		A		Soil and sediment retention		T⊥												
	Wild animals, plants and other biomass provisioning services				Solid waste remediation s	ervices													
Genetic material services Water supply					Water purification service	ie .	1	-	+							-	+	-	
Other provisioning services	s						+=												
egulating and maintenance service					Water flow regulation serv	rices	+	-	+						-	-	+	-	
Global climate regulation s					Flood control services		+=												
Rainfall pattern regulation					Storm mitigation services		\perp	-	-	-	-					-	+	-	
Local (micro and meso) clir Air filtration services	mate regulation services				Noise attentuation service	s	Τ±												
Soil quality regulation serv					Pollination services		1	_	-								-		_
Soil and sediment retention Solid waste remediation se			***				+												
Water purification services				•	Biological control services	.													ĺ
Water flow regulation servi Flood control services	ices	-			Nursery population & hab	itat maintenance services		-	+		-					-	+	-	
Storm mitigation services					Other regulating and main	tenance services	T_{\perp}												
Noise attentuation services					o and regarding and man		++										_		_
Pollination services Biological control services							++										-		
Nursery population & habi				Cultura	l services														
Other regulating and maint	tenance services		0		Recreation-related service	s	I+	-	-							-	-	-	
Itural services							1	_									+	-	Ī
Recreation-related services					Visual amenity services		$+$ \pm												
Visual amenity services Education, scientific and re	waarch caruicas	-	N		Education, scientific and r	es earch services		-	-								-	-	
Spiritual, artistic and symb					Spiritual, artistic and sym	bolic services													_
																		\neg	Ī

Supply Table

																							_
					Selecto	ed ecosy	ystem t	ypes (b	ased on	1 Level	3 - EFG o	f the IU	CN Glob	bal Eco	system	Typol	logy)				ы		7
								Terrestr	ial					Fr	eshwate	er	N	larine			8		
			T1 Tr	opical-su	btropical	forests	T2 Tem			ests	-	Ι,	7	F1	_	FM1	M1	N	AFT1		2		
				.,				and wood	flands	_			_		_						ģ		
SUPPLY		INITS OF MEASURE	Tropical-subtropical lowland rainforests	Tropical-subtropical dry forests and scrubs	Tropical-subtropical montane rainforests	Tropical heath forests	Boreal and temperate high montane forests and woodlands	Deciduous temperate for ests	Town now the nousing collection in the second of the second secon	og opriya rot g	1 1	1	Derivied semi-natural pastures and old fields	Per manent upland streams		intermittently closed and open lakes and lagoons	Seagrass meadows	i Mi	_	Total Supply resident ecosystem assets	Supply from non-resident ecosystem asset	TOTAL SUPPLY	
		HEADONE	71.1	11.2	12.3	12.4	12.1	12.2	'	2.0		_	17.5	F4.1	-	rm1.5	1412.1	1417	12.3	-	- 1	- -	
Selected ecosystem services (reference li	list)																						-

					-
T1.1	Tropical-subtropical lowland rainforests	T1 Tro			
T1.2	Tropical-subtropical dry forests and scrubs	pical-sub			
T1.3	Tropical-subtropical montane rainforests	otropical		Select	1
T1.4	Tropical heath forests	l forests		ed ecos	
T2.1	Boreal and temperate high montane forests and woodlands	T2 Ten		ystem	
T2.2	Deciduous temperate forests	npera anr'	Ter	types/	
	T	-te	al	ased	
T2.6	Temperate pyric sclerophyll forests and woodlands	orests		on Lev	
:				el 3 - E	
:				FG of	
		т		the IUC	
T7.5	Derivied semi-natural pastures and old fields	7		N Glob	
F1.1	Permanent upland streams	F1	Fr	bal Eco	
:			eshwate	systen	
FM1.3	Intermittently closed and open lakes and lagoons	FM1	er	1 Typo	
M1.1	Seagrass meadows	,		logy)	
:					
MFT1.3	Coastal saltmarshes and reedbeds	MFT1			
Total	Supply resident ecosystem assets				
	Supply from non-resident ecosystem assets	s - Imports	orts	S	' '
Total	l Supply ecosystem services				<u> </u>
TOTAL	AL SUPPLY				<u> </u>

Selected ecosystem services (reference list					Se	lecte	d indus	\neg			Biomass provisioning	Crop provisioning Grazed biomass provisioning Livestock provisioning services Aquaculture provisioning services Wood provisioning services	EFG of	the IUC		Fre	system			Marin	ie .				
Selected ecosystem services (reference list					Se	lecte	d indus	tries				Livestock provisioning services Aquaculture provisioning services	EFG of			Fre					ie.				
Selected ecosystem services (reference list					Se	lected	d indus	tries				Aquaculture provisioning services	EFG of			Fre					ie	<u> </u>			
Selected ecosystem services (reference list					Se	lecte	d indus	tries				Aquaculture provisioning services	EFG of			Fre					ie			Π	\top
Selected ecosystem services (reference list					Se	lecte	d indus	tries									eshwate	er	F	Marir.	ne]		1	
Selected ecosystem services (reference list					Se	lecte		\neg	_			wood provisioning services				1 1	, ,		1 6			1		1	
Selected ecosystem services (reference list					Se	lecte		\neg					-	17	'	F1	-	FM1	M1	-	MFT1				
Selected ecosystem services (reference list								Electricity, gas, steam and air conditioning supply	ste on activities			Wild fish and other natural aquatic biomass provisioning services Wild animals, plants and other biomass provisioning services			old fields			s and lagoons				sets	Sec		
ielected ecosystem services (reference list								910	e, wa		Comption and an interest	biolilass provisioning services			es and			open lakes			Speds	ecosystem assets	Exports - intermediate services	g g	
elected ecosystem services (reference list						ying		E all	romod		Genetic material services		H		pastur	eams		do pue			and reedbeds	syste	diate	Total Use by ecosystem assets	
elected ecosystem services (reference list						maru	اعوا	as, su); Sew		Water supply		Н		atrical	and stre		closed a	8		marshes an		l a	yster	
ielected ecosystem services (reference list			ance		×s	Mining and quarrying	Manufacturing	8 /6	supply;		Other provisioning service	es			emi-u	nt upla		antly o	opeau		altman	use resident	- inte	8	
elected ecosystem services (reference list			Agriculture	Forestry	Fisheries	ning	anufa	pply	ater:						rivied	mane		ermitt	gr 355		astal salt	9	ports	s by	USE
Selected ecosystem services (reference list		UNITS OF	₹	œ.	ű	Σ	Σ	i 8 i	<u>≥ E</u>	Regulat	ing and maintenance servic	es	1	1	å	8		Ĕ	×	1	8	2	ă	ta C	TOTAL USE
selected emplysterin services pererence us.	liet)	MEASURE						\dashv	-[Global climate regulation	services			17.5	F1.1	-	FM1.3	M1.1		MFT1.3	<u> </u>	+	P	12
Provisioning services											Rainfall pattern regulation										=				
	provisioning ed biomass provisioning								_		Local (micro and meso) cli		<u> </u>								_		-		\vdash
	tock provisioning services			(•						illiate regulation services													\vdash
	aculture provisioning service of provisioning services				V				-		Air filtration services		-								_		+		\vdash
	fish and other natural agua										Soil quality regulation ser	vices													
biomas	hass provisioning services I animals, plants and other										Soil and sediment retention	n services				\square					-		-		⊢
biomas	nass provisioning services					8		_	_		Solid waste remediation s	ervices				\square	\square						_		╄
Genetic material services Water supply						Ā					Water purification service	25													\perp
Other provisioning services											Water flow regulation serv														\vdash
legulating and maintenance services												vices													
Global climate regulation services Rainfall pattern regulation service									-		Flood control services		-								-		-		\vdash
Local (micro and meso) climate re											Storm mitigation services														
Air filtration services Soil quality regulation services											Noise attentuation service	es											-		\vdash
Soil and sediment retention service				- 4.							Pollination services														
Solid waste remediation services Water purification services	8					Ч					Biological control services		l —								-		-		\vdash
Water flow regulation services					\sum	31		• •		7															
Flood control services Storm mitigation services										•	Nursery population & hab										-		-		\vdash
Noise attentuation services											Other regulating and main	ntenance services				\Box									=
Pollination services Biological control services								-	$\neg \mathbb{I}$	_											_		+		\vdash
Nursery population & habitat main	naintenance services									Cultura	l services														
Other regulating and maintenance	nce services				•		\mathcal{H}	-			Recreation-related service	es	I								-		-		\vdash
ultural services							H				Visual amenity services														F
Recreation-related services Visual amenity services							7		-		,														\vdash
Education, scientific and research											Education, scientific and r	esearch services	L												
Spiritual, artistic and symbolic ser Other cultural services	services										,														

Use Table

								e _n l.	ected eco	nomis:	mite								Selecte	d ecosys	tem types	(based o	on Lev	el 3 - EFG	of the	IUCN G	ilobal	cosyste		ology)	Marin		-			
								Seli	естеа есс	nomic t	inits		Τ	Т	\sqcap						Terr T2 Temperat		orests		Т	_	+			 	Π	Ī	1			
				<u> </u>		Se	lected	industr	ies								T1 Trop	oical-sub	tropical	forests		oodlands		_		17	F		FM1	M1	-	MFT1				
			UNITS OF	Agriculture	Forestry	Fisheries	Mining and quarrying	Manufacturing Bectricity, gas, steam and air conditioning	Ay; s	Services	Other industries	tal Industry Government consumption	Household consumption	tal use by resident economic units	Exports - final ecosystem services	al Use by economic units	Tropical-subtropical lowland rainforests	Tropical subtropical dry forests and scrubs	Tropical subtropical montane rainforests	Tropical heath forests	Boreal and temperate high montane for ests and woodlands Deciduous temperate forests	=	Temperate pyric sclerophyll forests and woodlands	***	-	 Dorivinel comin attural mactures and old fields			Intermittently closed and open lakes and lagoons	Seagrass meadows	1	Coastal saltmarshes and reedbeds	Total use resident ecosystem assets	Exports - intermediate services	Total Use by ecosystem assets	TOTAL USE
USE			MEASURE								-,-					_	T1.1	T1.2	T1.3	T1.4	T2.1 T2.2		T2.6		. .	17.	.5 F1	1	FM1.3	M1.1		MFT1.3	è		è	2
	d ecosystem services (refer	renœ list)		-	_	_	_				_							_		_		_	_				_	_	-							
	ning services Biomass provisioning	Crop provisioning			1																						1	ŀ	+	-						
		Grazed biomass provisioning			1								Sal	loct	ed e			ic .	mite								1	ŀ								
		Livestock provisioning services			┺								Se	iect	eu e	COI	10111	ic u	mite	<u> </u>		_			_		1	- 1								
		Aquaculture provisioning services			1																1	1	- 1				1	- 1								
		Wood provisioning services			1																						1									
	Genetic material services Water supply Other provisioning service			->				\		elec			1 1 1 1 1 1 1 1 1 1	K	[7	activitie		7																		
	ing and maintenance service Global climate regulation			+						-			15		•	ا≨		"	T		T	T	ш,				ı	ŀ	+							
	Rainfall pattern regulation				1								air condi	5		2								S		es	1									
	Local (micro and meso) cl				1					1			٥)	e	ح		1			1	1	- 1	resident economic units		services	1	l								
	Air filtration services				1								-		waste	management and remediation								5		2	1									
	Soil quality regulation ser			-	1					1			7		Š	at		1			1_	1		.2		Se	1	ļ	+	-						
	Soil and sediment retention Solid waste remediation s				1					1			2		1 00	0		1			1 8	_	. 1	Ε		E	1		-							
	Water purification service				1								steam and		sewerage,	9		1			E I	5	5	2		final ecosystem	1 :	units								
	Water flow regulation ser				1					6	9				ē	el					l #	¥	۱ ۲	5		75		Ę								
	Flood control services				1					5			1 6	3	l ě	-		1			5		1	S		S	1	5								
	Storm mitigation services				1					5	:		t	5	. و ا	임		1 .	,		l su		5	ĭ		8	1 '	Ě								
	Noise attentuation service	es T			1					2		0.0			Š	ē			انة		1 8	8	2	2		e	1	economic	-	-						
	Pollination services Biological control service				1					5	-	.≘	gas	2	<u>```</u>	님			5		Ĭ	9	1	õ		<u>a</u>	1	č	-	-						
	Nursery population & hab				1	ارو				7		ⅎ	5	~	2	ē			8	-	E	+	;	S		Ę.	1	8	_							
	Other regulating and mair					5			S	6	,	ಕ	12		5	티		1	<u> </u>	2	ΙĔ	=	5	5												
					4	Ĭ I		5	<u>e</u> .	6	0	£	.0		S	ge	8	-	=	st	=	ج ا		þ		t2	1	à								
	services					Agricuiture		Forestry	Fisheries	Mining and quarrying		Manufacturing	Flectricity	supply	Water supply;	g	Services		Otner Industries	Industry	Government consumption	Household consumption	<u> </u>	9		Exports	1 .									
	Recreation-related service	es			1 3	<u> </u>		<u> </u>	S-	2.		ā	8	3 5	at	ā	2	-	Ĕ	2	1 8	=	3	asn		ĝ	Ι.	8								
	Visual amenity services	 			4	₹		2	ıΞ	Σ		Σ	u.	ı s	>	E	Se	(5		Ű	Ĭ	.	3		ŵ	1)								\vdash
	Education, scientific and r Spiritual, artistic and sym				-	-				_	1		+=	- 5,		_		_	$\overline{}$	otal			\dashv	Total	\vdash		† '	otal								
	Other cultural services	NOTE OF FICES			1															Ħ				Ħ			1	5								\vdash
	variation at a trices			\pm	1				l	1	- 1				1			1	- 1	Ĕ	1	1	- 1	ř			1	≚								ш

Ecosystem services and climate change indicators

- Any indicators you think would be of high relevance?
- What about monetary valuation?
- And what about linking to Energy and Air Emission accounts?



Some indicators that can be derived from the extent account



Forests fulfil a number of functions that are vital for humanity.

- Target 15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests.
- SDG Indicator 15.1.1: Forest area as a proportion of total land area
- Forest is defined as land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.

15 LIFE ON LAND



Wetlands and other water related ecosystems are critical for the supply ecosystem services.

- Target 6.6: By 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
- SDG indicator 6.6.1: Change in the extent of water-related ecosystems over time
 - Wetlands
 - Open waters
 - Artificial water bodies
 - Vegetated wetlands

6 CLEAN WATER AND SANITATION



The productive potential of land must be increased to deliver the goods and services required by a growing population.

- Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world
- SDG Indicator 15.3.1: Proportion of land that is degraded over total land area
 - Land cover
 - Land productivity
 - Carbon stock

15 LIFE ON LAND



Description of SDG 15.3.1.

- SDG 15.3.1 is grounded in three sub-indicators:
 - 1. Evaluation of land cover and land cover changes
 - 2. Analysis of land productivity status and trends based on net primary productivity.
 - 3. Determination of carbon stock values and changes
- An area of land is degraded if it is assessed as being degraded on any one of these three sub-indicators
- Baseline is from 2000 to 2015. LDN means no further net degradation between 2015 and 2030. Tends reported every 4 years to UNCCD (See SDG 15.3.1 Good Practice Guidance*).
- The SEEA can support calculating this indicator
 - > Informing on land cover flows (Ecosystem Extent or Land Cover Accounts)
 - > Providing spatial data infrastructure for integrating information on land productivity and carbons stock (Ecosystem Condition Accounts)

