System of Environmental Economic Accounting

Tools available for ecosystem accounting

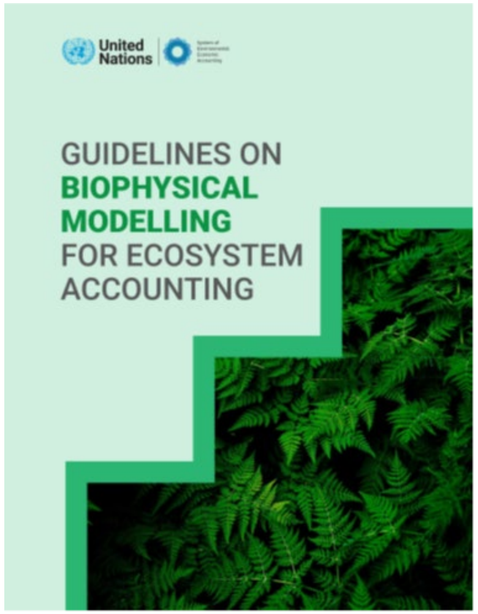
Bram Edens and Julian Chow

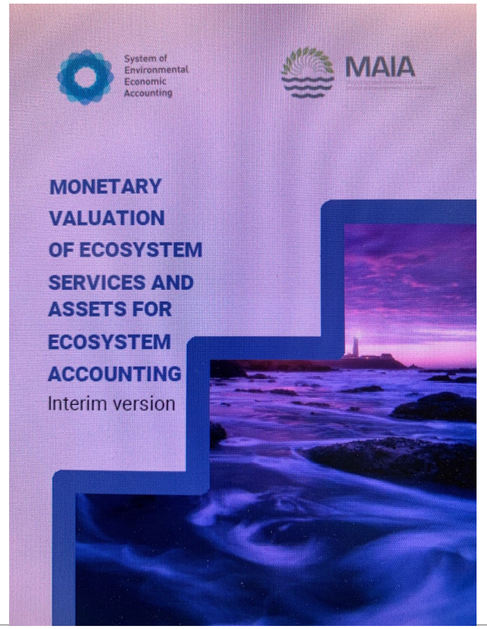
United Nations Statistics Division

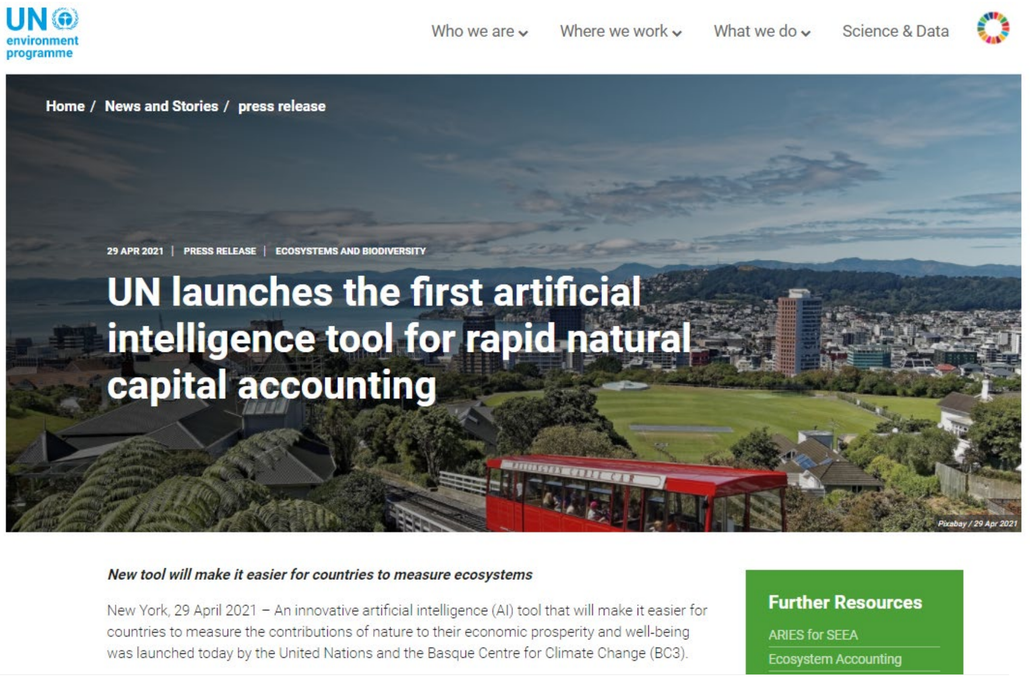
United Nations

Outline

- Guidelines on biophysical modeling for SEEA Ecosystem Accounting
- Technical report on monetary valuation
- Compilation tools
  - > ARIES for SEEA

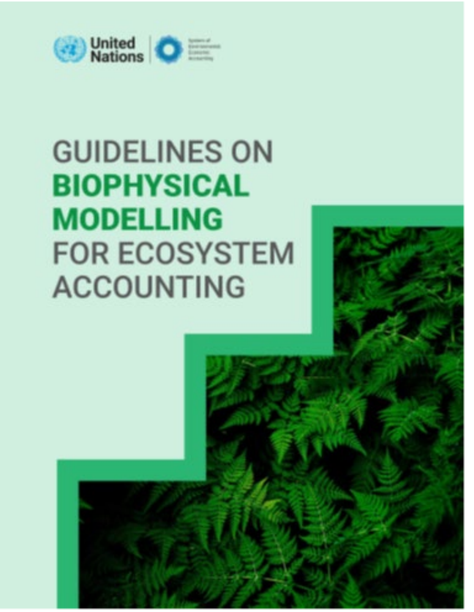






SEEA

Biophysical guidelines – context



- Why guidelines on biophysical modeling?
  - > Data needed for ecosystem accounts not usually captured in regular data sources
  - > Ecosystem accounting - as spatially explicit - requires mapping
- Biophysical modelling can :
  - > fill data gaps where information is not readily available,
  - > spatially allocate data that is not de facto spatially explicit.
- Biophysical modelling may be instrumental, it can never replace data collection processes:
  - > Earth observation data sets need ground-truthing
  - > Models rely on in situ data (adjust model setup to local circumstances / calibration)
- Diverse models and tools have proliferated over the past decade and are constantly evolving.
  - > Most models not developed specifically for accounting purposes, many models produce results can be used directly in SEEA EA or produce results that can be modified for use in SEEA EA.

Biophysical guidelines: scope

- Scope:
  - Terrestrial ecosystems, including primarily terrestrial datasets, definitions, modelling approaches and challenges
  - Biophysical, mostly on provisioning + regulating services (currently include 10 ES)
  - Core accounts: extent, condition, ecosystem services (not carbon / species etc.)
- Audience:
  - Ecosystem accounts compilers + managers
  - Assumes familiarity with SEEA Ecosystem Accounting but does not assume knowledge of biophysical modelling
- Process:
  - Under auspices of UNCEEA
  - Global consultation in 2021
  - The Guidelines was welcomed by the UN Statistical Commission at its 53rd session in 2022

Guidelines – outline

1. Introduction
2. Process guidance for agencies
3. Modeling for ecosystem accounts
4. Modeling for extent accounts
5. Modeling for condition accounts
6. Modeling for ecosystem service accounts
7. Data quality
8. Future of biophysical modeling
9. Annexes
    1. Global data sources + data portals
    2. Modelling techniques
    3. Cartography essentials
    4. Literature list (16 pages)

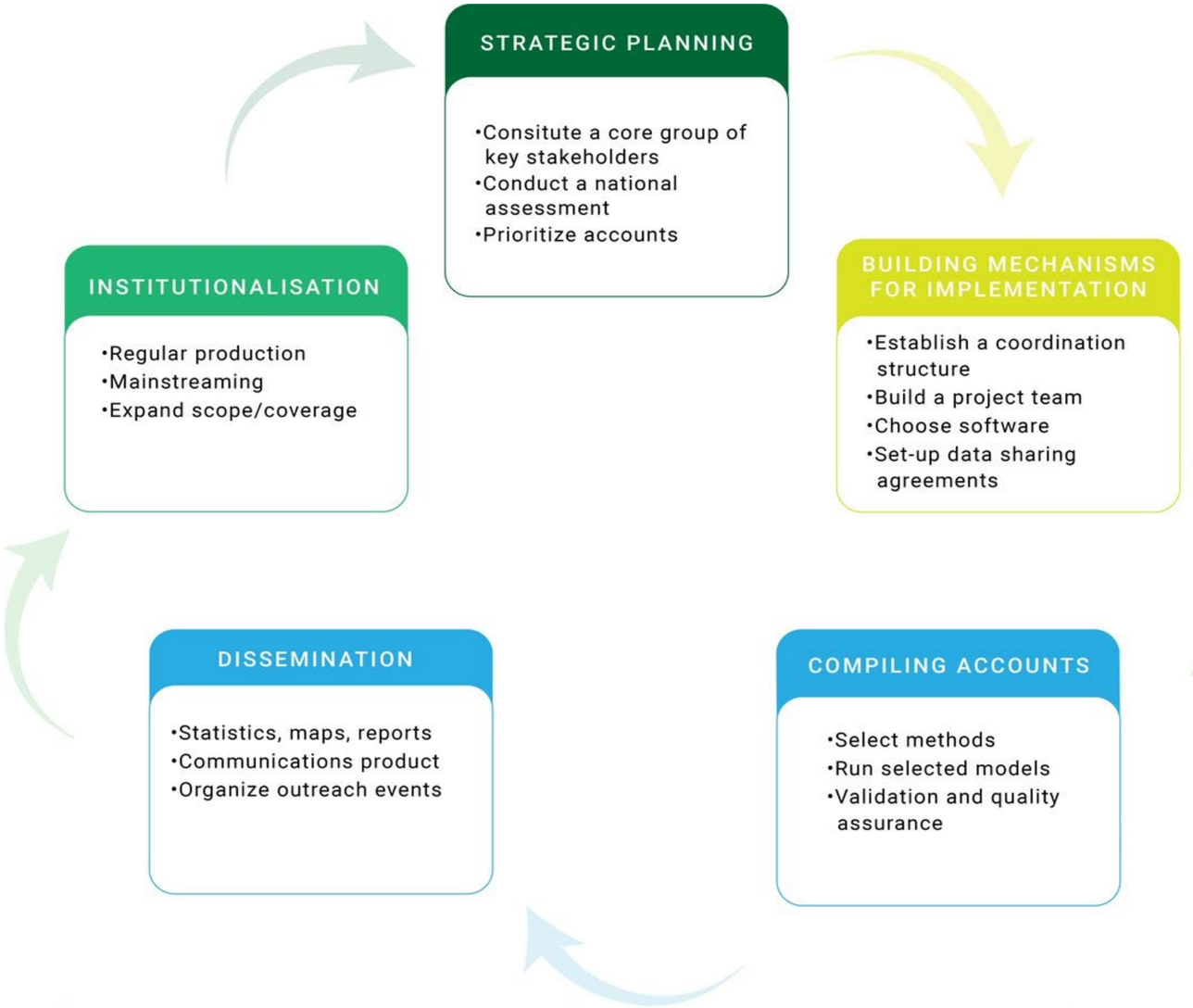


Figure 1: *The process of implementing SEEA EA*

Guidelines – characteristics

- Tiered approach
  - > recognizes countries are in different circumstances (data availability + expertise)
  - > may differ per ES
  - > progress over time
- Decision trees to facilitate choices
- Extensive references (also examples)
- Living document:
  - > Key tables placed on SEEA website to be regularly updated
  - > https://seea.un.org/ecosystem-accounting/biophysical-modelling

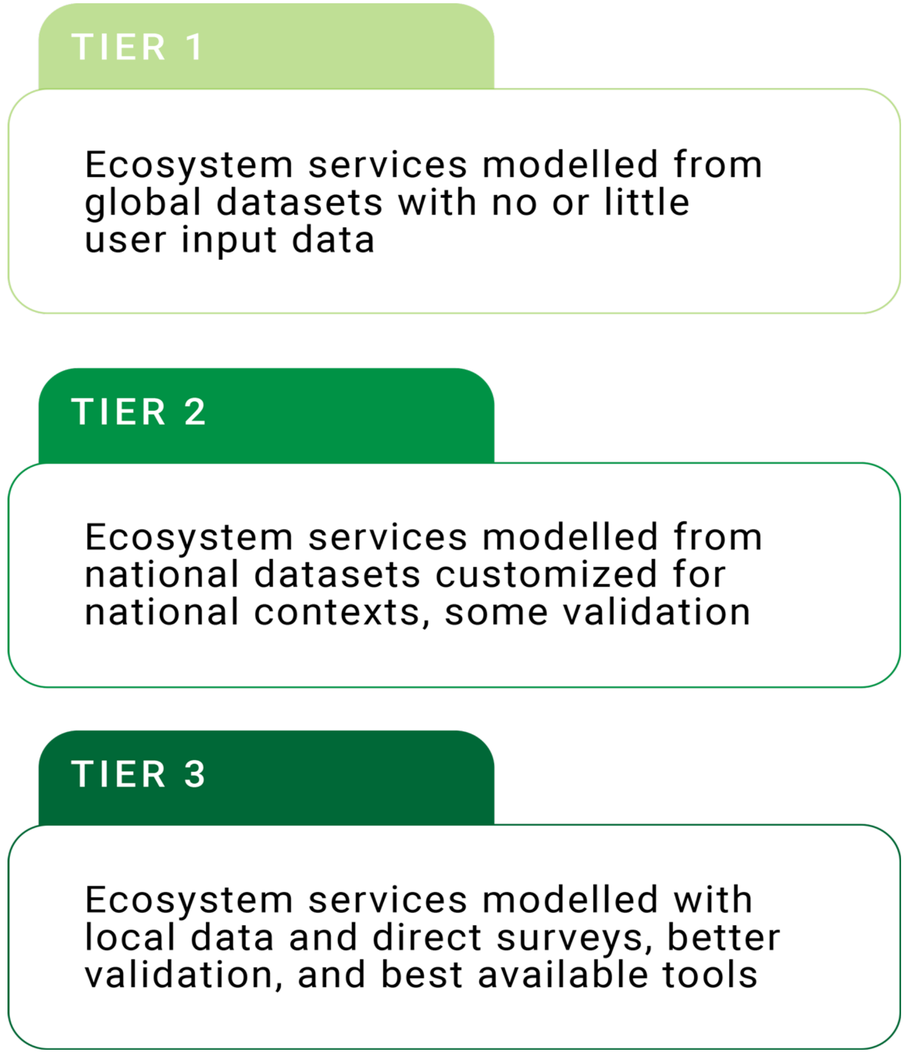
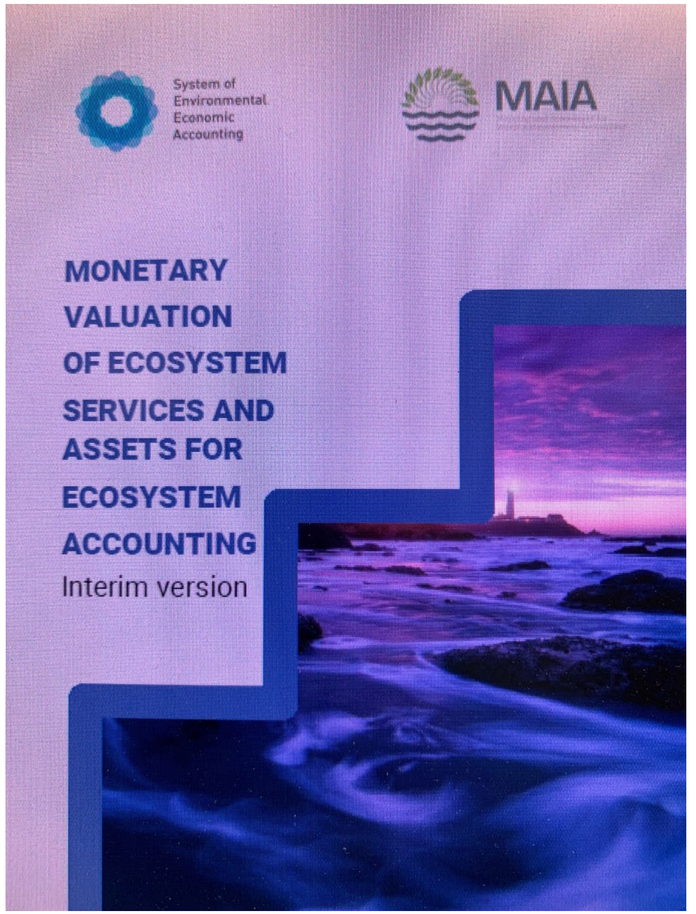


Figure 2: *Tiered approach*

Technical report on valuation

- Technical report – (not guidelines)
  - > Allows to address demand in short term for those who wish to undertake monetary valuation in context of SEEA EA
  - > Interim status - work will continue
    - SEEA Implementation strategy
    - SNA revision process
    - WG on SNA valuation principles
- Next steps:
  - > To be released as joint output of NCAVES and MAIA project (not a UN document)



Valuation report – outline

1. Introduction
2. Foundations
3. Valuation methods
4. Valuing ecosystem services
    1. *Tiers per ES*
5. Valuing ecosystem assets
6. Other considerations
    1. *Value transfer*
    2. *Platforms and tools*
    3. *Aggregation*
    4. *Communicating values*

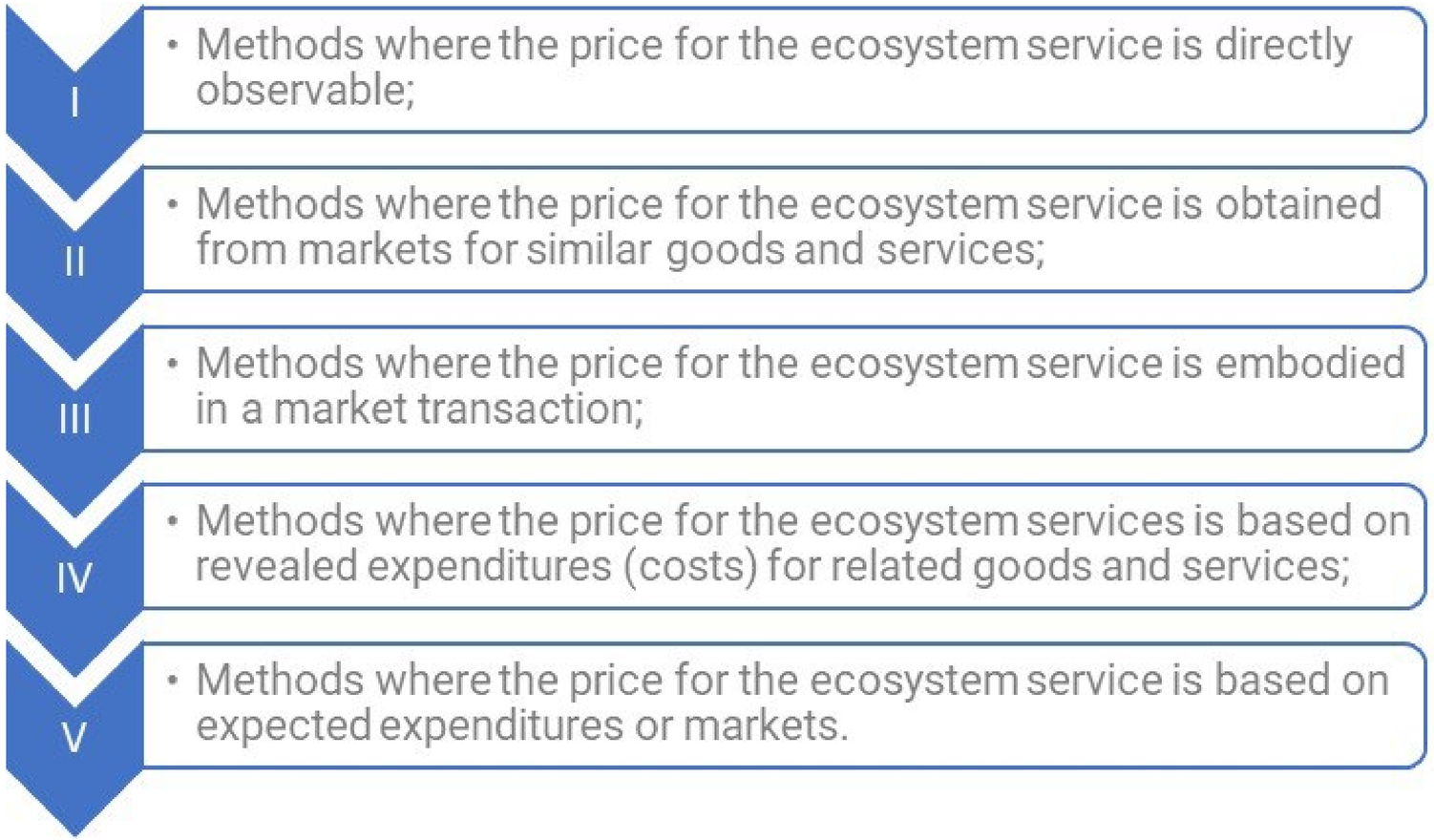


Figure 3: *Preference order of valuation techniques (SEEA EA)*

ARIES for SEEA Explorer

- **AR**rtificial **I**ntelligence for **E**nvironment and **S**ustainability
- Application on Aries platform (by Basque Centre for Climate Change):
  - Uses global data and models to generate a basic set of ecosystem accounts
  - Enables compilation anywhere on earth (country; watershed;)
  - AI -> machine reasoning to construct “best available model”
  - Aries has around 150 global data sets, many of them based on EO (e.g. land-cover; elevation; precipitation)
  - Improvement with national data where available
  - Transparent (metadata + download)

https://seea.un.org/content/aries-for-seea

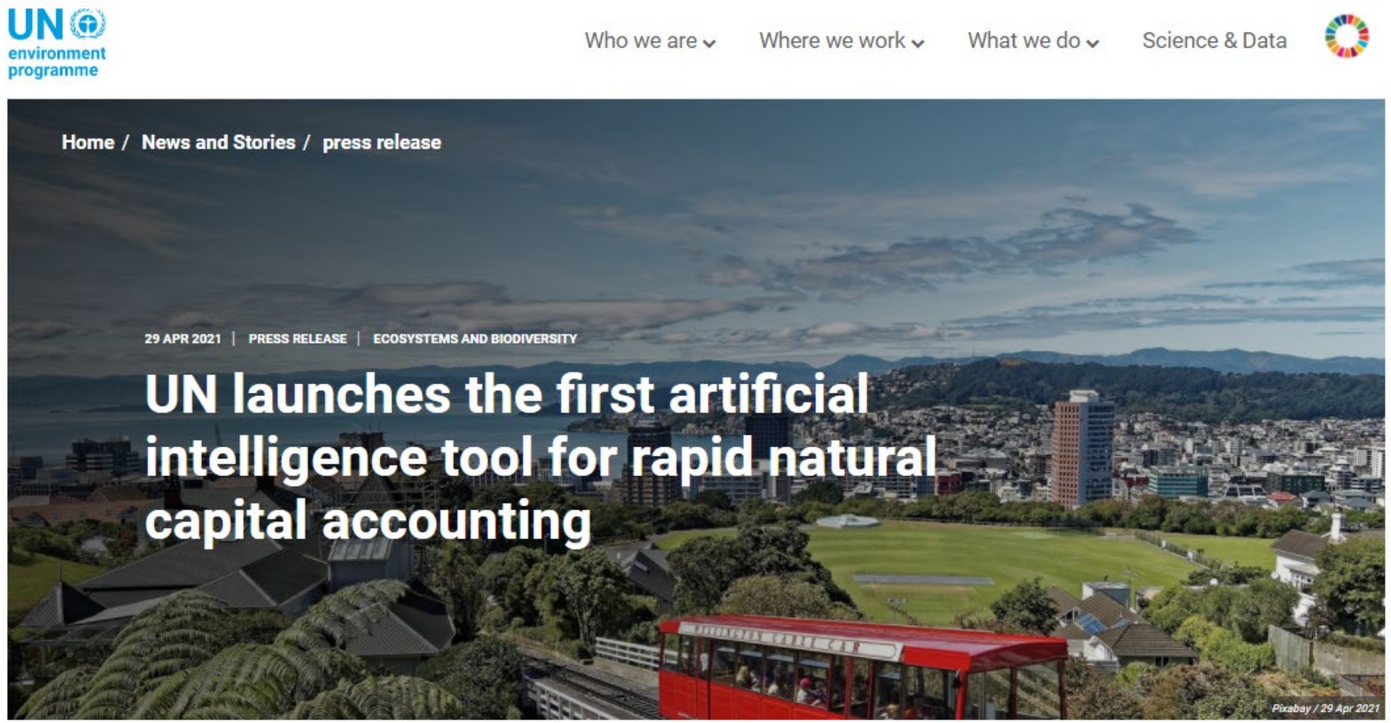
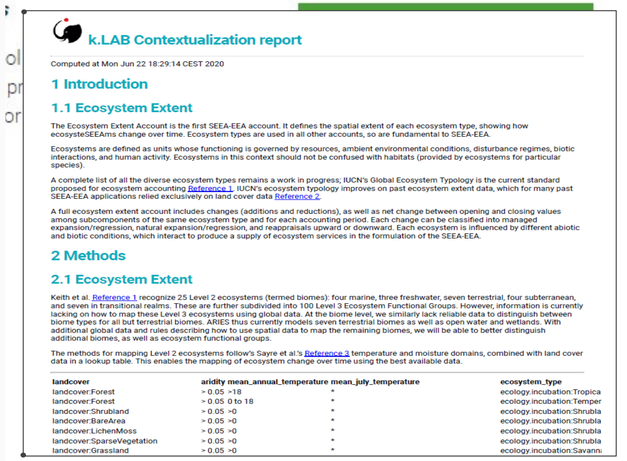


Table 1. Occurring ecosystem types (selected level 3 Ecosystem Functional Groups of the IUCN Global Ecosystem Typology 2.0)

	Intertidal forest shrubland	Coastal saltmarsh reedbed	Cropland	Urban industrial ecosystem	Temperate
Extent at start of 2012 (km²)	158.25	366.39	16017.82	650.13	390.60
Extent at start of 2014 (km²)	158.25	360.81	15978.72	692.57	403.63
Net change	0.00	-5.59	-39.10	42.45	13.03

Table 2. Occurring ecosystem types (selected level 3 Ecosystem Functional Groups of the IUCN Global Ecosystem Typology 2.0)

			Intertidal forest shrubland	Coastal saltmarsh reedbed	Cropland	Urbar
Opening extent (at start of 2012)			158.25	366.39	16017.82	650.1
	Additions to extent					
		Expansions	0.00	0.00	32.39	42.45
	Reductions in extent					
		Regressions	0.00	5.59	71.49	0.00
Net change in extent			0.00	-5.59	-39.10	42.45
Closing extent (at start of 2014)			158.25	360.81	15978.72	692.5


k.LAB Contextualization report

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1 Introduction

1.1 Ecosystem Extent

The Ecosystem Extent Account is the first SEEA-EEA account. It defines the spatial extent of each ecosystem type, showing how ecosysteSEEAms change over time. Ecosystem types are used in all other accounts, so are fundamental to SEEA-EEA.

Ecosystems are defined as units whose functioning is governed by resources, ambient environmental conditions, disturbance regimes, biotic interactions, and human activity. Ecosystems in this context should not be confused with habitats (provided by ecosystems for particular species).

A complete list of all the diverse ecosystem types remains a work in progress; IUCN's Global Ecosystem Typology is the current standard proposed for ecosystem accounting Reference 1. IUCN's ecosystem typology improves on past ecosystem extent data, which for many past SEEA-EEA applications relied exclusively on land cover data Reference 2.

A full ecosystem extent account includes changes (additions and reductions), as well as net change between opening and closing values among subcomponents of the same ecosystem type and for each accounting period. Each change can be classified into managed expansion/regression, natural expansion/regression, and reappraisals upward or downward. Each ecosystem is influenced by different abiotic and biotic conditions, which interact to produce a supply of ecosystem services in the formulation of the SEEA-EEA.

2 Methods

2.1 Ecosystem Extent

Keith et al. Reference 1 recognize 25 Level 2 ecosystems (termed biomes): four marine, three freshwater, seven terrestrial, four subterranean, and seven in transitional realms. These are further subdivided into 100 Level 3 Ecosystem Functional Groups. However, information is currently lacking on how to map these Level 3 ecosystems using global data. At the biome level, we similarly lack reliable data to distinguish between biome types for all but terrestrial biomes. ARIES thus currently models seven terrestrial biomes as well as open water and wetlands. With additional global data and rules describing how to use spatial data to map the remaining biomes, we will be able to better distinguish additional biomes, as well as ecosystem functional groups.

The methods for mapping Level 2 ecosystems follow's Sayre et al.'s Reference 3 temperature and moisture domains, combined with land cover data in a lookup table. This enables the mapping of ecosystem change over time using the best available data.

landcover	aridity mean_annual_temperature	mean_july_temperature	ecosystem_type
landcover:Forest	> 0.05 >18	*	ecology:incubation:Tropica
landcover:Forest	> 0.05 0 to 18	*	ecology:incubation:Temper
landcover:Shrubland	> 0.05 >0	*	ecology:incubation:Shrubla
landcover:BareArea	> 0.05 >0	*	ecology:incubation:Shrubla
landcover:LichenMoss	> 0.05 >0	*	ecology:incubation:Shrubla
landcover:SparseVegetation	> 0.05 >0	*	ecology:incubation:Shrubla
landcover:Grassland	> 0.05 >0	*	ecology:incubation:Savanna

UN launches the first
open-source technology for
rapid natural capital accounting

ARIES for SEEA Content

Extent

- Currently maps **29 ecosystem types** (primarily terrestrial & wetland) based on IUCN GET 2.0 methods
- Expend towards 50 or so classes

Condition

- Forest condition - 6 variables
- Expend towards other ETs

Ecosystem Services

- Currently 5 **ecosystem services** (crops; pollination; erosion; carbon; recreation)
- Physical (some monetary)
- Adding water flow regulation + supply

Indicators

- Selected SDGs
- Selected post-2020 GBF

(in progress)

Current ARIES for SEEA content: Ecosystem services

Supply and use tables

Ecosystem Services and Accounts:	Physical	Monetary
1. Crop provisioning (ecosystem contribution)	✓	✓
2. Crop pollination (insect pollinators contribution)	✓	✓
3. Global climate regulation services (carbon storage)	✓	✓
4. Soil erosion control services (physical only)	✓	-
5. Nature-based tourism (non-domestic)	✓	✓

Application examples: Metadata for Goal A, Goal B, Target 9 and Target 11 for the Post-2020 Global Biodiversity Framework

	Goal A	Goal B, Target 9 and 11
Methodology	Ecosystem extent accounts from the SEEA framework	Ecosystem services account from the SEEA framework
Data collection method	▪ National data can be collected through existing sources (databases, maps, reports), including participatory inventories on land management systems as well as remote sensing data collected by national statistical offices and mapping agencies at the national level. ▪ In the absence of national data sources, regional and global datasets will be collected to complement and support existing national indicators through global data platforms and mechanisms endorsed by the UN Statistical Commission. Global estimated data will be sent to national authorities for validation.	
Accessibility	▪The SEEA Ecosystem Accounting chapters on ecosystem extent and services are adopted as part of an international statistical standard on ecosystem accounting by the United Nations Statistical Commission at its 52th session in 2021. ▪ARIES for SEEA Explorer is an open access application.	
Global data sources	The ARIES for SEEA Explorer allows to derive a basic ecosystem extent accounting (for the period between 1992 and 2020) in the terrestrial, freshwater and coastal realms using a multilayer look-up table approach which combines global data sources on land cover and other condition metrics to approximate ecosystem function groups	The ARIES for SEEA Explorer allows for compilation of ecosystem services account through an existing ecosystem services modelling platform
Availability and release calendar	Indicators are in development. The global monitoring process for this indicator, the update frequency of update and release calendar are currently under development. The year on when the first round of data will be ready is pending.	

THANK YOU

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