



United Nations

Department of  
Economic and  
Social Affairs



System of  
Environmental  
Economic  
Accounting



ARIES  
Artificial Intelligence for Environment & Sustainability



k.LAB  
Knowledge Integrated Modelling

bc<sup>3</sup>

BASQUE CENTRE  
FOR CLIMATE CHANGE  
Klima Aldaketa Ikergai  
Sustainability, that's it!



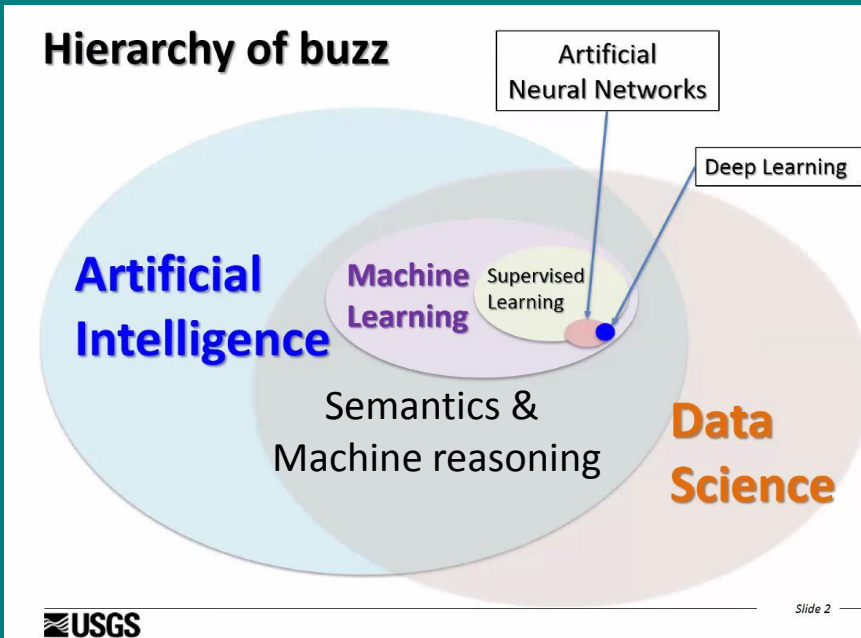
EXCELENCIA  
MARÍA  
DE MAEZTU



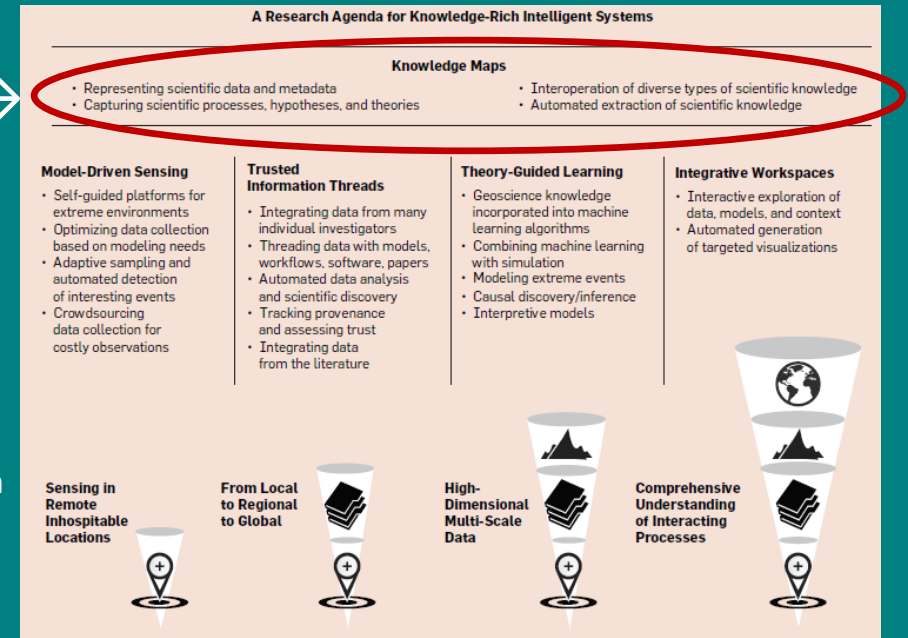
# Semantics & environmental-economic accounts of ecosystem services

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# Artificial Intelligence for Environment & Sustainability (ARIES)



Semantics →



Gil et al. 2019. Intelligent systems for geosciences: An essential research agenda. Comm. ACM 62:76-84.

Reasoning algorithms

+

Decision rules

+

Multidisciplinary semantics

+

Open data & models

+

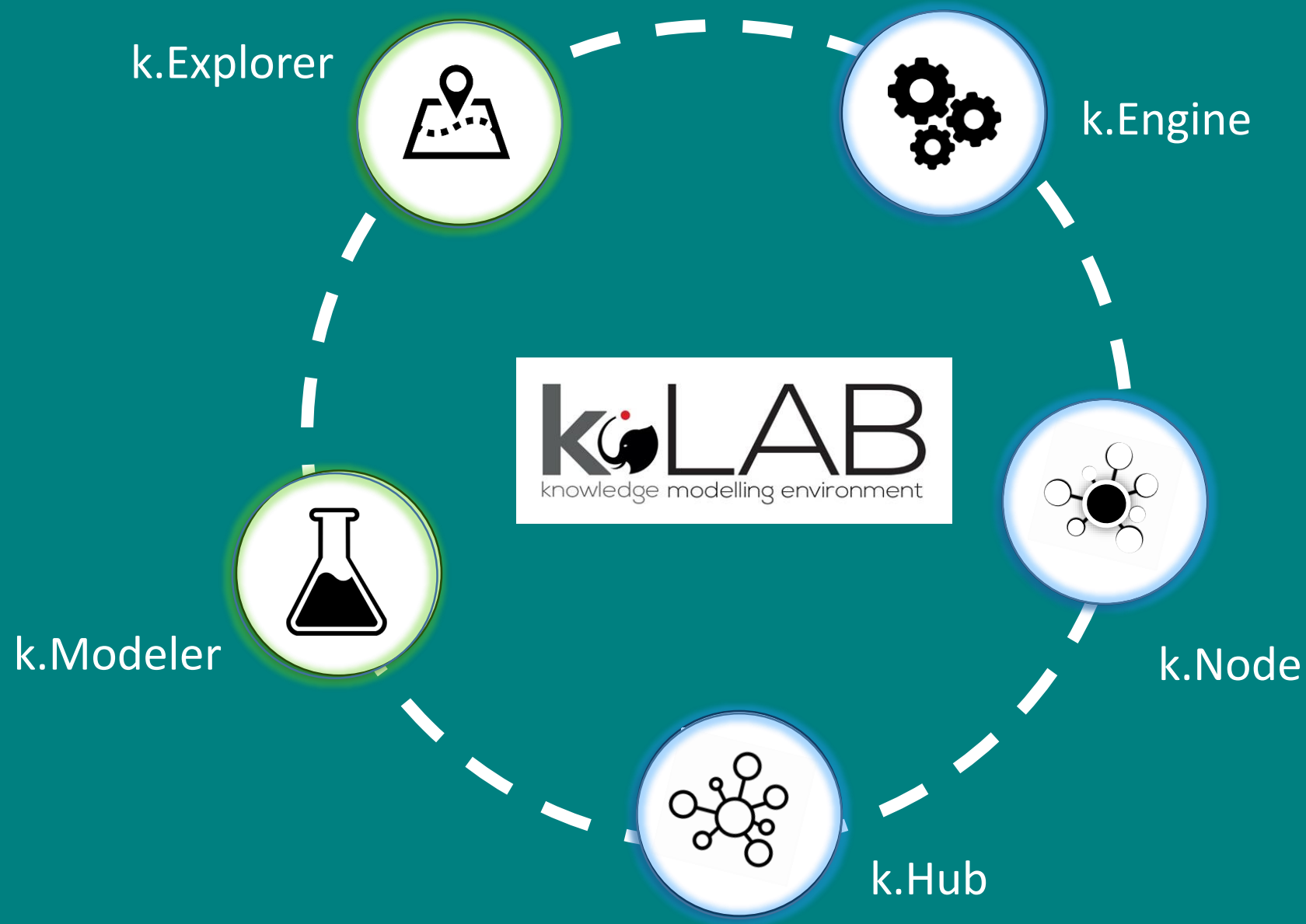
Open-source software

=

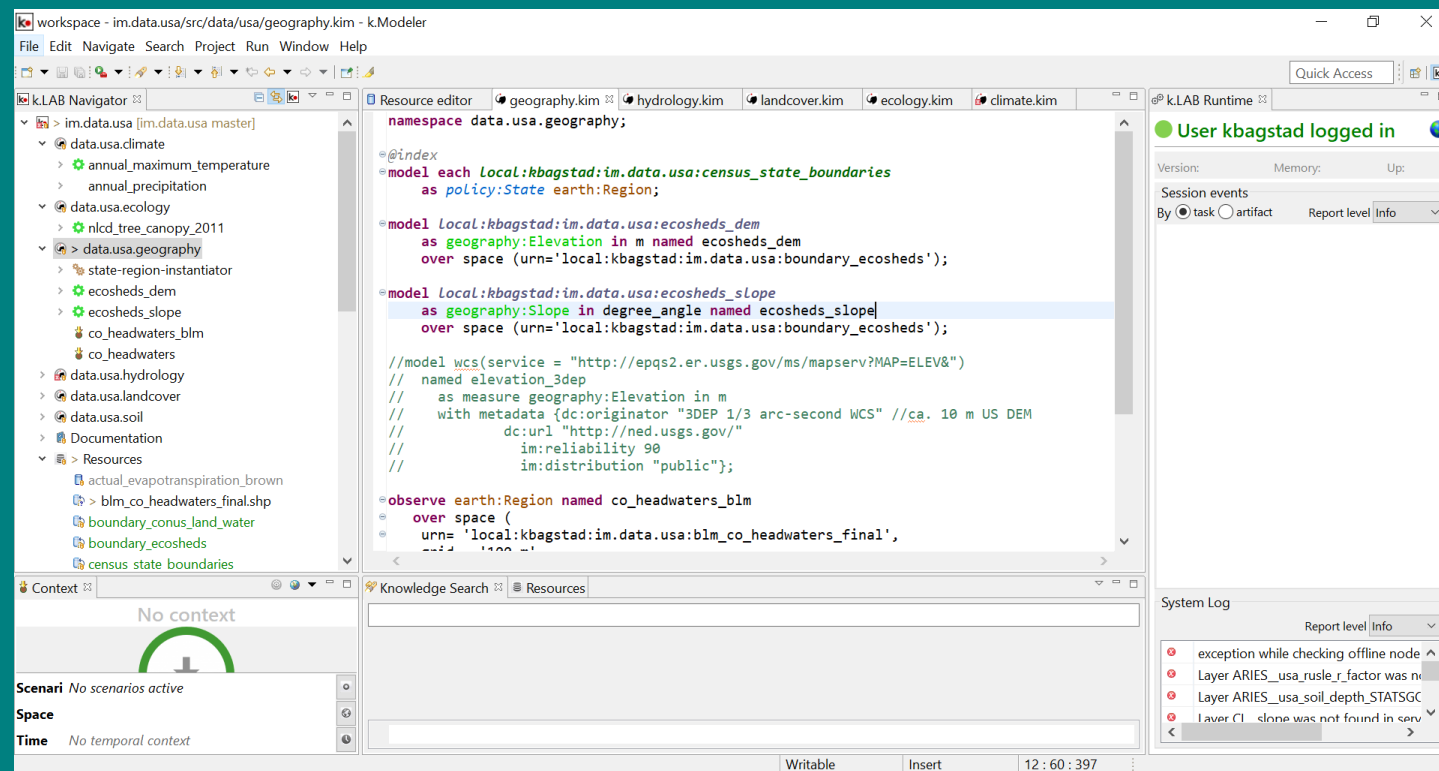
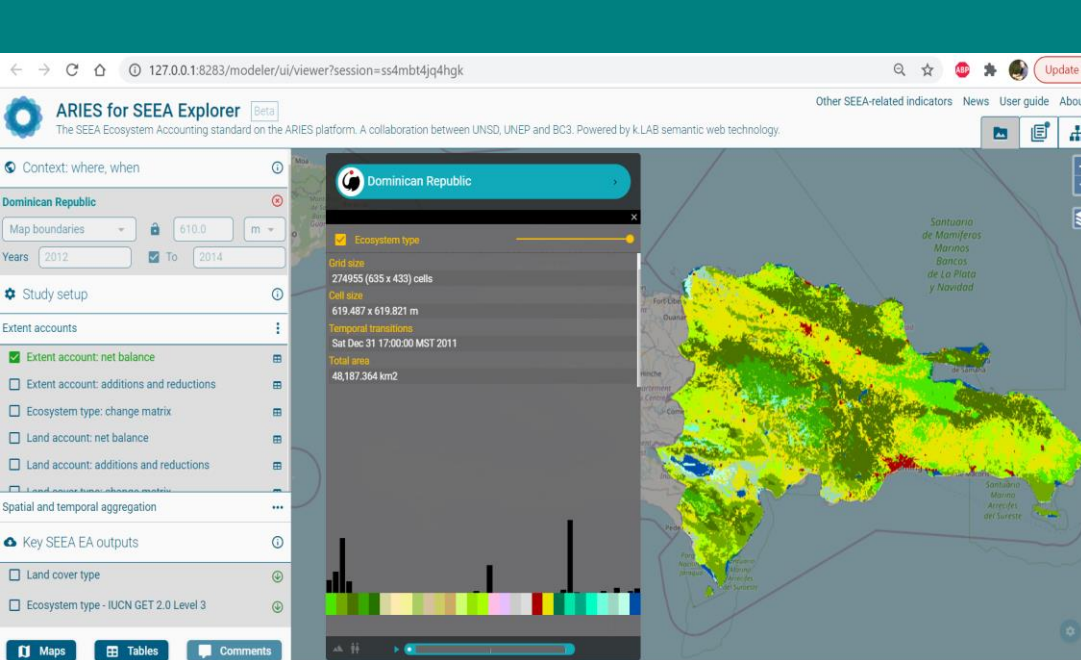
Fast, FAIR  
multidisciplinary modeling

# The k.LAB stack: support for a semantic web of observations

Includes the k.IM language, the modeling engine and API, the node API, authentication hub, the modeler's IDE and user-end web tooling



# Interfaces for nontechnical & technical users



Access & run scientific models in minutes through a web browser, using cloud-based data, anywhere on Earth



Contribute & semantically annotate new data & model resources for reuse by scientific community & public



# ARIES for SEEA: Rapid, standardized environmental-economic accounting

- Global, customizable models approach enables SEEA EA compilation anywhere & improvement with local data where available
  - Fast & easy to learn
- Automate production of maps & tabular output
- Infrastructure for the community to share & reuse interoperable data & models

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


Who we are ▾ Where we work ▾ What we do ▾ Science & Data 

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29 APR 2021 | PRESS RELEASE | ECOSYSTEMS AND BIODIVERSITY

## UN launches the first artificial intelligence tool for rapid natural capital accounting

**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	Temperature
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	Urban
Opening extent (at start of 2012)	158.25	366.39	16017.82	650.13
Expansions	0.00	0.00	32.39	42.45
Reductions in extent	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	692.57

**k.LAB Contextualization report**

Computed at Mon Jun 22 18:29:14 CEST 2020

### 1 Introduction

#### 1.1 Ecosystem Extent

The Ecosystem Extent Account is the first SEEA-EA account. It defines the spatial extent of each ecosystem type, showing how ecosystems change over time. Ecosystem types are used in all other accounts, so are fundamental to SEEA-EA. 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. IUCN's ecosystem typology improves on past ecosystem extent data, which for many past SEEA-EA applications relied exclusively on land cover data.

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 regressions 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-EA.

### 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 the Sayre et al.'s Reference 2 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.

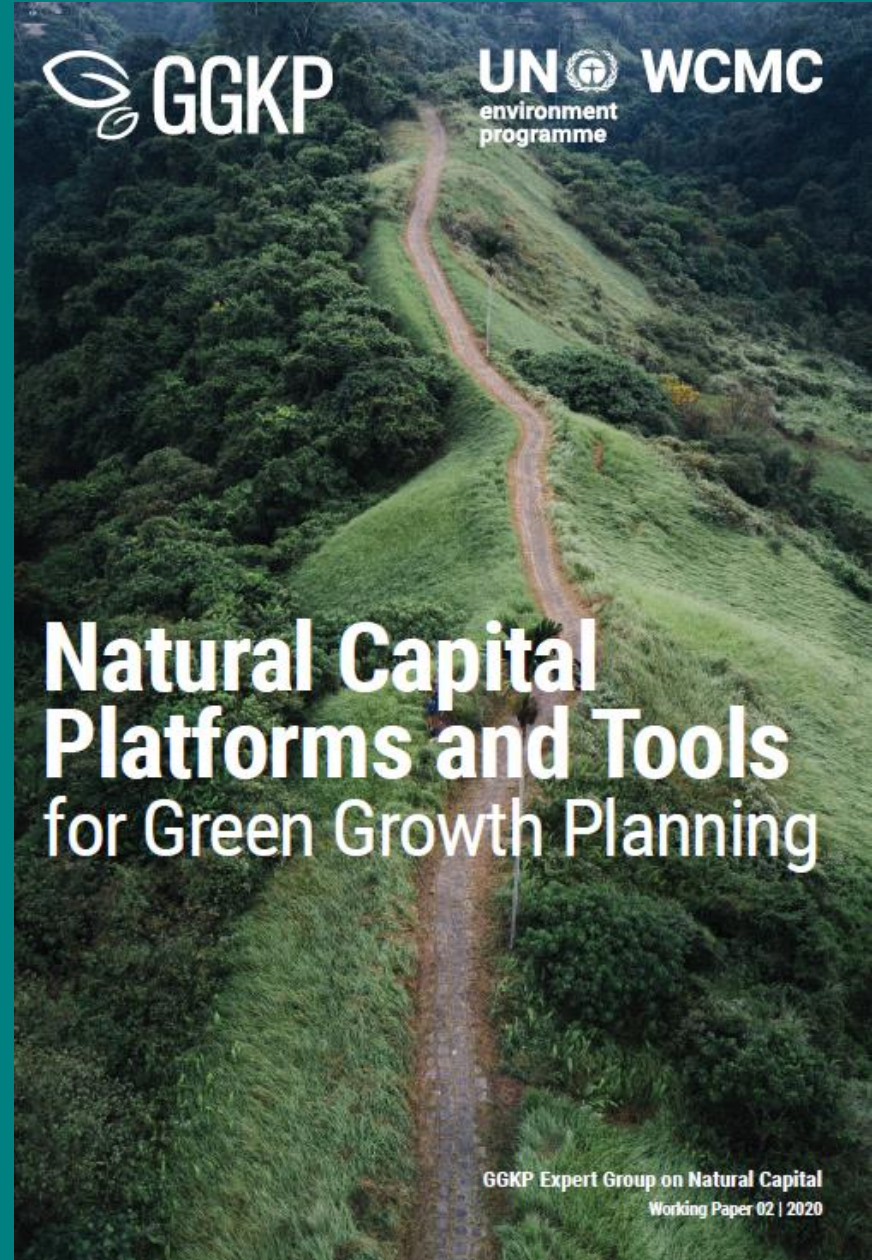
landcover	aridity	mean_annual_temperature	mean_july_temperature	ecosystem_type
landcover Forest	> 0.05 - 18	+	+	ecology incubation Tropical
landcover Forest	> 0.05 0 to 18	+	+	ecology incubation Temper
landcover Shrubland	> 0.05 - 4	+	+	ecology incubation Shrubla
landcover BareArea	> 0.05 - 4	+	+	ecology incubation Shrubla
landcover LichenMoss	> 0.05 - 4	+	+	ecology incubation Shrubla
landcover SparseVegetation	> 0.05 - 4	+	+	ecology incubation Shrubla
landcover Grassland	> 0.05 - 4	+	+	ecology incubation Savanna

# Toward a shared vision

SEEA accounts & related indicators will be:

1. rapidly recompilable as new science emerges,
2. quickly produced to show the most recent trends as new annual data become available, with
3. robust international comparisons possible from common global data, while country-specific customization is still easily done.

This vision moves high-quality, meaningful information from scientists into the hands of decision makers, the public, and the media as quickly as possible.



EARTH OBSERVATIONS FOR  
ECOSYSTEM ACCOUNTING



# SEEA interoperability strategy

1. Current state of interoperability & vision for the future
2. Roles & responsibilities (data providers, modelers, institutions incl. NSOs)
3. Implementing the strategy (pilot testing, engaging key stakeholders, governance, training/capacity building)
4. Conclusions

[https://seea.un.org/sites/seea.un.org/files/interoperability\\_strategy\\_draft.pdf](https://seea.un.org/sites/seea.un.org/files/interoperability_strategy_draft.pdf)

