



SEEA Ecosystem Accounting: Regional Training Workshop for Asia and the Pacific

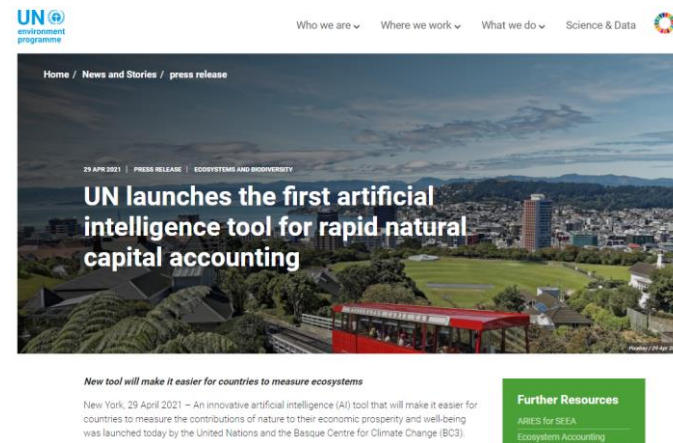
6th of June 2023

Making Science Matter in Policy-Making Where Nature Counts.

ARIES for SEEA

ARIES for SEEA – modeling environment & data hosting platform to support countries' compilation of ecosystem accounts

- Enables SEEA EA compilation anywhere on earth for national review/ vetting
- Where local knowledge (data, models and model parameterizations) are available:
 - Data and models made interoperable & reusable to substantially ease future application, production of maps & tables
 - Development of data collection template
 - Handbook/guide to obtain accounts-ready data to assist countries with less experience and build capacity within their teams



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

ARIES for SEEA Explorer¹, an application running on the ARIES platform

- Most common global data sets, many of them based on EO (e.g., land-cover; elevation; precipitation) already integrated
- ARIES' modular modelling nature (opposed to monolithic approach) facilitates the improvement and dissemination of national/local data & models
- AI → **machine reasoning** to construct best-available model for region of interest
- **Transparent** (metadata + download + analysis replicability + free access)

Computed at Mon, Jun 22 10:29:14 CEST 2020

1 Introduction

1.1 Ecosystem Extent

The Ecosystem Extent Account in the first SEEA-EEA account 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-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 proposal for ecosystem accounting. [Table 1](#), IUCN's ecosystem typology improves on past ecosystem extent data, which for many past SEEA-EEA applications relied exclusively on forest cover data. [Table 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 changed expansion/regression, natural expansion/regression, and regression/erosion or dieback. 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

Kath et al. [reference 1](#) recognize 25 Level 2 ecosystems (termed biomes): four marine, three freshwater, seven terrestrial, four subterranean, and seven in transitional areas. These are further subdivided into 102 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 initially lack reliable data to distinguish between biomes types for all but terrestrial biomes. ARES' team 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 follows 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.

	Intertidal forest shrubland	Coastal saltmarsh reedbed	landcover	anlty mean, annual, temperature mean, July, temperature	ecosystem, type
Extent at start of 2012 (km²)	158.25	366.39	landcoverForest	+ 0.05 -18	ecology incubationTropical
Extent at start of 2014 (km²)	158.25	360.81	landcoverShrubland	- 0.05 0 to 18	ecology incubationTemperate
Net change	0.00	-5.59	landcoverBarrenarea	- 0.05 -0	ecology incubationShrubland
			landcoverLichenMoss	- 0.05 -0	ecology incubationShrubland
			landcoverSavannaVegetation	+ 0.05 -0	ecology incubationShrubland
			landcoverGrassland	- 0.05 -0	ecology incubationSavanna
				-39.10 42.45	
					403.63
					13.03

	Intertidal forest shrubland	Coastal saltmarsh reedbed	Oriental	Urbia
Opening extent (at start of 2012)	158.25	366.39	16017.82	650.1
Additions to extent				
Expansions	0.00	0.00	32.39	42.42
Reductions in extent				
Regressions	0.00	5.59	71.49	0.00
Net change in extent	0.00	-5.59	-39.10	42.42
Closing extent (at start of 2014)	158.25	360.81	15978.72	692.1

Global vs. local datasets



Global data (e.g., ESA-CCI land cover) harmonise information for all countries on Earth, are **consistent over time**, enabling **direct comparison** across years & countries.



Local data are typically **more accurate, trusted, well-suited** for local/national use but are single observations. Combining & harmonizing multiple versions to obtain a time series can be **cumbersome**.



Possible solution:

1. **Semantic** annotation provides **consistent definitions** of the data

What does semantic annotation mean?

Identifying and correcting inconsistencies (e.g., different projections or country boundaries, illogical transitions, no-data values)



Web-semantic modelling

Semantics are concepts

FARM

spe
cies

global

outdoor

What do they mean and how are they interconnected with each other?

Growth

im

abstract process Growth

"Any endogeneous transformation happening in a system its internal structure."

is IntransitiveProcess

has children

(Growth

"Positive or negative growth makes a system acquire a larger size or functional throughput"

creates Collapse);

Ecology

process Growth

"Growth in ecology refers to population growth."

is im:Growth **within** Population

Biology

process Growth

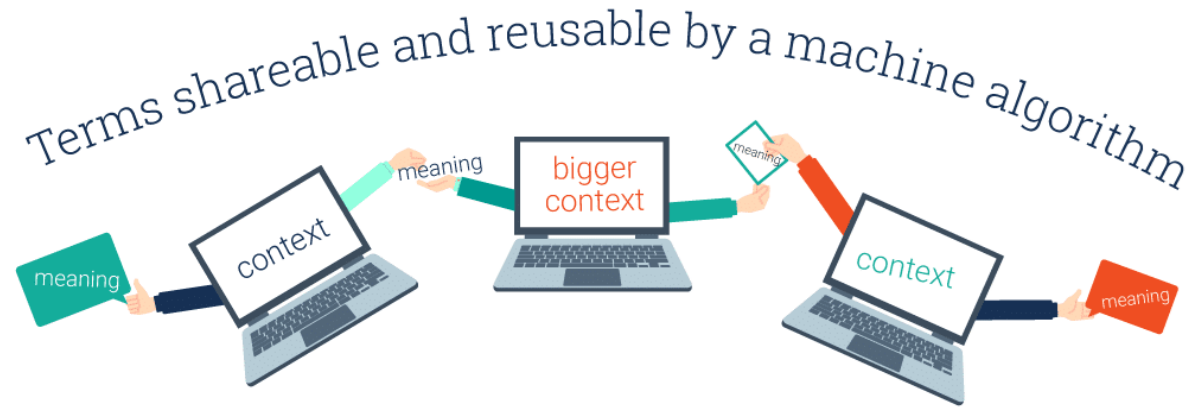
"Biological growth only happen during life and affects the biomass of an individual."

is im:Growth

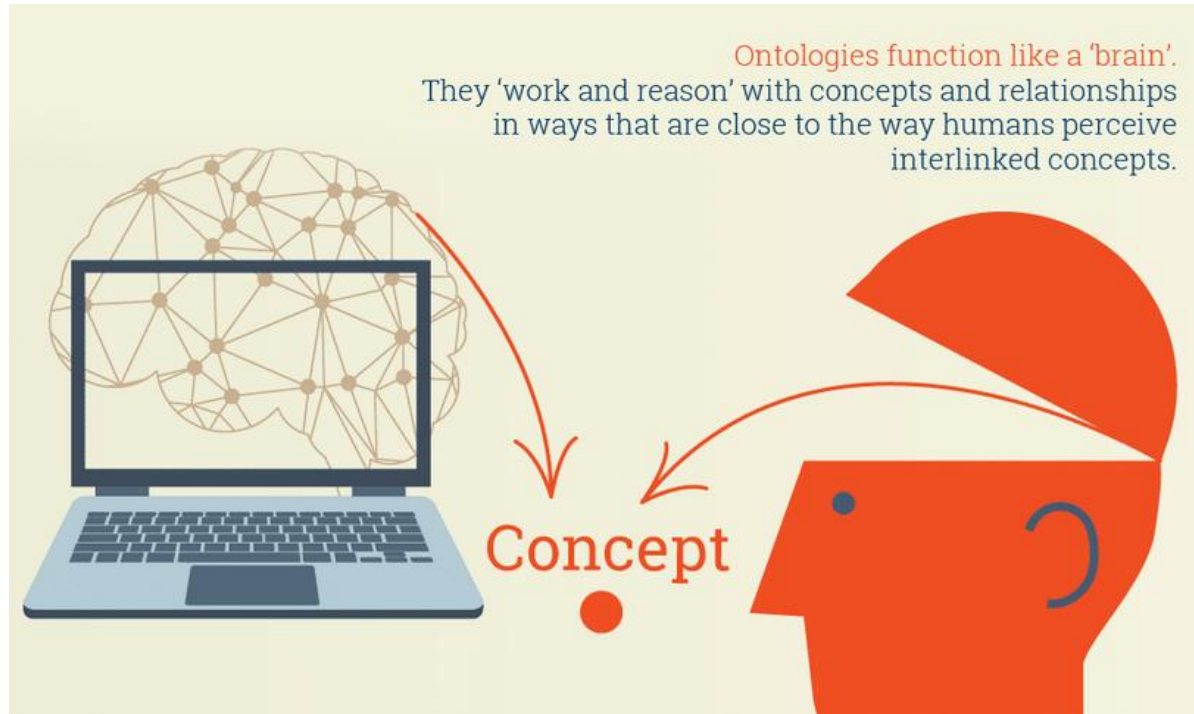
affects Biomass **within** Individual

applies to Life;

Well-defined concepts, are written in our language but also machine-readable. This allows is the ability of the artificial intelligence to think automatically or semi-automatically (**the machine reasoning**). Moreover, this enables the information to be exchanged with other machines and also adjusted to different contexts. Since it's an **open and collaborative** system, this is **constantly improving**



N. Guarino, D. Oberle and S. Staab, "What Is an Ontology?" In: S. Staab and R. Studer, Eds., Handbook on Ontologies, Springer Berlin Heidelberg, Berlin, Heidelberg, 2009, pp. 1-17.



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Model *'Local:alessio.bulckaen:im.countrysupport.philippines:im-nca-philippines.Lc_32651_50m_vnd_2010'*,
'Local:alessio.bulckaen:im.countrysupport.philippines:im-nca-philippines.Lc_32651_50m_vnd_2015'
as **landcover:LandCoverType** **classified into**
landcover:NonIrrigatedArableLandHerbaceous **if** 1,
landcover:OpenMixedForest **if** 2,
landcover:Shrubland **if** 3,
landcover:InlandWaterBody **if** 4,
landcover:ClosedMixedForest **if** 5,
landcover:Grassland **if** 6,
landcover:BareArea **if** 7,
landcover:ArtificialSurface **if** 8,
landcover:InlandSwamp **if** 9,
landcover:WaterBody **if** 10,
landcover:PermanentCropland **if** 11,
landcover:Wetland **if** 12;

```
model "kLab:copernicus.static:sis-agrometeorological-indicators:rainy_days_per_month"  
as count of earth:Storm during im:Month named rainy_days_per_month;
```

```
model 'im.data.global:im-data-global-geography.elevation-global 90m  
#interpolation=bicubic'  
as geography:Elevation in m;
```

```
@intensive(space)
```

```
model ecology:Vegetation chemistry:Carbon im:Mass in t/ha  
observing  
landcover:LandCoverType without landcover:WaterBody named land_cover_type,  
presence of chemistry:Burned earth:Region named burned_land,  
type of geography:ContinentalRegion named continental_region,  
presence of im:Critical (conservation:Pristine ecology:Forest earth:Region) named frontier_forest,  
type of ecology:EcoFloristicRegion named ecofloristic_region  
lookup (land_cover_type, ecofloristic_region, continental_region, frontier_forest, burned_land, ?)  
into VEGETATION_CARบอน_TABLE;
```

Global vs. local datasets



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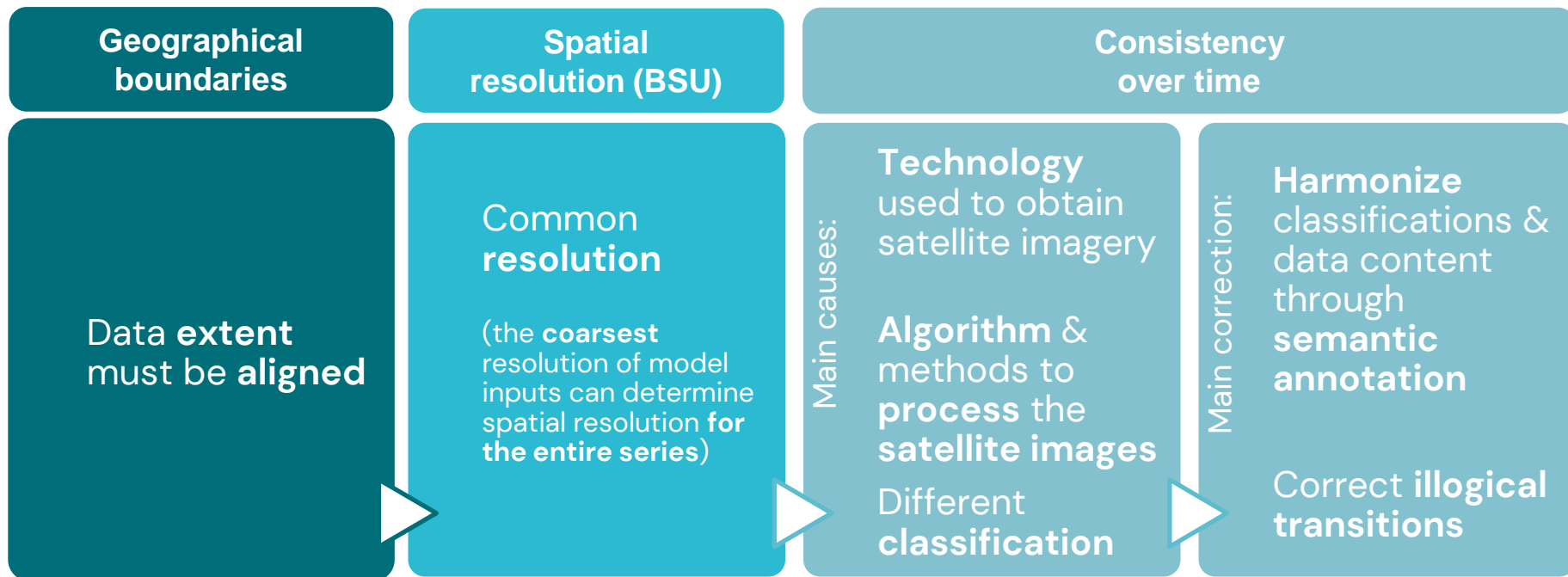
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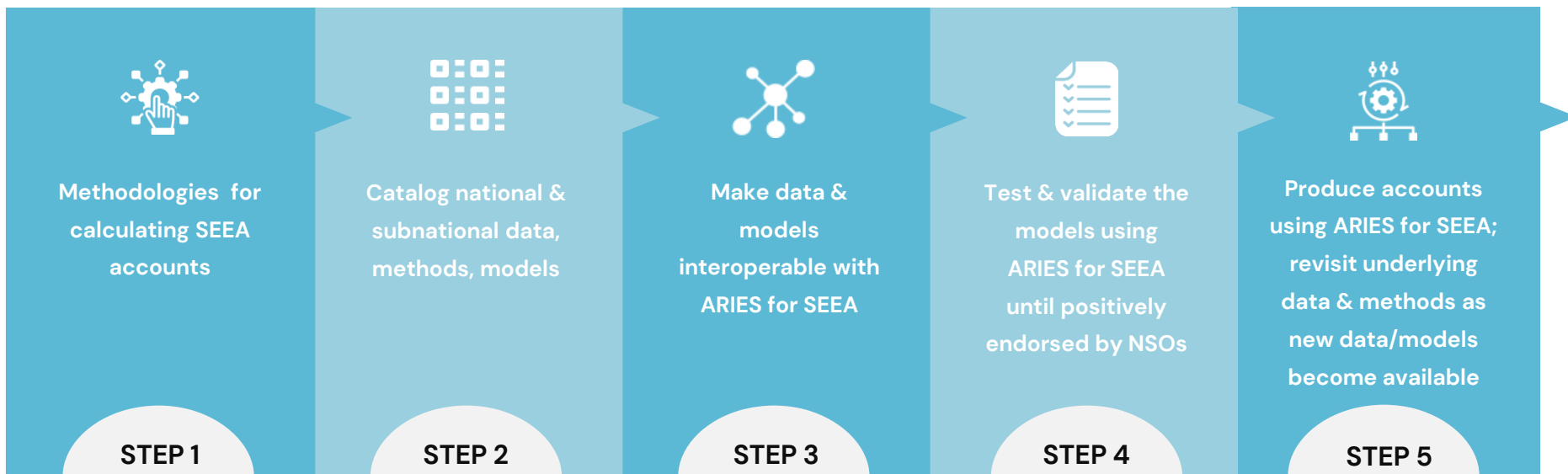
Possible solution:

1. **Semantic** annotation provides **consistent definitions** of the data
2. ARIES can help verify whether data are suitable for accounting by **identifying and correcting inconsistencies** (e.g., different projections or country boundaries, illogical transitions, no-data values)

Data harmonization and time series



How can NSOs/governments use ARIES for SEEA



Note: at no point above is there a step for "run ARIES for SEEA in your country using default global data/models," nor to "directly compare outputs derived from global data & models to results from step 4." Those steps could optionally happen, but publicizing results using global data/models too early may risk undermining confidence in the process.

Making models interoperable

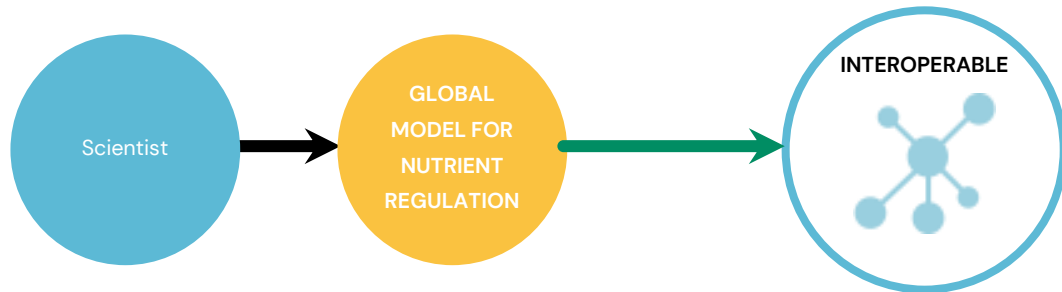
- ARIES for SEEA is **not** just for countries with less experience in the compilation of accounts
- By making better science interoperable and reusable, developed data/models in other context could improve global uptake of SEEA EA more than traditional capacity building,
 - > Model developers specify conditions under which a particular model or parameterization of a model is appropriate for reuse

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Example 1

A scientist has developed a global model for nutrient regulation (a service not currently available in ARIES for SEEA),



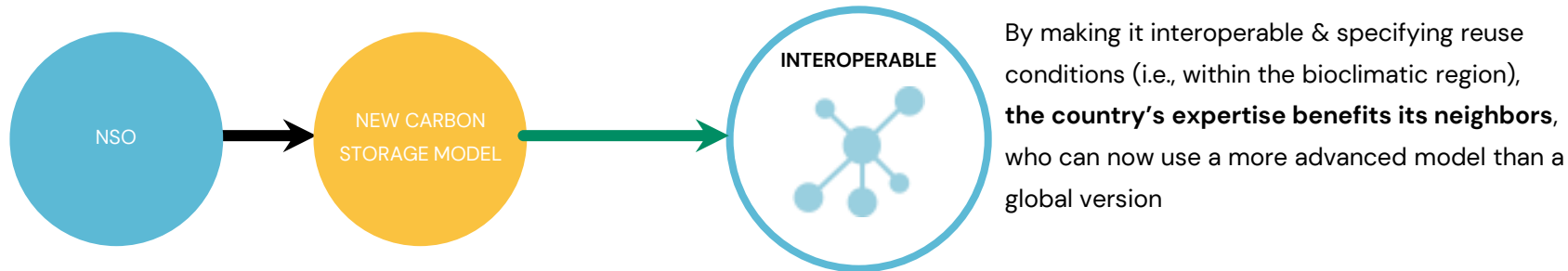
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Example 2

A NSO has developed and vetted a new carbon storage model that works well within a large, multi-nation bioclimatic region



Making models interoperable

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- By making better science interoperable and reusable, developed data/models in other context could improve global uptake of SEEA EA more than traditional capacity building,
 - › Model developers specify conditions under which a particular model or parameterization of a model is appropriate for reuse

Example 1: A scientist has developed a global model for nutrient regulation (a service not currently available in ARIES for SEEA).

- › By making it interoperable, this ES can now be added to SEEA EA accounts in nations around the world

Example 2: A NSO has developed and vetted a new carbon storage model that works well within a large, multi-nation bioclimatic region.

- › By making it interoperable & specifying reuse conditions (i.e., within the bioclimatic region), the country's expertise benefits its neighbors, who can now use a more advanced model than a global version

- Given the power of this paradigm, we hope that agencies with more experience and stronger capacity support this more, benefiting other countries too.

Future opportunities

- **Strongly support EO4EA & similar initiatives, which are essential to mainstream adoption of environmental accounting**
- Working towards future data becoming **accounts-ready**
- Move towards (semantic) interoperability of data & models. For instance:
 - > Custodians of data sets (global & national) to share data through APIs / nodes
 - > Interconnect data through semantics / classifications
 - > For land use & cover, align with FAO-LCCS / LCML, for Ecosystem Type align with IUCN GET through experts' input – authorities & classifications custodians play an important role



Application Programming Interface is a way for two or more computer programs to communicate with each other. It is a type of software interface, offering a service to other pieces of software

A **node** is any physical device within a network of other tools that's able to send, receive, or forward information. A personal computer is the most common node.

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2021

AN INTEROPERABILITY STRATEGY FOR THE NEXT GENERATION OF SEEA ACCOUNTING



[Link to the document](#)

Roles of key stakeholders

- **Data providers** (NSOs, science agencies, academic scientists): agree on & provide data using common formats & hosting protocols (e.g., OGC¹ standards for spatial explicit data, SDMX² for tabular data)
 - **Modelers** (science agencies, academic scientists): use modeling practices that will make models more easily linked & documented (more modular, less monolithic); use community consensus semantics
 - **NSOs & other institutions** (NSOs, space/mapping agencies, GEO initiatives, large academic collaborations): endorse and maintain interoperable data & models over the long term.
-
- Publication Ethic: giving credit where credit is due – **Credit** for data and models provider(s) in ARIES



Environmental modelling: finding Simplicity in Complexity

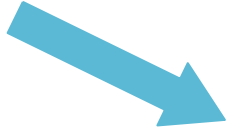
The complexity of environmental modelling



Data access and
manipulation

- Difficulties to access the data
- Time to process the data
- Data storage capacity
- Access to results

Forest



Environment



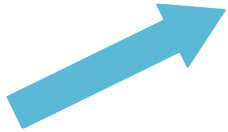
Biology



Geography



Ecology



Social Agents



The complexity of modelling



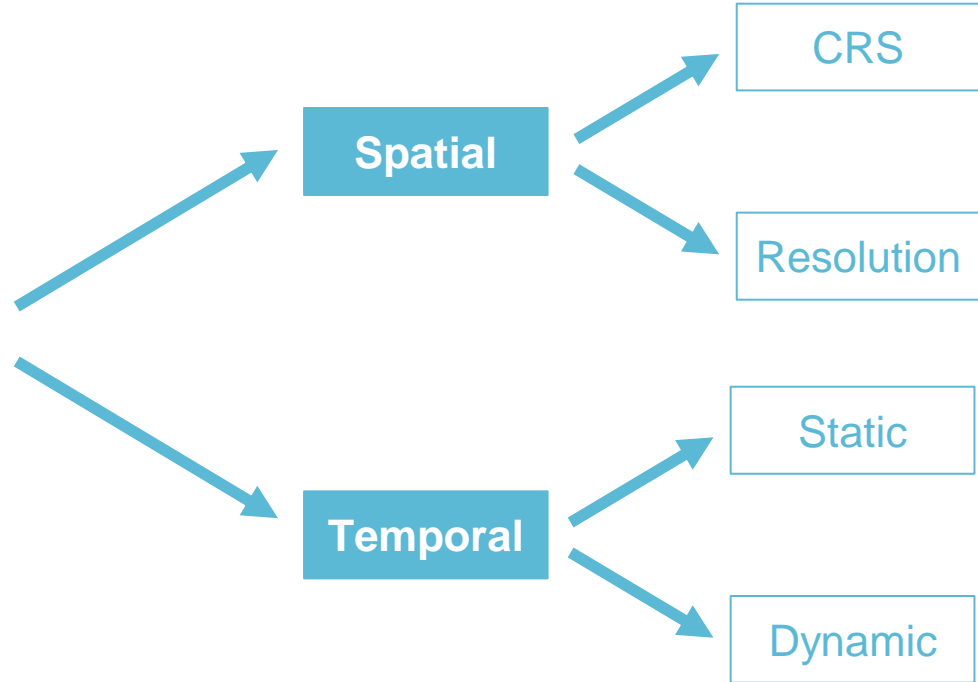
Data access and manipulation



Multidisciplinarity



Different spatial and time scales



The complexity of modelling



Data access and manipulation



Multidisciplinarity



Different spatial and time scales



Blackbox models



FAIR principles

FINDABLE

Open, free and accessible data



ACCESSIBLE

Unique identifier that allows to find data quickly and efficiently



INTEROPERABLE

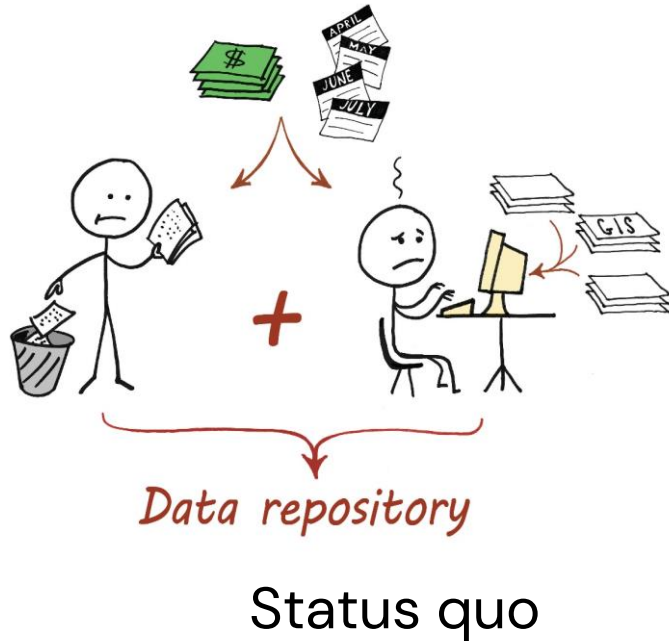
Data are organized by thematic areas, but also related interconnected across them



REUSABLE

Data (and models) can be applied to other spatial and temporal contexts





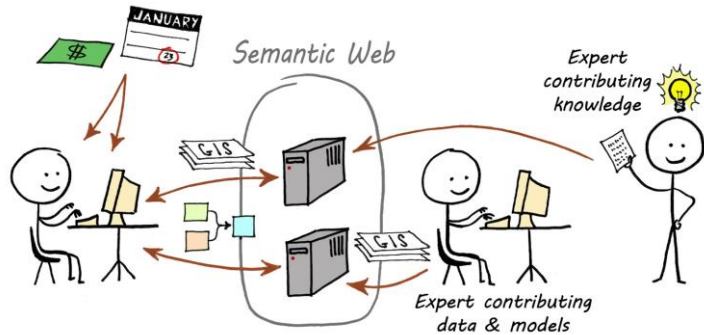
A methodology is often **difficult to implement**:

- Time to obtain and process the data;
- Access and process the data and models;
- Limited computational capacity;
- Limited storage capacity.

Double-efforts are very common.

Everyday **accessibility hindrances**:

- Final users cannot access **results** (many time she's not a technician);
- Technical users cannot access the **models** to re-use, adapt or improve them.



Optimizing the processes through interoperability and the web-semantic

Totally **transparent access** to:

- Data;
- Methodology;
- Processing steps (the combination of the above);
- Results.

Great storing and computational **capacity**.

Interoperability within data and models.

Access for all users: expert, technical and non-technical.

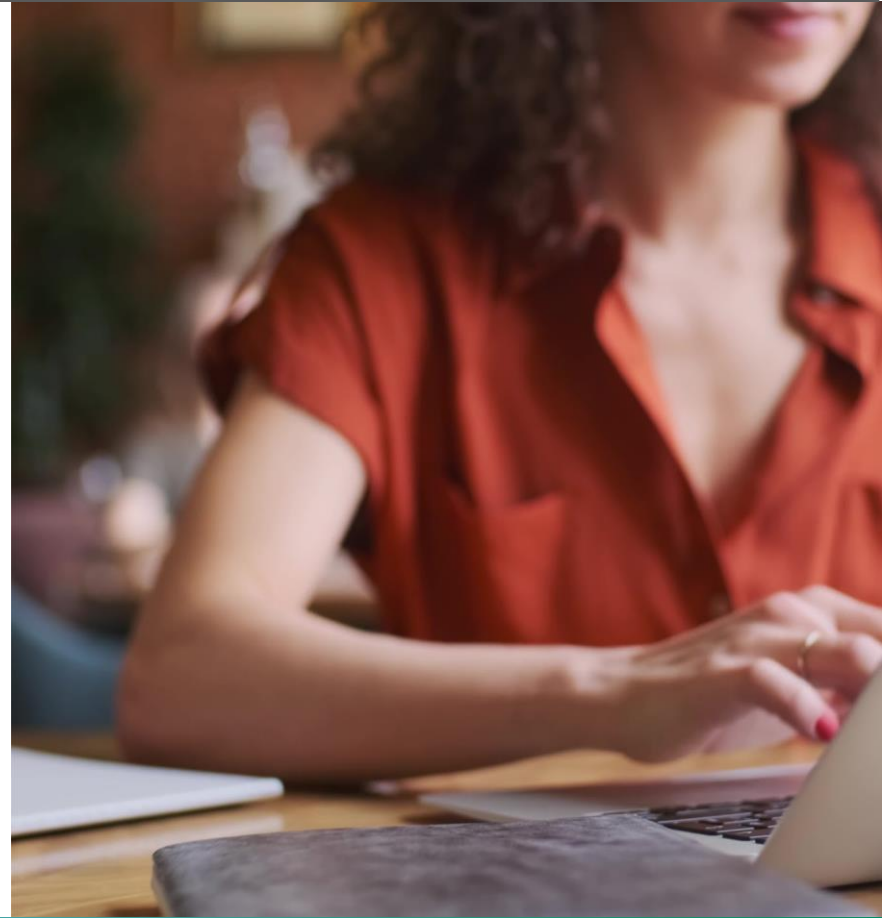
Collaborative platform to optimize efforts made by different experts in different areas.

Access the application

1. The first step is to **register** in the Integrated Modelling hub
2. Once created a profile, **access the link** to launch the application from your browser (or download the Control Center – the software for modelers, and install it on your engine)
3. Use the intuitive user-interface to **compile account(s) everywhere on earth**

Useful links to explore

1. [ARIES for SEEA explorer](#)
2. [Registration in the IM hub](#)
3. [Technical note](#)
4. [YouTube channel](#)
5. Write us for support at support@integratedmodelling.org or for if you're interested to join our modelling journey at aries@integratedmodelling.org

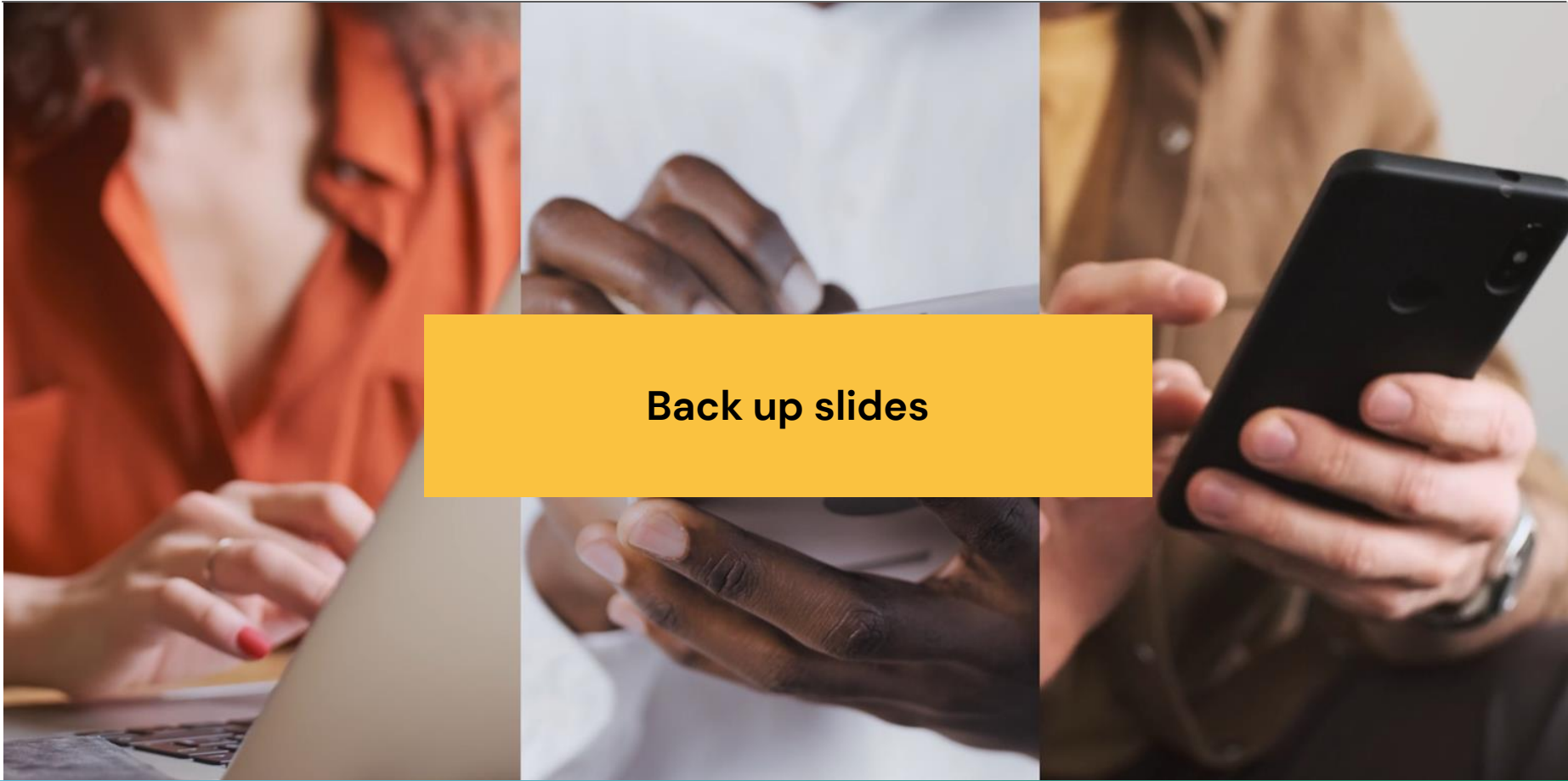




Thank you!



www.aries.integratedmodelling.org

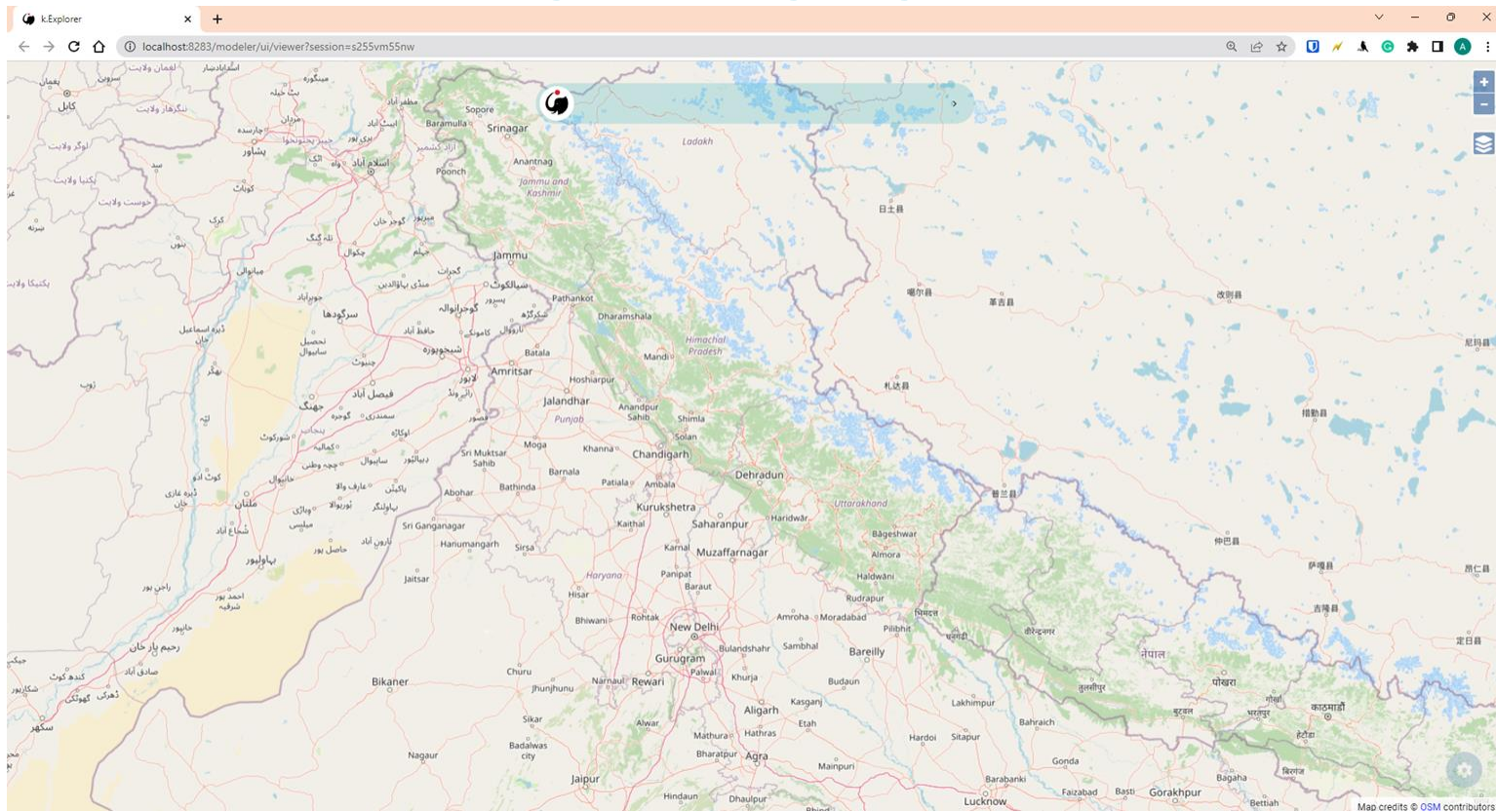


Back up slides

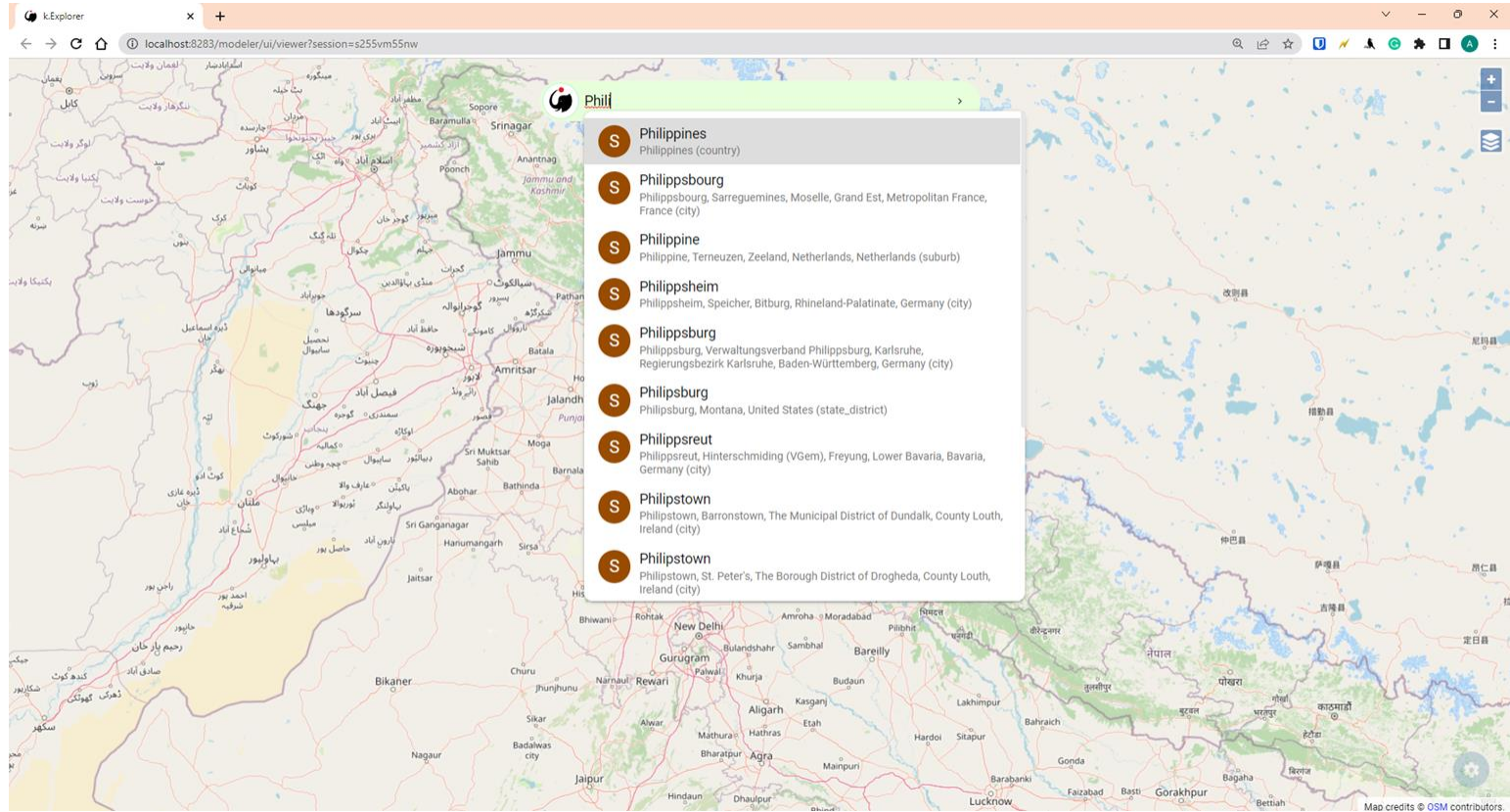


Hands-on session on the k.Explorer

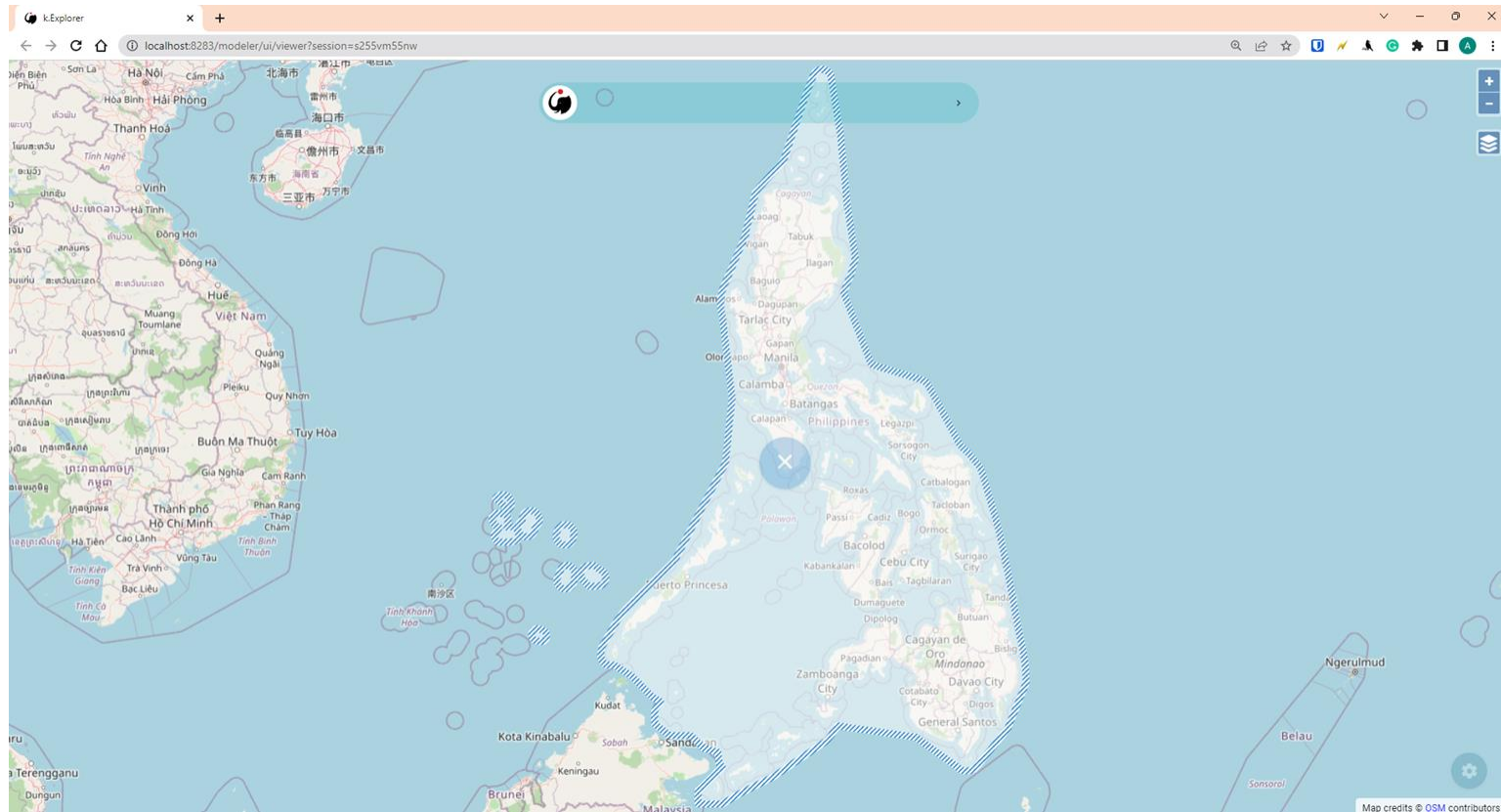
set a context by typing in the geographic location



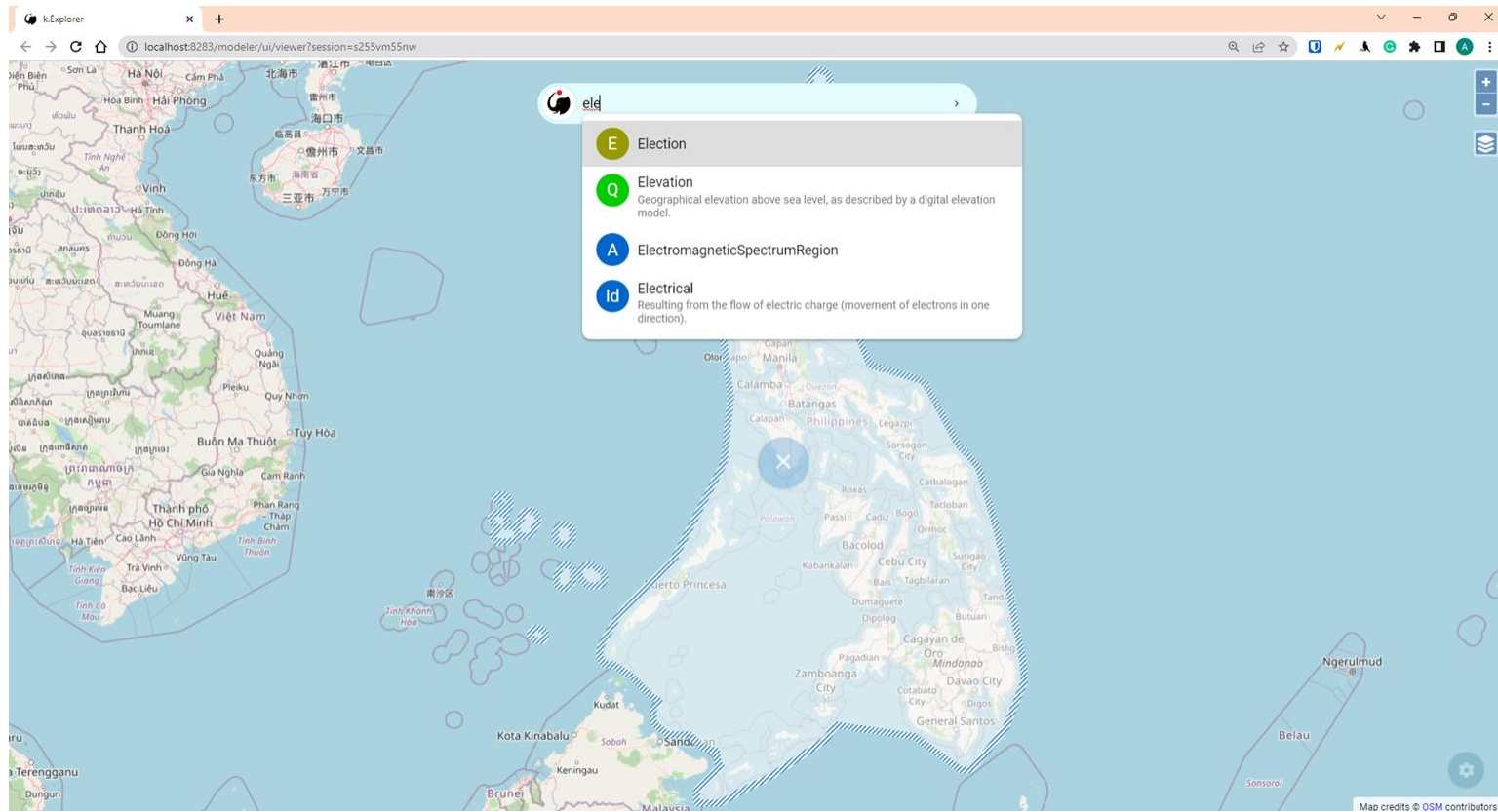
(use the upper case to browse for the name)



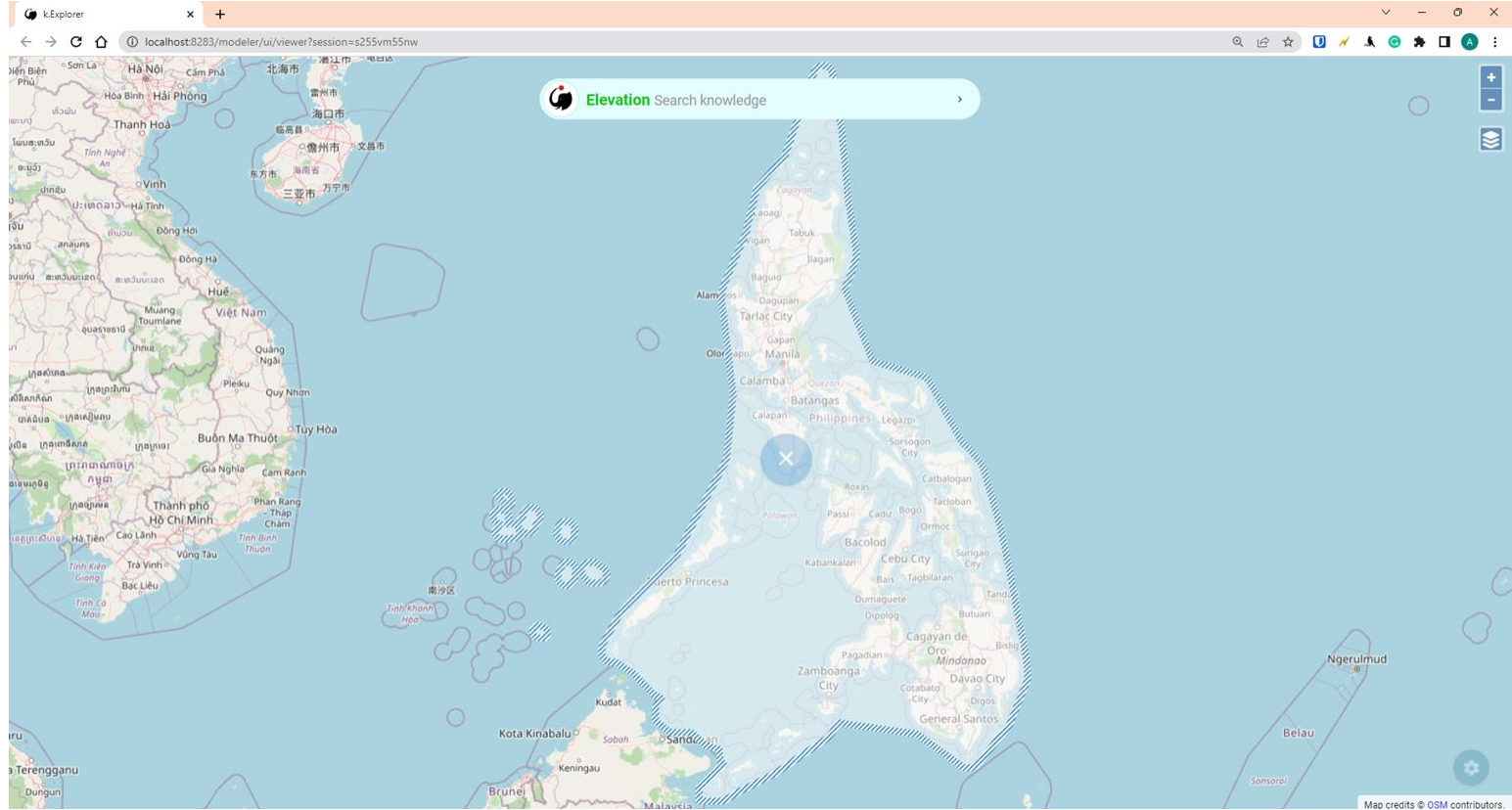
the k.Explorer sets the spatial context of your analysis



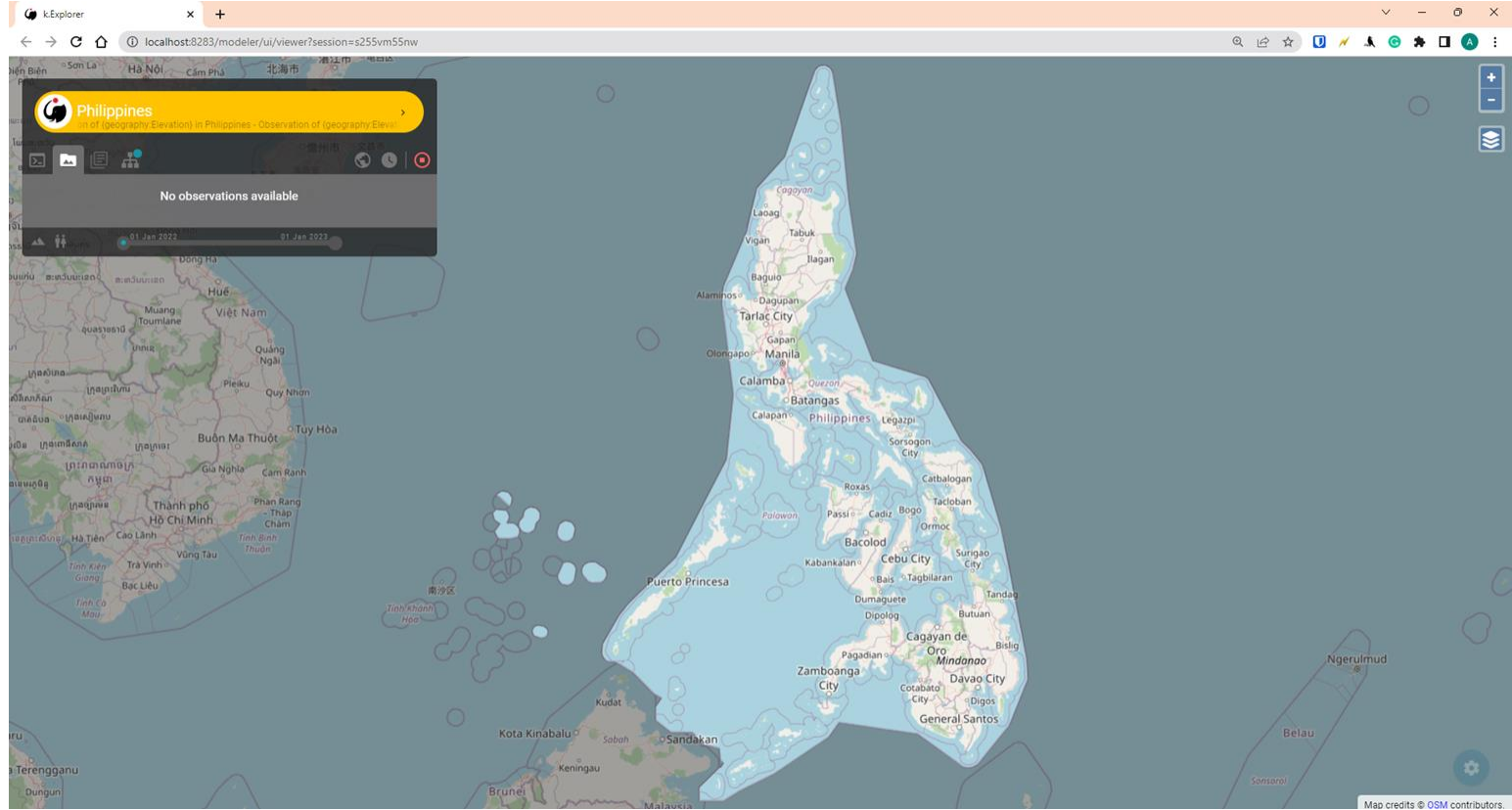
query what you want to observe (use lower case)



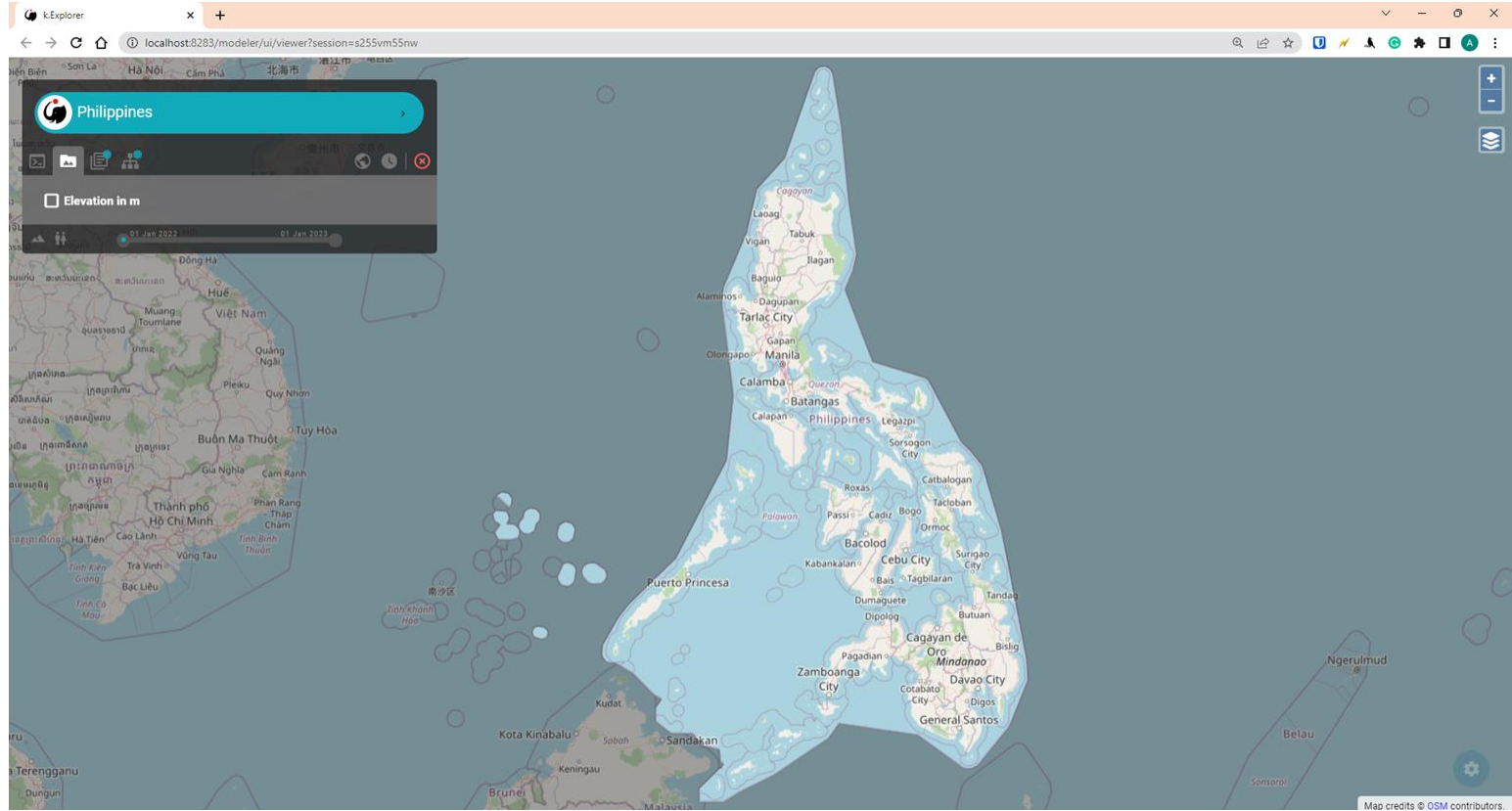
select the concept and press Enter



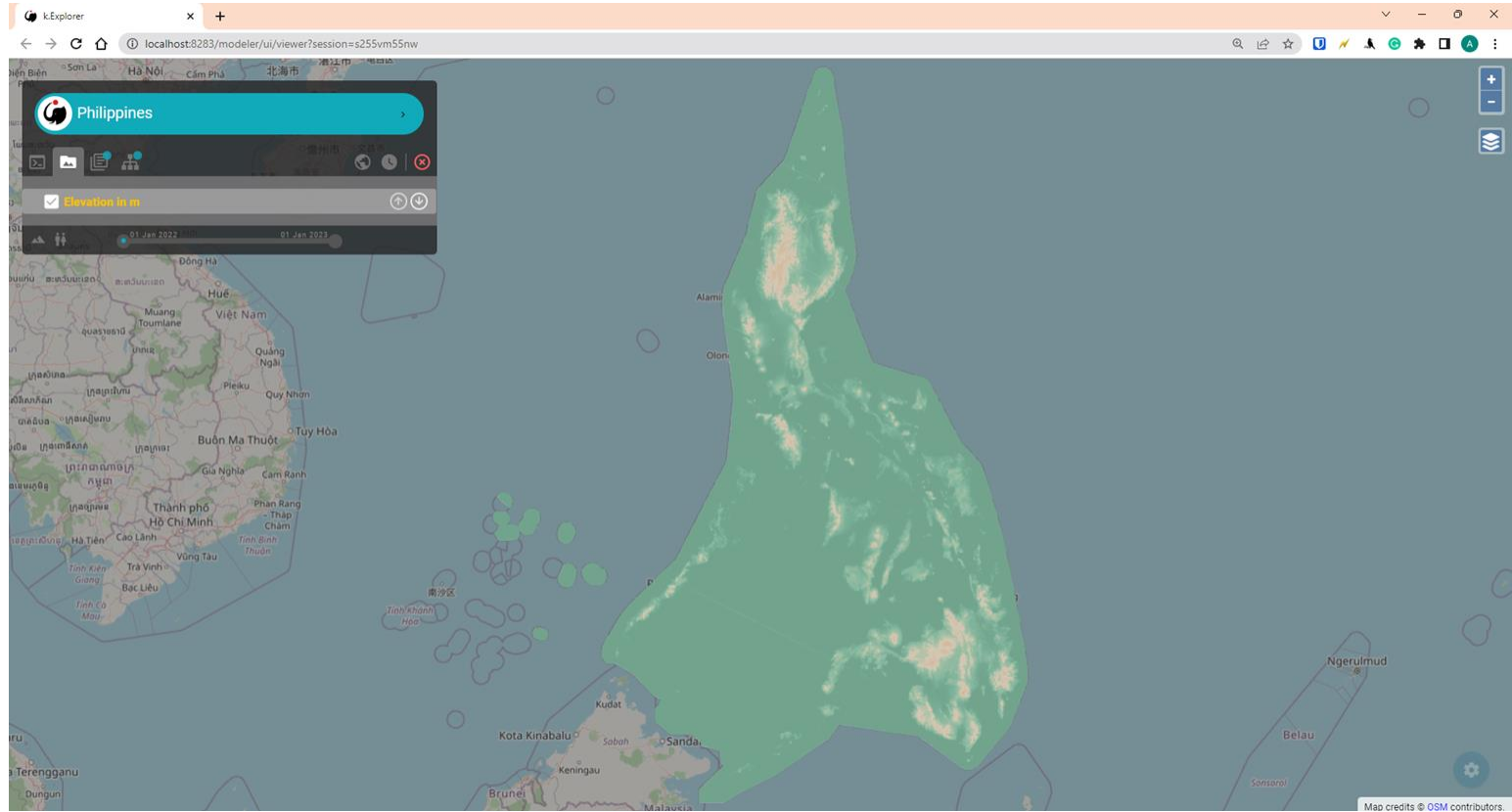
the k.Explorer starts the computation



providing the answer for that context



each output can be visualized in the interface



from the *Search knowledge* press the space bar

The screenshot shows the k.Explorer web application interface. A search results panel is open, displaying a list of knowledge items related to the search query. The items are categorized into Carbon storage, Pollination, and Flood regulation. Each item has a green 'Q' icon, a title, a brief description, and a checkmark in a circle on the right.

Search knowledge

Carbon storage

- Organic Carbon Mass**
The total amount of stored carbon originating from ecosystem processes. Includes organic matter in the soil, roots and aerial vegetation. ✓
- Vegetation Carbon Mass**
The total amount of stored carbon in vegetation, including roots and aerial parts. ✓

Pollination

- Net value of Pollination**
The net value of pollination, showing the balance between demand and actual provision in each point of the landscape. ✓
- Occurrence of Pollinator Insects**
The likelihood of finding pollinator insects in each point, composed of a weather and a landscape component. ✓
- Weather suitability for Pollinator Insects**
The weather-related component of the likelihood of finding pollinator insects in each point. ✓
- Landscape suitability for Pollinator Insects**
The landscape-related component of the likelihood of finding pollinator insects in each point. ✓

Flood regulation

- Proneness to flooding**

The background map shows the Philippines with various cities labeled, including Manila, Cebu City, and Davao City. The map is overlaid with a semi-transparent layer representing the search results.

Map credits © OSM contributors.

to obtain a drop-down menu suggesting commonly-used models

The screenshot shows the k.Explorer web application interface. A search bar at the top left contains the text "Search knowledge". A dropdown menu is open, displaying a list of knowledge items under various categories. The background is a map of the Philippines with various cities labeled.

Search knowledge

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Pollination

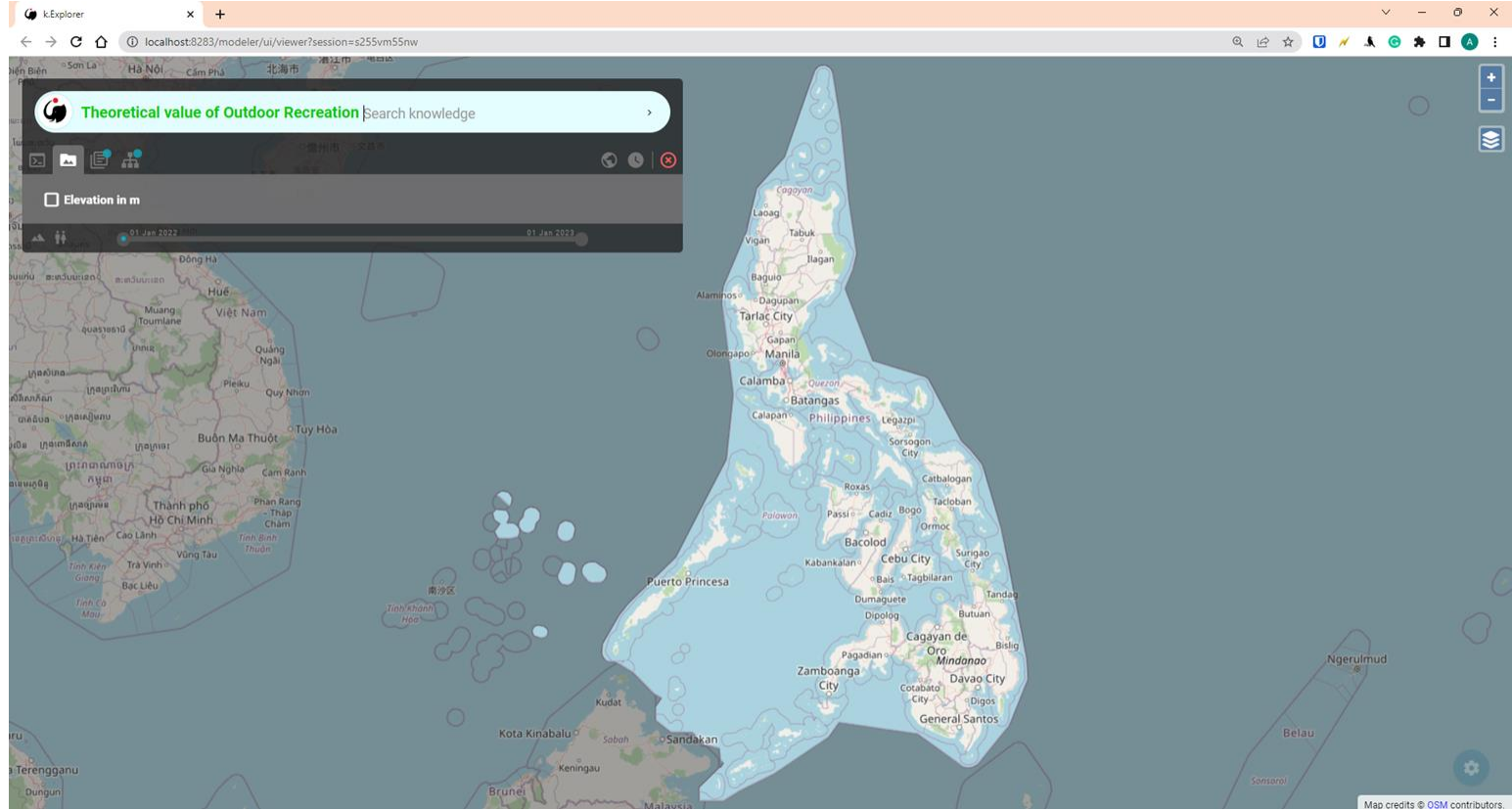
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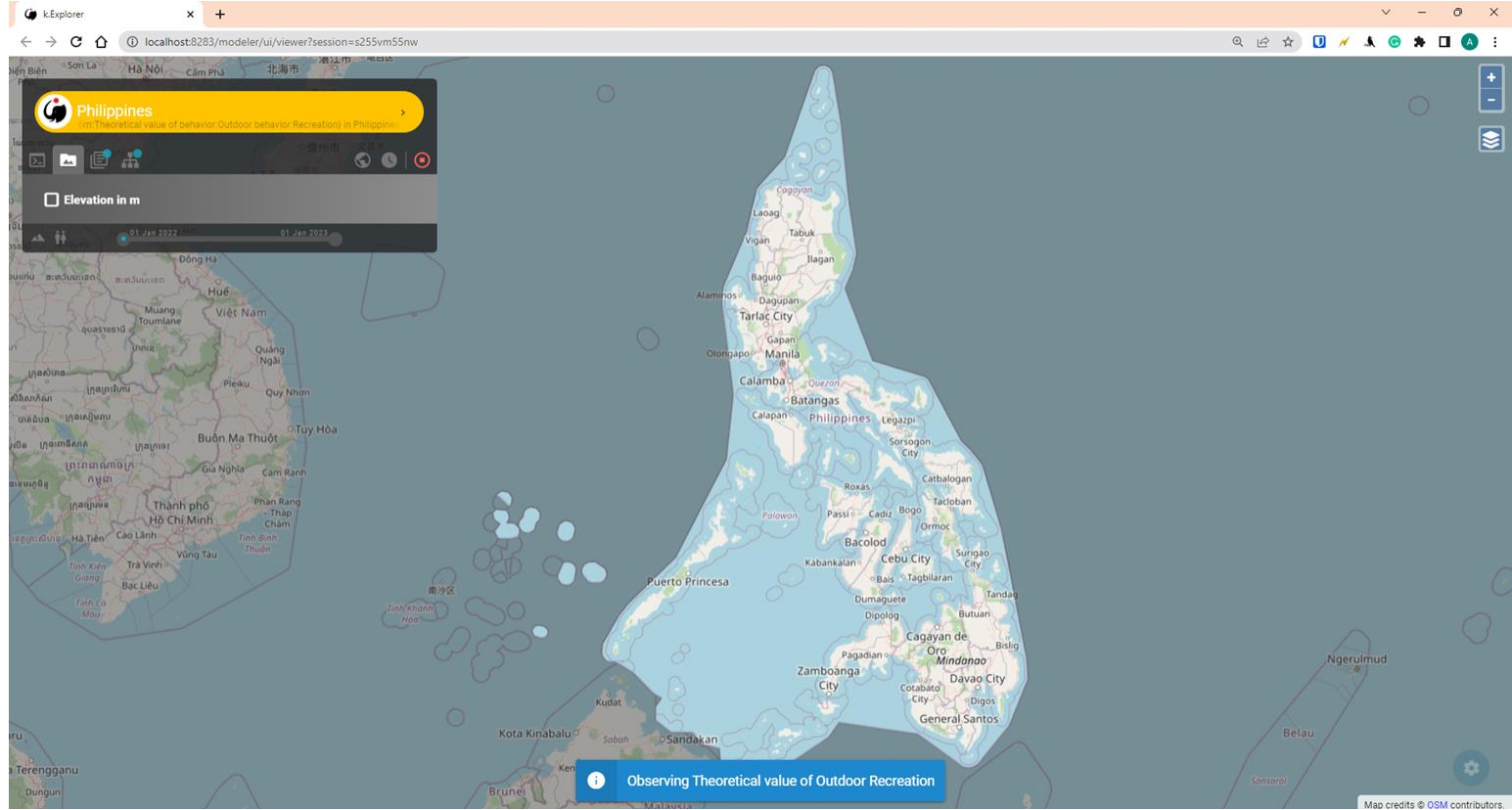
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Map credits © OSM contributors.

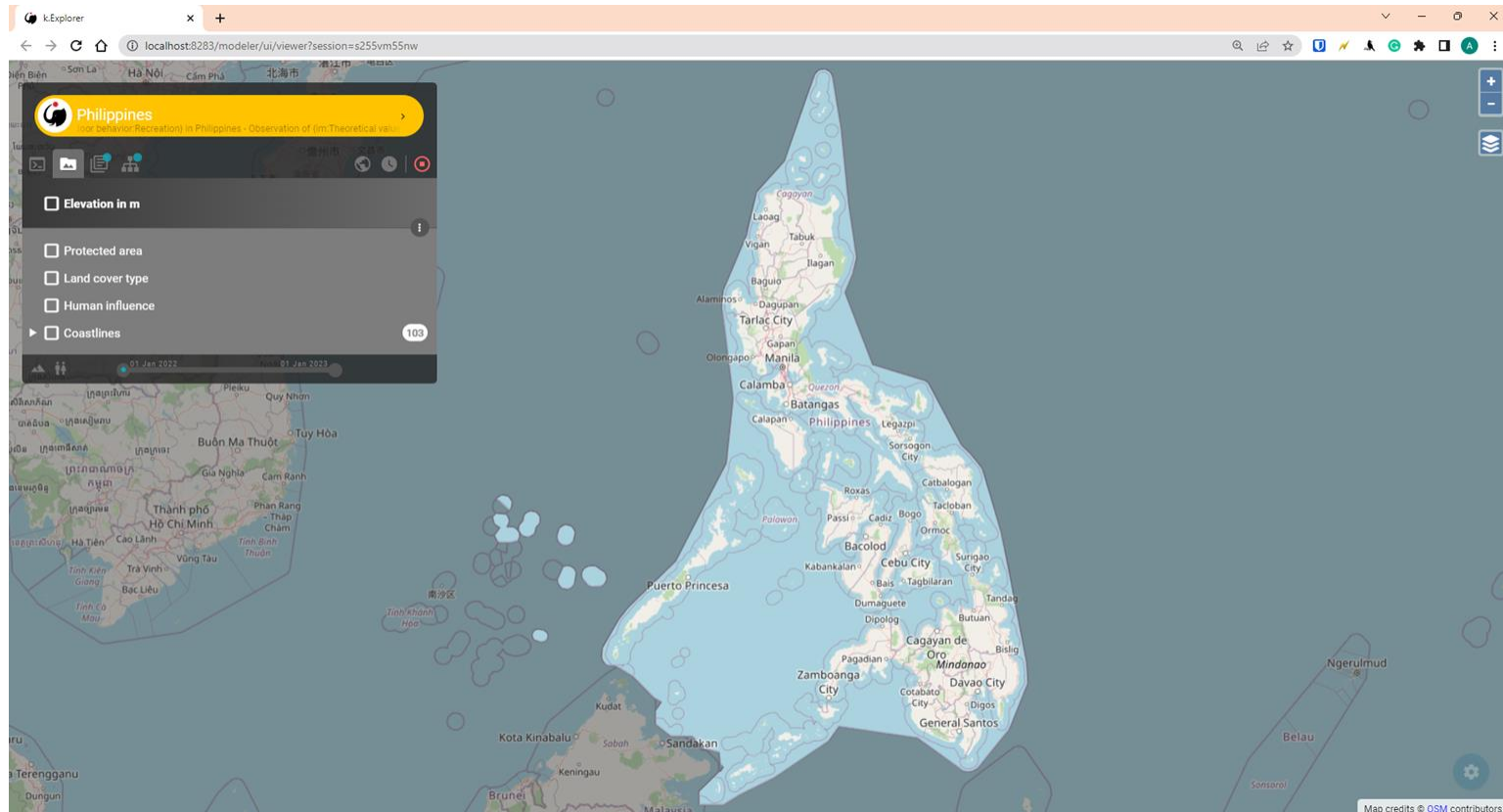
select the model



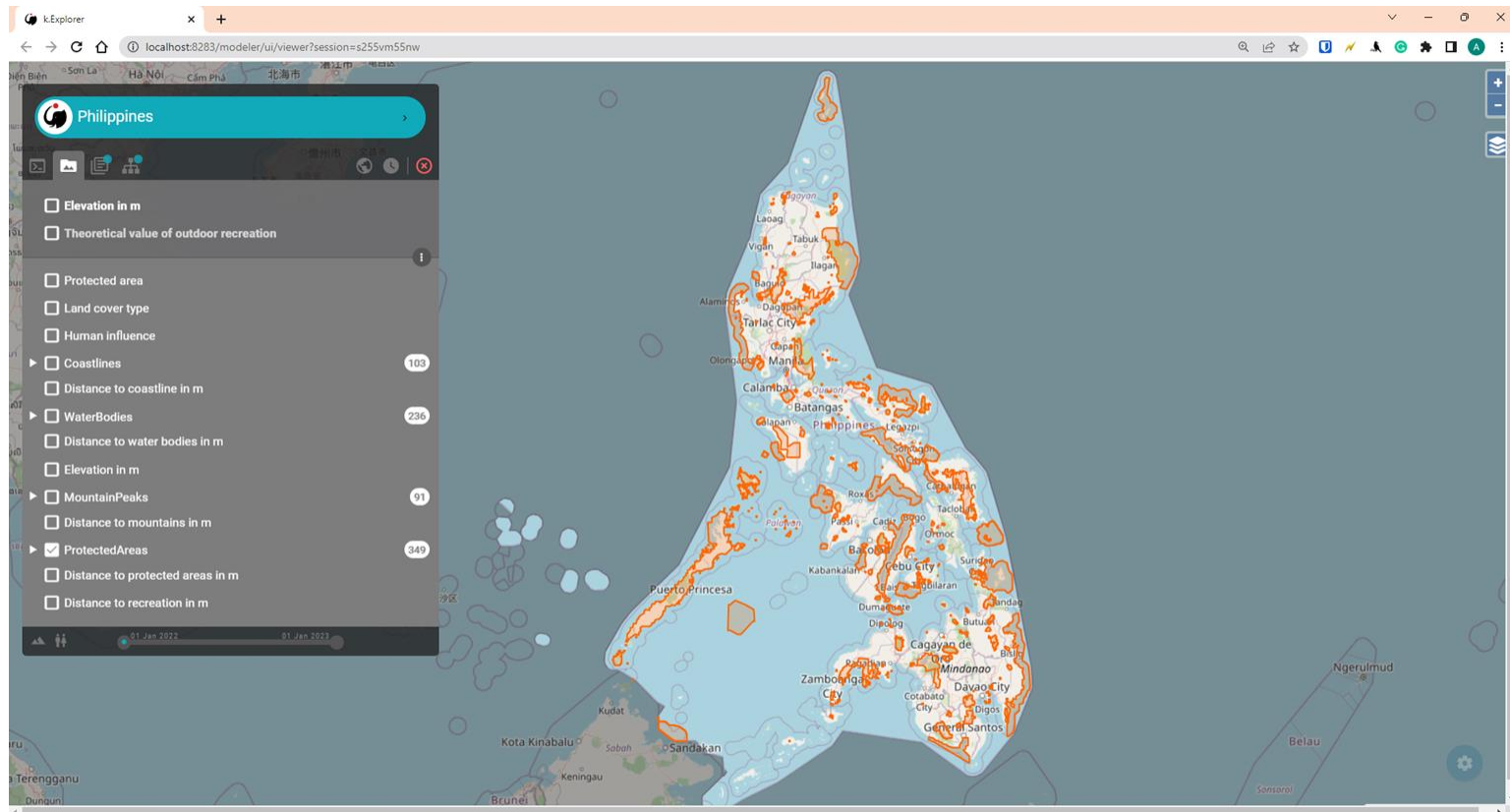
Press Enter to start the computation



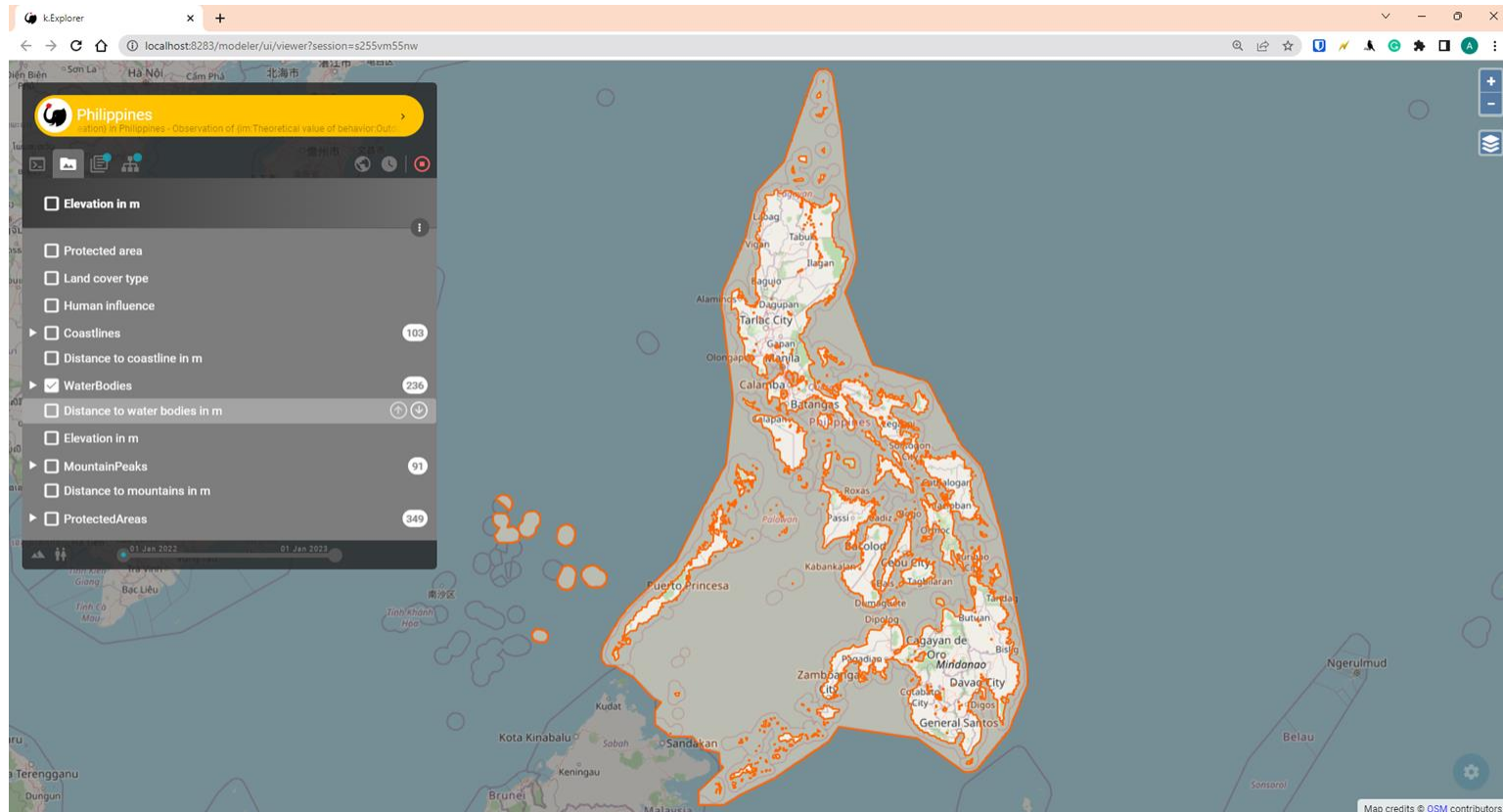
as intermediate outputs are computed they are listed



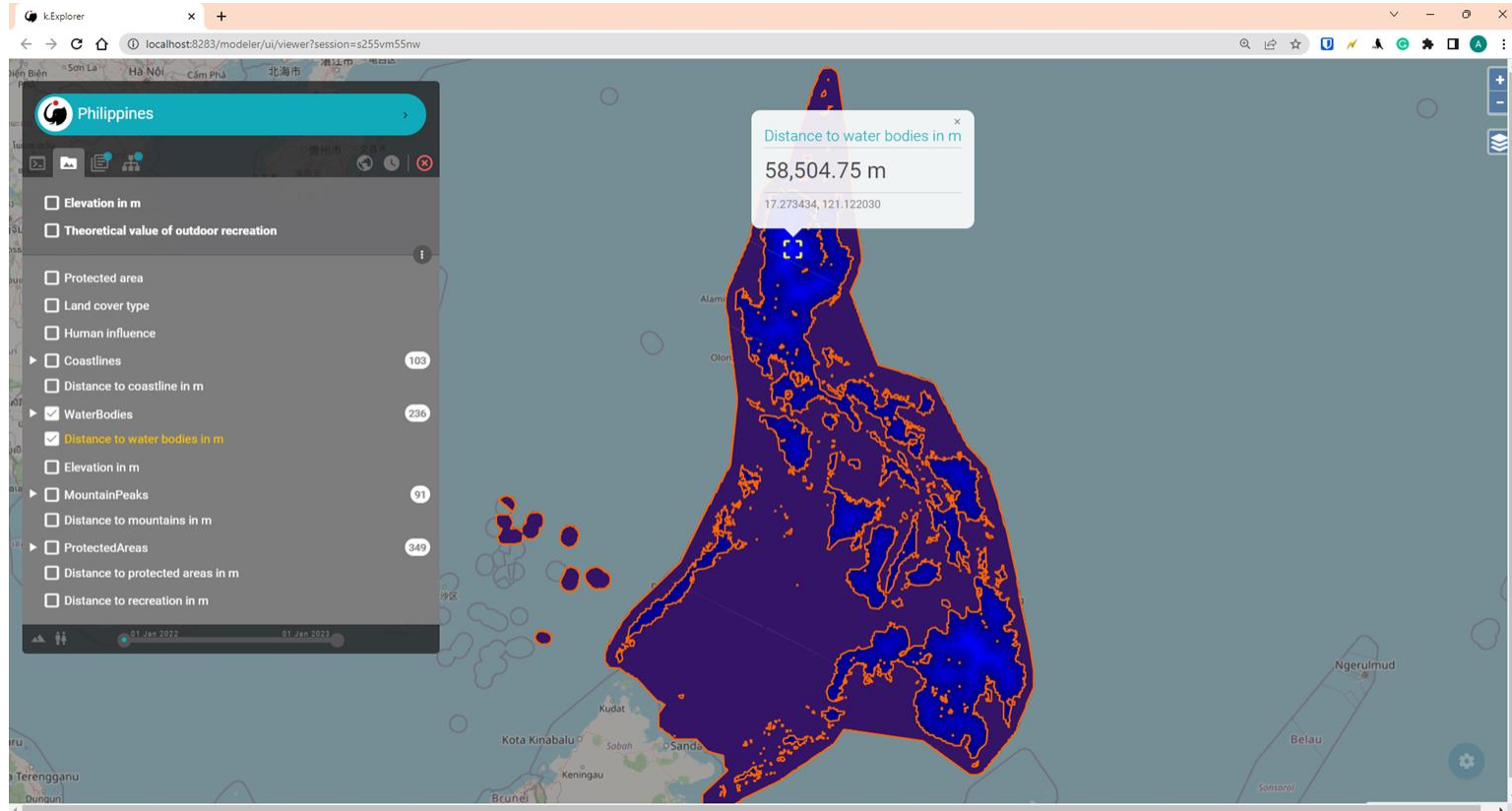
maps can be result of vectorial information



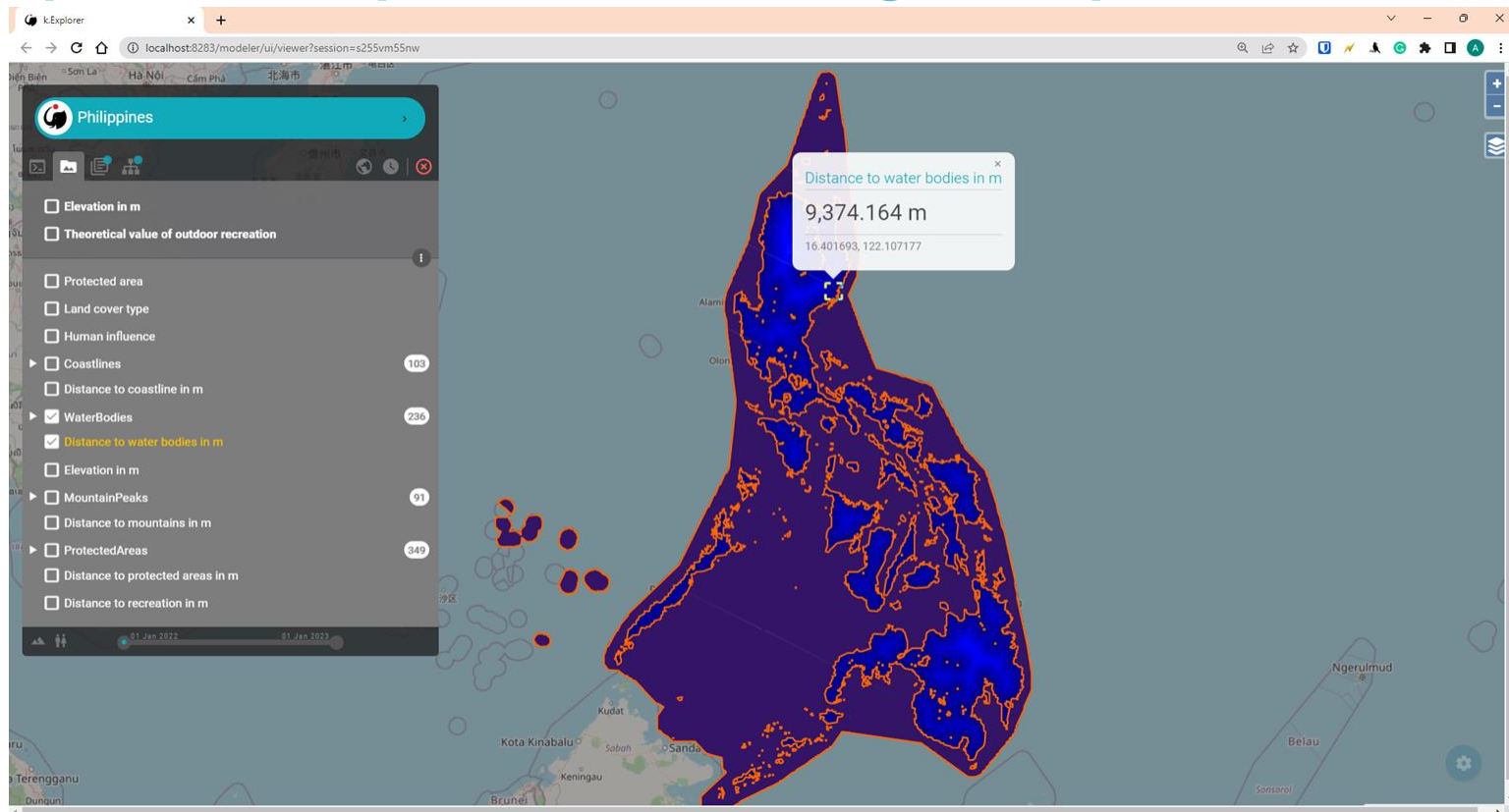
example of the vector map (basic input – original layer)



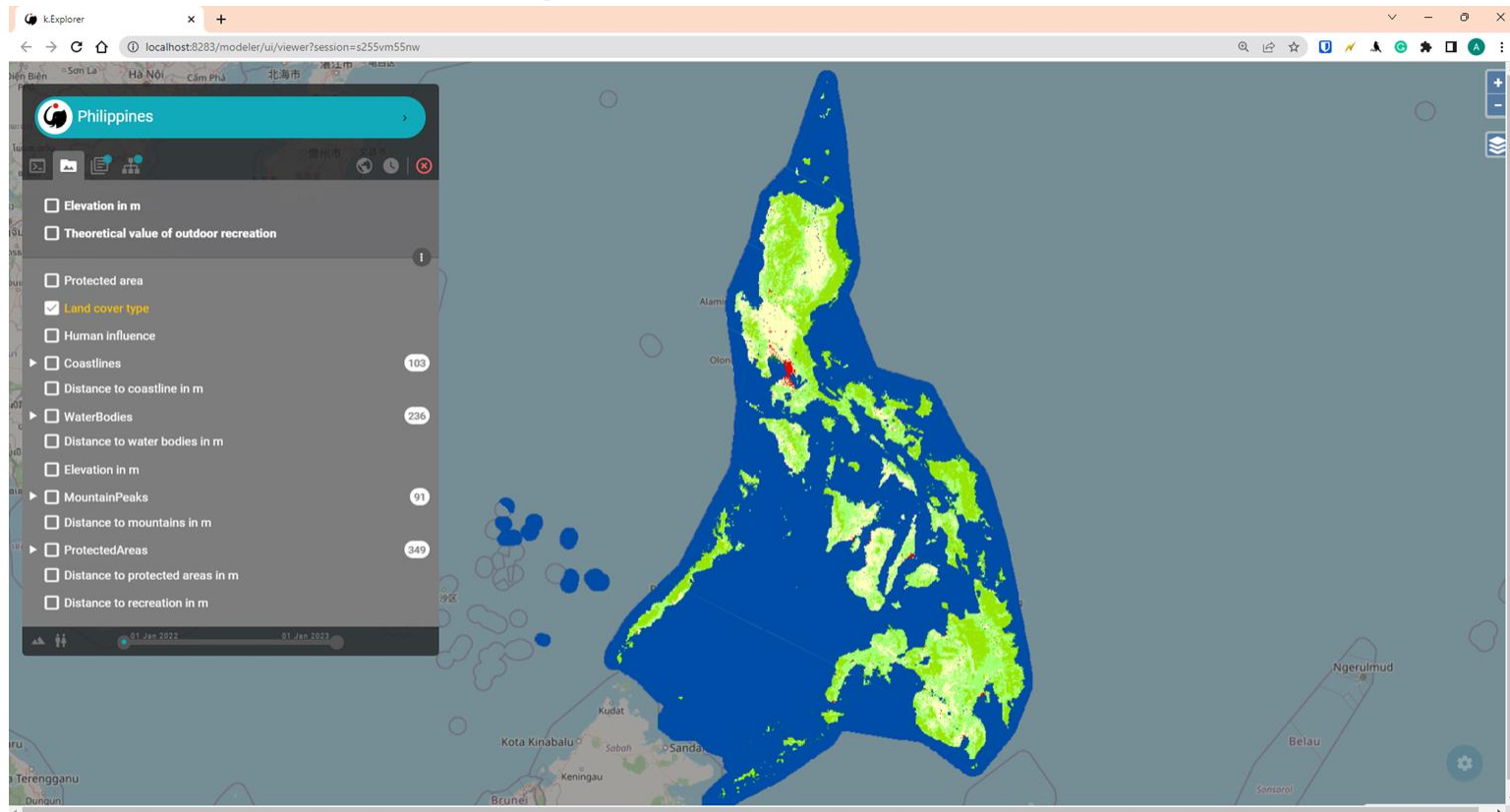
example of a map built on the original layer



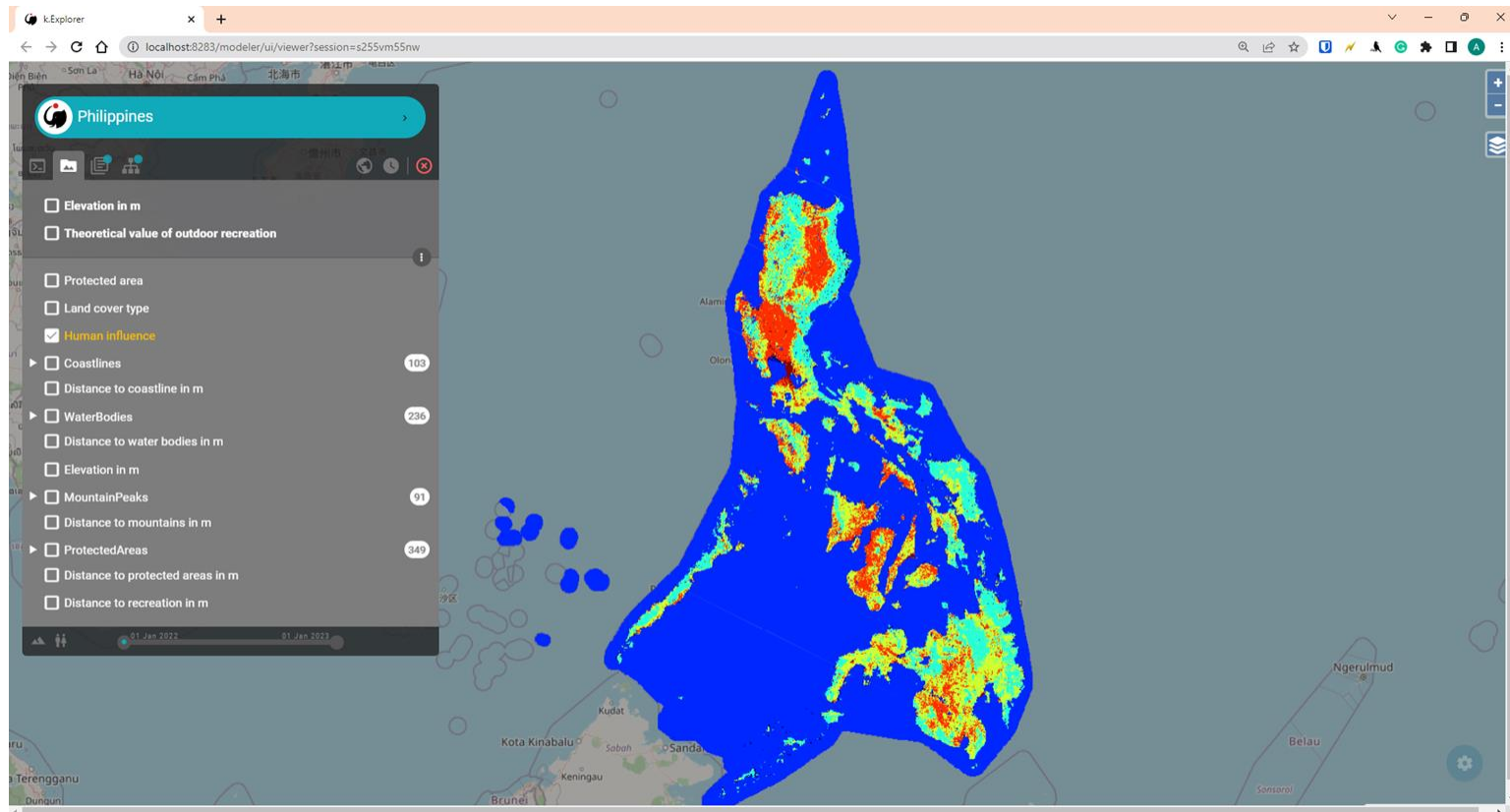
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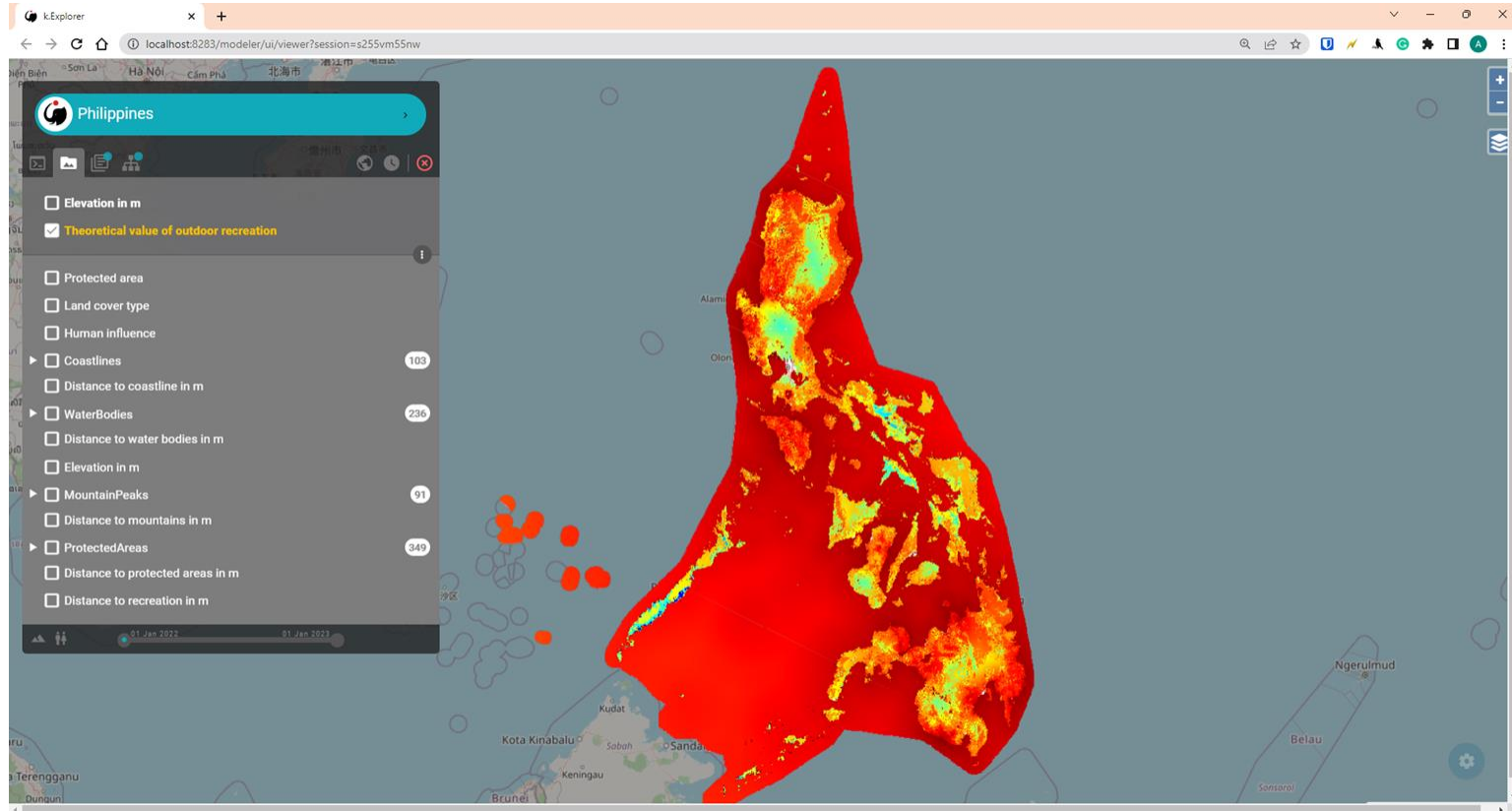
maps can carry ecological information



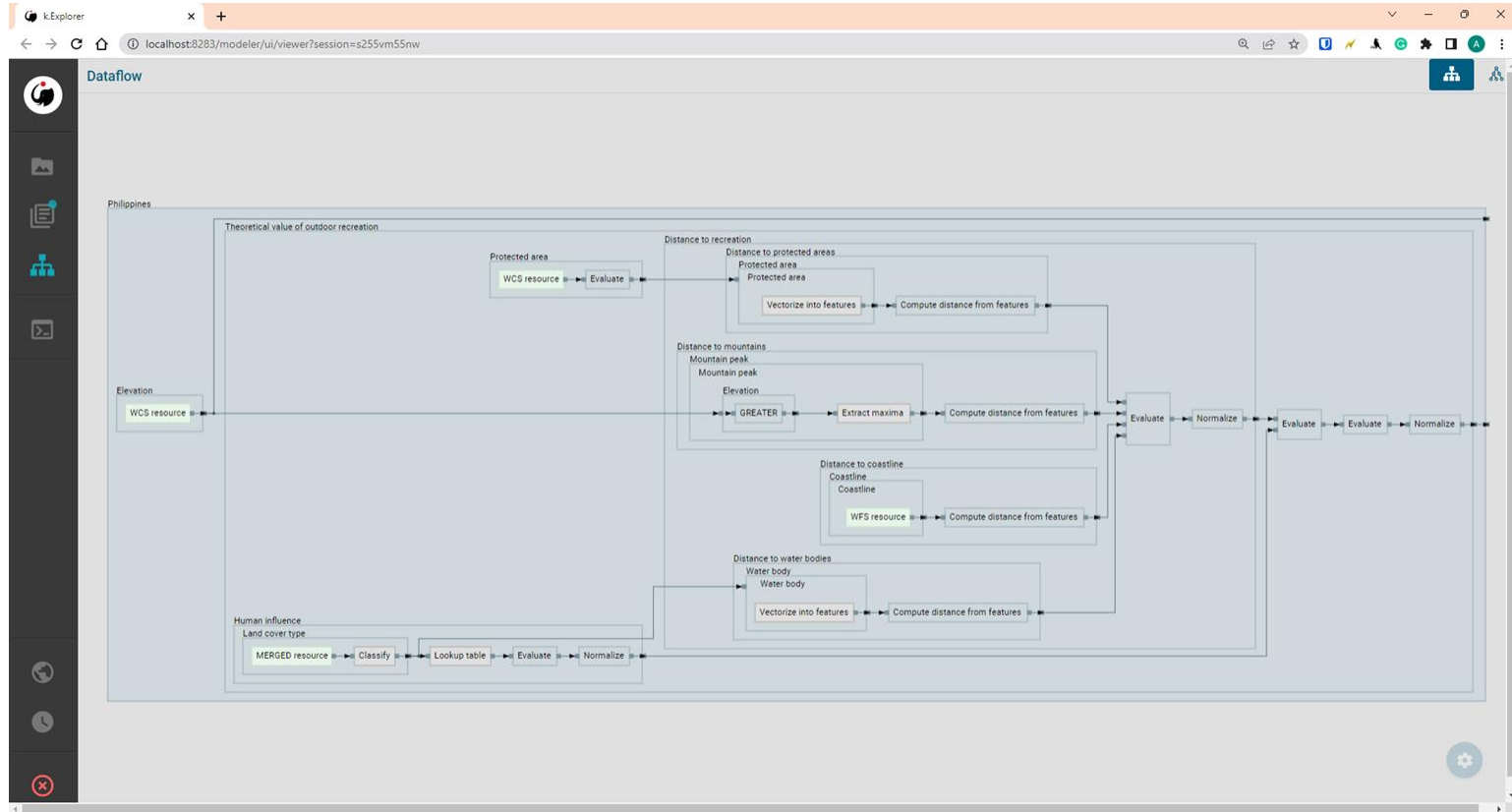
as well as social and economic components



map of the final output



the dataflow section showing the modelling “strategy”



data documentation

The screenshot shows the k.Explorer web interface. The main workspace is titled "Dataflow" and contains a diagram with a central box labeled "WCS resource" (highlighted in green) and a larger box labeled "Protected area" (highlighted in grey). An arrow points from the "WCS resource" box to the "Protected area" box. On the right side, a metadata panel is open, displaying information for a resource titled "im-data-global-conservation.wdpa_250m_2021".

Protected area

WCS resource

im-data-global-conservation.wdpa_250m_2021

This processing step retrieves the contents of a data or model resource from the semantic web. Resources can be data files, data services (using protocols such as OGC or OpenDAP), or may interface to more complex computations or running simulations.

Resources are identified by a unique Uniform Resource Name (URN) used together with the scale of observation to retrieve data or trigger computation. Metadata and provenance records associated with this resource are shown below.

Title
Protected Areas: Terrestrial, Coastal and Marine

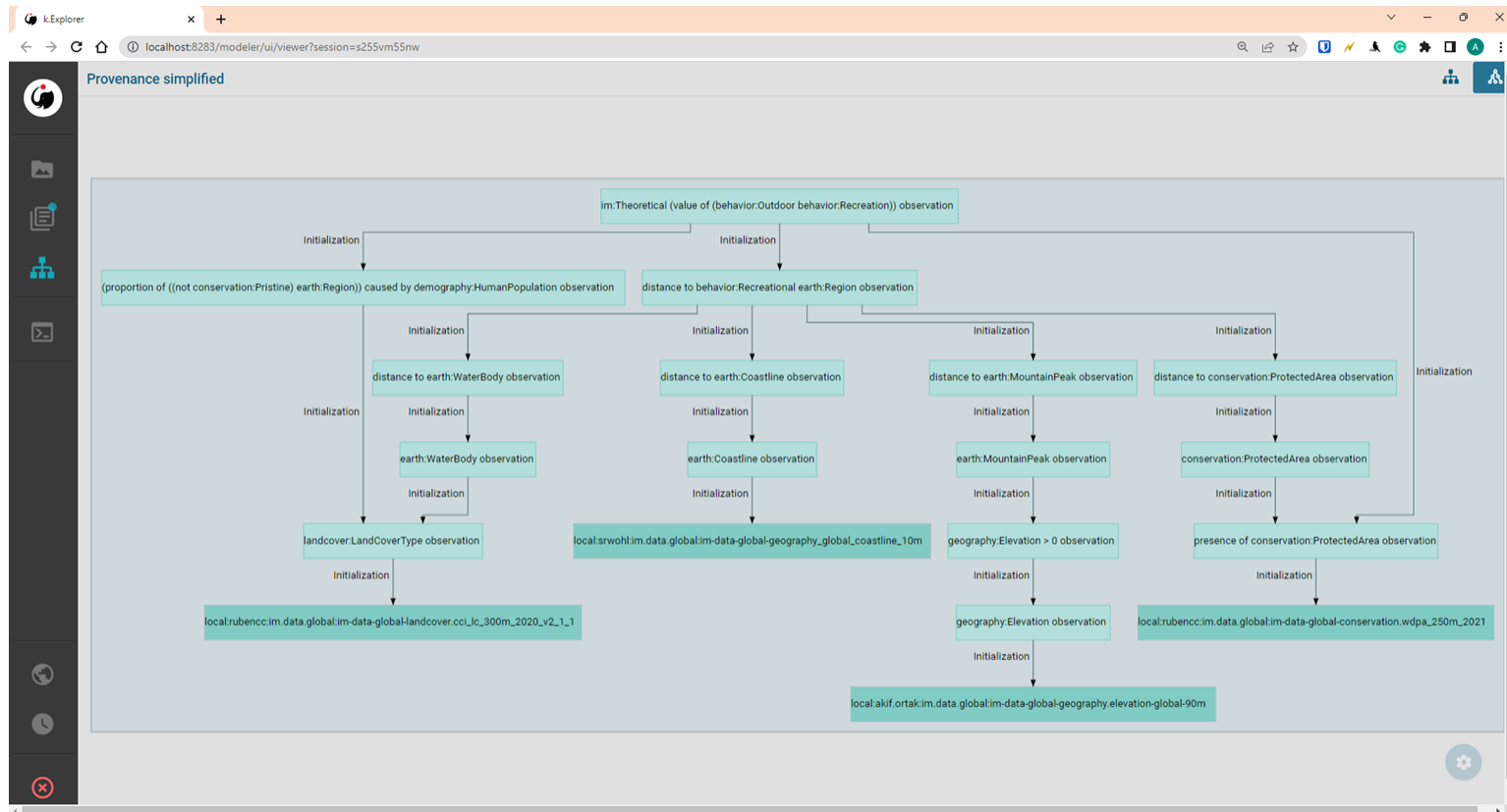
Originator

Description
Raster (GeoTIFF) derived from the Vectors May 20 21 Geopackage data accessed from the Protected Planet web site. There are three classes: Terrestrial = 0 Coastal = 1 Marine = 2 and no data is 9

URL
<https://www.protectedplanet.net/en/thematic-areas/wdpa/tab-WDPA>

Keywords
protected, marine, coast, terrestrial

simplified data provenance section



automatically generated report

The screenshot shows a web browser window with the following content:

- Browser Address Bar:** localhost:8283/modeler/ui/viewer?session=s255vm55nw
- Table of Contents (Left Sidebar):**
 - 1. Introduction
 - 2. Methods
 - 3. Results
 - 4. Discussion
 - 5. References cited
- Main Content:**
 - ## 1. Introduction
 - ### Global supply-demand ecosystem service models for ARIES

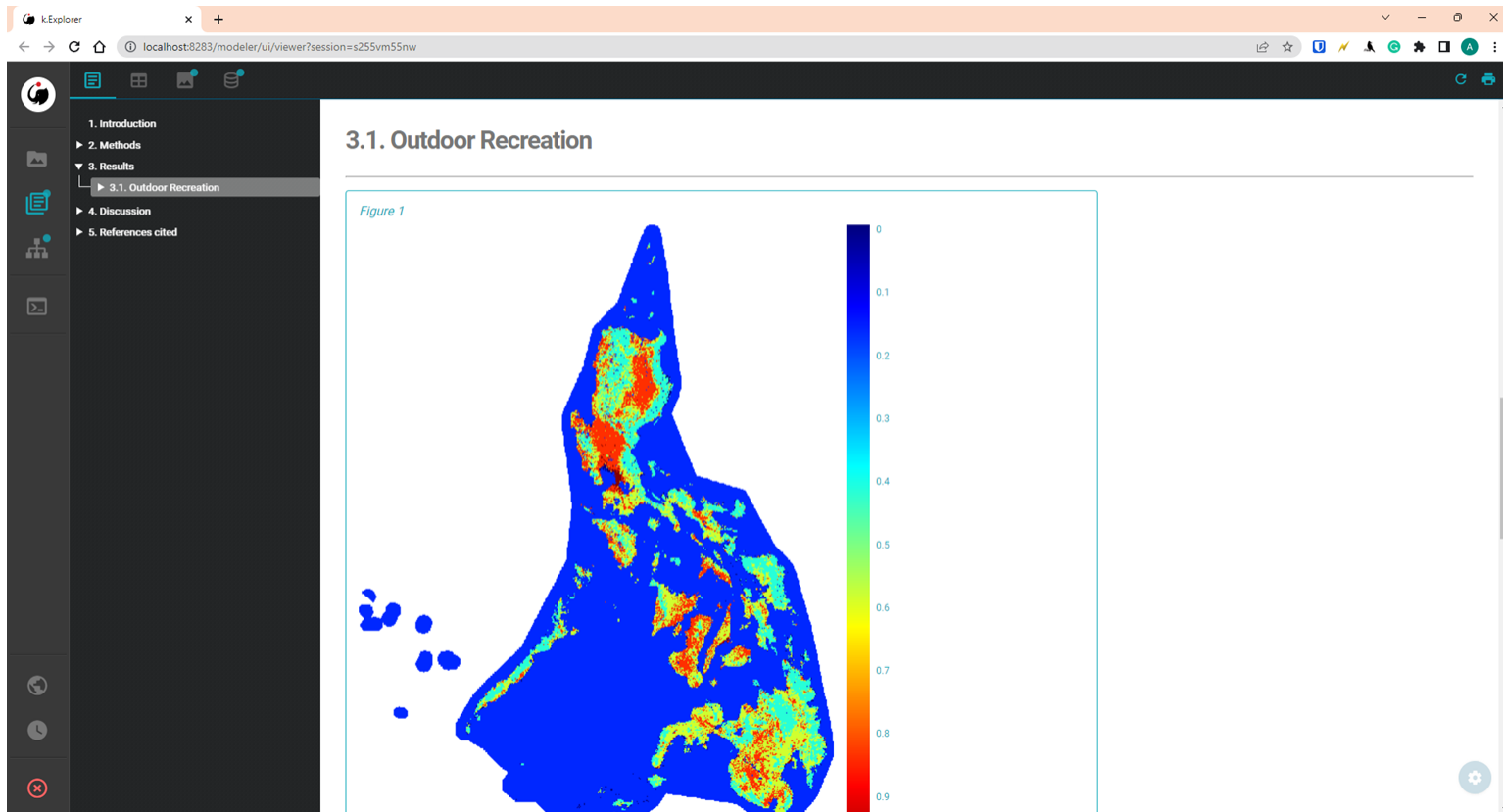
The baseline modeling of ecosystem services (ES) supply and demand is conducted in ARIES using a suite of logical statements, data, and models that are used when not enough information is available to build more detailed, dynamic flow models. The models built by ARIES using such statements have, in general, similar resolution and conceptual detail as those available in other ES assessment toolkits such as INVEST or ESTIMAP. They can run anywhere in the world with no user input (using global data and parameters), while offering the option to easily customize models with context-specific data and parameters. This approach enables rapid ES quantification, as models are automatically adapted to the application context and run using the best available data for the context. The models use publicly available global- and continental-scale data as defaults. Advanced users can modify data input requirements, model parameters, or entire model structures to capitalize on high-resolution data and context-specific model formulations.
 - ### Recreation models

The recreation models are inspired by the ESTIMAP model of nature-based outdoor recreation developed by Paracchini et al. (2014) for Europe. ARIES calculates supply and demand using ranked values, which are relative to the context of the analysis. In the simplest version without customization, recreation supply is seen as a multiplicative function of naturalness and the distance-driven accessibility of nature-based factors of attractiveness, computed as Euclidean distance to protected areas, mountain peaks, coastline and water bodies (including rivers, lakes and oceans). The model computes the proportion of human-impacted naturalness as a reclassification of land cover types. Recreation demand is an additive function of population density, and distance to main cities combined with travel time. Values are generated combining supply and demand with different methods including a net balance, to identify surplus and deficit hotspots, and multiplicative function that estimates relative number of trips.
 - ## 2. Methods
 - ### 2.1. Outdoor Recreation

The proportion of **naturalness impacted by human activities** (so-called *hemeroby*) is computed as a reclassification of land cover type. The method is based on the look-up table published by Paracchini et al.¹.

landcover	hemeroby
landcover:ArtificialSurface	7
landcover:Vineyard	4
landcover:FruitAndBerryPlantation	5
landcover:OliveGrove	4

summarizes all information



as well as detailed descriptions of the datasets used

The screenshot shows a web browser window with the URL `localhost:8283/modeler/ui/viewer?session=s255vm55nw`. The application interface includes a dark sidebar on the left with navigation icons and a main content area with two dataset cards.


Global elevation data
 Protected Areas: Terrestrial, Coastal and Marine
 1:10 m coastline vector data; Natural Earth

Global elevation data
 NCEAS Environment and Organisms (ENO) Working Group

Geography/Global/SRTM/ASTER/DEM/Elevation

SRTM digital elevation models (DEMs) were previously available only between 60 degrees N-60 degrees S latitude. This limited the ability to run elevation and slope-dependent models in the northern polar regions. EarthEnv developed a 90 m DEM compatible with previous SRTM data and covering latitudes between 83 degrees N-S.

Robinson, N., Regetz, J., and Guralnick, R. P. (2014). EarthEnv-DEM90: A nearly-global, void-free, multi-scale smoothed, 90m digital elevation model from fused ASTER and SRTM data. *ISPRS Journal of Photogrammetry and Remote Sensing*, 87,2014, 57-67. Available at <http://www.sciencedirect.com/science/article/pii/S0924271613002360>.




Robinson, N., Regetz, J., Guralnick, R. P.
 Robinson, N., Regetz, J., and Guralnick, R. P. (2014). EarthEnv-DEM90: A nearly-global, void-free, multi-scale smoothed, 90m digital elevation model from fused ASTER and SRTM data. *ISPRS Journal of Photogrammetry and Remote Sensing*, 87,2014, 57-67. Available at <http://www.sciencedirect.com/science/article/pii/S0924271613002360>.

<https://www.earthenv.org/DEM>

Protected Areas: Terrestrial, Coastal and Marine

Conservation/Global/protected/marine/coast/terrestrial

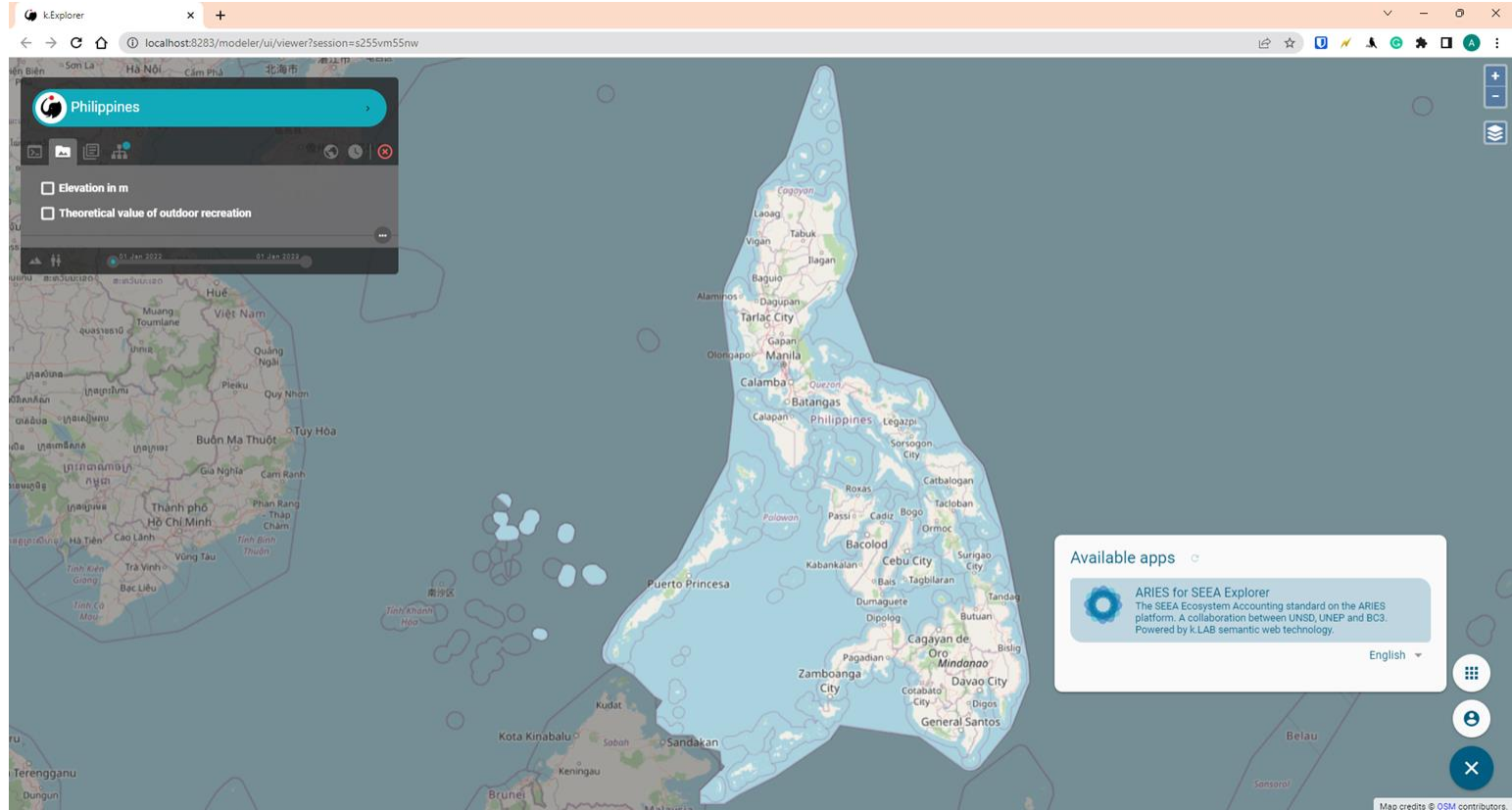
Raster (GeoTIFF) derived from the Vectors May 2021 Geopackage data accessed from the Protected Planet web site. There are three classes: Terrestrial = 0 Coastal = 1 Marine =2 and no data is 9



<https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA>

1:10 m coastline vector data; Natural Earth

ARIES for SEEA application



ARIES for SEEA application

ARIES for SEEA Explorer Beta

The SEEA Ecosystem Accounting standard on the ARIES platform. A collaboration between UNSD, UNEP and BC3. Powered by k.LAB semantic web technology.

Other SEEA-related indicators News User guide About

Context: where and when

Region of interest

Map boundaries m

Years To

Study setup

- Extent accounts
- Condition accounts
- Ecosystem services accounts physical
- Ecosystem services accounts monetary

Spatial and temporal aggregation

Key SEEA outputs

Maps Tables Comments

Philippines

- Elevation in m
- Theoretical value of outdoor recreation

01 Jan 2022 01 Jan 2023

Map credits © OSM contributors.

ARIES for SEEA application

The screenshot shows the ARIES for SEEA Explorer web application. The interface is divided into several sections:

- Navigation:** A top navigation bar includes 'Other SEEA-related indicators', 'News', 'User guide', and 'About'. A secondary navigation bar on the right contains icons for home, list, and user profile.
- Context: where and when:** A section for defining the region of interest, including 'Map boundaries' (set to 300 m), 'Years' (2012 to 2019), and a 'Study setup' section.
- Extent accounts:** A list of checkboxes for various extent accounts, such as 'net balance', 'additions and reductions', and 'change matrix' for ecosystem, land, and land cover types.
- Condition accounts:** A section for selecting condition accounts, including 'Ecosystem services accounts physical' and 'monetary'.
- Spatial and temporal aggregation:** A section for defining spatial and temporal aggregation parameters.
- Key SEEA outputs:** A section for selecting key SEEA outputs.
- Map:** A central map of the Philippines with a highlighted region of interest. A right-hand panel shows settings for 'Philippines', including 'Elevation in m' and 'Theoretical value of outdoor recreation'. A timeline at the bottom of the panel shows the period from 01 Jan 2022 to 01 Jan 2023.
- Footer:** A footer at the bottom right of the map area reads 'Map credits © OSM contributors.'

ARIES for SEEA application

The screenshot shows the ARIES for SEEA Explorer web application. The interface is divided into several sections:

- Context: where and when:** Includes a 'Region of interest' section with a 'Map boundaries' dropdown, a lock icon, a value of '300', and a unit of 'm'. Below this are 'Years' fields set to '2012' and '2019' with a checked 'To' box.
- Study setup:** A section for configuring the study parameters.
- Extent accounts:** A section for defining the extent of the accounts.
- Condition accounts:** A section for defining the conditions of the accounts.
- Metrics (choose one or more):** A section for selecting metrics, including 'Forest condition metrics'.
- Output tables:** A section for selecting output tables, including 'Ecosystem condition variable account', 'Ecosystem condition indicator account', and 'Ecosystem condition index simplified'.
- Ecosystem services accounts:** A section for selecting ecosystem services accounts, including 'physical' and 'monetary'.
- Spatial and temporal aggregation:** A section for selecting spatial and temporal aggregation options.
- Key SEEA outputs:** A section for selecting key SEEA outputs.

The main map area displays a map of the Philippines with a region of interest highlighted in blue. The control panel on the right shows 'Philippines' selected, with options for 'Elevation in m' and 'Theoretical value of outdoor recreation'. The browser address bar shows 'localhost:8283/modeler/ui/viewer?session=s255vm55nw'.

ARIES for SEEA application

ARIES for SEEA Explorer Beta

The SEEA Ecosystem Accounting standard on the ARIES platform. A collaboration between UNSD, UNEP and BC3. Powered by k.LAB semantic web technology.

Other SEEA-related indicators News User guide About

Context: where and when

Region of interest

Map boundaries m

Years To To

Study setup

Extent accounts

Condition accounts

Ecosystem services accounts physical

- Crop provisioning: ecosystem contribution
- Crop provisioning: pollination contribution
- Global climate regulation: C storage
- Sediment regulation: soil erosion control
- Recreation: nature-based tourism

Ecosystem services accounts monetary

Spatial and temporal aggregation

Key SEEA outputs

Maps Tables Comments

Philippines

- Elevation in m
- Theoretical value of outdoor recreation

Map credits © OSME contributors.

ARIES for SEEA application

ARIES for SEEA application

The screenshot displays the ARIES for SEEA Explorer web application. The main interface features a map of the Philippines with a pop-up window titled "Additional SEEA-related indicators". The pop-up window contains a list of indicators with checkboxes:

- CBD 2050 (Goal A)
- CBD 2050 (Goal b)
- CBD 2030 (Target B)
- SDG 15
 - SDC 15.4.2: Mountain Green Cover Index

The interface also includes a sidebar with various settings and options:

- Context: where and when**
 - Region of Interest**: Map boundaries, 300 m
 - Years: 2012 To 2019
- Study setup**
- Extent accounts**
- Condition accounts**
- Ecosystem services accounts physical**
- Ecosystem services accounts monetary**
- Spatial and temporal aggregation**
- Key SEEA outputs**

At the bottom of the sidebar, there are buttons for **Maps**, **Tables**, and **Comments**. The top navigation bar includes "Other SEEA-related indicators", "News", "User guide", and "About".

ARIES for SEEA application

ARIES for SEEA Explorer Beta

The SEEA Ecosystem Accounting standard on the ARIES platform. A collaboration between UNSD, UNEP and BC3. Powered by k.LAB semantic web technology.

Context: where and when

Region of Interest

Map boundaries m

Years To

Study setup

Extent accounts

Condition accounts

Ecosystem services accounts physical

Ecosystem services accounts monetary

Additional SEEA indicators

SDC 15.4.2: Mountain Green Cover Index

Spatial and temporal aggregation

Key SEEA outputs

Maps Tables Comments

Other SEEA-related indicators News User guide About

Philippines

Additional SEEA-related indicators

- CBD 2050 (Goal A)
- CBD 2050 (Goal b)
- CBD 2030 (Target B)
- SDG 15
 - SDC 15.4.2: Mountain Green Cover Index

CLOSE

Map credits © OSM contributors

ARIES for SEEA application

ARIES for SEEA application

ARIES for SEEA Explorer Beta

The SEEA Ecosystem Accounting standard on the ARIES platform. A collaboration between UNSD, UNEP and BC3. Powered by k.LAB semantic web technology.

Other SEEA-related indicators News User guide About

Context: where and when

Region of interest

Map boundaries m

Years To

Study setup

Extent accounts

Condition accounts

Ecosystem services accounts physical

Ecosystem services accounts monetary

Additional SEEA indicators

SDC 15.4.2: Mountain Green Cover Index

Spatial and temporal aggregation

Key SEEA outputs

Philippines

- Elevation in m
- Theoretical value of outdoor recreation
- Protected area
- Land cover type
- Human influence
- Coastlines
- Distance to coastline in m
- WaterBodies
- Distance to water bodies in m
- Elevation in m
- MountainPeaks
- Distance to mountains in m
- ProtectedAreas
- Distance to protected areas in m
- Distance to recreation in m
- Mountain presence
- Landcover type mountain
- Mountain presence with vegetation
- Slope in deg
- Slope in radians
- Mountain morphology type

103

236

91

349

01 Jan 2022 01 Jan 2023

Map credits © OSM contributors.

ARIES for SEEA application

The screenshot displays the ARIES for SEEA Explorer web application. The browser address bar shows the URL: localhost:8283/modeler/ui/viewer?session=s255vm55nw. The application header includes the logo, title "ARIES for SEEA Explorer [Beta]", and a subtitle: "The SEEA Ecosystem Accounting standard on the ARIES platform. A collaboration between UNSD, UNEP and BC3. Powered by k.LAB semantic web technology." Navigation links for "Other SEEA-related indicators", "News", "User guide", and "About" are present.

The interface is divided into several sections:

- Context: where and when:**
 - Region of interest:** "Philippines" (selected), "Map boundaries" (dropdown), "300" (value), "m" (unit).
 - Years:** "2012" (start), "2019" (end), with a checked "To" box.
- Study setup:**
 - Extent accounts
 - Condition accounts
 - Ecosystem services accounts physical
 - Ecosystem services accounts monetary
 - Additional SEEA indicators: "SDC 15.4.2: Mountain Green Cover Index" (checked).
- Spatial and temporal aggregation:** (dropdown menu)
- Key SEEA outputs:** (dropdown menu)

A central panel on the left lists various indicators with checkboxes:

- Elevation in m
- Theoretical value of outdoor recreation
- Protected area
- Land cover type
- Human influence
- Coastlines
- Distance to coastline in m
- WaterBodies
- Distance to water bodies in m
- Elevation in m
- MountainPeaks
- Distance to mountains in m
- ProtectedAreas
- Distance to protected areas in m
- Distance to recreation in m
- Mountain presence
- Landcover type mountain
- Mountain presence with vegetation
- Slope in deg
- Slope in radians
- Mountain morphology type

The main map area shows the Philippines with red-shaded regions representing the selected indicator. The map includes labels for various cities and regions like Alaminos, Bac, Bogo, Zamboanga, and Sandakan. A legend at the bottom right of the map area reads "Map credits © OSM contributors." The bottom of the interface has buttons for "Maps", "Tables", and "Comments".

ARIES for SEEA application

The screenshot displays the ARIES for SEEA Explorer web application. The interface includes a navigation menu on the left with sections like 'Context: where and when', 'Study setup', 'Extent accounts', 'Condition accounts', 'Ecosystem services accounts physical', 'Ecosystem services accounts monetary', and 'Additional SEEA indicators'. The 'Additional SEEA indicators' section has a checkbox for 'SDC 15.4.2: Mountain Green Cover Index' which is checked.

The main content area features a map of the Philippines with a red overlay representing the Mountain Green Cover Index. A pop-up window for 'Philippines' provides the following details:

- Mountain presence with vegetation:** A slider control is visible.
- Grid size:** 656600 (700 x 938) cells
- Cell size:** 2,023.125 x 2,006.401 m
- Temporal transitions:** Sat Jan 01 01:00:00 CET 2022
- Total area:** 1,007,509.642 km²

At the bottom of the pop-up, a legend shows a red bar and a blue bar, with the text 'Not present' below them. The map interface also includes a 'Maps' button, a 'Tables' button, and a 'Comments' button at the bottom left. The top right corner contains navigation links for 'Other SEEA-related indicators', 'News', 'User guide', and 'About'.

ARIES for SEEA application

The screenshot displays the ARIES for SEEA Explorer web application. The browser address bar shows the URL: localhost:8283/modeler/ui/viewer?session=s255vm55nw. The application title is "ARIES for SEEA Explorer" with a "Beta" badge. Below the title is a subtitle: "The SEEA Ecosystem Accounting standard on the ARIES platform. A collaboration between UNSD, UNEP and BC3. Powered by k.LAB semantic web technology." Navigation links include "Other SEEA-related indicators", "News", "User guide", and "About".

The interface is divided into several sections:

- Context: where and when:** Includes "Region of interest" (set to Philippines), "Map boundaries" (set to 300 m), and "Years" (set to 2012 to 2019).
- Study setup:** Lists various account types such as "Extent accounts", "Condition accounts", "Ecosystem services accounts physical", and "Ecosystem services accounts monetary".
- Additional SEEA indicators:** A checkbox for "SDC 15.4.2: Mountain Green Cover Index" is checked.
- Key SEEA outputs:** Includes buttons for "Maps", "Tables", and "Comments".

The main map area shows the Philippines with a red overlay representing the Mountain Green Cover Index. A sidebar on the left provides details for the selected indicator:

- Indicator:** Mountain presence with vegetation
- Grid size:** 656600 (700 x 938) cells
- Cell size:** 2,023.125 x 2,006.401 m
- Temporal transitions:** Sat Jan 01 01:00:00 CET 2022
- Total area:** 1,007,509.642 km²

At the bottom of the sidebar, there is a legend for "Present" with a red color swatch. The map includes a scale bar and a "Beta" logo in the bottom right corner.

ARIES for SEEA application

The screenshot displays the ARIES for SEEA Explorer web application. The interface includes a navigation menu on the left with sections for 'Context: where and when', 'Study setup', 'Extent accounts', 'Condition accounts', 'Ecosystem services accounts physical', 'Ecosystem services accounts monetary', 'Additional SEEA indicators', 'Spatial and temporal aggregation', and 'Key SEEA outputs'. The 'Additional SEEA indicators' section is active, showing 'SDC 15.4.2: Mountain Green Cover Index' with a green checkmark. The main map area shows the Philippines with a red overlay representing the Mountain Green Cover Index. A sidebar on the left of the map provides details for the selected region: 'Philippines', 'Mountain presence with vegetation' (checked), 'Grid size: 656600 (700 x 938) cells', 'Cell size: 2,023.125 x 2,006.401 m', 'Temporal transitions: Sat Jan 01 01:00:00 CET 2022', and 'Total area: 1,007,509.642 km2'. The bottom of the interface features 'Maps', 'Tables', and 'Comments' buttons, along with a 'Beta' badge and a 'Map credits © DSM contributors' notice.

ARIES for SEEA application

The screenshot shows the ARIES for SEEA Explorer web application. The interface includes a sidebar with various settings and a main map area. A modal window titled "ARIES for SEEA user guide" is overlaid on the map, displaying the following content:

ARIES for SEEA user guide

I. The ARIES for SEEA application

The ARIES for SEEA Explorer is a web-based application built on the k.LAB Integrated Modelling Platform. The application has access to all information (data and models) available on the Integrated Modelling network, and provides a dedicated user interface to easily compile accounts within the UN System of Environmental-Economic Accounting (SEEA).

ARIES for SEEA can also be accessed via software download for recurrent users, for better performance in terms of speed and computation capacity. More info at: <https://integratedmodelling.org/getting-started/>

1.1 Spatial and temporal context of the analysis

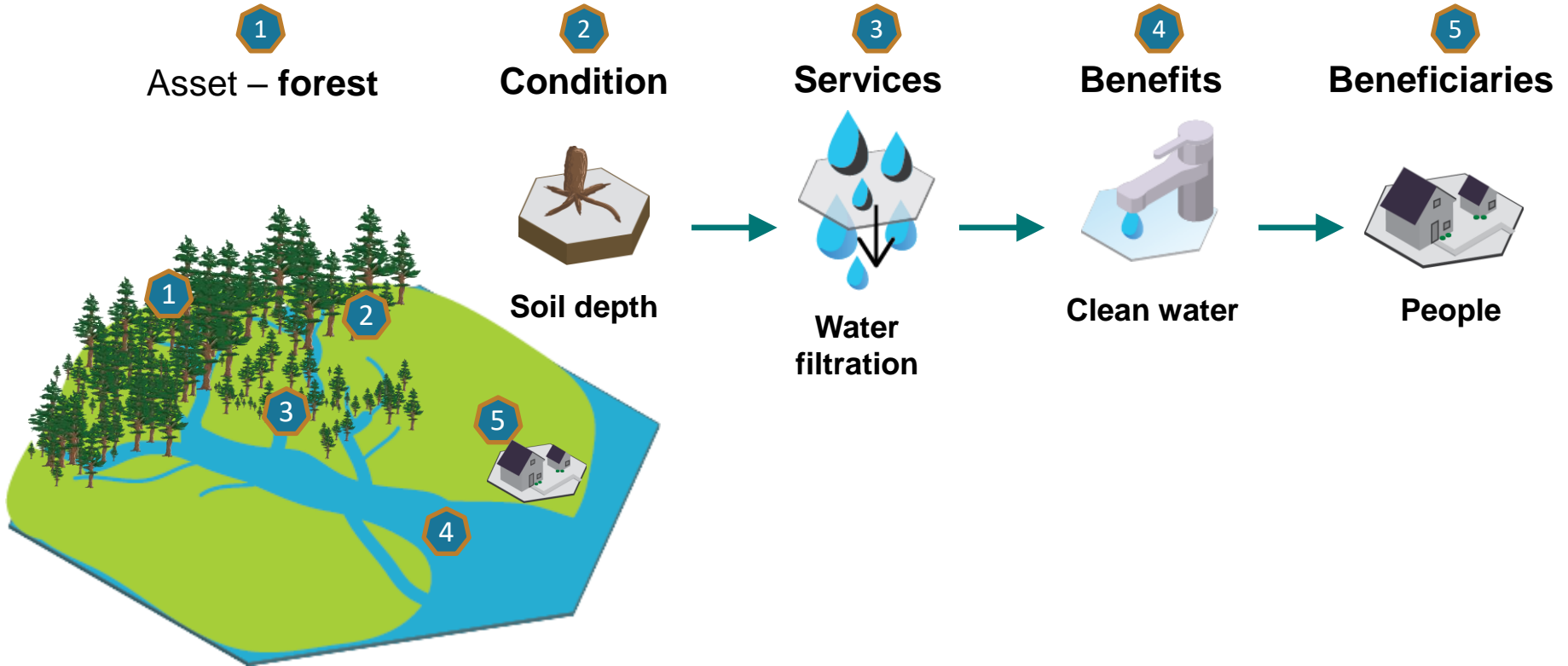
At the top of the menu on the left side of the screen, you can specify the geographic area and temporal and spatial scale.

1.1.1 Where

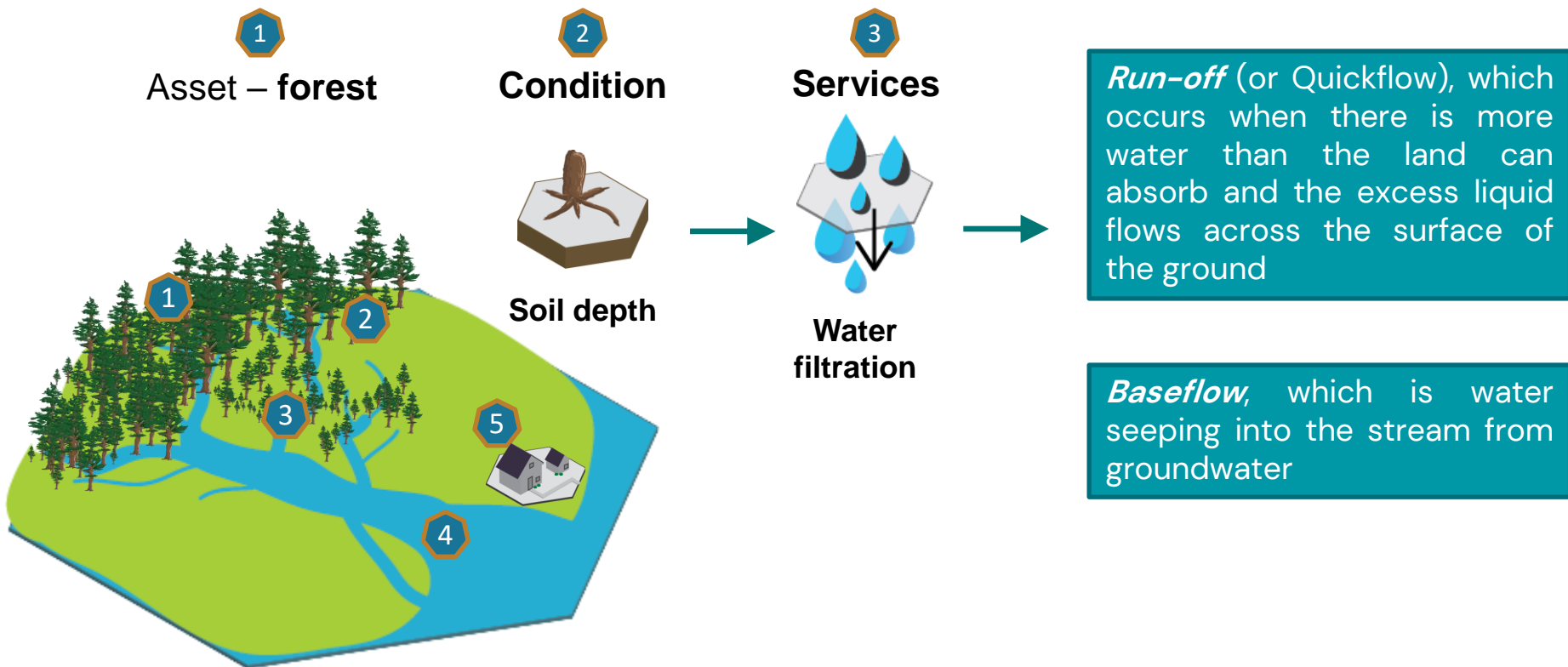
At the top of the panel, there a drop-down menu provides three options to select an analysis context by zooming and panning on the map. When the "administrative regions" or "river basin" option is chosen, the currently highlighted context will be outlined in light blue.

The background interface shows a sidebar with settings for "Context: where and when", "Region of Interest" (Map boundaries, 300 m, 2012-2019), "Study setup", "Extent accounts", "Condition accounts", "Ecosystem services accounts physical", "Ecosystem services accounts monetary", "Additional SEEA indicators" (SDC 15.4.2: Mountain Green Cover Index), "Spatial and temporal aggregation", and "Key SEEA outputs". The main map area displays a map of the Philippines with a highlighted region.

SEEA EA Framework – Illustrative Example



SEEA EA Framework – Illustrative Example



SEEA EA and SDGs

- SDG 15.1.1: Forest area as a proportion of total land area
- SDG 15.3.1: Proportion of land that is degraded over total land area



- SDG 6.6.1: Change in the extent of water related ecosystems over time



- SDG 11.7.1: Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities

Using the SEEA EA for Calculating Selected SDG Indicators

Report of the NCAVES Project





k.LAB

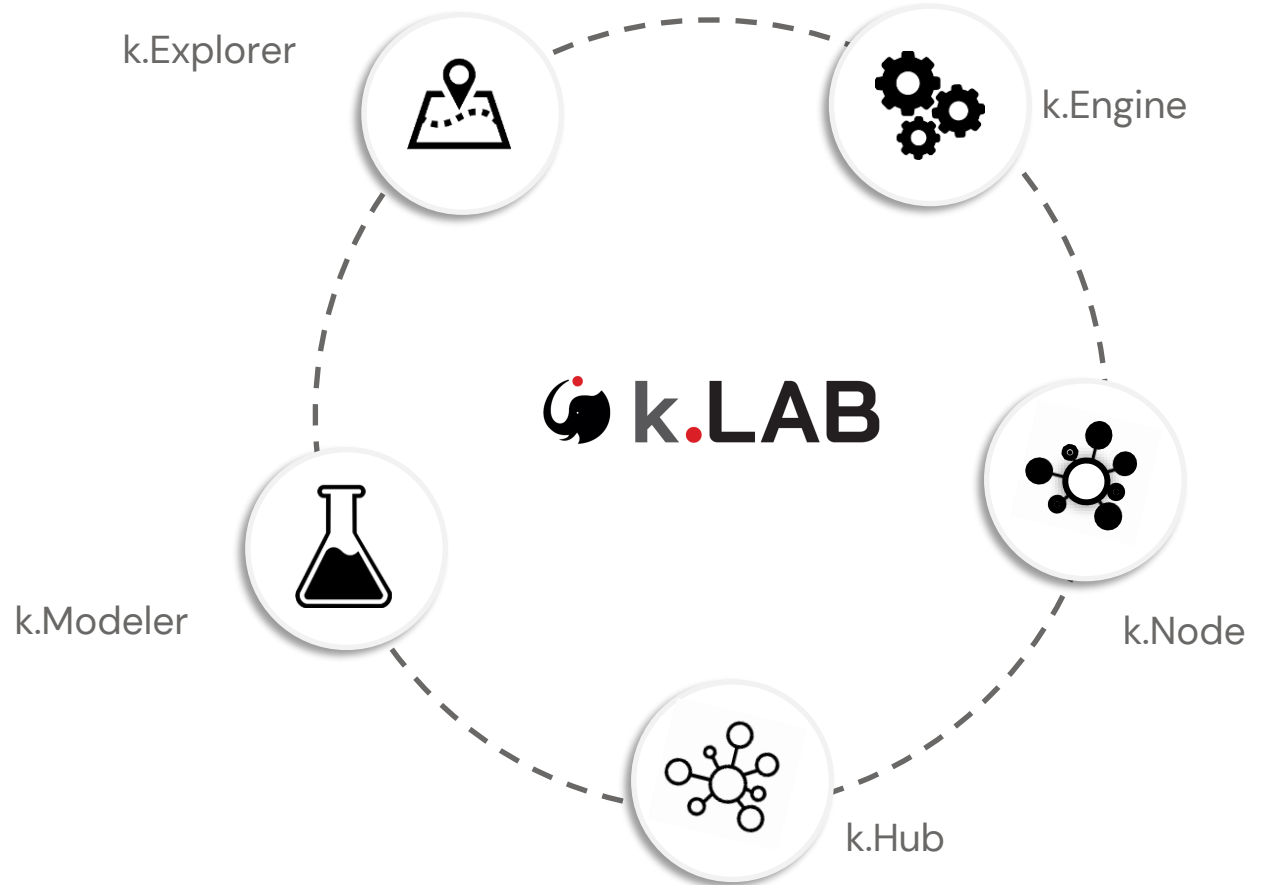
The knowledge laboratory



A semantic web for sustainability: revolutionizing how we write, find, link and reuse data and models.

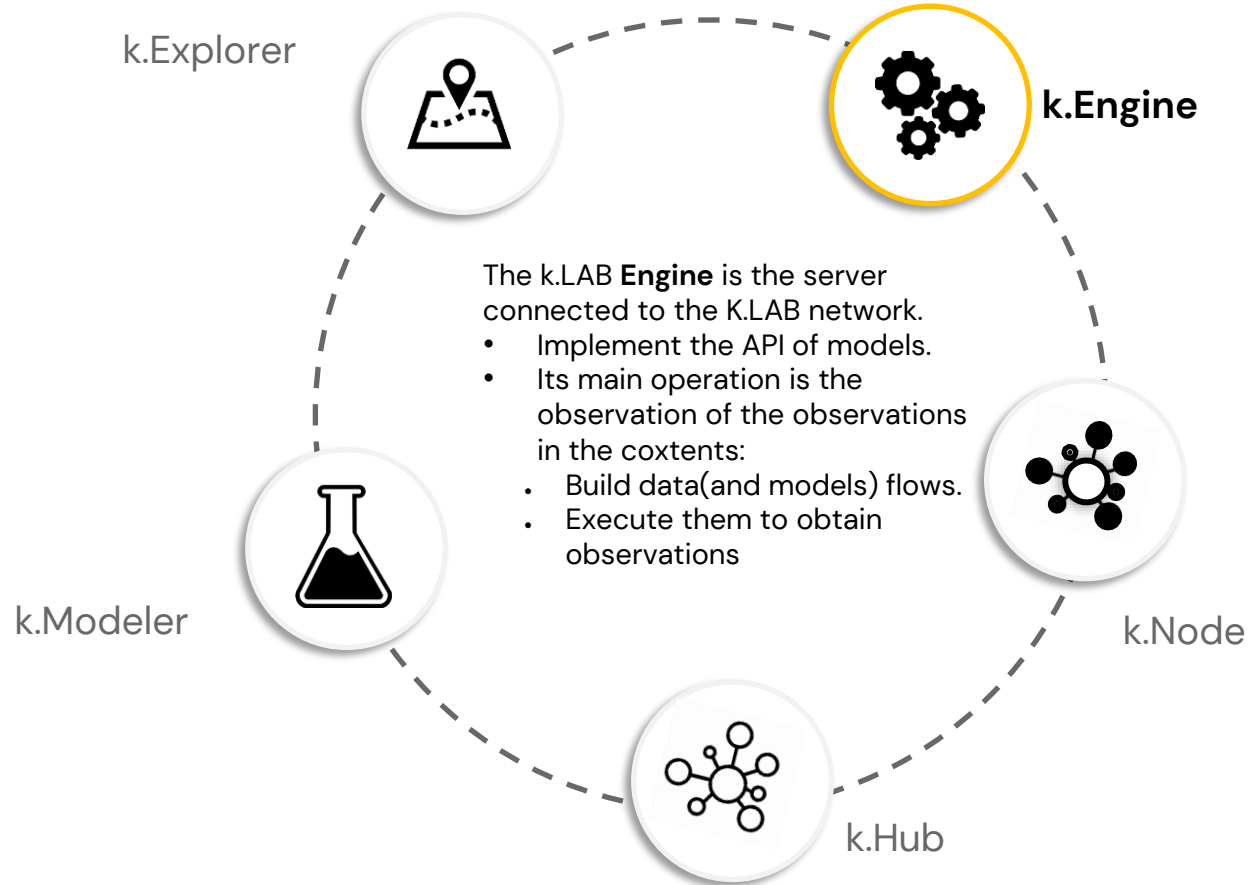
The k.LAB platform supports observations made in the semantic web

Include its own semantic language, **k.IM**, used to program in this context



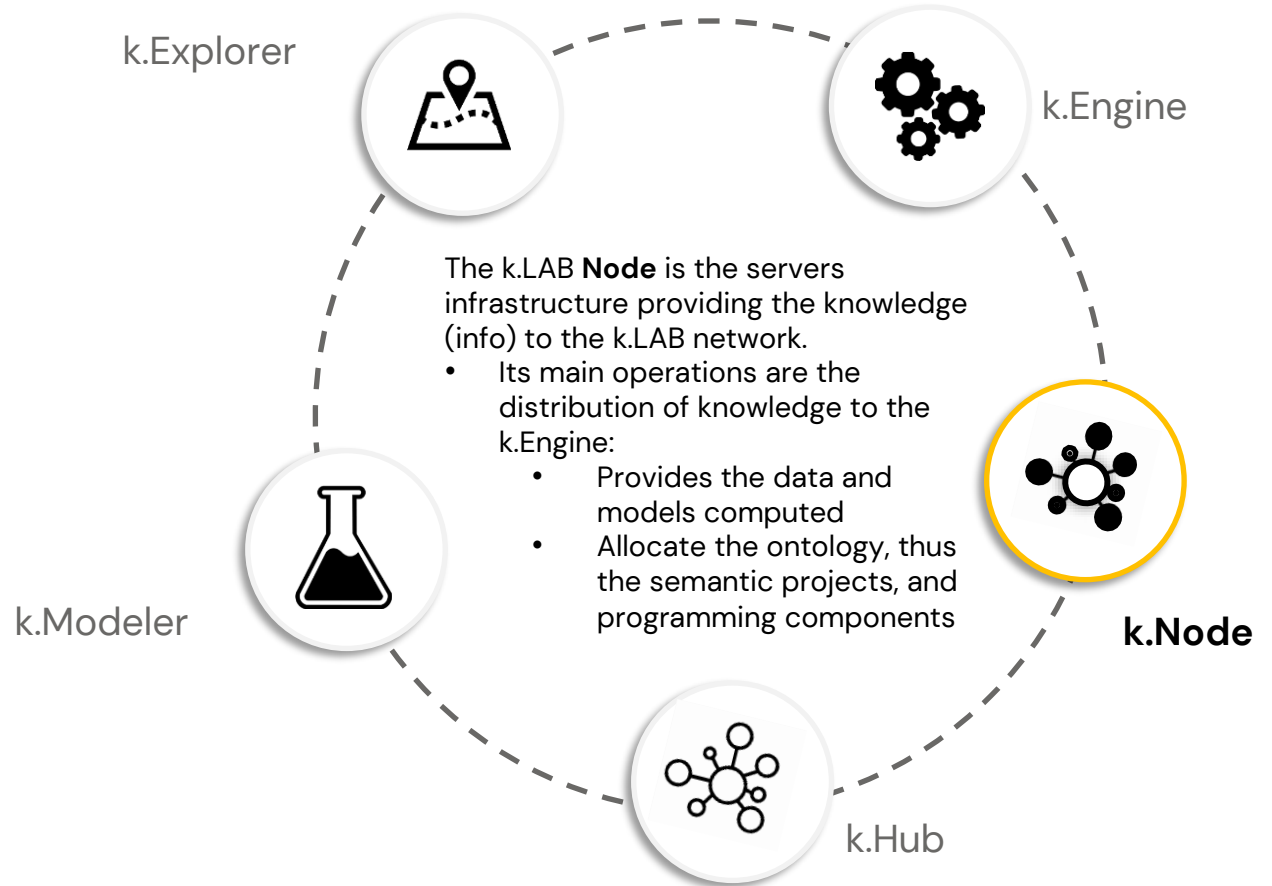
The k.LAB platform supports observations made in the semantic web

Include its own semantic language, **k.IM**, used to program in this context



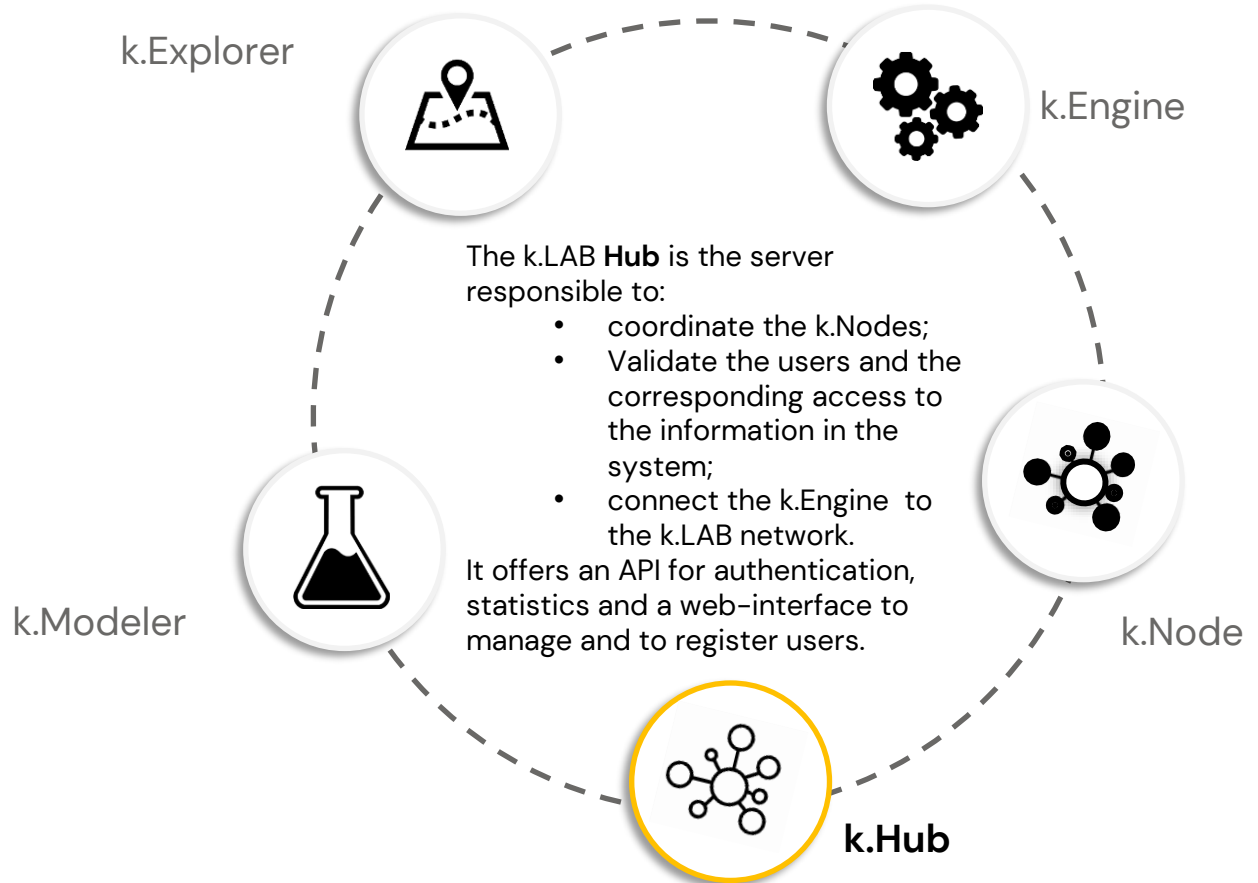
La plataforma k.LAB: soporte para una web semántica de observaciones

Incluye el lenguaje semántico
de programación **k.IM**



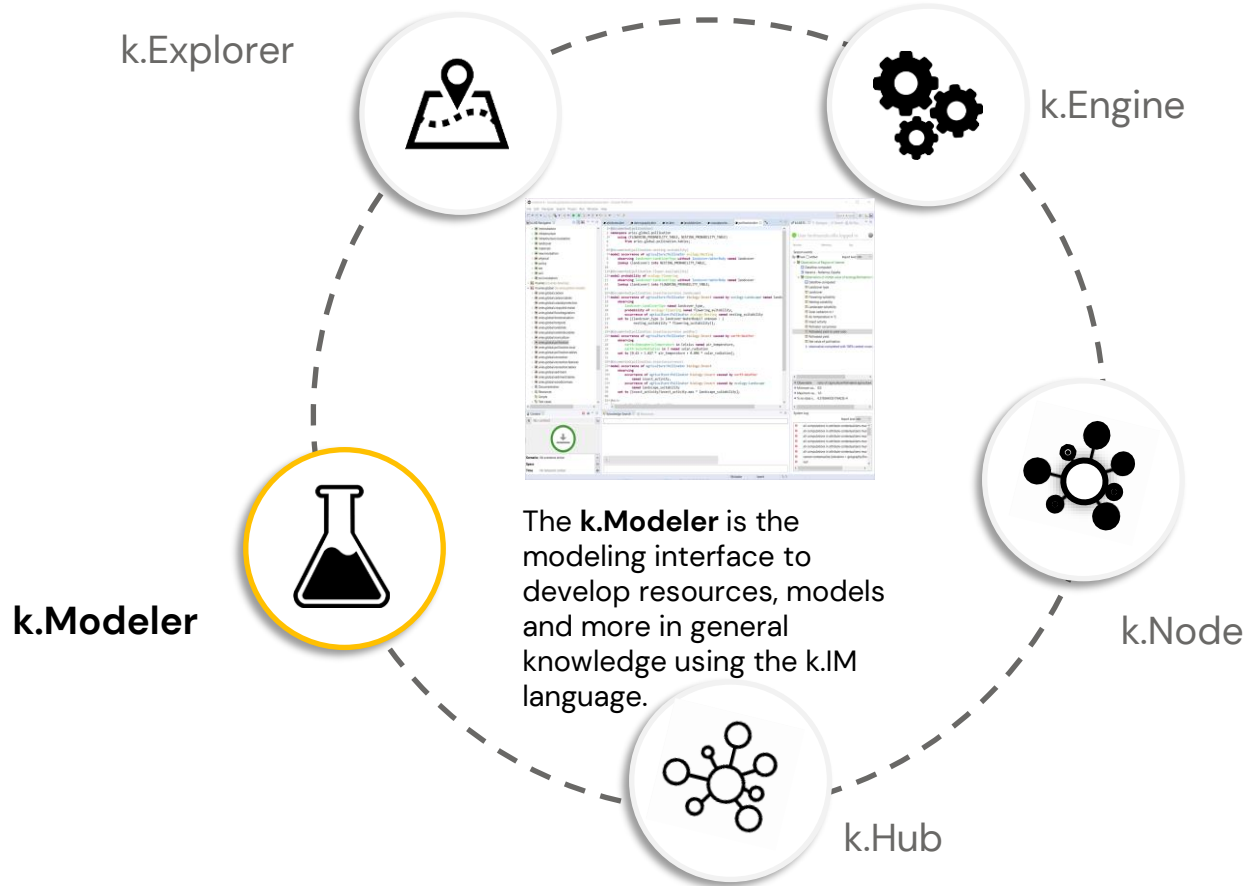
The k.LAB platform supports observations made in the semantic web

Include its own semantic language, **k.IM**, used to program in this context



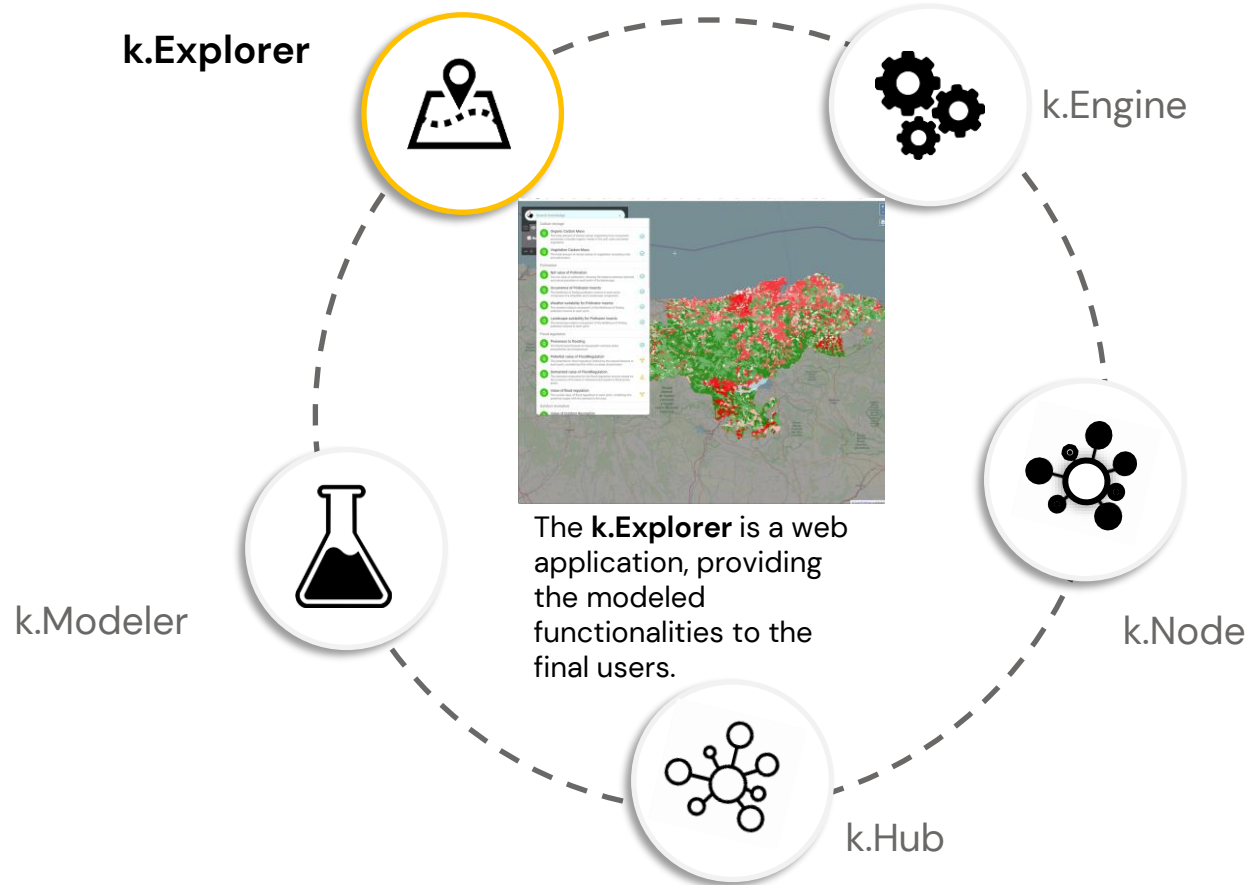
The k.LAB platform supports observations made in the semantic web

Include its own semantic language, **k.IM**, used to program in this context



The k.LAB platform supports observations made in the semantic web

Include its own semantic language, **k.IM**, used to program in this context



The key is a technology built for INTEROPERABILITY, developed on FAIR¹ data/models principles

Semantic web modelling

ARIES is connected to a library in which each component of a model is break down into in **modular** components, which allows and greatly simplify the use (and reuse) or the substitution of a certain input in the model composition when a more appropriate element becomes available in the system (i.e. local vs global data)

AI: machine reasoning

As each component of a model or data is connected to a concept through its semantic, the best combination of data and models available in the system is **automatically integrated** to answer the query posed by user (methodological, spatial and temporal dimensions are all considered).

Which algorithms are used to prioritize resources?

A de-centralised system with real democratic access to the knowledge produced

The system is built to can interconnect information hosted on a network of individual nodes (k.IM), based on open-source software language and always free to use for non-profit purposes. The language used to model and integrate data is **universal** because readable by machines as well as humans; being this very similar to English, it is also very **intuitive** for non-expert modelers. As more data and models are integrated in the system, the quality and the variety of those increases, not with a simple additional but a **multiplicative effects**. Each expert can contribute with new knowledge, and leverage on the knowledge created by others. This allows to find better answer to the questions posed to the system. ARIES also generates very detailed report(s) and a visual diagram of the data and model(s) used to guarantee **full transparency and traceability** of each individual result.

Machine reasoning: How do can a machine pick the “best” data/model under which circumstances?

Initial prioritization, adjustable by advanced users:

1. Lexical scope (how “close” are the data/model to the namespace, project, within k.LAB repositories);
2. Trait concordance (shared attributes with concept requested);
3. Scale coverage (data with more complete coverage chosen preferentially);
4. Scale specificity (local models chosen over national, over global);
5. Inherency (models specified for location/scale-specific use chosen over generalized models);
6. Subjective concordance (user-specified metadata & weightings);
7. Evidence (data models chosen over computed models)
8. Reliability (human input that affects the reliability of a source of information)