

A satellite night view of Europe, showing the continent illuminated by city lights against the dark background of the night sky and the blue glow of the atmosphere. The lights are concentrated in major urban centers and along coastlines.

# A QGIS plug-in to produce EU SEEA Ecosystem Accounts

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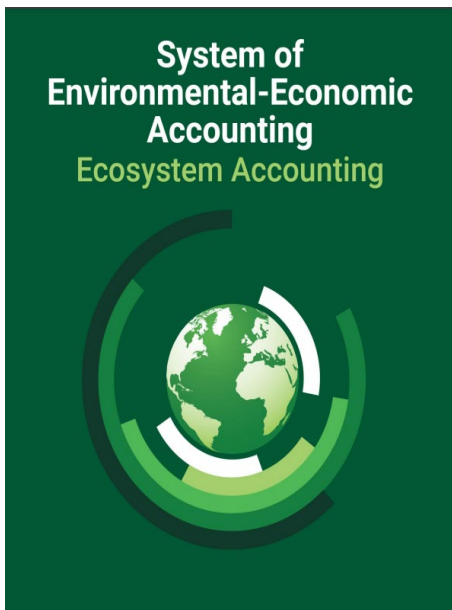
Marcel Buchhorn, Thomas Danckaert, Maarten Van Loo, Wim Peelaerts, **Bruno Smets**, Steven Broekx

ESA Living Planet Symposium 2022, Bonn



# Context

## Standardization phase



## Implementation phase

### TIER 1

Ecosystem services modelled from global datasets with no or little user input data

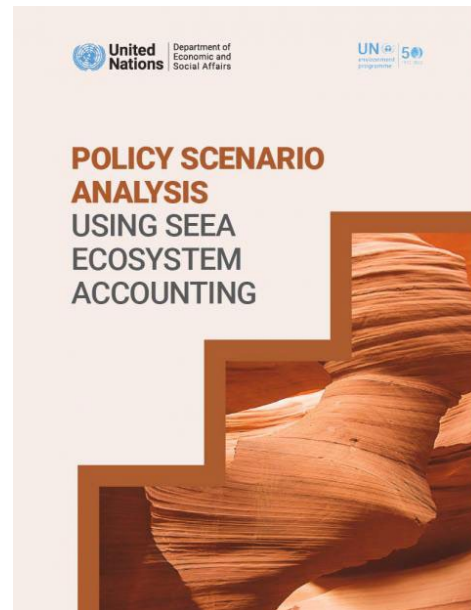
### TIER 2

Ecosystem services modelled from national datasets customized for national contexts, some validation

### TIER 3

Ecosystem services modelled with local data and direct surveys, better validation, and best available tools

## Use phase

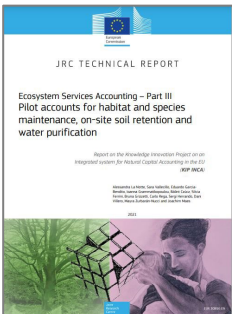




# Support mainstream of NCA (Tier2/3) in Europe



KIP-INCA PILOT      EU REGULATION



*Support in INCA Phase-3*

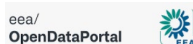
vito +

1. EU methodological Guidelines
2. INCA Account Tool ←
3. Validation Methods
4. Demo policy use



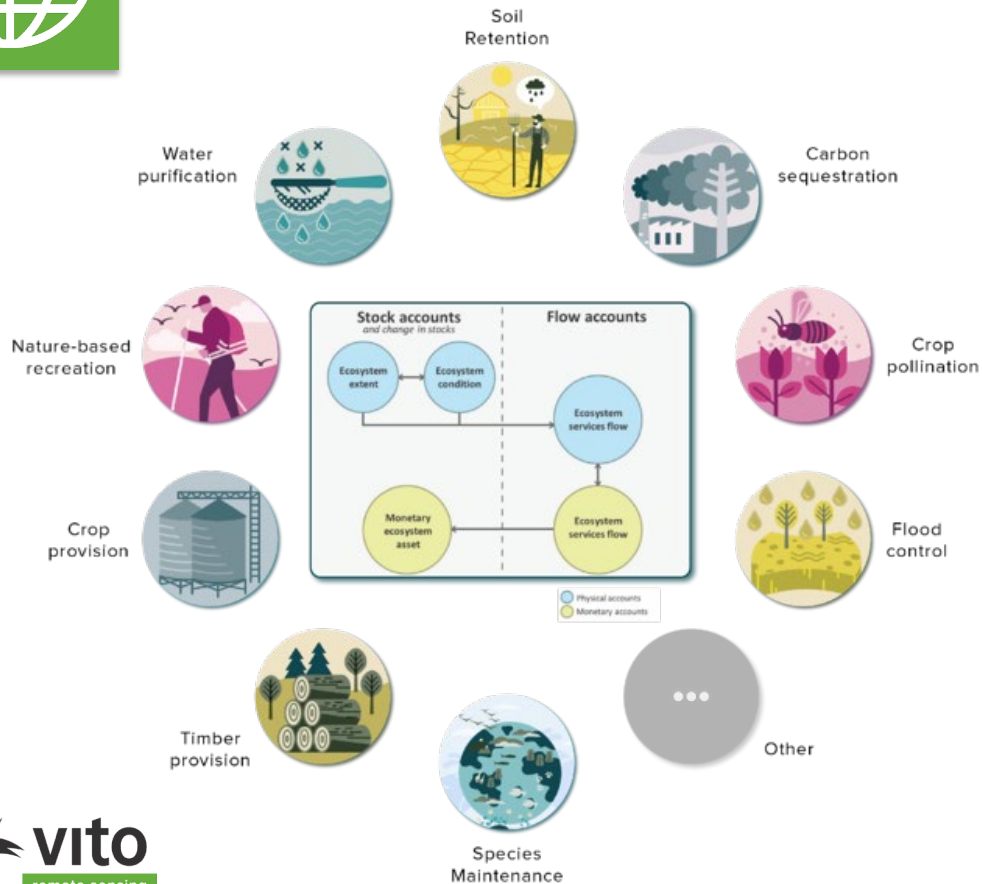
- Unified Framework
- Harmonization
- Feedback loop
- Multi-user
- Open source

EU or National data-sets





# Services in INCA tool



	Service	Beta
<i>Provisioning</i>	Crop provision	X
	Wood provision	X
<i>Regulating</i>	Soil Retention	X
	Crop pollination	X
	Air filtration	
	Carbon sequestration	X
	Carbon retention	
	Local climate regulation	
<i>Cultural</i>	Water purification	X
	Flood control	X
	Species maintenance	X
	Nature-based	X
	Tourism	

1.0 (end 2022)

2.0 (end 2023)



# User Requirements for INCA tool

Type of User	Needs	Tool interaction	Required skills
<b>Basic User</b>	Only source for national accounts / Cross validation of national models	Consultation and use of final results at national level (tabular data)	Consultation and processing of tabular data (e.g. MS Excel)
<b>Proficient User</b>	Starting point to develop improved national accounts	Operate the tools on a national level and replace input data with national data sources	Consultation and processing of spatial data (e.g. GIS software – QGIS, ArcGIS)
<b>Expert User</b>	Starting point to develop national accounting procedures and perform R&D (e.g. JRC)	Operate the tools to replace formulas (open source code) and input data	Programming skills (e.g. python, ...)



# From PILOT to FAIR

## Findability

- DOI for algorithm model
- Rich Metadata annotation (production date, units, used inputs, etc.)

## Accessibility

- Free and open source published under EUPL (end 2022)
- Installation, user and developer manuals
- Run on a normal PC to upscaled on high-end machines (cloud, multi-core)
- Basic to proficient to expert users

## Interoperability

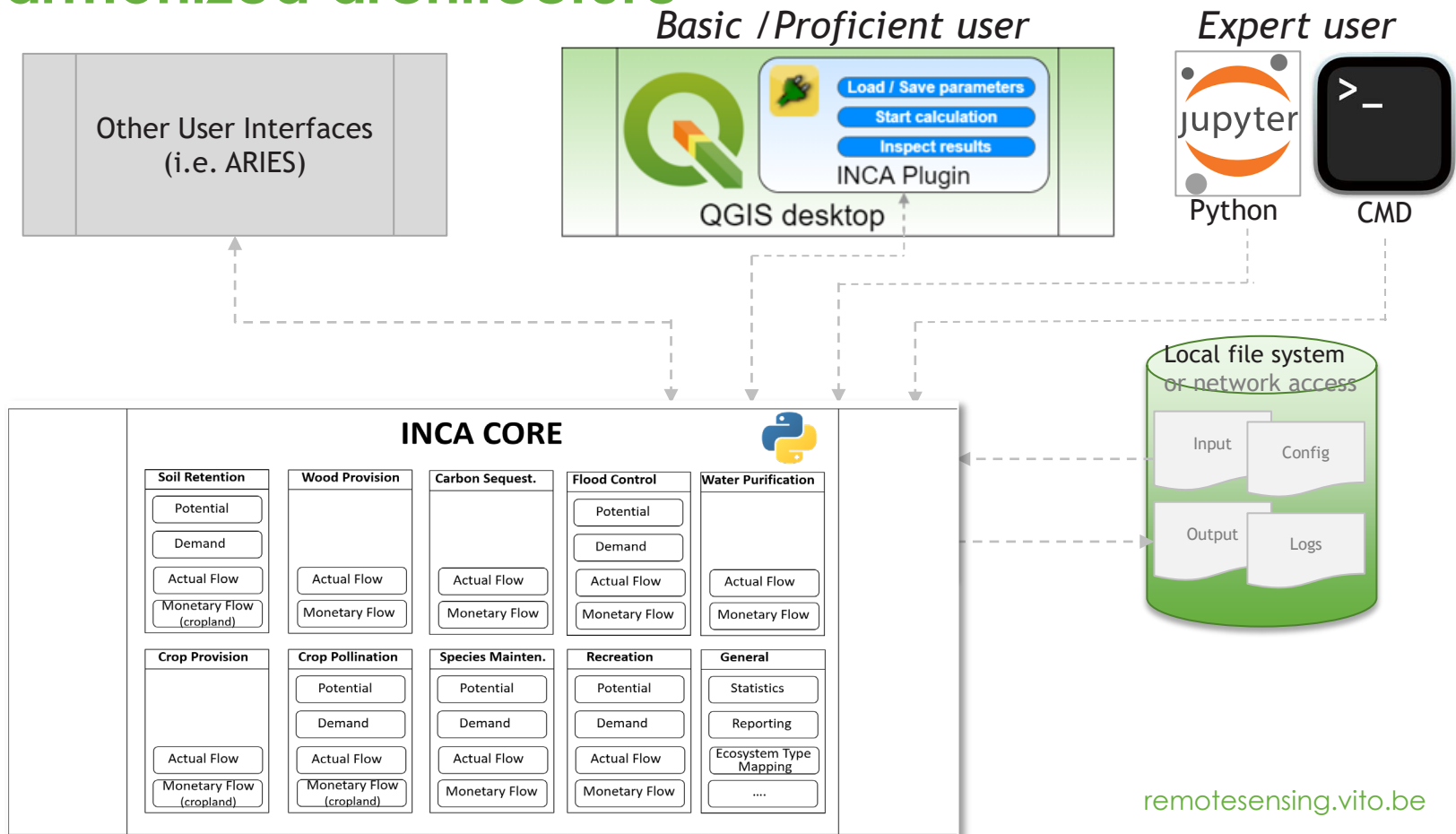
- Compliant to SEEA EA EU guidelines
- Common API (INCA architecture)
- Harmonized reporting across EU (cog, csv, xlsx templates)
- Tested on Linux and Windows

## Reusability

- Modular standard design, easy to add new services
- Modular design, enables integration in different platforms

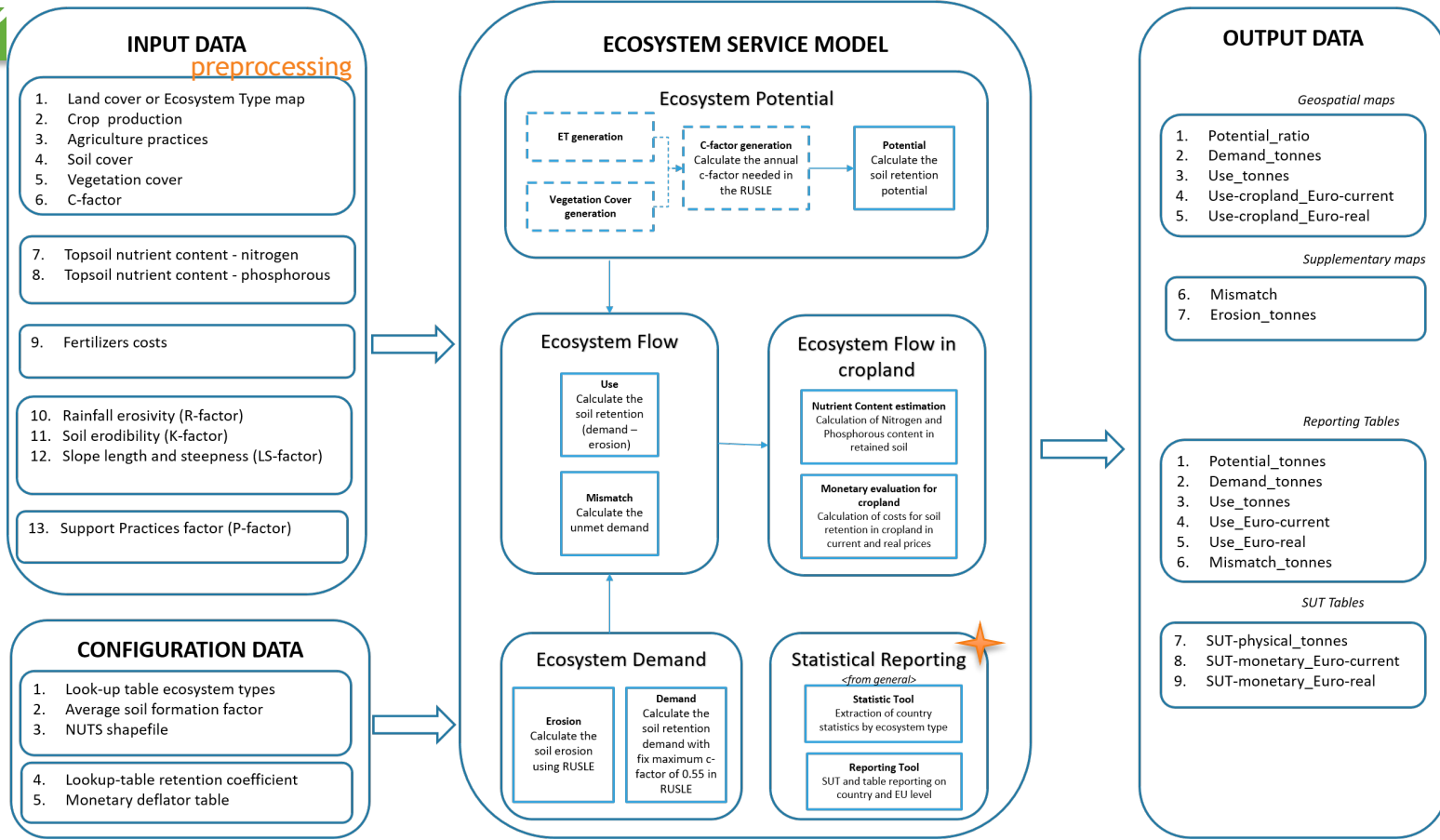


# Harmonized architecture





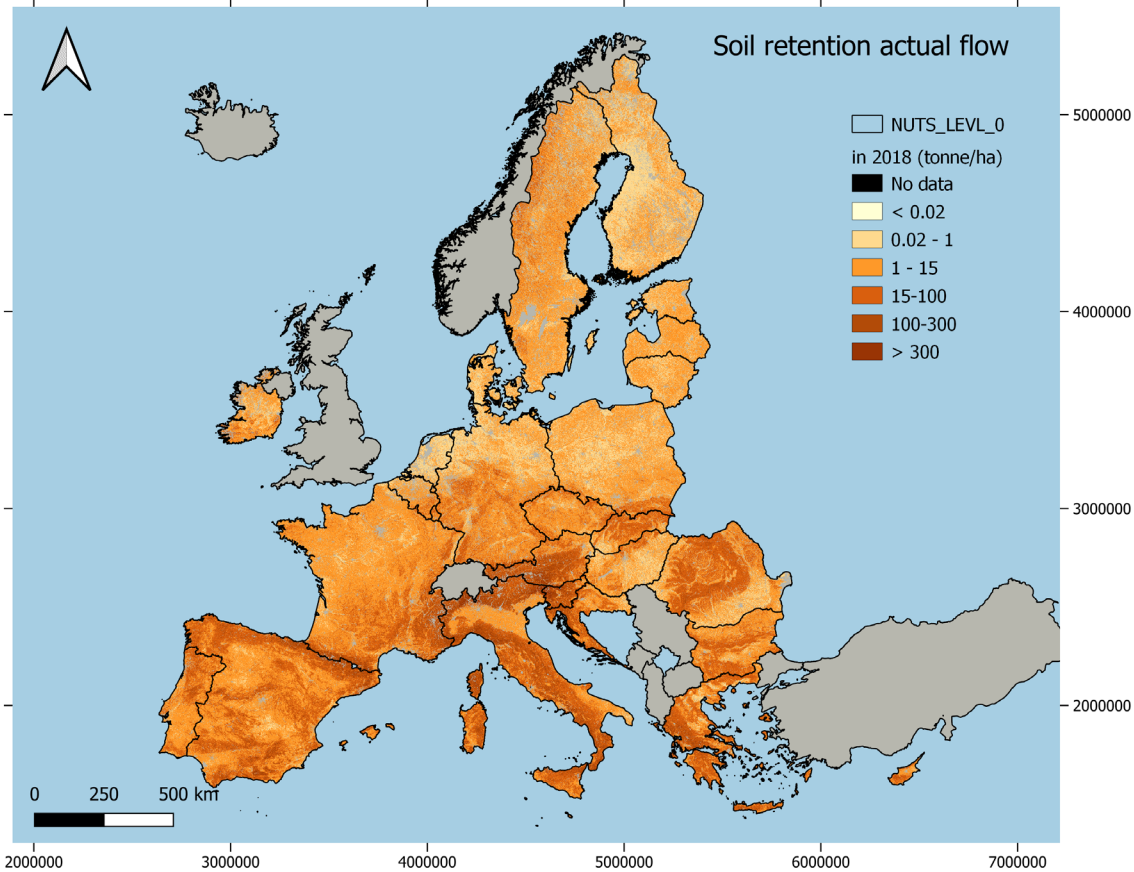
# Example soil retention – CORE module







# Example soil retention flow @ EU





# Example soil retention - flow @ NUTS

INCA

Working directory: C:\Data\INCA\TEST\_AT

**Study Area**

Year: 2018

NUTS regions: C:\Data\INCA\INPUT\NUTS\_RG\_01M\_2016\_3035\_LEVL\_0.shp

Extent: INPUT\soil\_retention\AT\retention\_rate\_AOI-EU28-2016\_100m\_EPSG3035\_AT.tif

Ecosystem Service: Soil Retention

Run name: soil\_2

Ecosystem Map: \Data\INCA\INPUT\soil\_retention\AT\ecosystem\_map\_2012\_AT.tif

Ecosystem Categories: Data\INCA\INPUT\soil\_retention\AT\ecosystem\_categories\_AT.csv

C-Factor: C:\Data\INCA\INPUT\soil\_retention\AT\c-factor\_2012\_INCA\_AT.tif

K-Factor: C:\Data\INCA\INPUT\soil\_retention\AT\k-factor\_AT.tif

LS-Factor: C:\Data\INCA\INPUT\soil\_retention\AT\ls-factor\_AT.tif

P-Factor: C:\Data\INCA\INPUT\soil\_retention\AT\p-factor\_AT.tif

R-Factor: C:\Data\INCA\INPUT\soil\_retention\AT\r-factor\_AT.tif

Topsoil N content: C:\Data\INCA\INPUT\soil\_retention\AT\topsoil\_n\_content\_AT.tif

N content scaling: 1000,00

Topsoil P content: C:\Data\INCA\INPUT\soil\_retention\AT\topsoil\_p\_content\_AT.tif

P content scaling: 1000000,00

Retention rate: C:\Data\INCA\INPUT\soil\_retention\AT\extent\_soilretention\_AT.tif

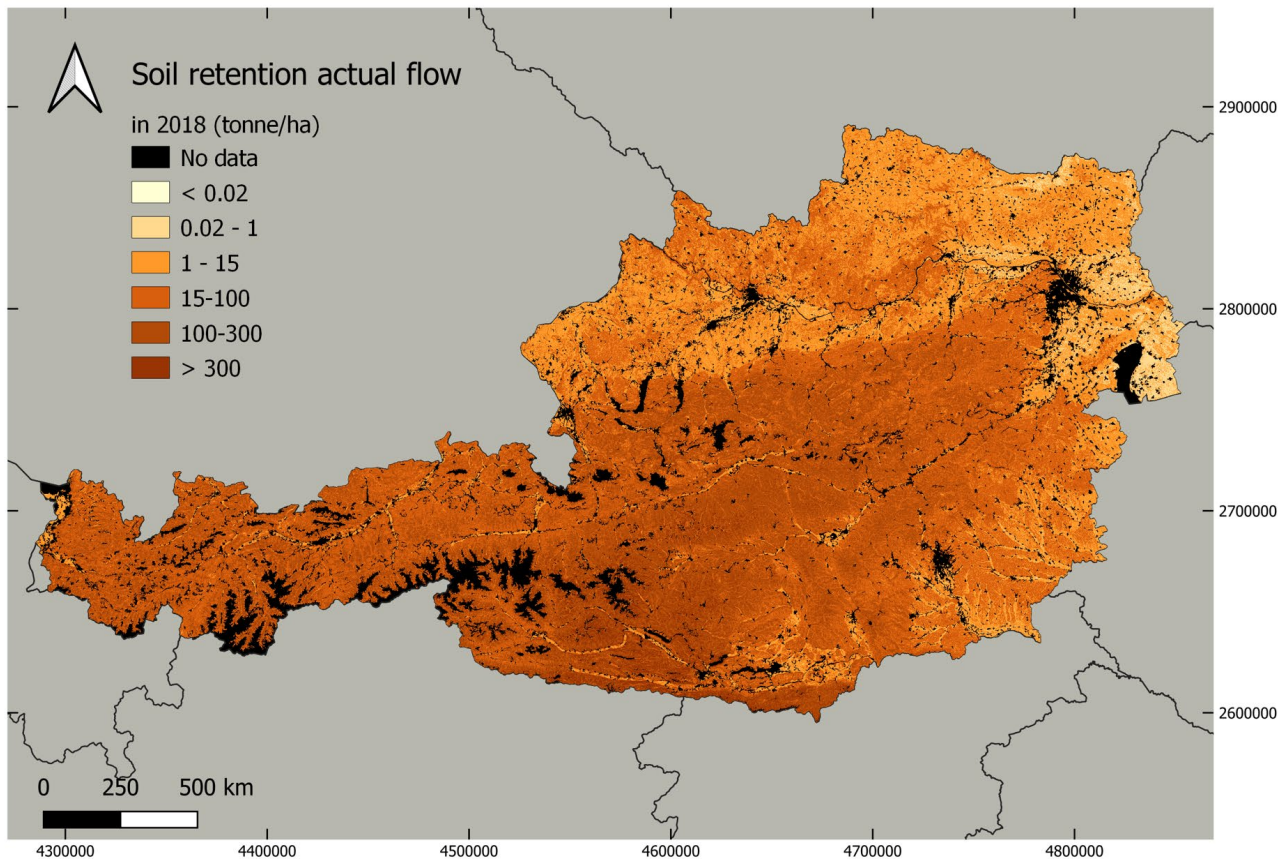
Average nutrient prices: \_retention\AT\annual\_average\_nutrient\_prices\_20211019\_AT.csv

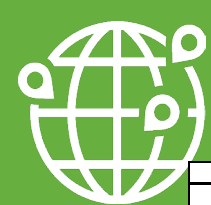
Bulk soil price: INPUT\soil\_retention\AT\annual\_bulksoil\_prices\_20211015\_AT.csv

EU member states: Data\INCA\INPUT\soil\_retention\AT\eu\_member\_states\_EU28.csv

Average soil formation factor: 1,40

Continue existing run   





# Example soil retention – SUT monetary

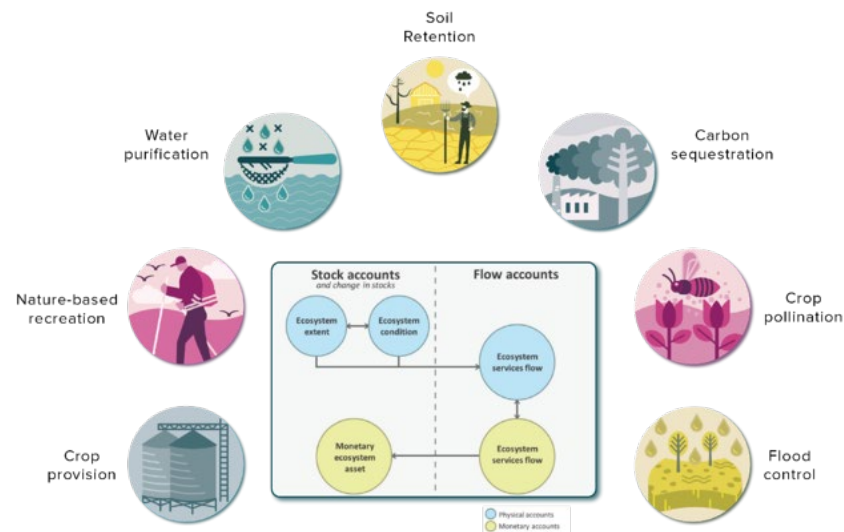
	SUPPLY 2018											Total	
	Economic Unit						Type of ecosystem unit						
	Primary sector		Secondary Sector	Tertiary sector	Households	Global Society	Urban	Cropland	Grassland	Woodland and forest	Heathland and shrub		Sparsely vegetated land
	Agriculture	Forestry											
soil retention	MAES Level-1												
million EURO year 2018 (current)													
AT							245						245
BE							62						62
BG							390						390
CY							37						37
CZ							229						229
DE							520						520
DK							35						35
EE							18						18
EL							765						765
ES							2,518						2,518
FI							27						27
FR							1,623						1,623
HR							233						233
HU							141						141
IE							45						45
IT							4,212						4,212
LT							51						51
LU							12						12
LV							33						33
MT							2						2
NL							11						11
PL							391						391
PT							411						411
RO							745						745
SE							75						75
SI							305						305
SK							156						156
EU							13,293						13,293

	USE 2018											Total	
	Economic Unit						Type of ecosystem unit						
	Primary sector		Secondary Sector	Tertiary sector	Households	Global Society	Urban	Cropland	Grassland	Woodland and forest	Heathland and shrub		Sparsely vegetated land
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FI	27												27
FR	1,623												1,623
HR	233												233
HU	141												141
IE	45												45
IT	4,212												4,212
LT	51												51
LU	12												12
LV	33												33
MT	2												2
NL	11												11
PL	391												391
PT	411												411
RO	745												745
SE	75												75
SI	305												305
SK	156												156
EU	13,293												13,293



# INCA Accounts series extended to 2018 using tool

The screenshot shows the INCA Platform website. At the top, there is a navigation bar with links: Home, About INCA, Publications, News, Data Catalogue, Map Tool, Glossary, and Contact Us. Below the navigation bar, the main content area is titled "How ecosystem services are assessed in INCA". It is divided into two columns: "Ecological side" and "Socio-economic side". Under "Ecological side", there are icons for "Ecosystem Service use" (a butterfly, trees, and a pond) and "Match" (trees and people). Under "Socio-economic side", there are icons for "Ecosystem Service use" (people and a power line) and "Mis-match" (a warning sign and people). To the right of the main content, there is a section titled "Ecosystem services map tool" with a "START" button and two dropdown menus for "Accounting tables" and "Complementary tables". At the bottom of the main content area, there are two dropdown menus for "Ecosystem extent (EEA) Extent of ecosystem types" and "Ecosystem condition State and trends of quality of ecosystem".



**About INCA**

INCA addresses key policy objectives of the EU's 7th Environment Action Programme and the EU Biodiversity Strategy to 2020.

[READ MORE](#)

**Publications**

Reports, scientific articles and technical documentation produced by the INCA project.

[SEE MORE](#)

**Data catalogue**

The data catalogue allows browsing the input and output datasets of the different ecosystem services.

[EXPLORE](#)





## Take-away message on INCA tool

- Standardized reference tool for ecosystem accounting in EU following SEEA-EA
- Highly customizable by MS (proficient & expert users)
- Cost efficient, reproducible and scalable
- Validated and in-use (INCA EU 2018-series)
- Enables custom integration of new services
- Manuals (installation, user, developers)
- Open Source (end 2022) and free
- A first step to adopt FAIR principles
- Enables integration in other platforms (e.g. ArcGIS, ARIES)



# You want to know more ...

## TRANSITION TO A SUSTAINABLE PLANET THROUGH NATURAL CAPITAL ACCOUNTING

Our economy and our human well-being highly depend on nature and its "services". Longley, we underestimated these services, but the recent COVID-19 pandemic - disrupting economies, societies and livelihoods around the entire globe - emphasized that **nations have to speed up their transition to "Green Stimulus", Economic Recovery and Long-Term Sustainable Development**. Otherwise we cannot restore employment and boost economic growth in sustainable manner. But we don't need traditional recovery efforts, we need conscious leadership and prioritize recovery efforts that are green, inclusive and resilient for future well-being. **Natural Capital Accounting (NCA) or ecosystem accounting can support the acceleration towards this new sustainable planet**. Discover more about NCA and the geospatial methodologies and tools we develop to ease and accelerate this transition at multi-scale.

A story about Biodiversity, SDGs, Geospatial, Natural Capital Accounting, Ecosystem services by Bruno Smets 16.01.2022

<https://blog.vito.be/remotesensing/accelerating-nca>



### Topical collection "From the assessment to the accounting of Natural Capital. Development and progress through empirical applications"

Closed for submission

Submission deadline: 15 April 2022



#### Topical collection editors

Alessandra La Notte, Ioanna Grammatikopoulou, Sylvie Campagne

#### Topical collection information

Natural Capital Accounts (NCA) are meant to complement the System of National Accounts (SNA), which represents the main source of information to assess the wealth of a country. To make NCA operational within and together with SNA, accounting mechanisms and rules have to be consistently applied. An evolution is foreseen from pure ecosystem and ecosystem services assessment to their structured accounting. After the System of Integrated Environmental and Economic Accounts - Ecosystem Accounting (SEEA-EA) was proposed in 2012 by the United Nations Statistical Division (UNSD) and recently adopted as a standard, there is a wide application of these accounting modules throughout the world. NCA is part of the wider SEEA accounting toolkit and is now the focus of considerable political commitment at Global, EU, national and regional scales. However, there is quite some uncertainty as to which accounts, which metrics can support which policy areas. With a broad range of application experiences (geographic, account types, policy priorities etc.), it is possible to enhance understanding of the relationship between the technical construction of the accounts and their use in decision making by end users. The goal of this topical collection is to present a number of applications of Ecosystem Accounting, that should ideally offer a series of insights to the discussion on how natural accounts be composed, what are the challenges and what are the future development needs. It is also meant to identify the way forward - on accounts development, their use in policy areas, and how to interpret the results so that NCA can realize its potential.

### Making the European INCA methodology for ecosystem accounting FAIR

*Marcel Buchhorn* ✉, *Bruno Smets* ✉, *Thomas Danckaert* ✉, *Maarten van Loo* ✉, *Steven Broekx* ✉, *Wim Peelaerts* ✉

[https://oneecosystem.pensoft.net/special\\_issues](https://oneecosystem.pensoft.net/special_issues)

[remotesensing.vito.be](https://remotesensing.vito.be)



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