Cross-agency cooperation view

Environmental and veterinary big data for One Health collaboration

Dario Piselli - Expert, Environment, Human Health and Well-being, EEA

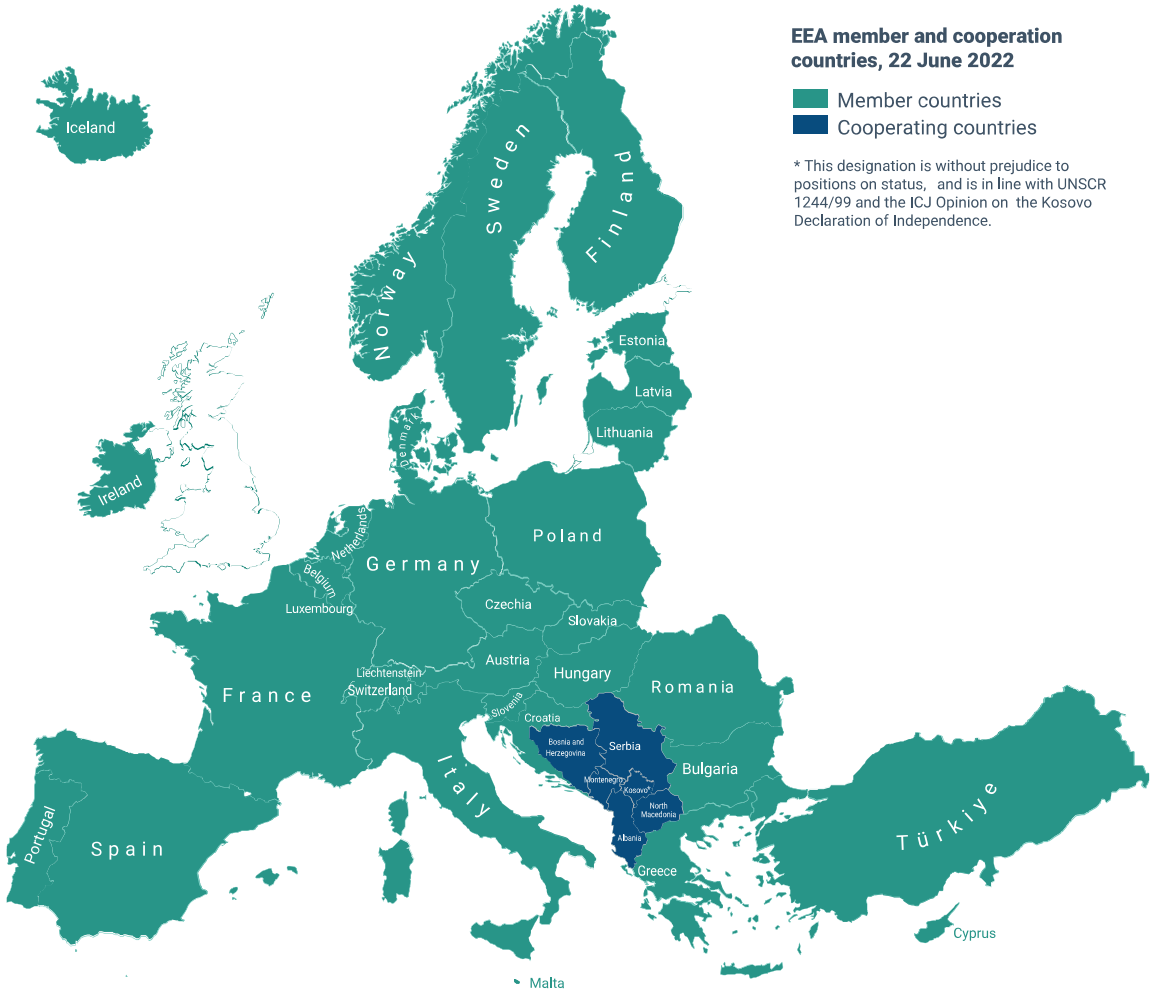
Third Veterinary Big Data Stakeholder Forum | 23 November 2023

European Environment Agency

The European Environment Agency and One Health

European Environment Agency

European Environment Agency



- An agency of the European Union, founded in 1994
- Collecting, analysing, assessing and providing information on environment and climate topics
- An interface between science and policy
- 260 staff + network of 2,000 experts in 38 countries
- One of the five ‘ENVI’ agencies (with ECDC, ECHA, EFSA and EMA)

European Environment Agency

EEA work areas supporting…

1 Biodiversity and ecosystems

2 Climate change mitigation and adaptation

3 Human health and the environment

4 Circular economy and resource use

5 Sustainability trends, prospects and responses

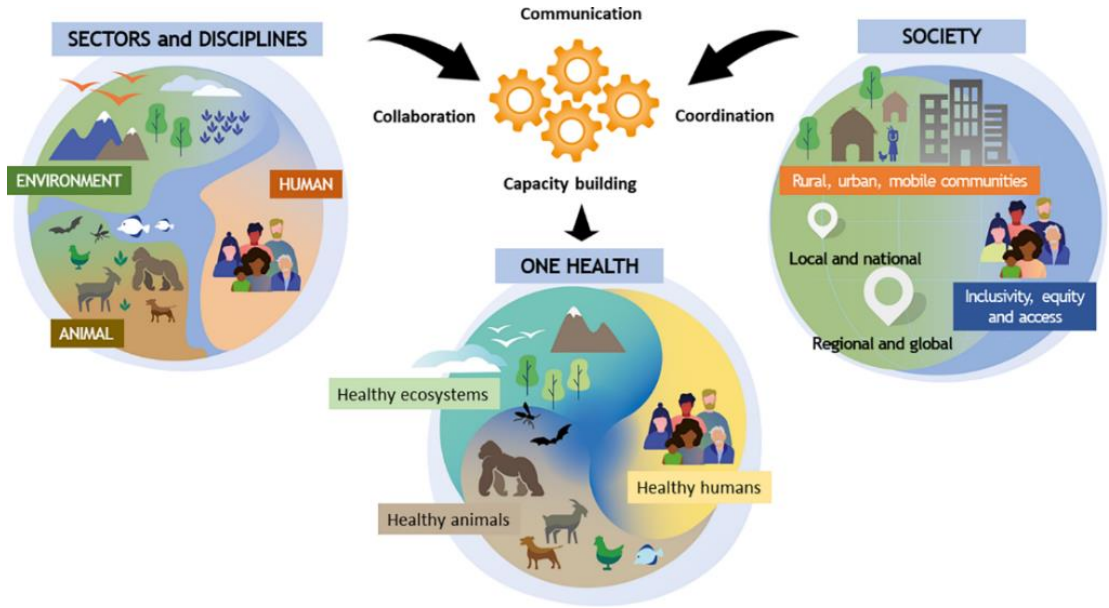
- First **climate-neutral** continent, incl. **Adaptation** Strategy
- **Biodiversity** Strategy 2030
- New **Circular Economy** Action Plan
- **Zero pollution** strategy
- **Farm to fork** strategy
- **Just transition**
- **Sustainable** European **Investment** Plan
- Future ready economy – new **industrial strategy**

EEA's growing interest in One Health

"One Health *is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and* ***the wider environment (including ecosystems)*** *are closely linked and interdependent."*

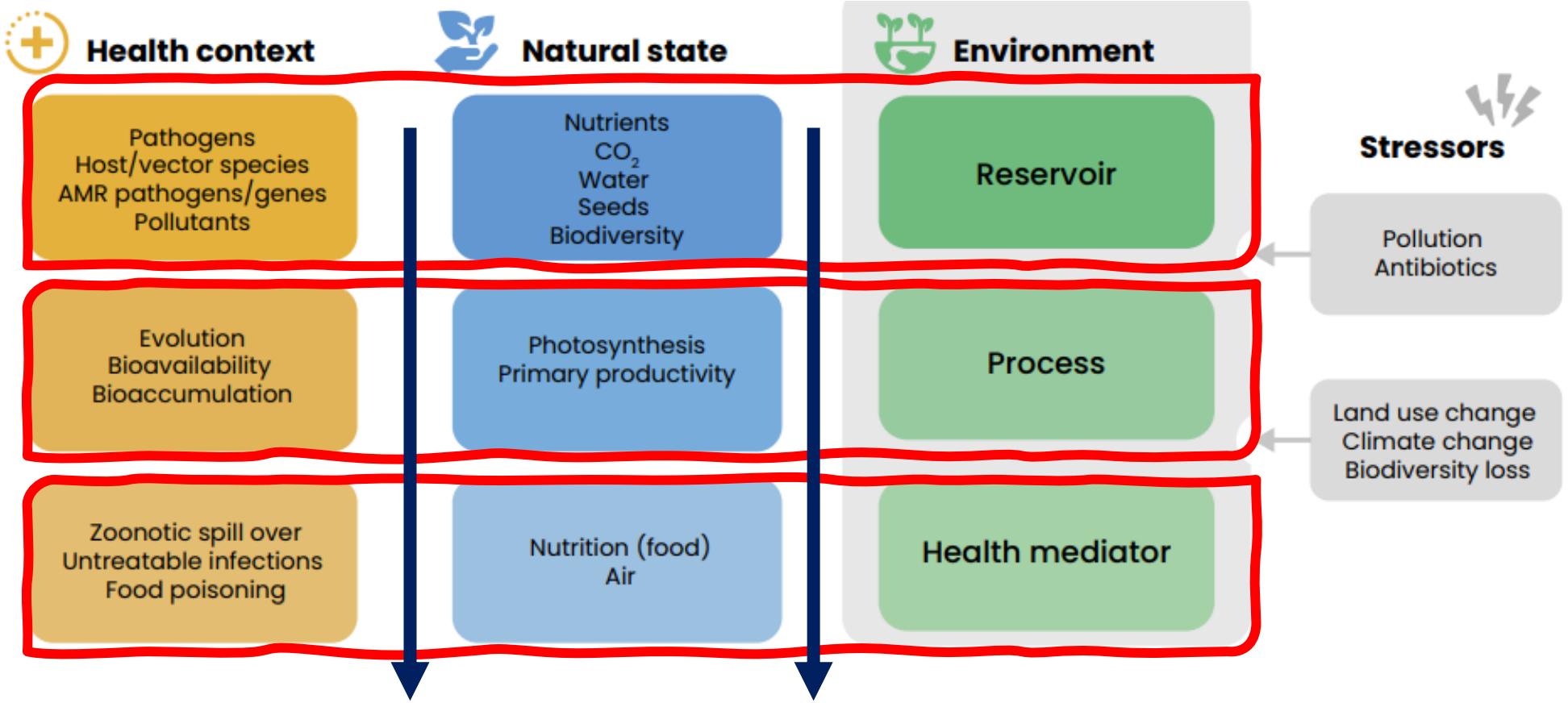
Evolving framing of One Health implies:

- Greater attention to **the role of the environment**
- **Collaboration and evidence integration** across disciplines
- Focus on **both communicable and non-communicable diseases**



Source: [OHHLEP et al, 2020]

The role of the environment in One Health



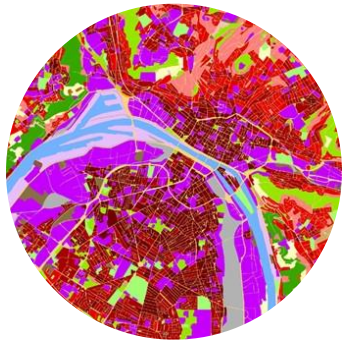
Source: [WHO, 2022]

One Health and ongoing/future EEA work

Future

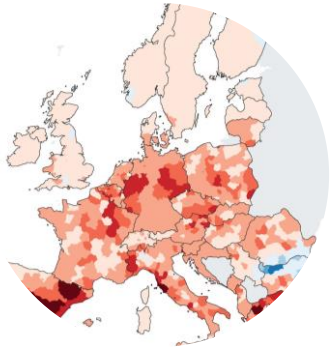
Health benefits of NbS

Spatial determinants of health



AMR in the environment

Ongoing



Climate & Health

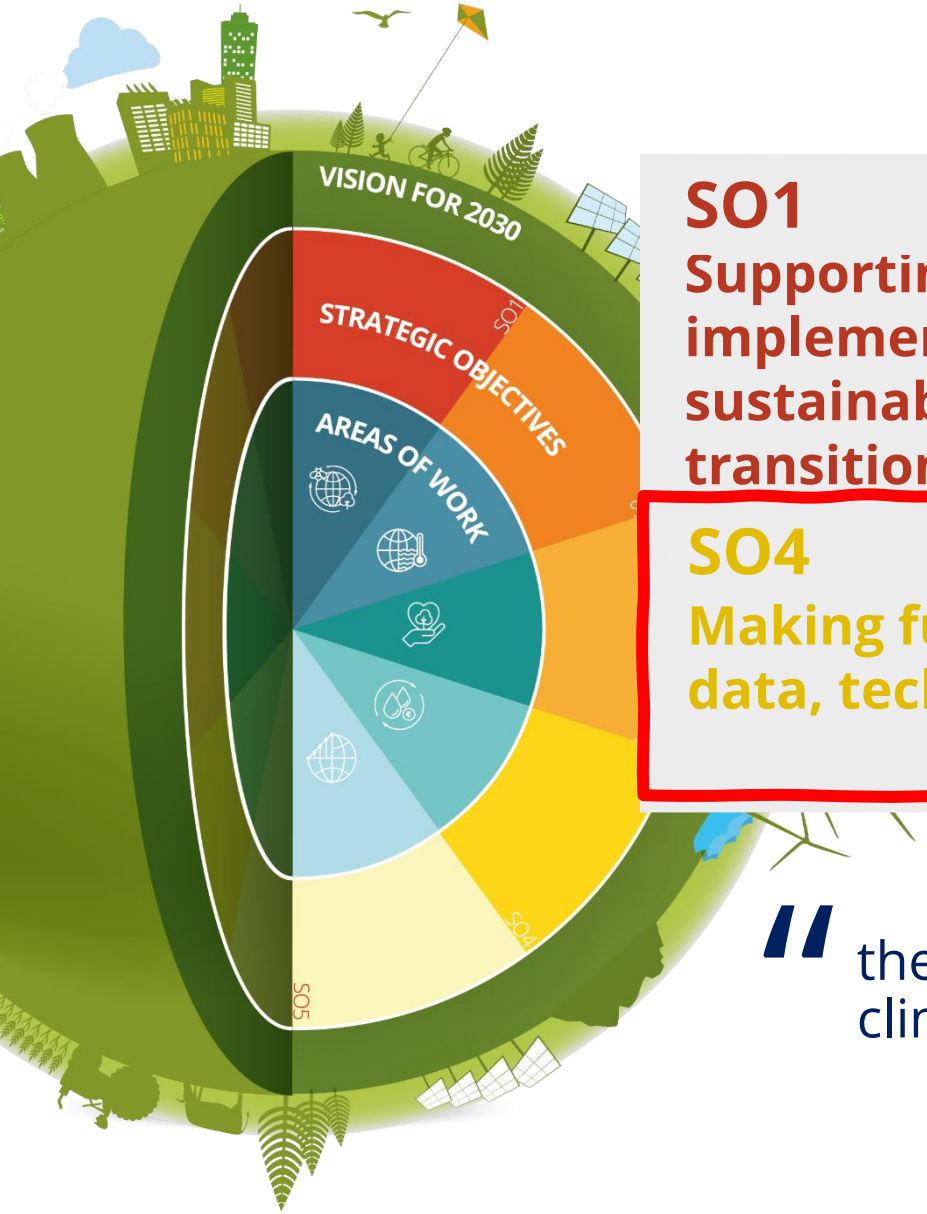
Zero Pollution monitoring

Environmental health risks

Big Data at the EEA

European Environment Agency

EEA-Eionet Strategy 2021-2030: Strategic objectives



SO1
Supporting policy implementation and sustainability transitions

SO2
Providing timely input to solutions for sustainability challenges

SO3
Building stronger networks and partnerships

SO4
Making full use of the potential of data, technology and digitalisation

SO5
Resourcing our shared ambitions

" the **leading network** for policy-relevant environment and climate knowledge at European Union and country levels "

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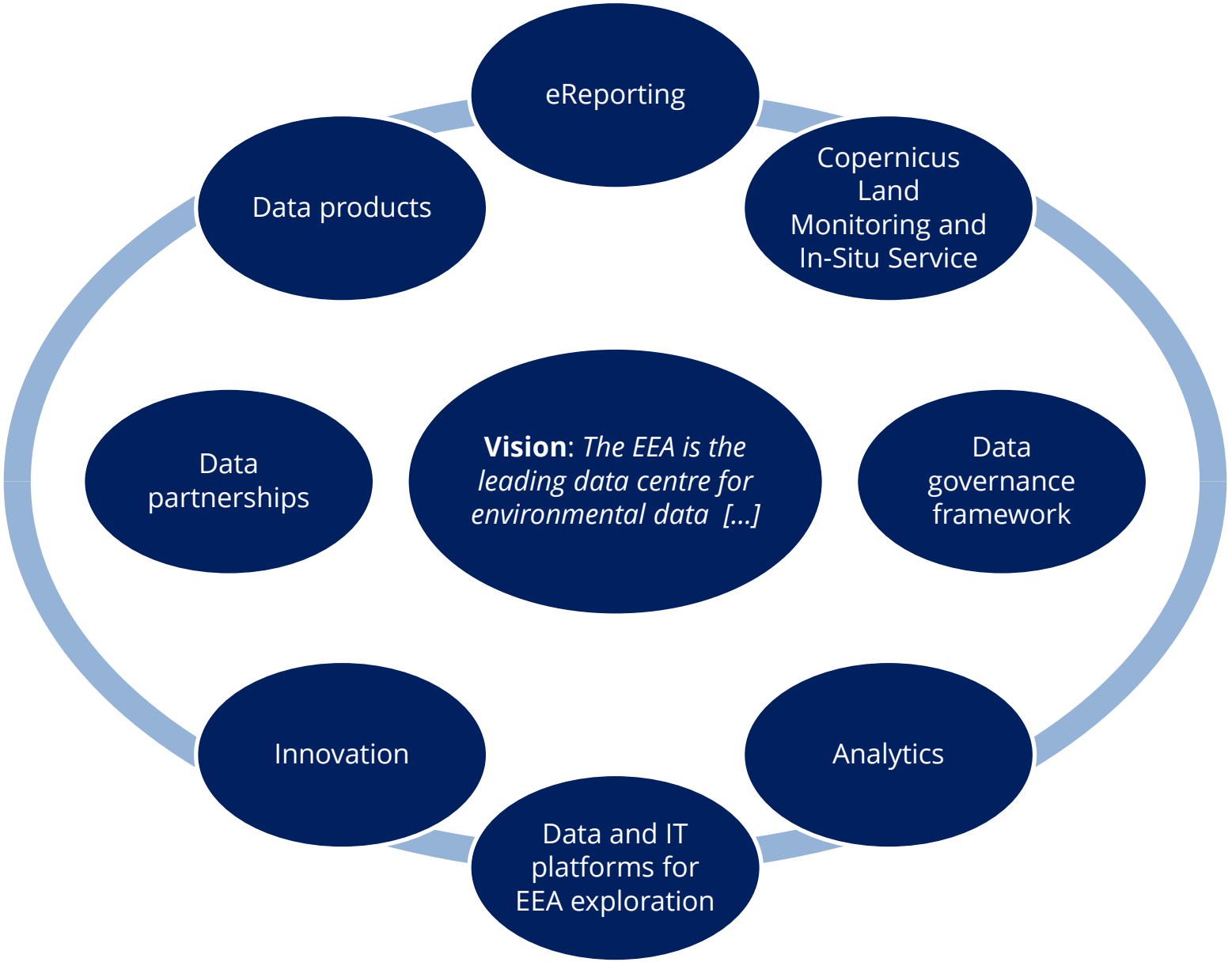
EEA data management strategy: strategic priority areas



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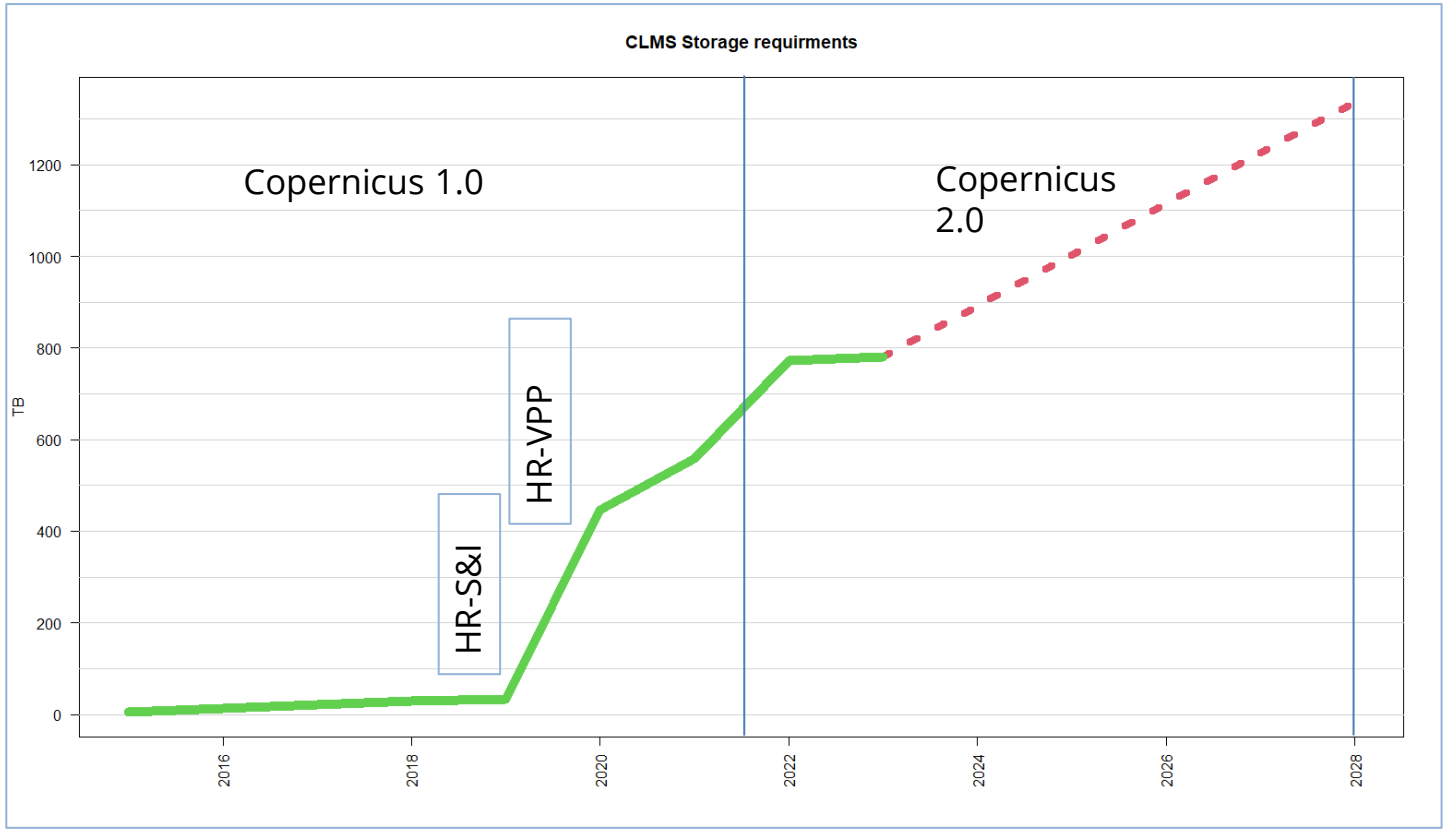
Example: the CLMS and its products

- One of the six Copernicus services, implemented jointly by EEA and JRC
- Products organised into five components:
  - Land cover and land use mapping
  - Priority area monitoring
  - Bio-geophysical parameters
  - European Ground Motion Service
  - Satellite, reference and validation data



Copernicus Europe's eyes on Earth

Land Monitoring Service

European Environment Agency

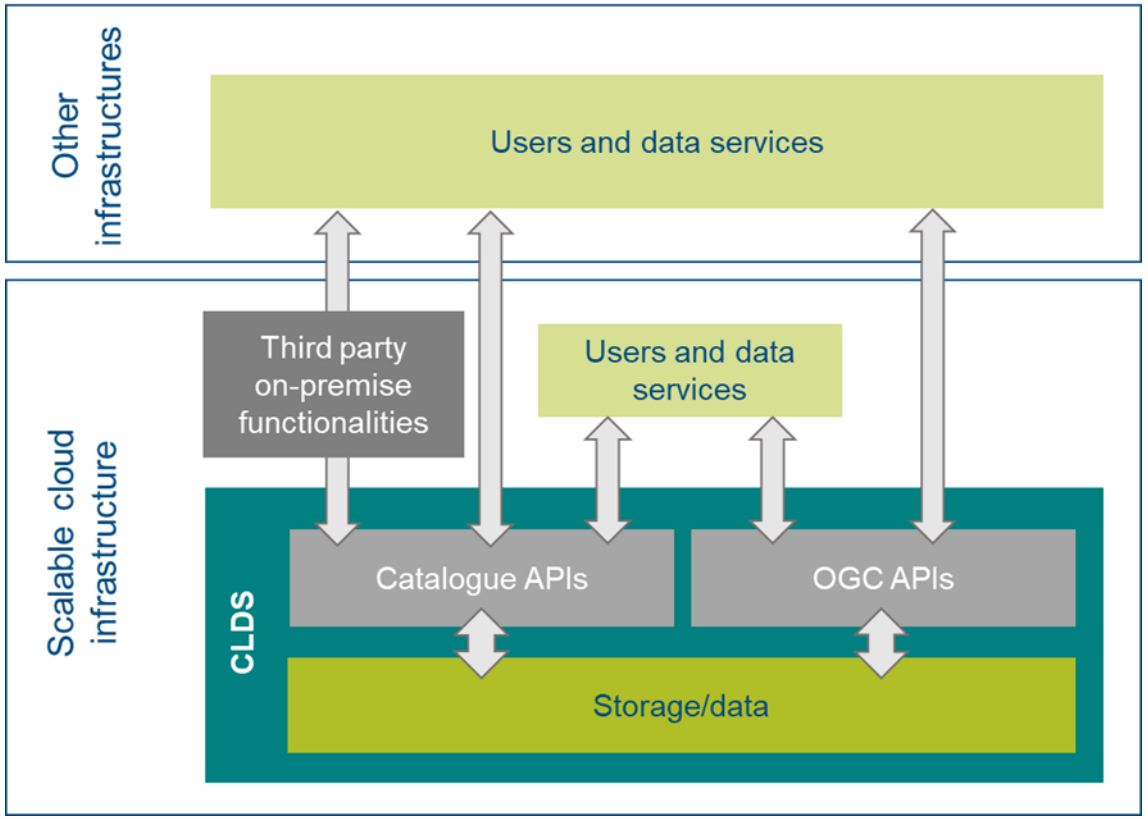
Using data: where are the issues?

- **Knowing about a product:**
  - Discoverability: A user has an issue that he/she is not even aware can be solved by means of geodata. How can we reach this user?
  - Findability: A user has an issue that he/she knows can be addressed with geodata, but how can this user find the potentially useful products?

- **Clear understanding of the relevant product:**
  - Once a potentially useful product was found, to work with the product, the user must learn about the content of the product

- **Exploitation of the data:**
  - Once the product is known, the users must know how to access and exploit it
  - Interoperability and reusability of the data

The Copernicus Land Data Store



- A new data governance for a new reality
- Ensure interoperability with other clouds and systems
- Ensure performant connectivity outside the CLDS
- Ensure competitive on-premise processing resources

Copernicus Europe's eyes on Earth

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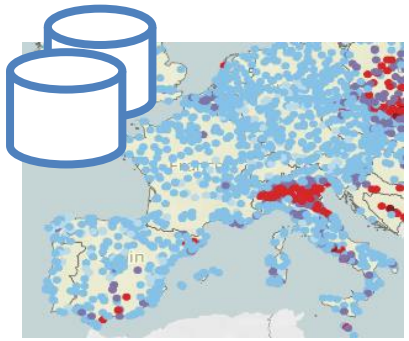
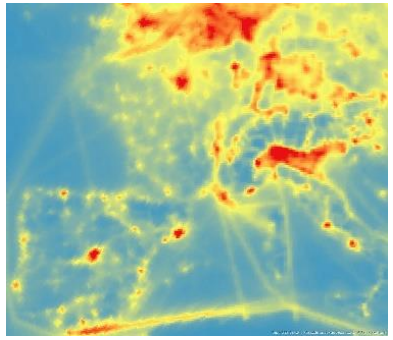
Example: from Big Data to information on air pollution

Air Quality e-Reporting

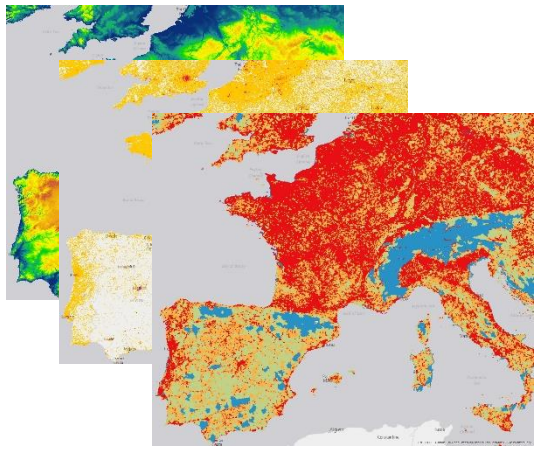
(AQ values at measurement locations)



Copernicus Atmospheric Monitoring Service

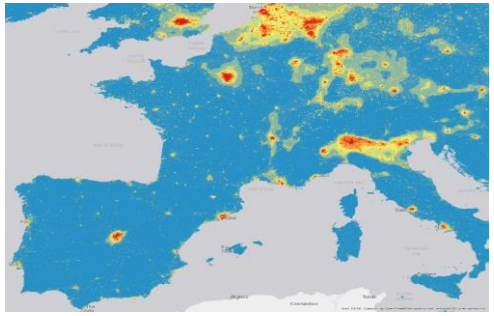


Copernicus Land Monitoring Service & other data

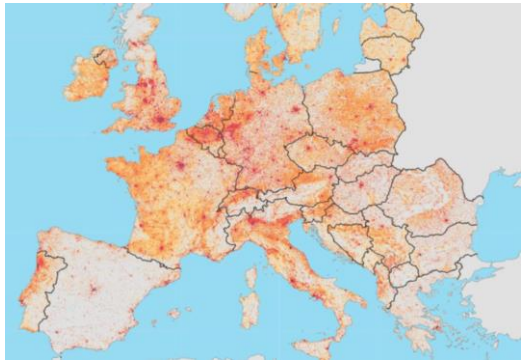


algorithm

Air Quality spatial predictions (here: downscaling to 1x1 km grids)



Spatial population grid -> Impact/exposure analysis –> health risk assessment



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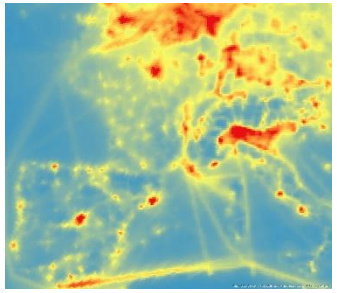
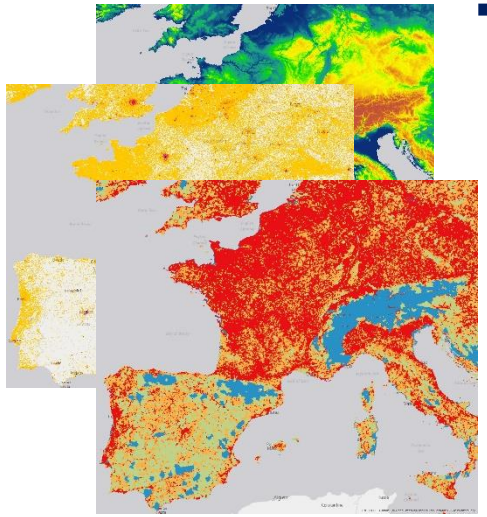
Machine learning: automated input (data cubes)

Copernicus Atmospheric Monitoring Service & Climate Change Service



Copernicus Land Monitoring Service



Air Quality e-Reporting

Working prototype production process

- *Automated data collection from CAMS and CCCS ,*
- *Pipeline which generates all necessary data sets for ML productions such as: training, validation and prediction sets, based on joints of land use, CAMS, CCCS and AQ e-Reporting data (on request)*

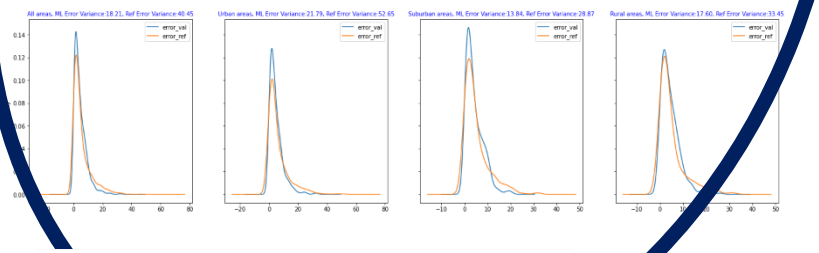
Machine learning: air quality maps

Feature selection (VIF & corr. vs target)

ML algorithm (XGBoost)

Hyperparameter tuning (cv)

Error analysis (test data set);
example below using 2014 – 2020 data

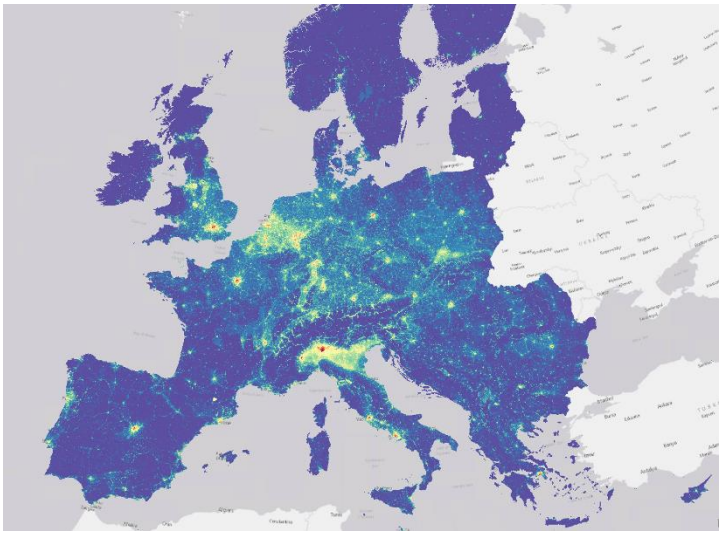


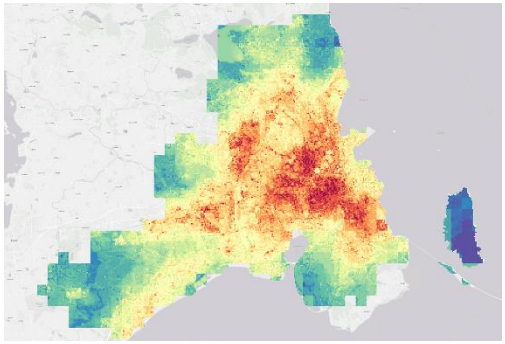
```
NO2 MQI, ML: 1.00 , Ref: 1.27
NO2 Correlation with AQ data, ML: 0.86 , Ref: 0.78
NO2 RMSE, ML: 6.21 , Ref: 8.34
```

not automated, Databricks notebooks

predictions

Air Quality spatial predictions
(downscaling to 1 km for Europe, 100 m for cities)





NO2, 2020, annual mean, Europe on 1km, Copenhagen on 100m

Cross-agency One Health collaboration and Big Data

European Environment Agency

Inter-agency task force on One Health

- One of the main outcomes of the **ONE – Health, Environment and Society** 2022 Conference hosted by EFSA in Brussels
- Joint commitment of the five ENVI agencies: **EFSA, ECDC, EEA, ECHA, EMA**.
- Task force currently developing a **2024-2026 action plan**
- **Inter-agency statement** published in November 2023 to support the 'One Health for all' conference

Priority work areas of the inter-agency task force

Strategic coordination

- Common One Health workplan
- Inter-agency statement on One Health

Research coordination

- Identifying common data needs and knowledge gaps
- Engaging with EU research funders

Informing policymakers

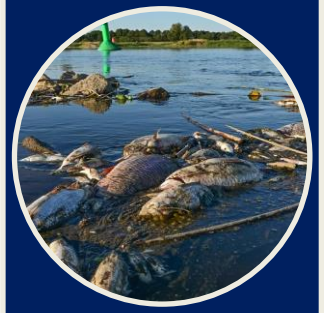
- Common engagement with EU and int'l stakeholders
- Joint trainings and events
- Support to One Health action plans by MSs?

Joint activities

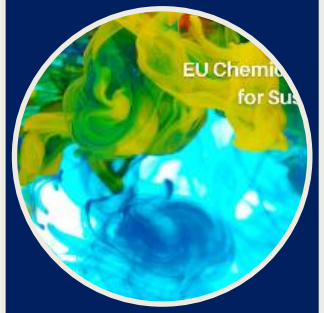
- Pilot joint projects to test cooperation
- Coordinated inputs to each other's activities
- Sharing of good practices

Existing ‘One Health’ collaborations between EU agencies

Emerging risks and impacts



Serious cross-border threats to health



CSS and Chemicals Legislation

PARC

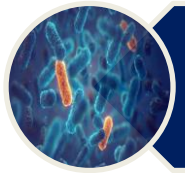
Partnership for the Assessment of Risks from Chemicals

Environmental risk assessment

One Health Task Force

Cross-agency data and knowledge

Looking forward: future Big Data collaborations for One Health?



Antimicrobial resistance

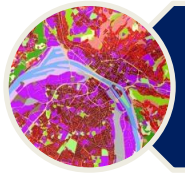
- Integrating antimicrobial use data with environmental data

Environmental risk assessment

- Environmental data used to support identification of potential hazards and risks

Exposure assessments (e.g. MRLs)

- Human biomonitoring data to support human dietary exposure assessments



Spatial determinants of health ('Health and place')

- Combining satellite and health data to assess influence of geospatial factors on **health**

Using environmental data to support veterinary epidemiology

- e.g. using Copernicus products in epidemiological studies of animal diseases

Thank you for your attention!

Do you have any other question or comment?

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