

■ Launch of Ocean Service

Applications of the LCLU service

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■ Camila Gómez

Remote Sensing Specialist

Land Cover and Use,
CopernicusLAC Chile





Land cover
and land use

Today's LCLU Workshop Agenda

Technical Presentation Session:

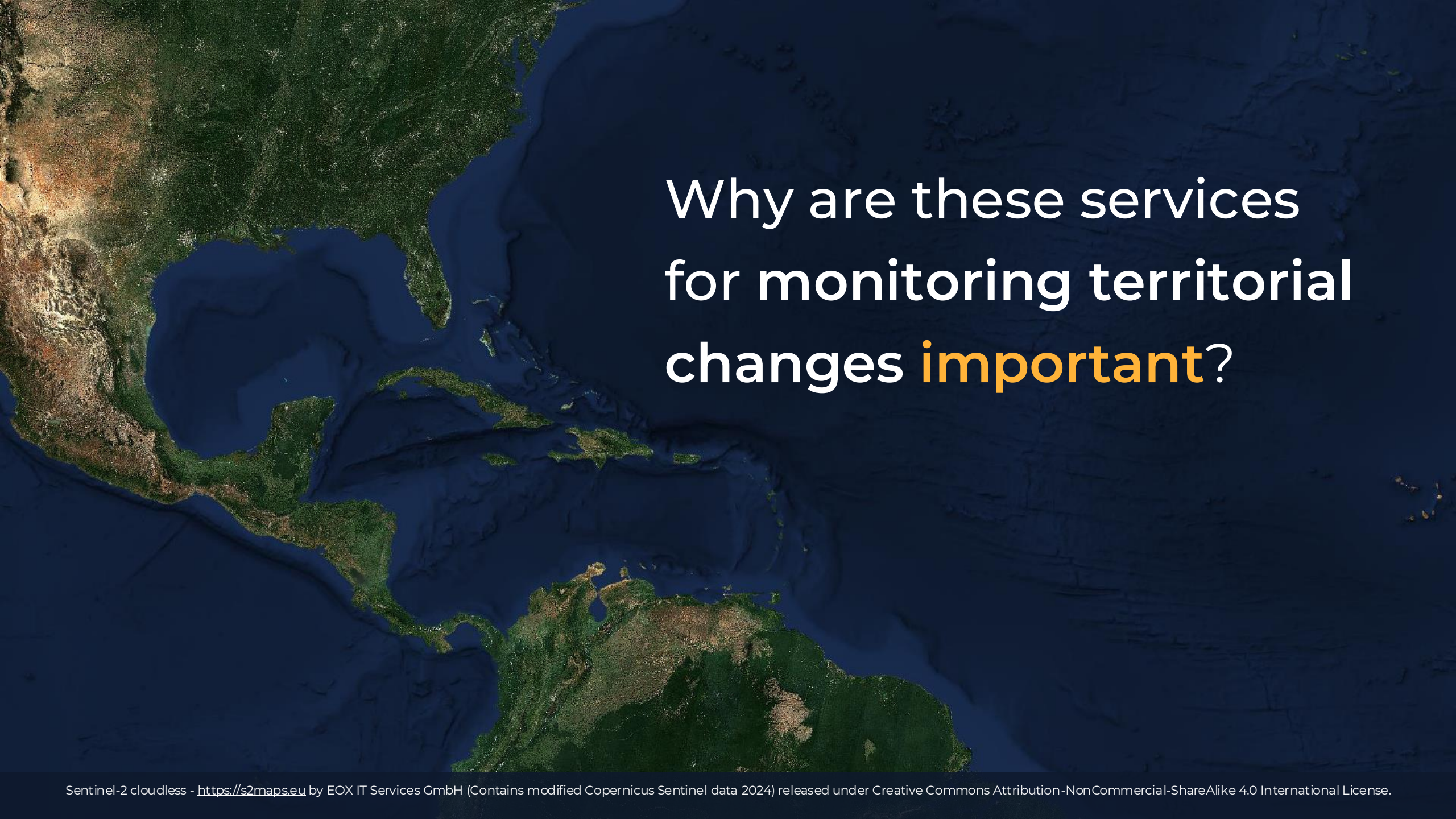
01. Introduction

02. The Service

- LCLU maps
- Development
- Results
- Future Challenges

03. The Service's Platform



A satellite image of the Caribbean Sea and surrounding landmasses, including North America, Central America, and South America. The text is overlaid on the right side of the image.

Why are these services
for monitoring territorial
changes **important**?

Regional Center Copernicus for America Latin America and the Caribbean

Storage, processing and distribution of satellite data
of the Program Copernicus

Image: Tabasco, Mexico >



Land cover and
land use

Direct access >



Urban Atlas

Direct access >



Coastal
monitoring

Direct access >



Sentinel image
repository

Direct access >



Private cloud

Direct access >

Regional Center Copernicus for America Latin America and the Caribbean

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Land cover and land use

Land Cover and Land Use (LCLU)

Geospatial analysis service provides accurate, up-to-date data to monitor **territorial changes**.



Crucial for **informed decision-making** in land-use planning and environmental management, helping to mitigate deforestation and protect biodiversity across the region.





Land cover
and land use

■ 02. The Service

LCLU maps

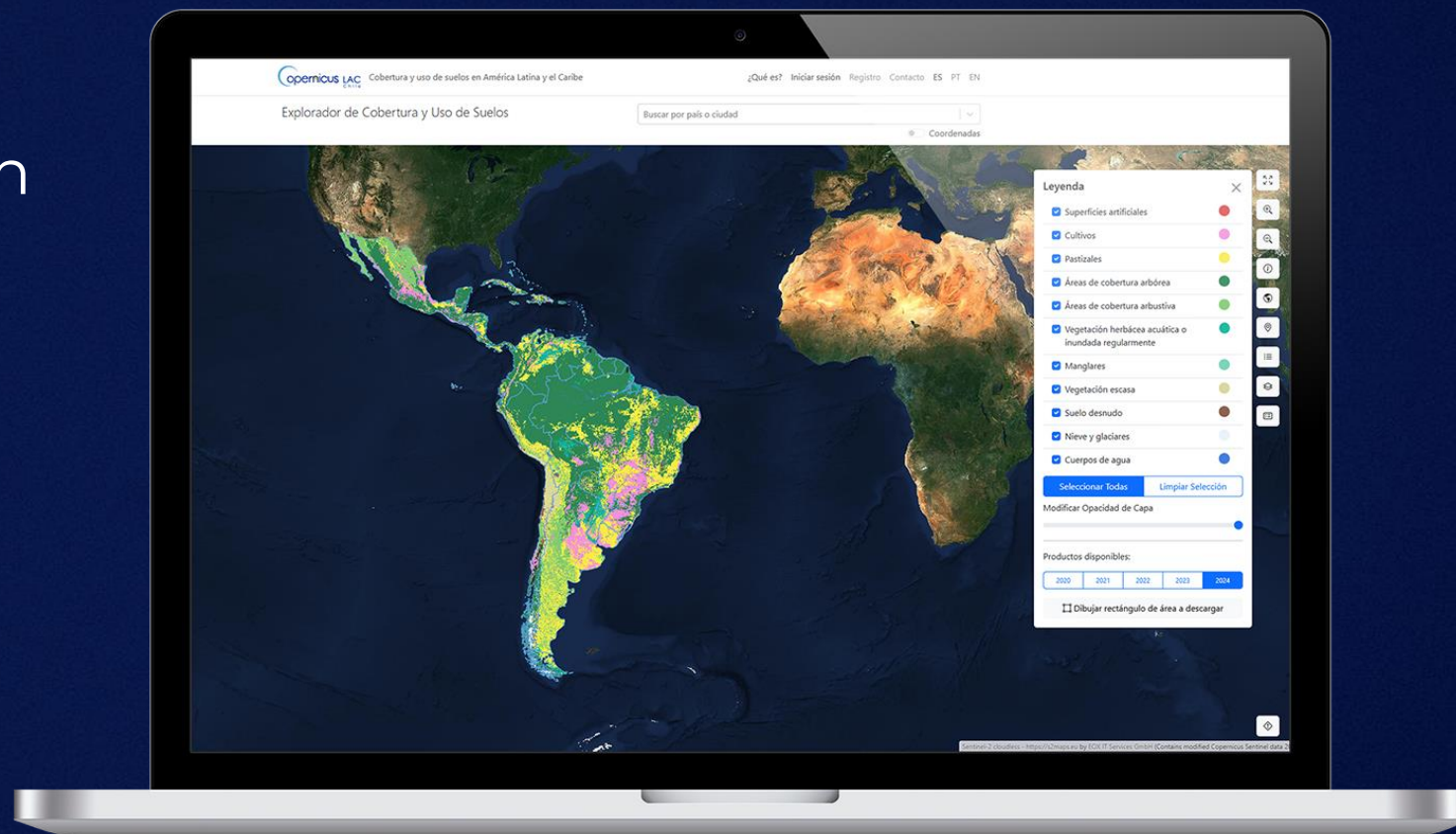




Land cover
and land use

Current version LCLU

- Version 2
- 20 meters resolution
- 2020-2024
- 11 classes





Land cover
and land use

Why does monitoring territorial changes matter?

Earth observation tools provide the evidence base for critical decisions across four strategic domains:



Sustainable
Planning



Environmental
Management



Biodiversity
Protection



Evidence-
Based Policy

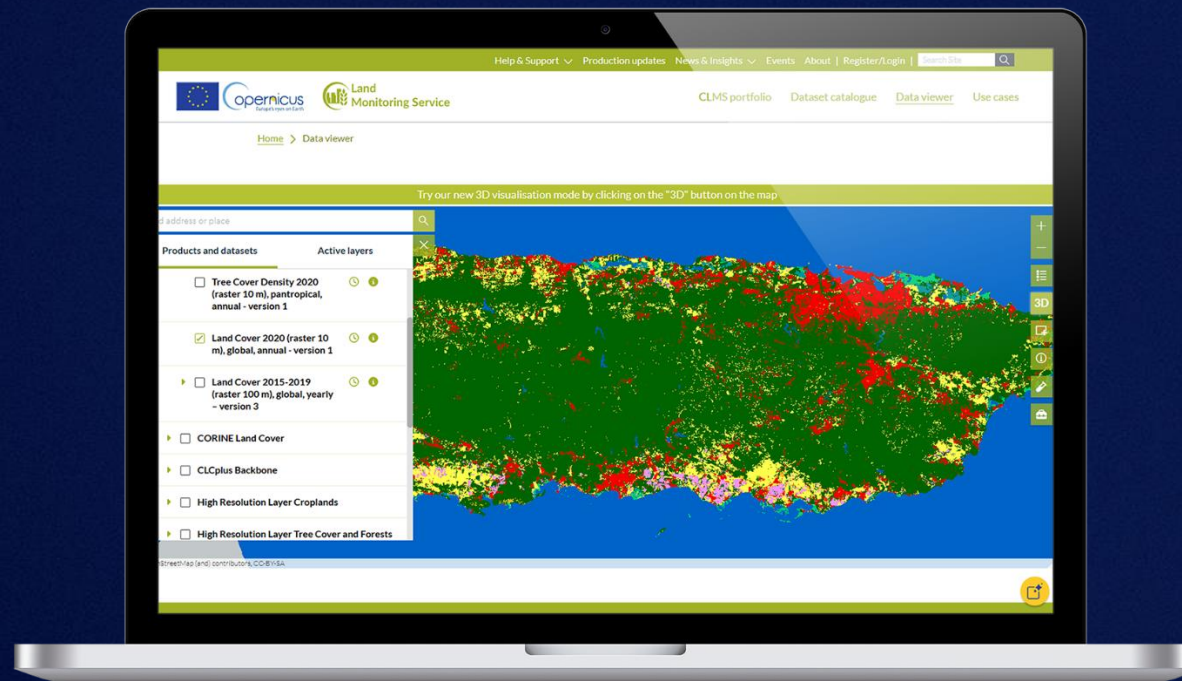




Land cover
and land use

How does our LCLU compare to similar offerings?

Full-coverage Land Cover & Use Global Dynamic Land Cover



- 10 m resolution
- 2020 in process of validation
- 11 classes

<https://land.copernicus.eu/en/products/global-dynamic-land-cover/land-cover-2020-raster-10-m-global-annual>

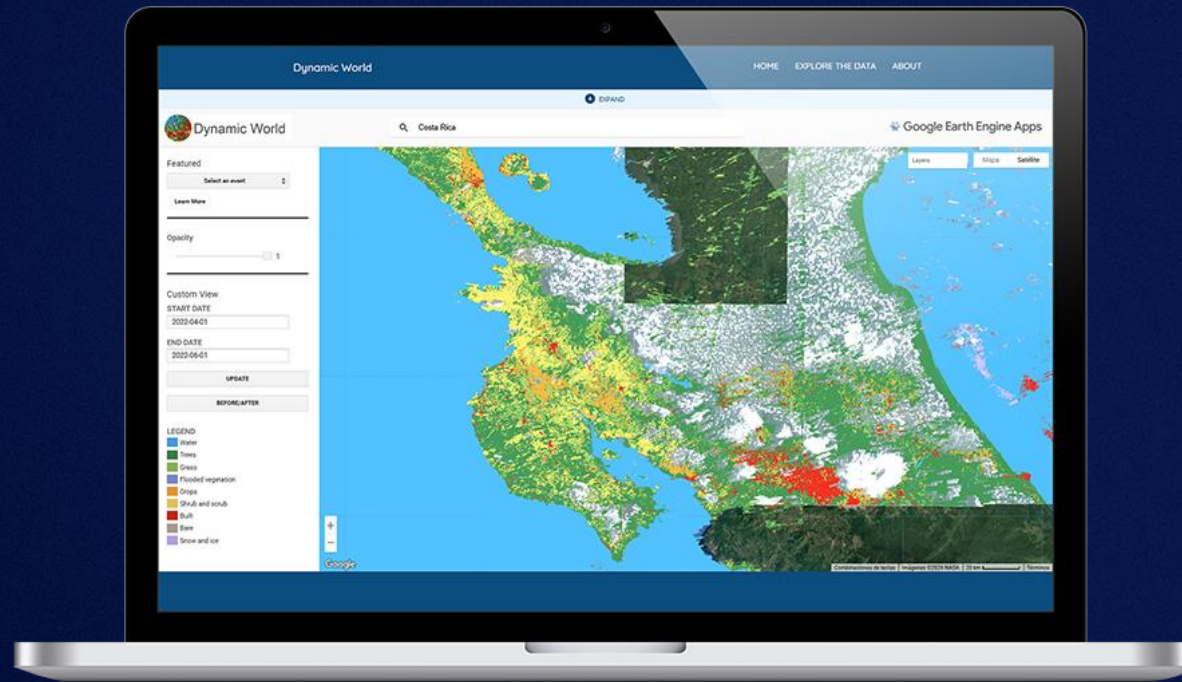




Land cover
and land use

How does our LCLU compare to similar offerings?

Google Dinamic World



- 10 m resolution
- Near real time (2018-2022)
- Sentinel 2
- 9 classes

Brown et al. (2022) Dynamic World, Near real-time global 10 m land use land cover mapping





Land cover
and land use

How does our LCLU compare to similar offerings?

Esri Land Cover



- 10 m resolution
- Near real time (2017-2024)
- Sentinel 2
- 9 classes

livingatlas.arcgis.com/landcover/





Land cover
and land use

How does our LCLU compare to similar offerings?

Regional Maps MAPBIOMAS



- 30m resolution
- Depends on the country (i. e. 1985-2024)
- 5 main classes + different levels

Available for Brazil, Argentina, Chile, Bolivia, Peru, Colombia, Venezuela and other regions (Amazonia, Pampa Trinacional, Chaco).

<http://plataforma.brasil.mapbiomas.org/>





Land cover
and land use

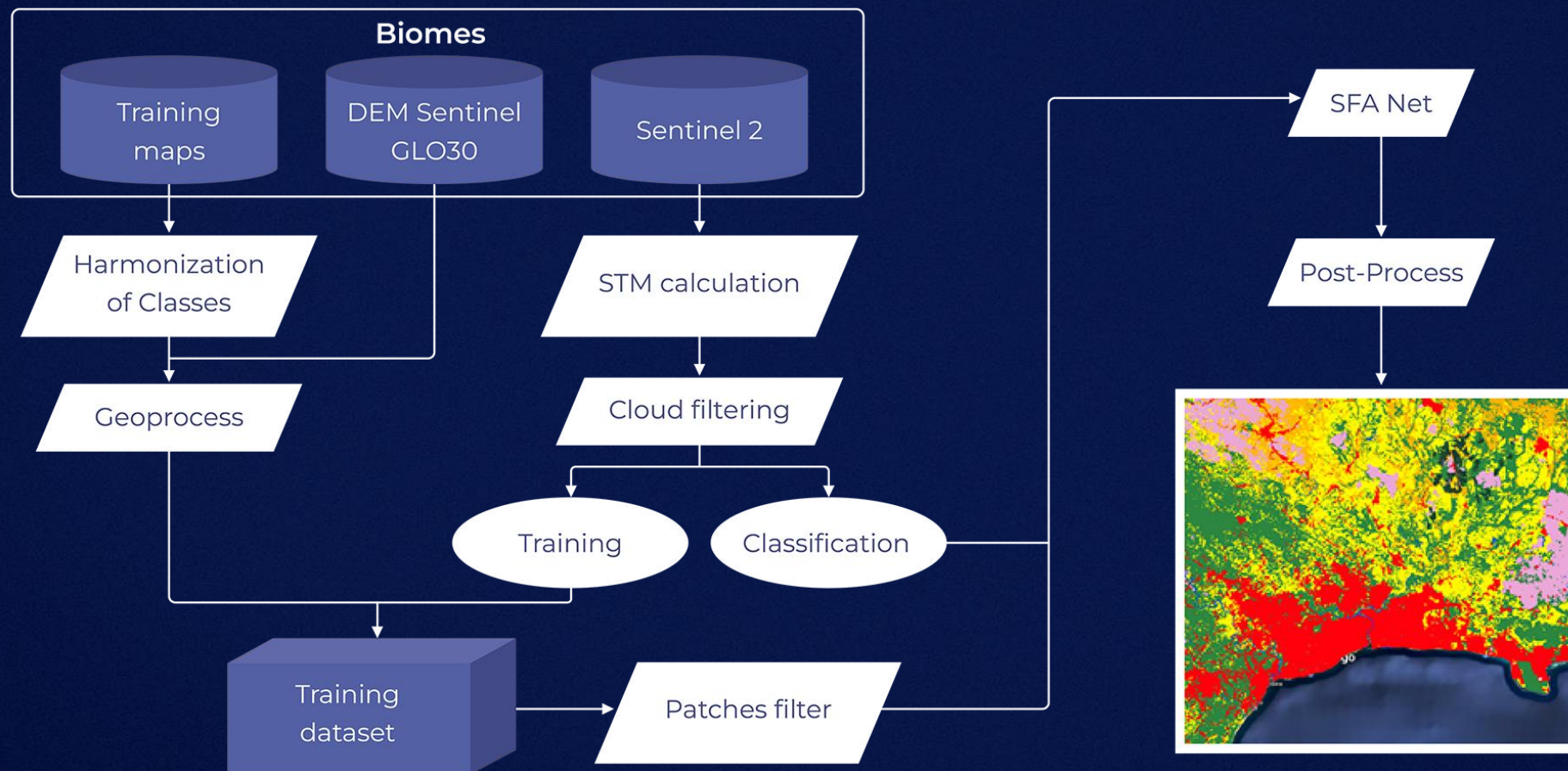
■ 02. The Service **Development**





Land cover
and land use

Current version LCLU





Land cover
and land use

How our LCLU Service has evolved

First version of LCLU

- Year 2023
- 20 meters resolution
- 7 classes

Training Data

Dynamic World

Global Dynamic
Land Cover

Geographical
differentiator

Köppen-Geiger

Machine
learning

Random Forest

Current version of LCLU

- Years 2020-2024
- 20 meters resolution
- 11 classes

Training Data

Regional maps

Copernicus
Glo30

Geographical
differentiator

Biomes

AI Neutral
Network

SFA Net





Land cover
and land use

11 classes

Categories of the CopernicusLAC

Chile Land Cover and Land Use Map



Artificial
Surfaces



Tree Covered Areas *



Mangroves



Cropland *



Shrubs Covered
Areas



Sparse
Vegetation



Grassland



Herbaceous vegetation,
aquatic or regularly
flooded



Bare soil



Snow and
Glaciers



Water
Bodies

* EUDR

Modified from FAO Global, Land Cover (GLC-SHARE) Beta-Release 1.0 Database, Land and Water Division, John Latham, Renato Cumani, Ilaria Rosati and Mario Bloise, 2014

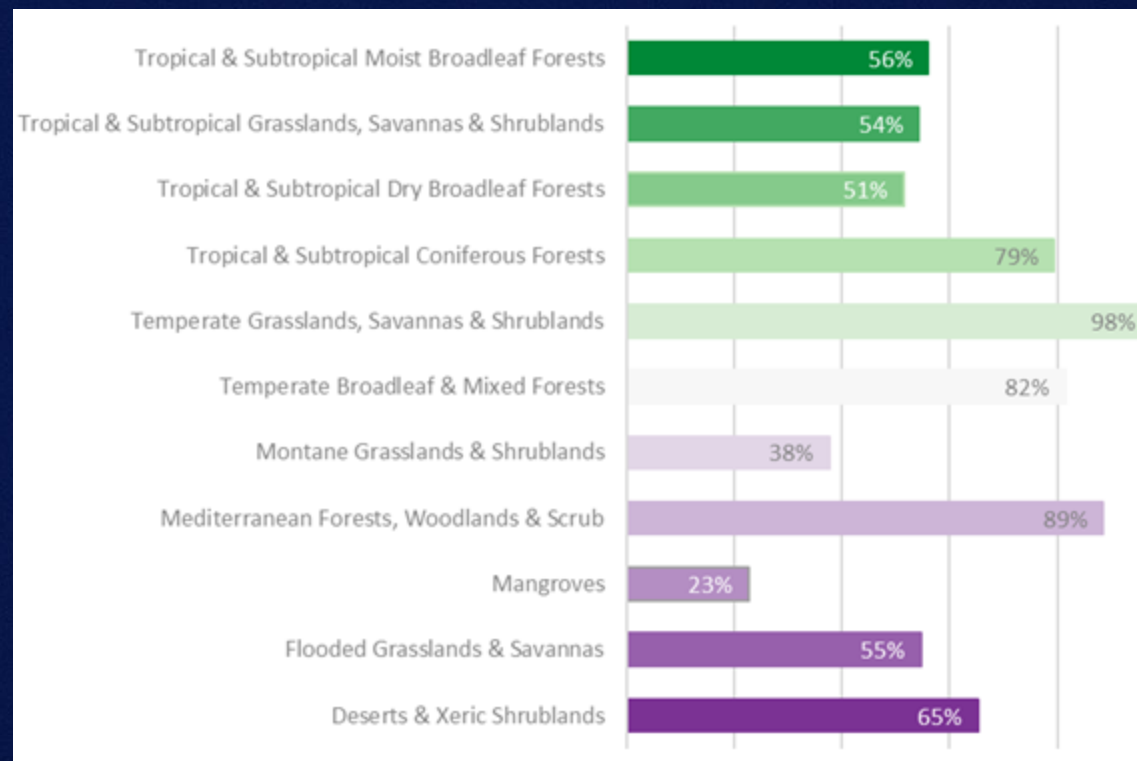
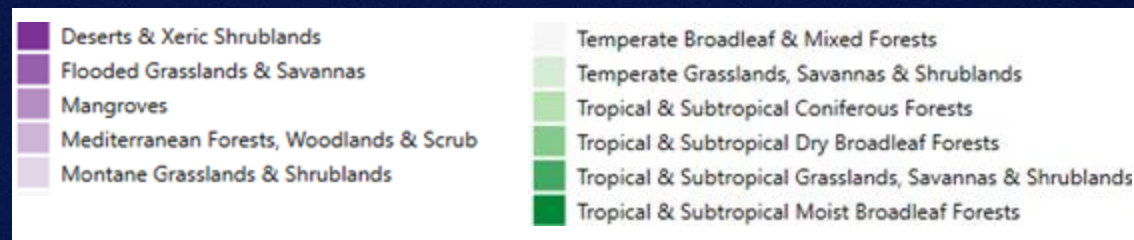




Land cover
and land use

Biomes

Dataset selection



Brazil

Brazil

Brazil

Mexico

Argentina

Chile

Argentina

Chile

Brazil

Brazil

Mexico

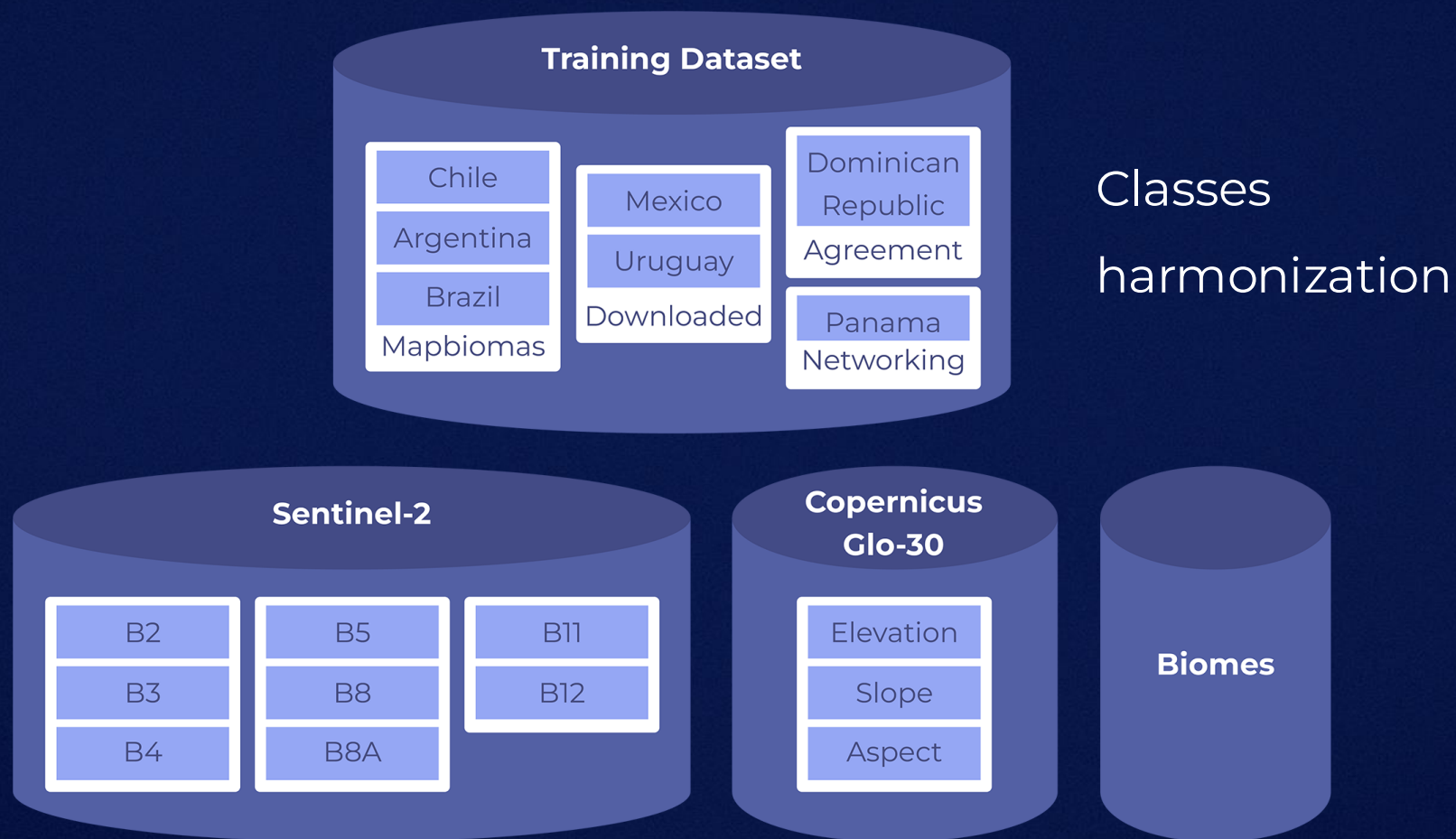
<https://www.resolve.ngo/>





Land cover
and land use

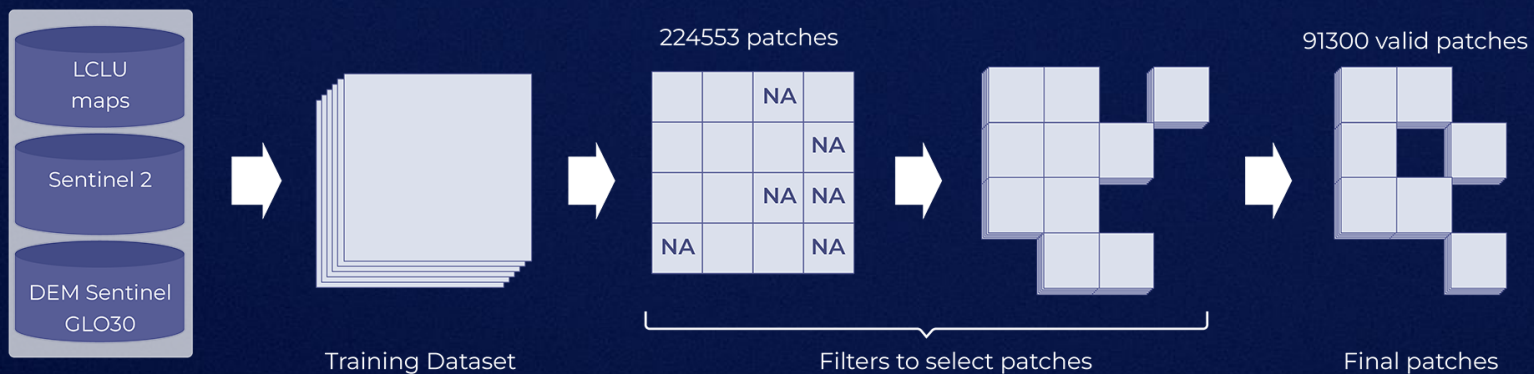
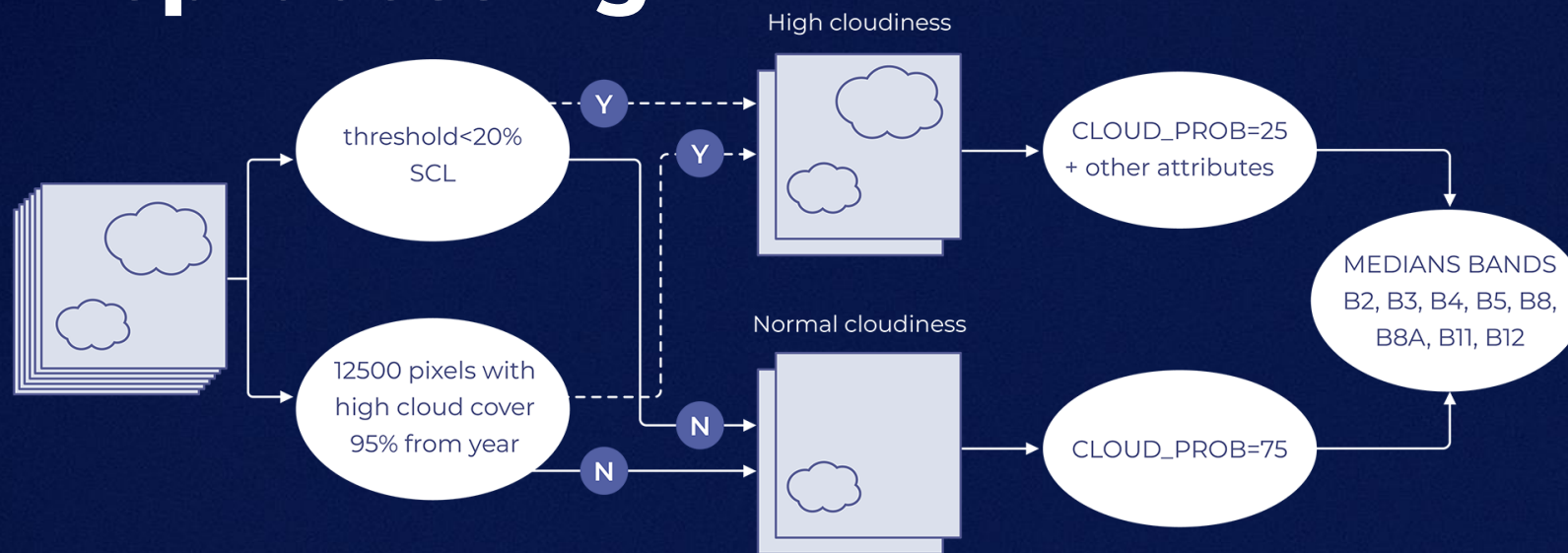
Training Data





Land cover
and land use

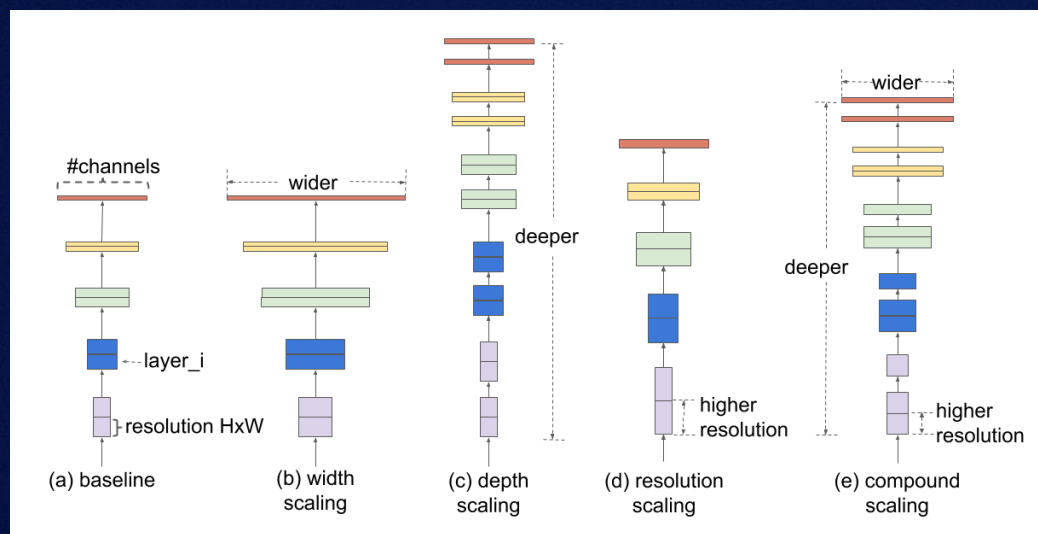
Preprocessing



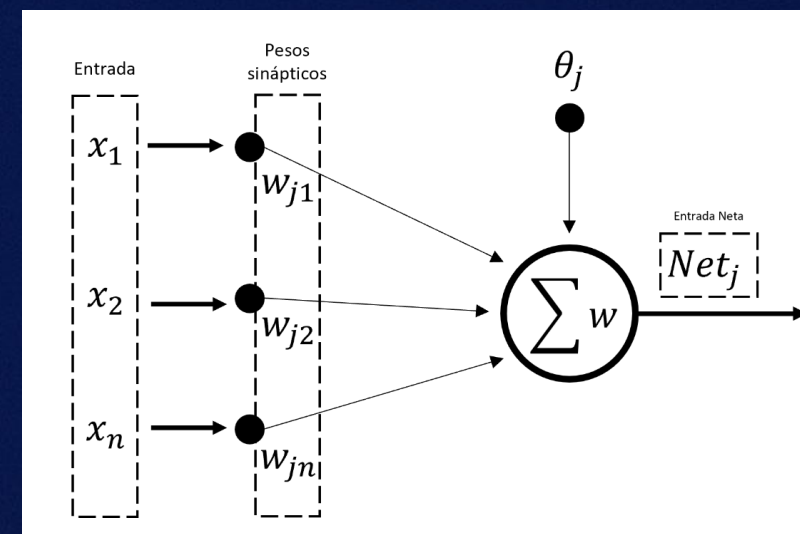


Land cover
and land use

Model



Tan et al. (2020)



Gómez et al. (2016)





Land cover
and land use

Model



Kensuke Koike

Physical representation of how a Convolutional Neural Network (CNN) processes visual data.

Many pictures of dogs



Feature Maps (identifying patterns)





Land cover
and land use

02. The Service Results





Land cover
and land use

Model Results

Class	0	1	2	3	4	5	6	7	8	9	10	11
0	0,52	0,01	0,13	0,19	0,12	0,03	0,00	0,00	0,00	0,00	0,00	0,00
1	0,08	0,53	0,19	0,04	0,08	0,07	0,00	0,00	0,00	0,00	0,00	0,01
2	0,03	0,01	0,85	0,08	0,03	0,01	0,00	0,00	0,00	0,00	0,00	0,00
3	0,02	0,00	0,05	0,81	0,07	0,04	0,01	0,00	0,00	0,00	0,00	0,00
4	0,02	0,00	0,02	0,04	0,90	0,01	0,01	0,00	0,00	0,00	0,00	0,00
5	0,01	0,00	0,02	0,05	0,03	0,89	0,00	0,00	0,00	0,00	0,00	0,00
6	0,02	0,00	0,00	0,01	0,06	0,00	0,90	0,00	0,00	0,00	0,00	0,01
7	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
8	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,93	0,07	0,00	0,00
9	0,00	0,00	0,00	0,00	0,02	0,02	0,00	0,00	0,04	0,90	0,00	0,00
10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
11	0,00	0,00	0,03	0,00	0,04	0,00	0,00	0,00	0,00	0,00	0,00	0,92

Artificial
Surface



Worst metric
Results are
too wide

Mangroves
and Snow and
Glaciars have
no metrics



Samples are so
small that all
data are in
training sample

Overall IOU: 0.7486

Overall F1: 0.8406

Loss: 0.416



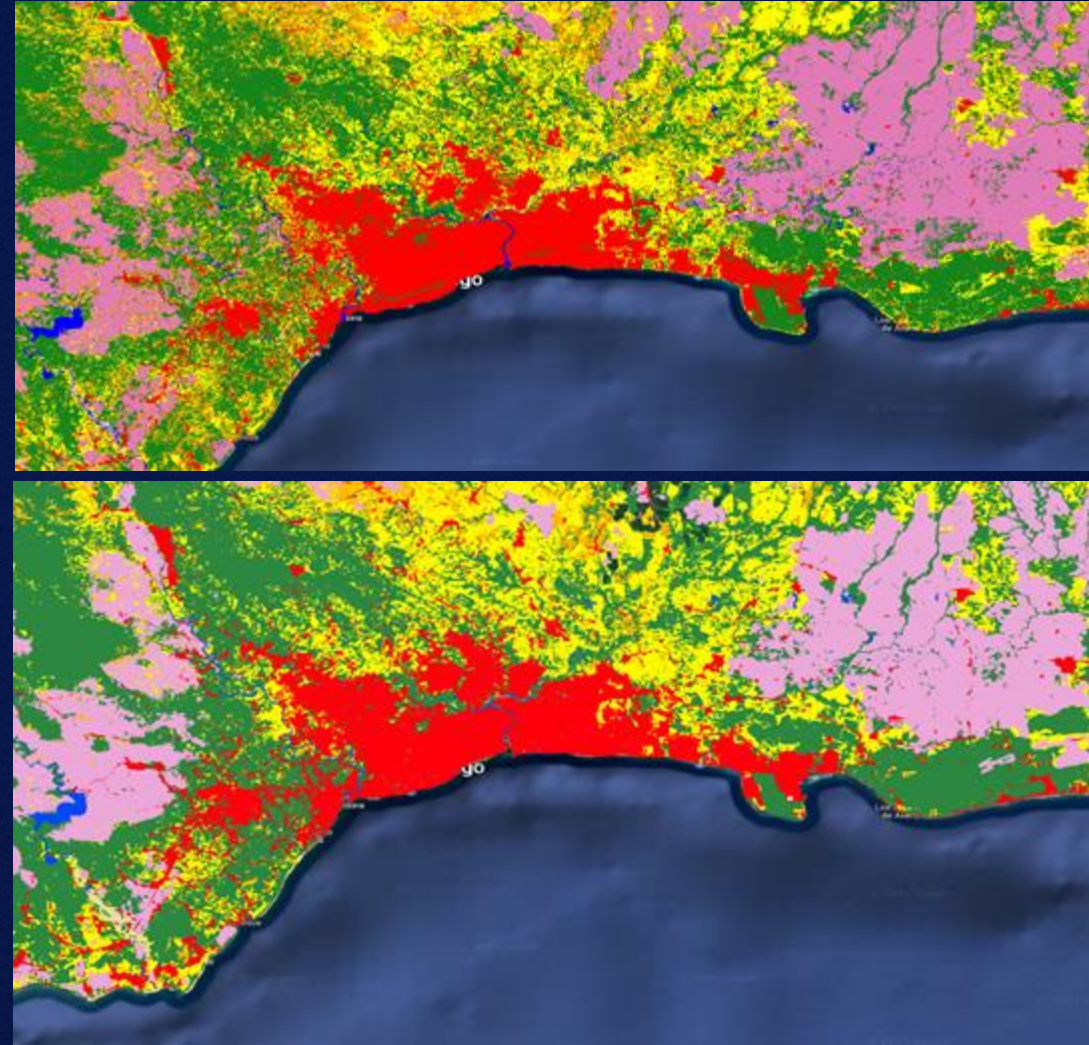


Land cover
and land use

Field Application

Land Cover and Land Use Map,
Dominican Republic

- | | | | |
|---|--|--|-------------------|
|  | Artificial Surfaces |  | Mangroves |
|  | Cropland |  | Sparse Vegetation |
|  | Grassland |  | Bare soil |
|  | Tree Covered Areas |  | Snow and Glaciers |
|  | Shrubs Covered Areas |  | Water Bodies |
|  | Herbaceous vegetation,
aquatic or regularly flooded | | |





Land cover
and land use

■ 02. The Service

Future Challenges





Land cover
and land use

What do you think of these classes?

Categories of the CopernicusLAC Chile Land Cover
and Land Use Map



Artificial
Surfaces



Tree Covered
Areas *



Mangroves



Cropland *



Shrubs Covered
Areas



Sparse
Vegetation *



Grassland



Herbaceous vegetation,
aquatic or regularly
flooded



Bare soil *



Snow and
Glaciers



Water
Bodies

* EUDR

* Future versions





Land cover
and land use

In Situ Data

- Vector datasets
 - Validated points
 - Ground Surveys
- 
- **Calibration & Training:** Provides the raw, localized parameters necessary to train machine learning algorithms and calibrate sensors.
 - **Validation:** Used as "ground truth" to assess accuracy, identify biases, and calculate error metrics in Earth observation models.

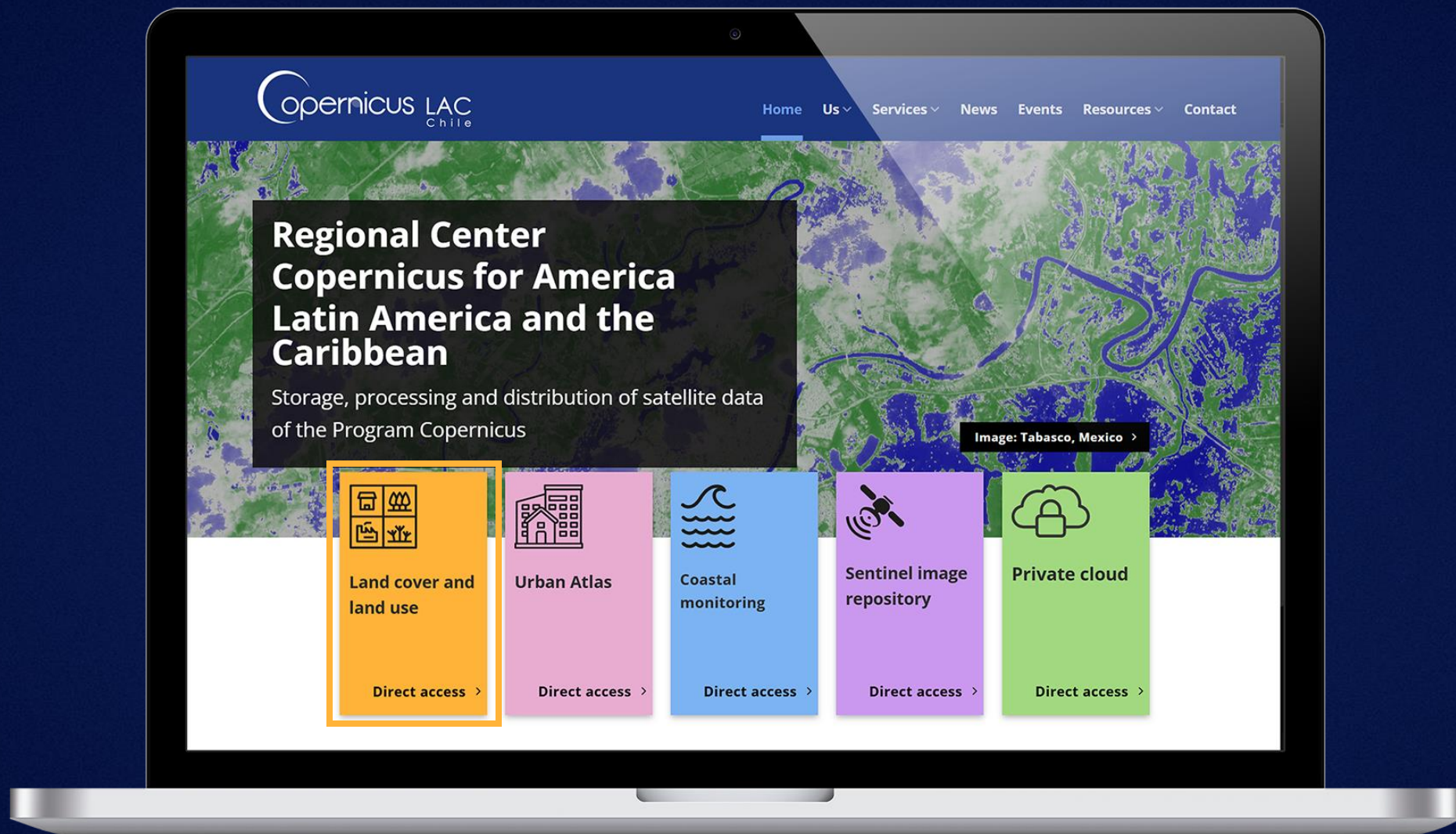




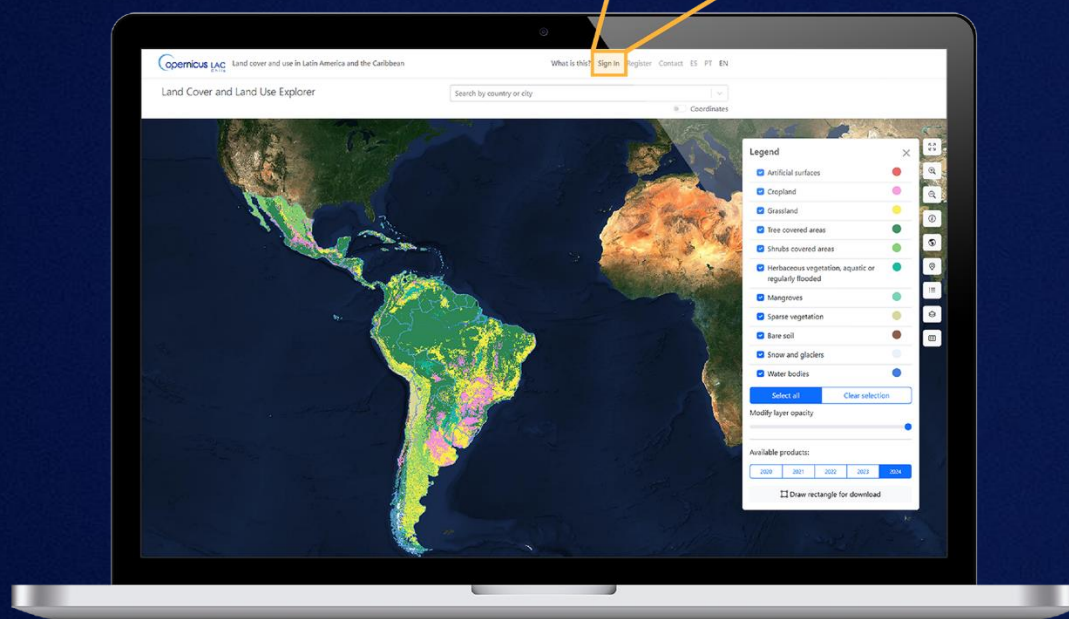
Land cover
and land use

03. The Service's Platform

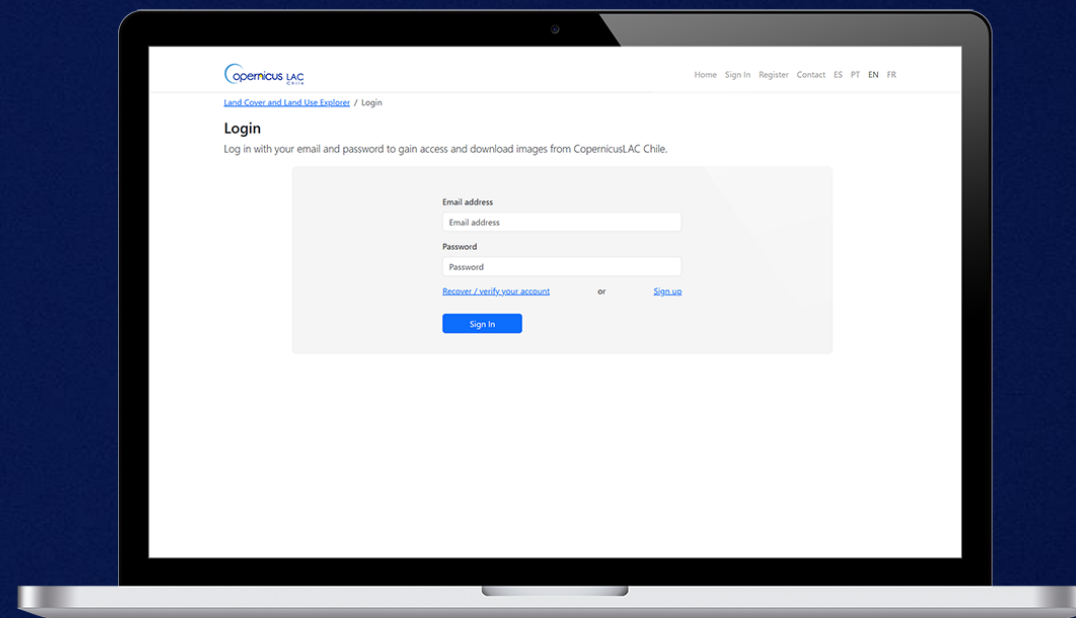




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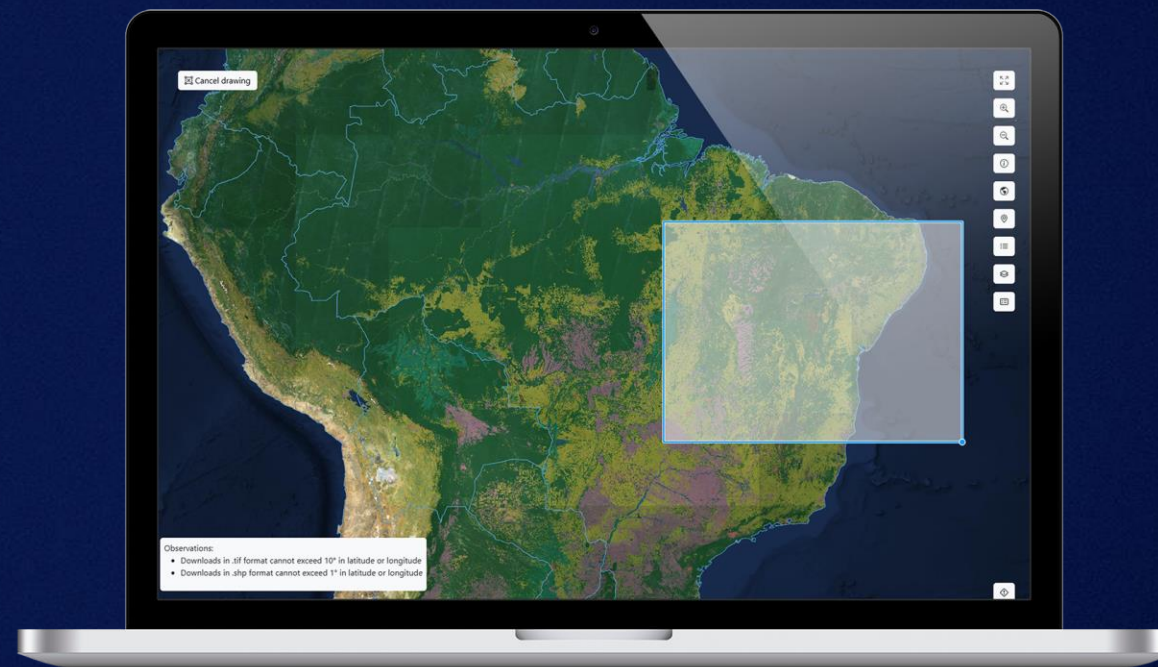
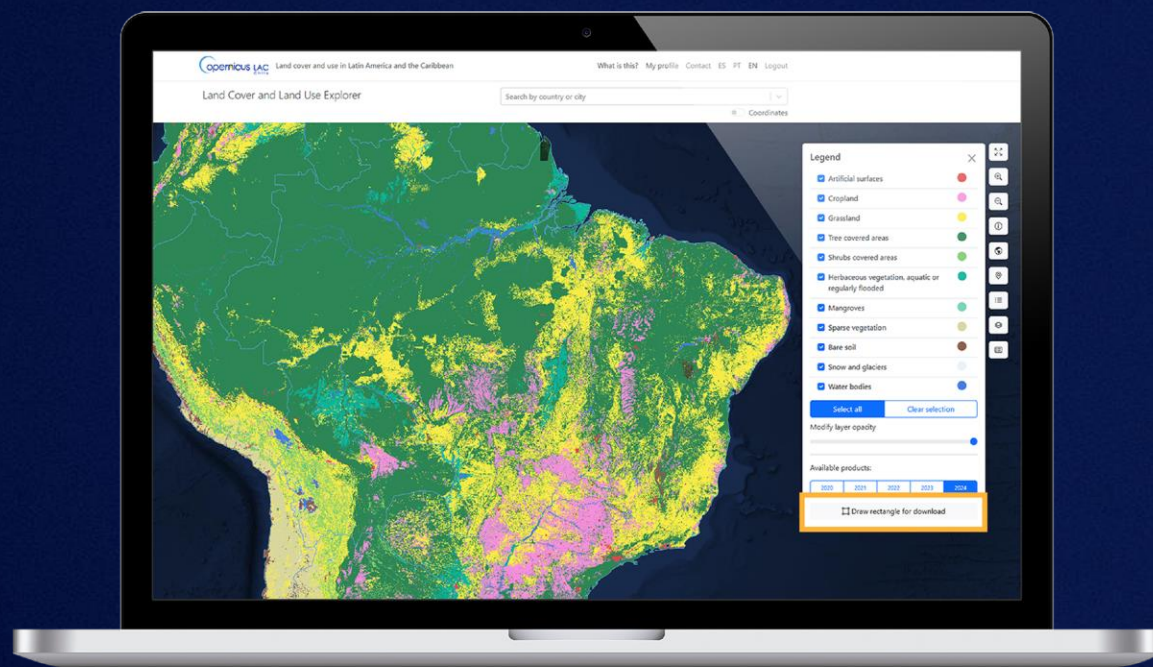
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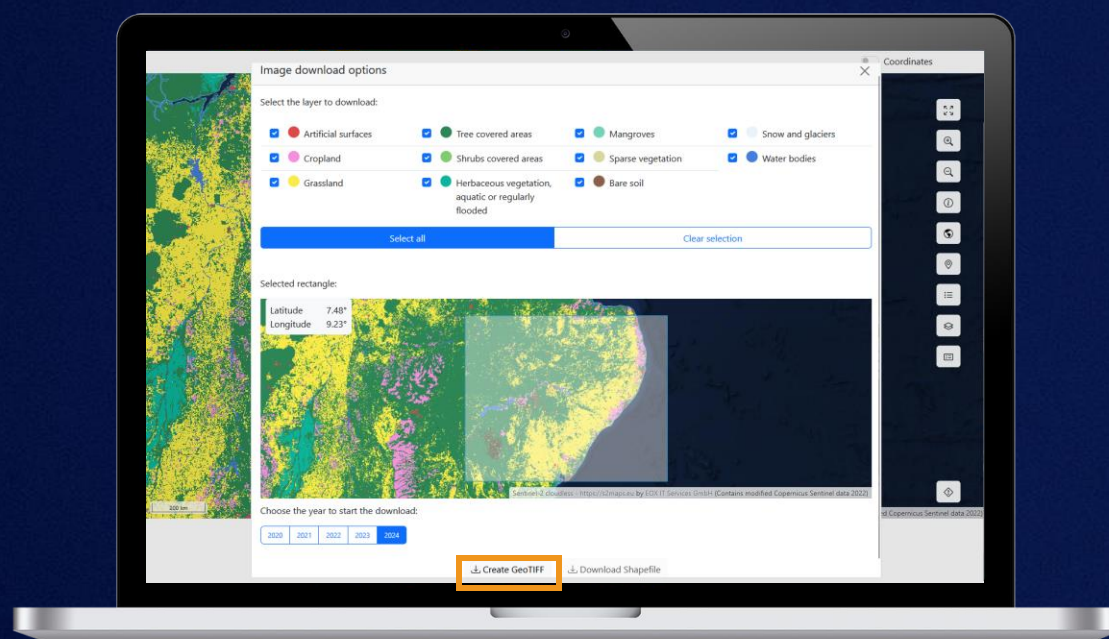
<https://iam.copernicuslac-chile.eu/en/login?flow=57f5e38b-15c8-4030-a2df-0776e5e3d24a>



Draw a rectangle for download



Choose classes year format



Check the Download History





Land cover
and land use



* Recap





Land cover
and land use

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01. Introduction

02. The Service

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Land cover
and land use

Today's LCLU Workshop Agenda

Hands on Session:

- What you'll need
- What to expect
- How we'll work together





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