

29 September - 01 October 2026 ESA-ESRIN | Frascati | Italy

Environmental Crimes joint workshop with ESA-JRC- UNODC

GEOINTECA:

A software package to integrate geospatial data into compliance risk assessments

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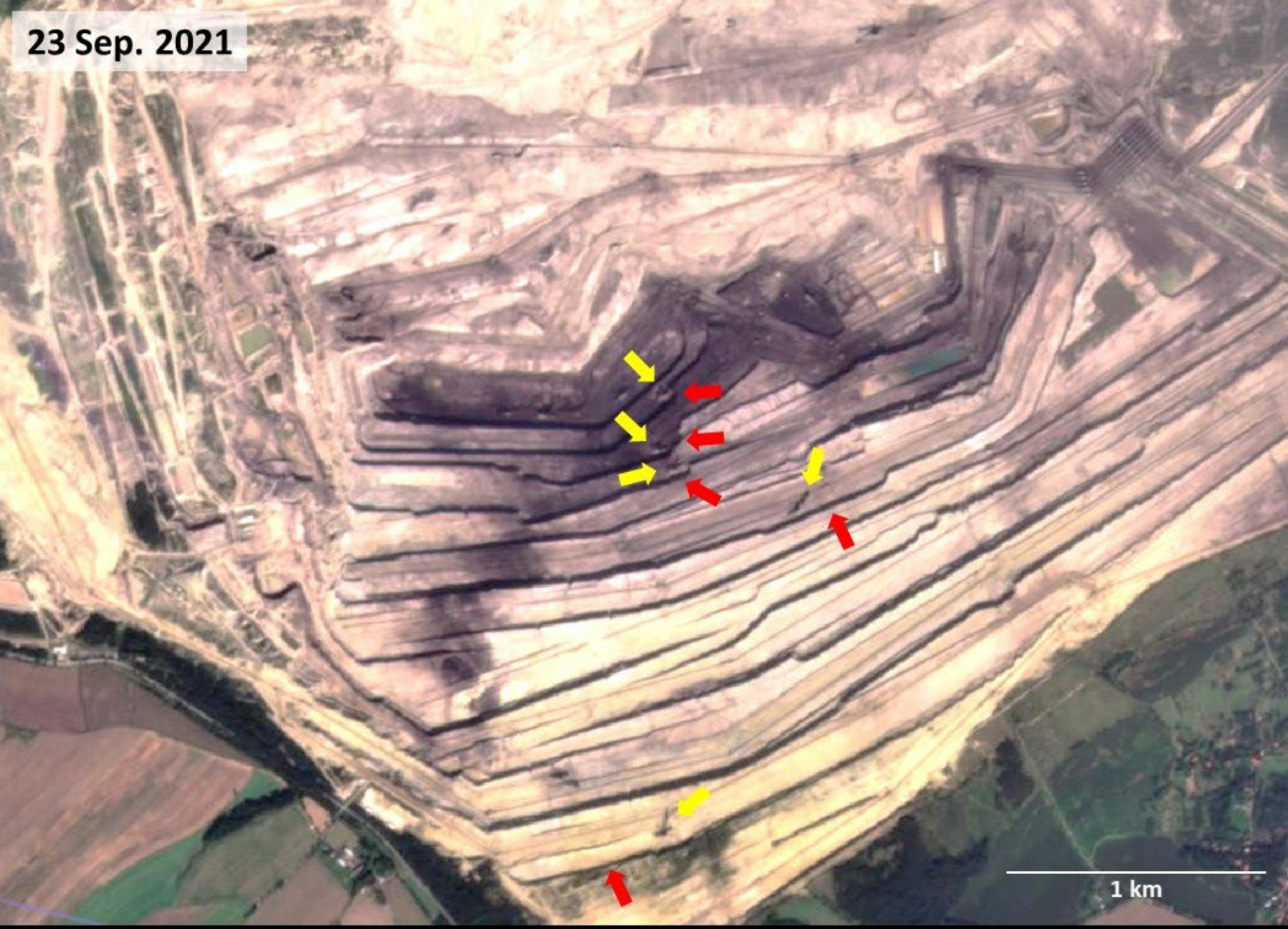


14 Sep. 2021



Background Image:
PlanetScope

23 Sep. 2021



Background Image:
PlanetScope

26 Sep. 2021



Background Image:
PlanetScope

Industrial Emissions Directive

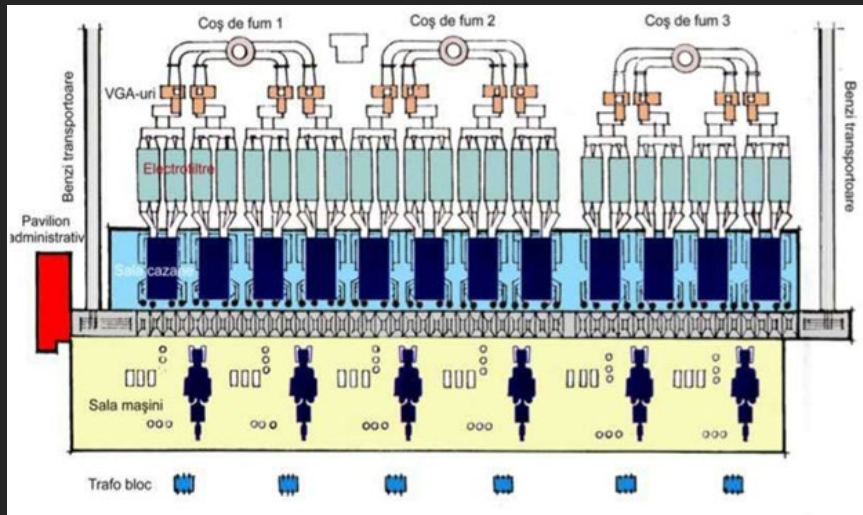


Diagram describing the power plant unit configuration

source: official documents of the LCPs



Industrial Emissions Directive



Satellite image acquired taken 26 February 2021

Source: Planet Scope



European
Commission

 About this site

 Back to the maps list

Bielsk Podlaski

Kleszczele

Беловежская
пуца

How can we check
compliance risk more
systematically?

Systematic compliance risk checks

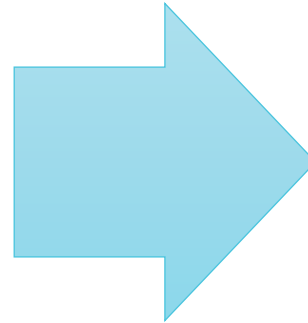
User requirements

- Legal framing
- Large areas
- Through time
- «Zoom in» & «Zoom out»
- «Alerts»

Systematic compliance risk checks

User requirements

- Legal framing
- Large areas
- Through time
- «Zoom in» & «Zoom out»
- «Alerts»



EO requirements

- Large spatial extent
- High cadence
- High spatial resolution
- Automation

Combine multiple geospatial data sets

Systematic compliance checks

$$\text{Risk} = \text{Exposure \& Vulnerability} \times \text{Hazard}$$

Protected forest habitats listed in the Habitats Directive



Habitat presence & type



Tree cover loss



Deterioration
risk assessment



Compliance
risk assessment

Risk component:
Information type:

Exposure & Vulnerability
Authoritative maps

Hazard
Remote Sensing

Orthophoto

An aerial orthophoto showing a dense forest landscape. A light-colored, winding road or path runs horizontally across the upper middle of the image. Several irregularly shaped ponds or wetlands are visible, particularly in the lower half of the image. The terrain appears to be hilly or uneven, with varying shades of green indicating different vegetation types or topography. The overall image is a high-resolution aerial photograph used for mapping purposes.

- ia Ruumiamet

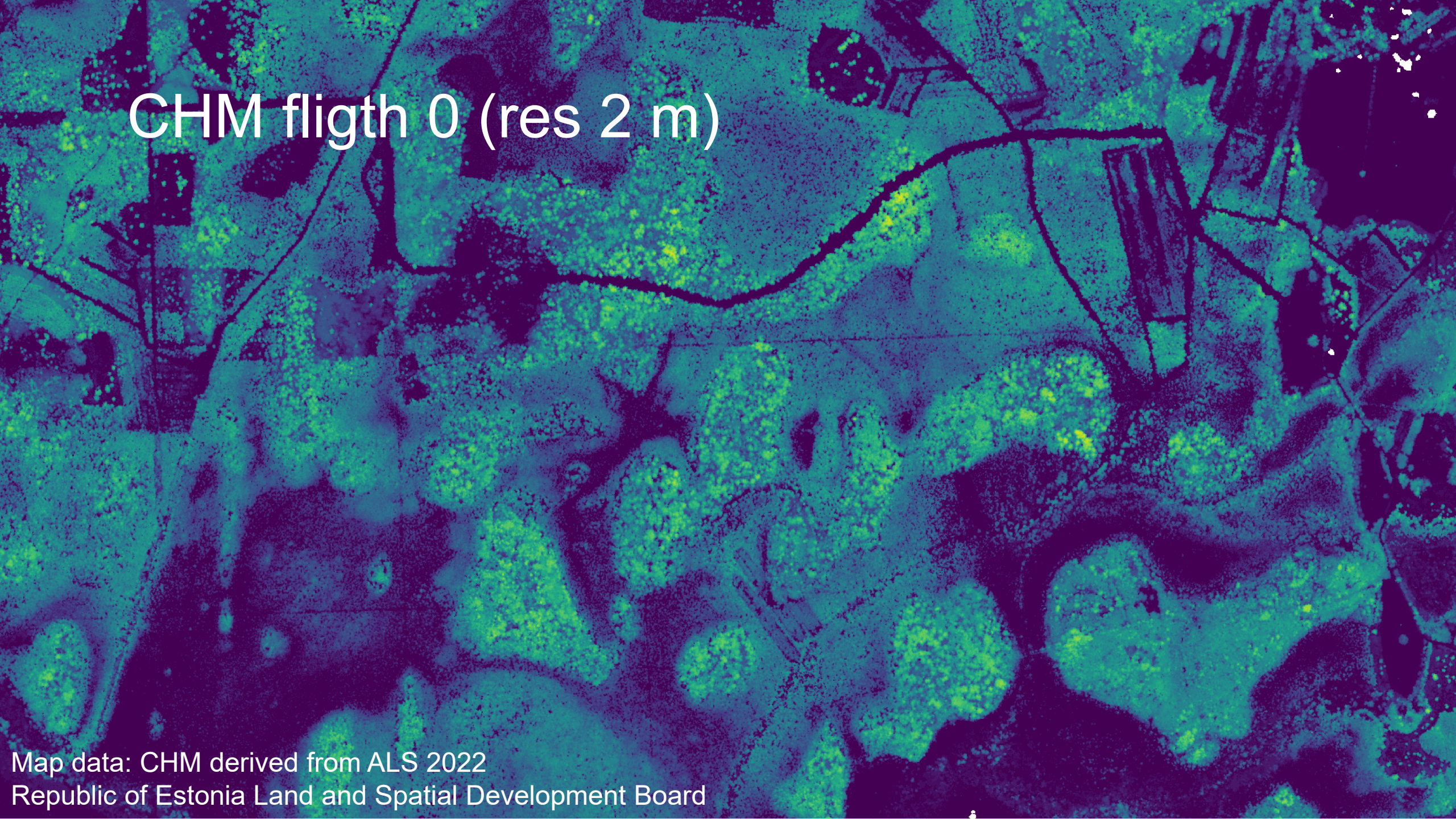
- ia Ruumiamet

Map data: orthophoto 2022
Republic of Estonia Land and Spatial Development Board

- ia Ruumiamet

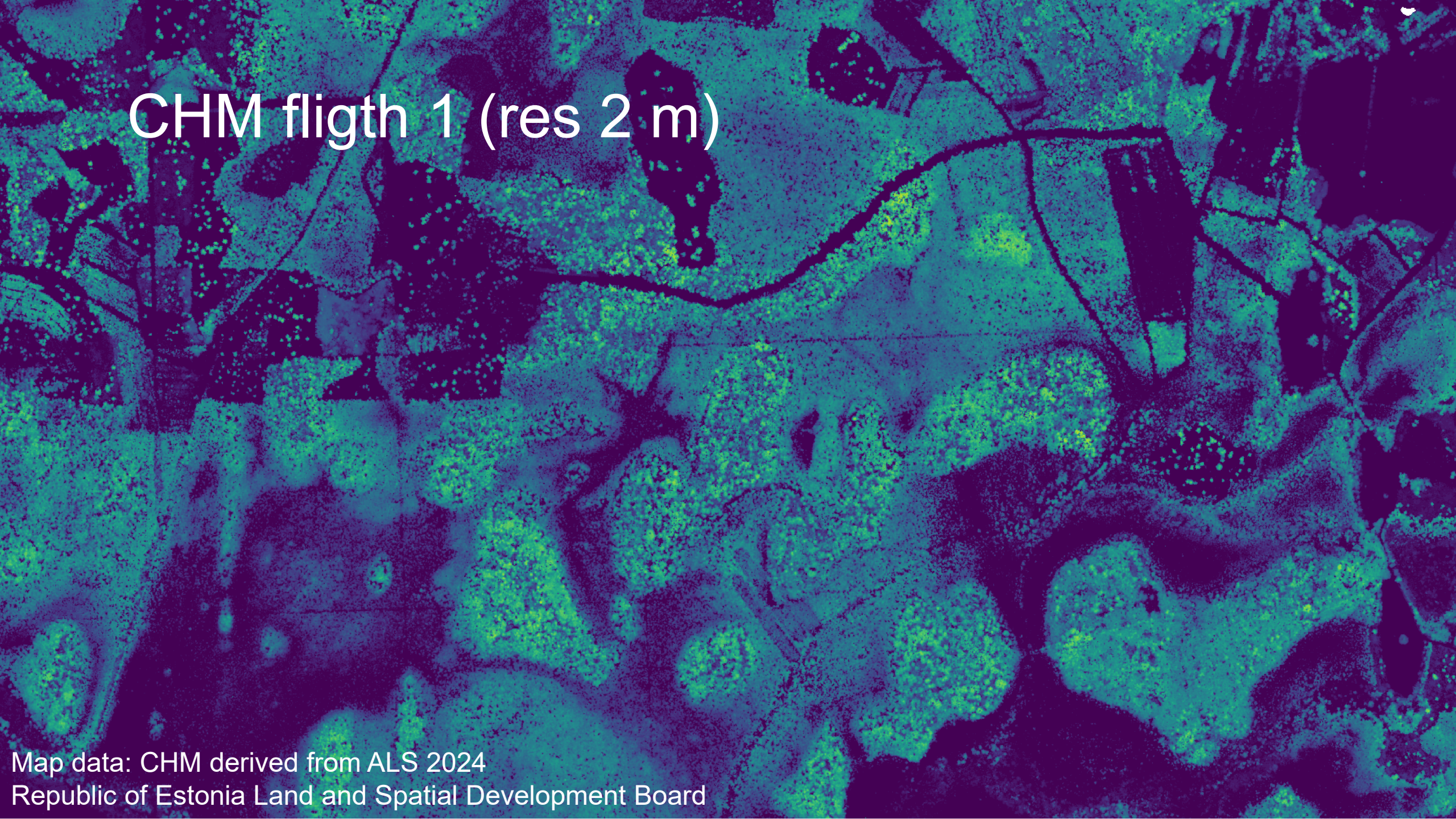
- ia Ruumiamet

CHM flight 0 (res 2 m)

An aerial photograph of a forest with a red line indicating a flight path. The forest is dense with green trees, and the red line is a single, continuous, slightly curved path that starts in the upper left and ends in the lower right. The path is approximately 2 meters wide. The background is a dense forest of green trees. The red line is a single, continuous, slightly curved path that starts in the upper left and ends in the lower right. The path is approximately 2 meters wide. The background is a dense forest of green trees.

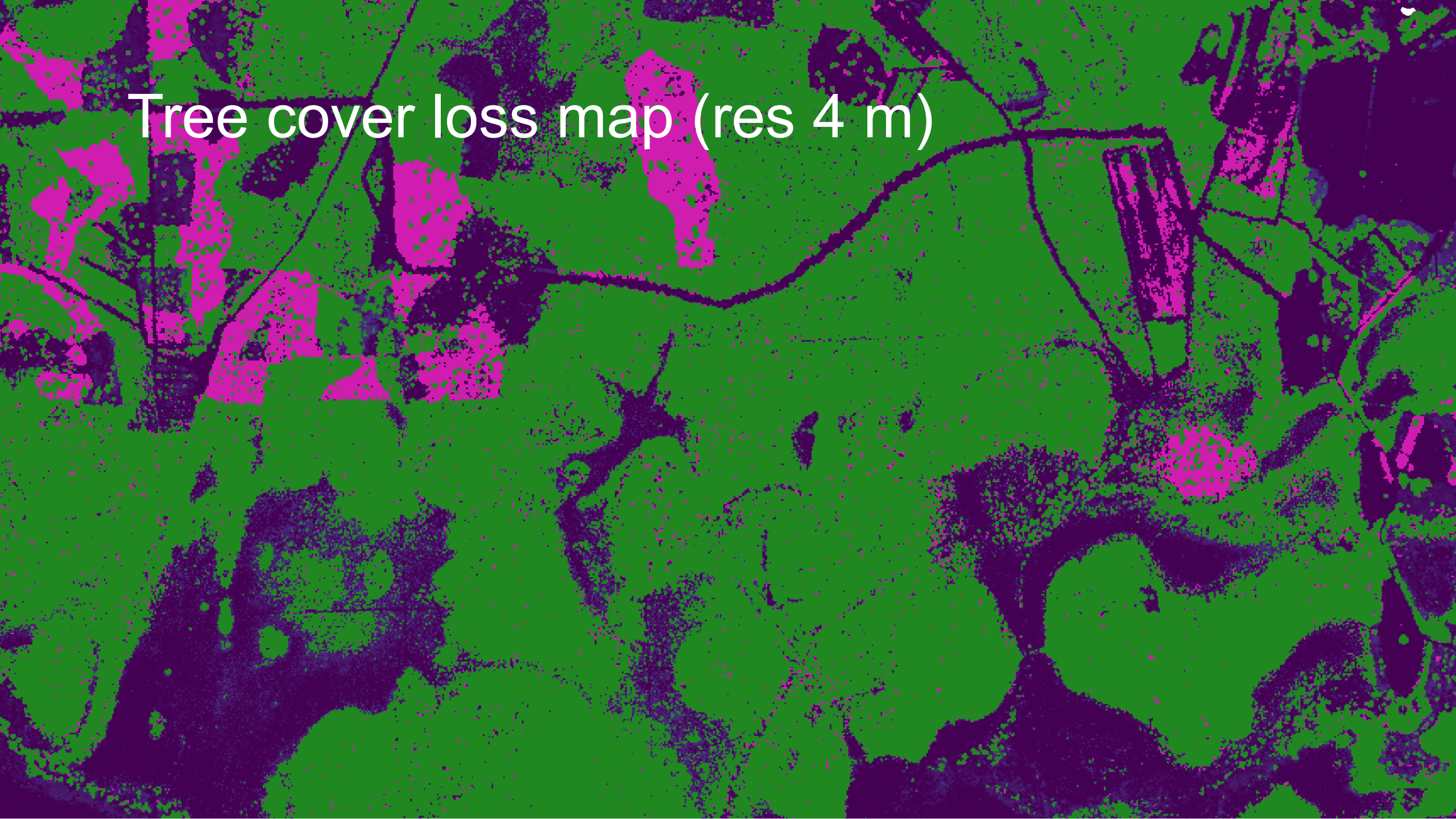
Map data: CHM derived from ALS 2022
Republic of Estonia Land and Spatial Development Board

CHM fligth 1 (res 2 m)

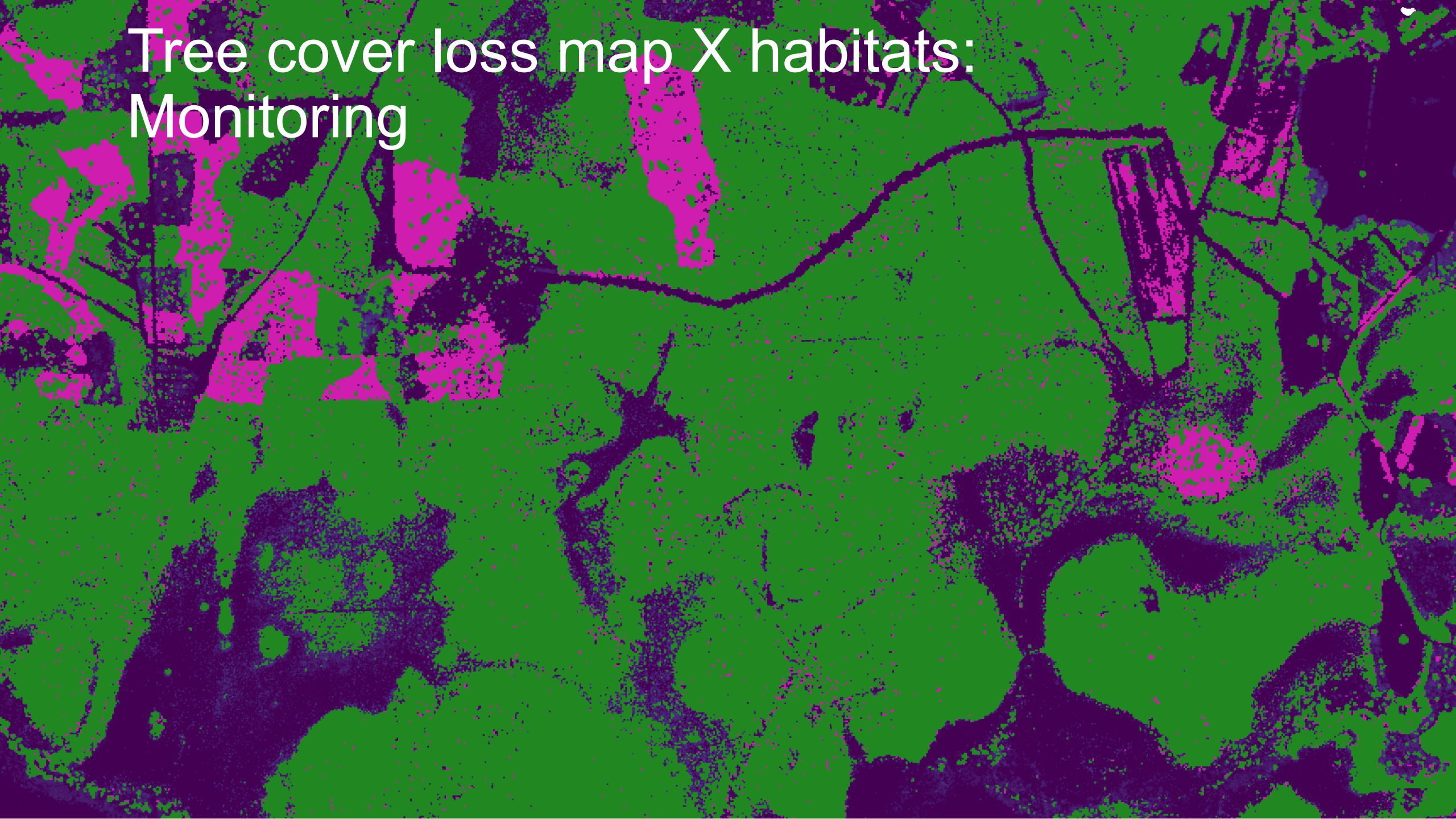


Map data: CHM derived from ALS 2024
Republic of Estonia Land and Spatial Development Board

Tree cover loss map (res 4 m)



Tree cover loss map X habitats: Monitoring



Rationale

Local assessment

Regional assessment

Hazards criteria

Percentage of tree cover loss above

0 10 20 30 40 50 60 70 80 90

Tree cover loss area (ha) above

0.01 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2

Annex I habitat type code

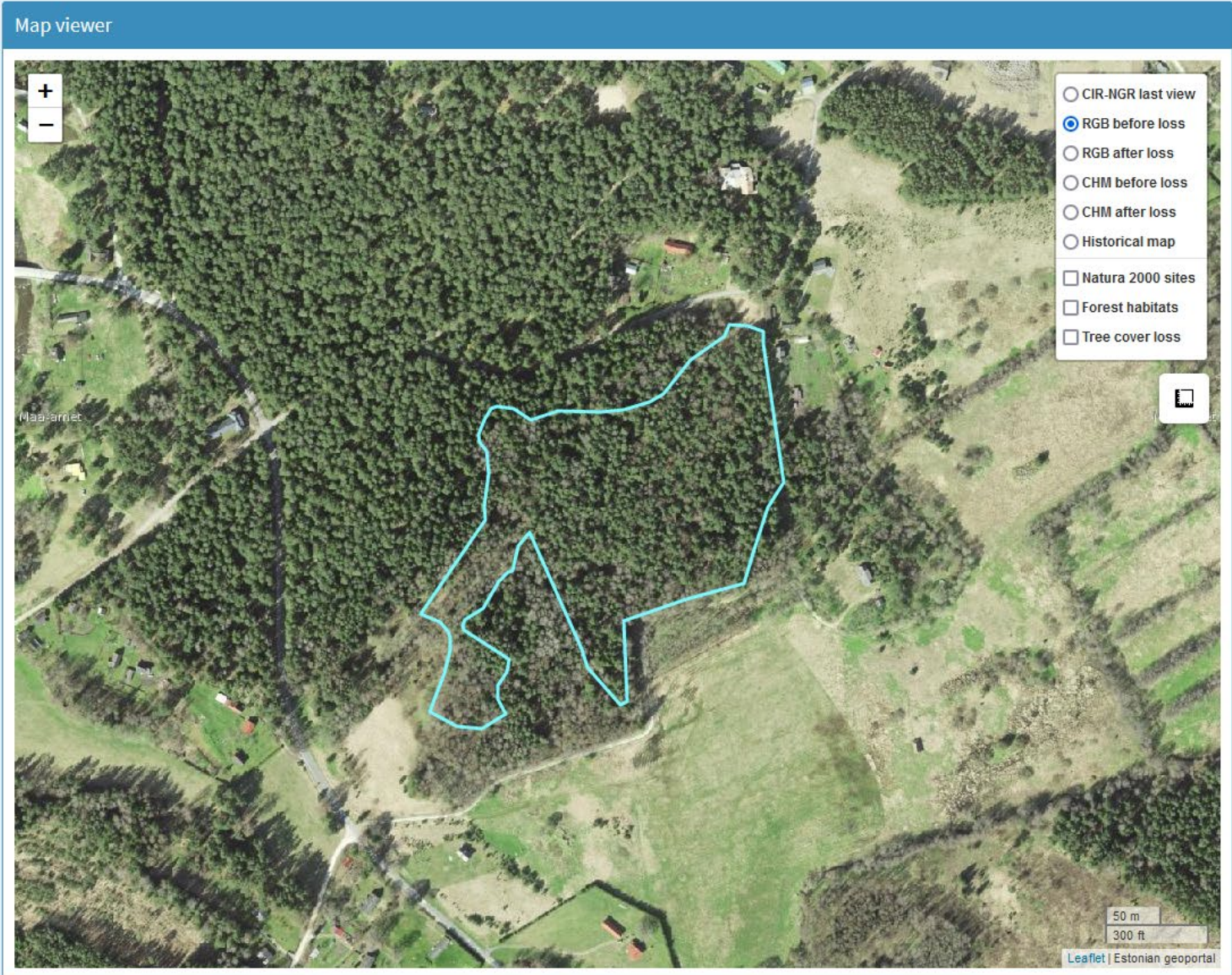
Any

Natura 2000 site

Not activated

45 hazards to monitor

20



Select a hazard

Hazard number

2

Percentage of tree cover loss:

70 %

Area of tree cover loss (in Natura 2000):

3.86 (0) ha

Habitat patch properties related to the selected hazard

Annex I habitat code

91D0*

Conservation status

National level

EU level

Habitat patch area

5.48 ha

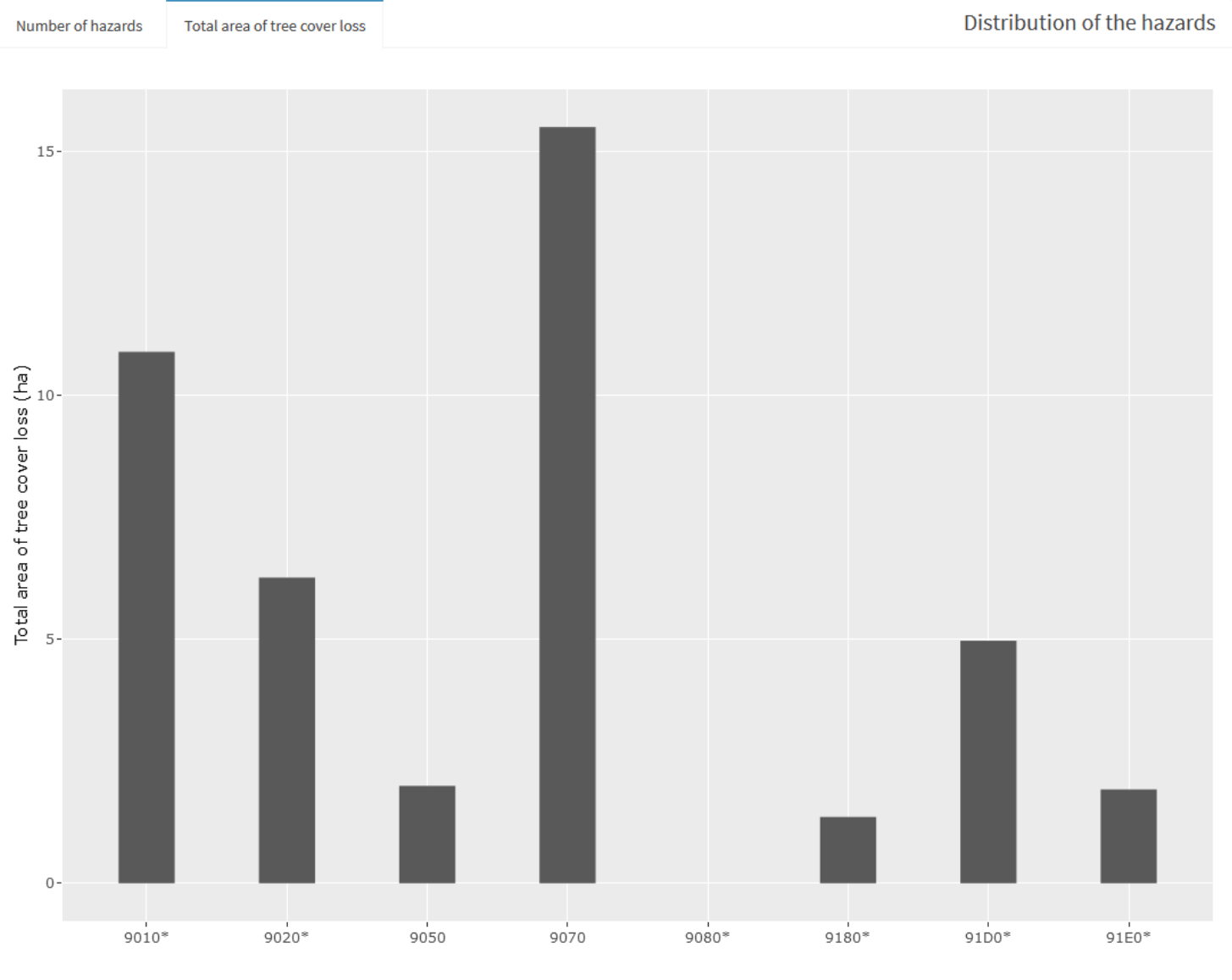
The boundaries of the habitat patch are shown in blue on the map.

- Rationale
- Local assessment
- Regional assessment
 - By Annex I habitat types
 - By Natura 2000 sites

Hazards criteria

Percentage of tree cover loss above

Tree cover loss area (ha) above



Limit analysis to Natura 2000 sites

Natura 2000 site

Not restricted to Natura 2000

Annex I habitat patches

Number

16183

Total area covered

41559.39 ha

summary of hazards

45 hazards considered

42.9 ha of tree cover loss within habitats

Complementarity of data sources

Temporal accuracy enabled by satellite imagery

- SpatioTemporal Asset Catalogs (STAC) integrated into the GEOINT tool
- Embedded access to S2 online catalogues: upload and view images on demand

The screenshot shows a web interface titled "Explore Sentinel-2 catalog". It includes the following elements:

- Select a time period:** Two input fields with dates "2024-06-03" and "2025-06-03" separated by a "to" label.
- Maximum cloud coverage (%):** A horizontal slider ranging from 0 to 100. The current value is set to 20.
- Download time series:** A button located below the cloud coverage slider.
- Display options:**
 - Stretching:** A horizontal slider ranging from 0 to 1. The current value is set to 1.
 - Select spectral index to display:** A dropdown menu with "ndvi" selected.

web.jrc.ec.europa.eu/rapps/content

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https://web.jrc.ec.europa.eu/rapps/content/1ec7eeab-6f03-40b2-81dc-959ba9cf87e5/

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Geospatial intelligence system

☰

📘 Rationale

⏪

📊 Regional assessment

⏪

➡️ By Natura 2000 sites

➡️ By Annex I habitat types

📍 Local assessment

Hazards criteria

Percentage of tree cover loss above

0

20

90

Tree cover loss area (ha) above

0.01

0.2

2

Number of hazards

Total area of tree cover loss

Distribution of the hazards

Limit analysis to Natura 2000 sites

Natura 2000 site

Not restricted to Natura 2000

Annex I habitat patches

summary of hazards

Tutorial

📊 The hazard distribution graph is interactive.

1. Set the hazards criteria using the options in the side bar. This will automatically update the graph values to show only the selected hazards.

2. Click on a particular bar on the graph to view the associated hazards in the Map Viewer (Local Assessment tab).

3. Use the mouse to zoom in on a specific part of the graph. Double-click to return to the full view.

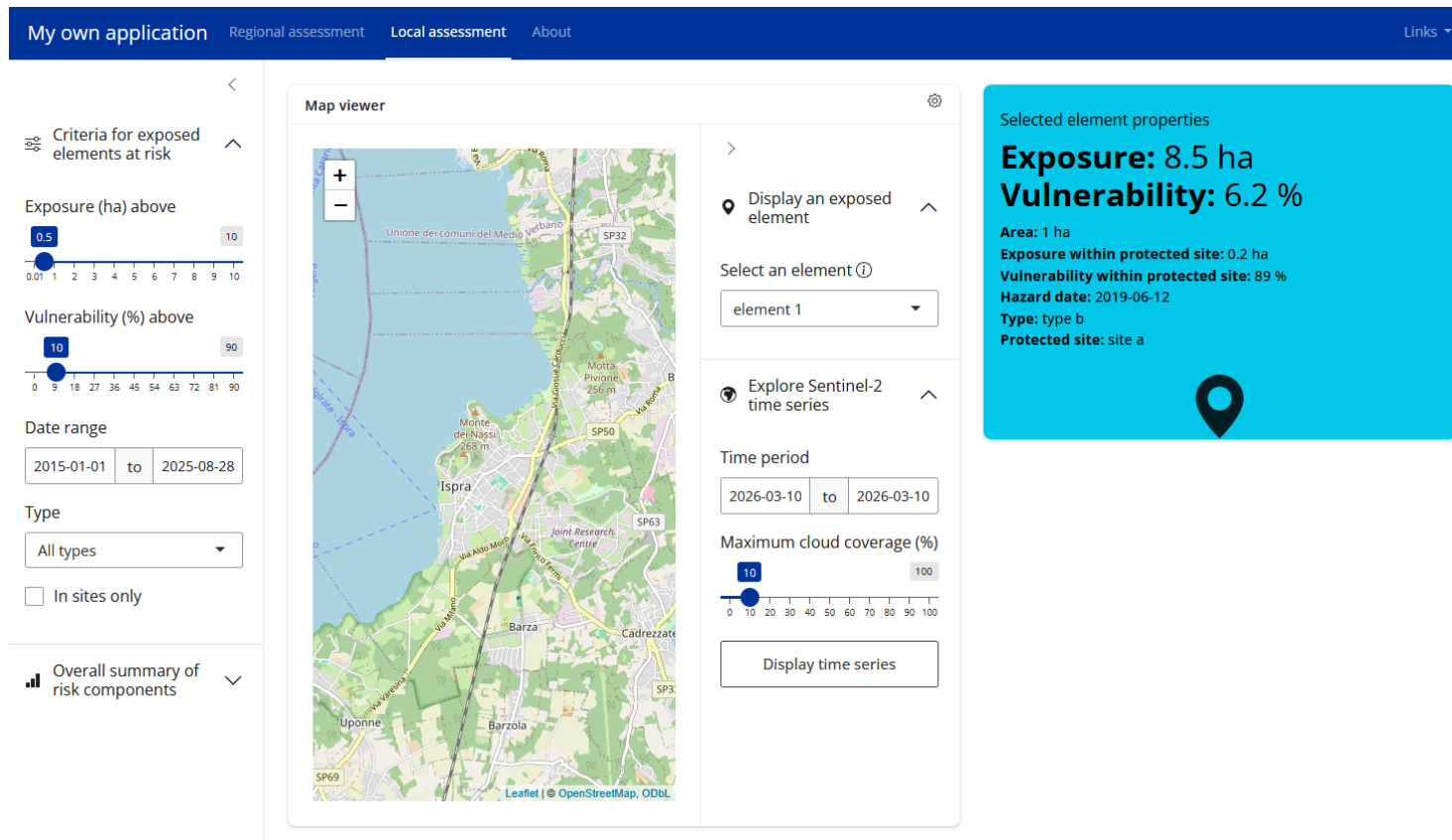
https://web.jrc.ec.europa.eu/rapps/content/1ec7eeab-6f03-40b2-81dc-959ba9cf87e5/_w_66a99b427e584feca8af3f38acdeda5b/#shiny-tab-summary_hab

Advantages of a GEOINTECA tool

- Consolidates datasets in a single interface around a compliance question
- Offers the possibility of incorporating any online Earth Observation data
- Quick analytical tool for experts
- For those without specialist geoscience skills a user-friendly interface
- Risk analysis framework makes it adaptable to other compliance questions

R-package ready for testing and tuning

- Want to deploy the application using your own datasets? – contact us



Thank you



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