



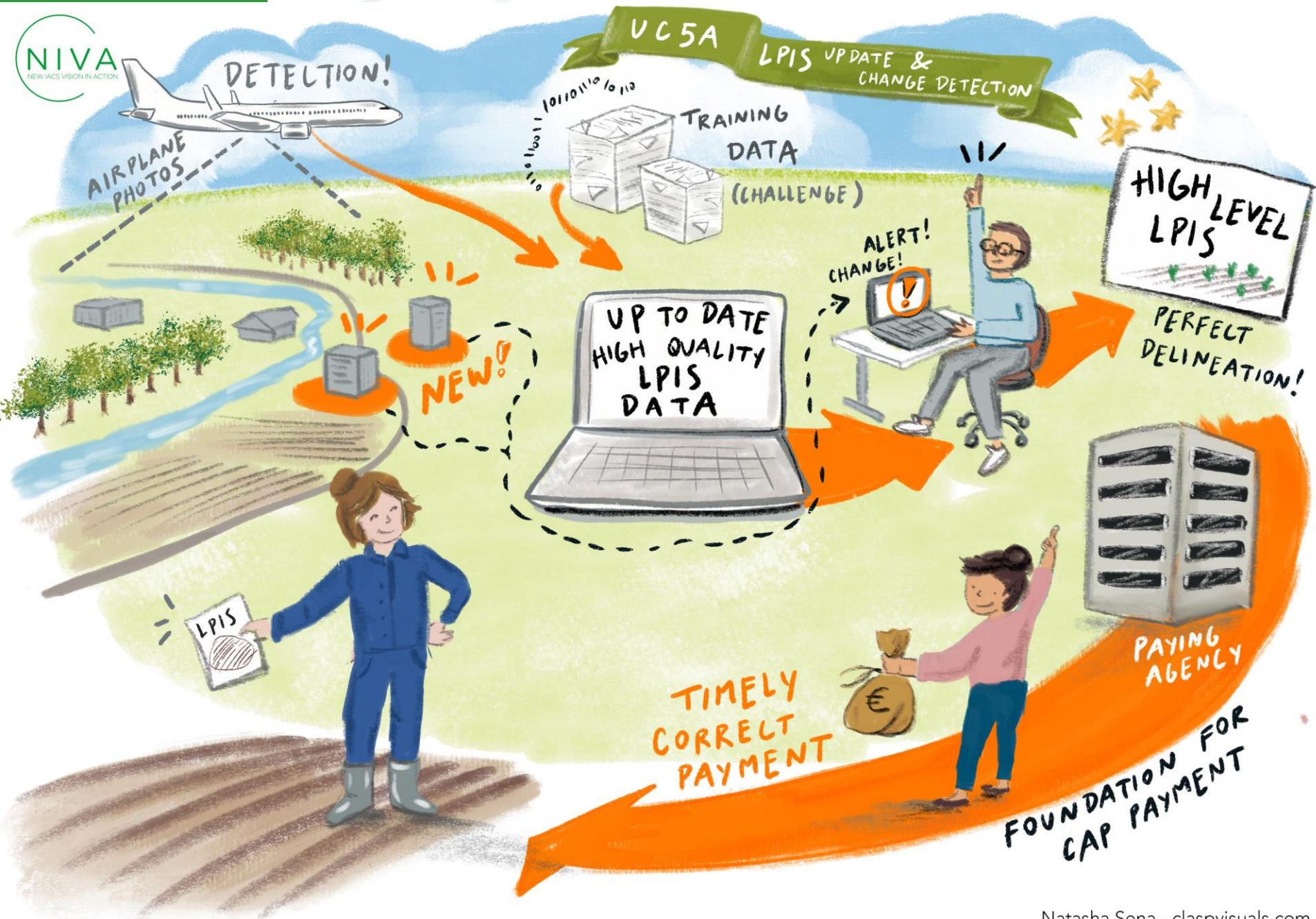
# UC5a: LPIS change detection

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NIVA Stakeholder Forum Santorini  
26 & 27 September 2022



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 842009



UC objective

## UC objective

The use case focus on helping paying agencies with updating LPIS.

LPIS can consists of many different elements, differ from member state to member state and from region to region. The traditional procedure is to have LPIS-operators manually updating the LPIS by using ortho-photos.

The aim of the use case has been to show, that LPIS-update do not have to be done manually by LPIS-operators.



## UC objective

The use case has focused on developing seven different algorithms for different elements to help identify possible changes for the update of LPIS.

The algorithms has been developed in France and in Denmark.

The seven algorithms identified to was:

- Tall vegetation
- Buildings
- Trees in rows
- Group of trees
- Unfortified roads
- Ponds incl. brim-vegetation
- artificial covered surfaces



UC results

# UC results

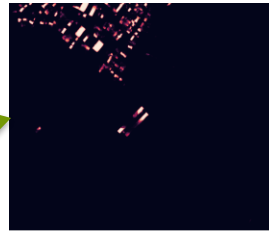
## Change detection in FR - buildings

### ODEON Landcover

ODEON stands for Object Delineation on Earth Observations with Neural network.  
[https://gitlab.com/nivaeu/uc5a\\_ign\\_mas\\_kdetection](https://gitlab.com/nivaeu/uc5a_ign_mas_kdetection)

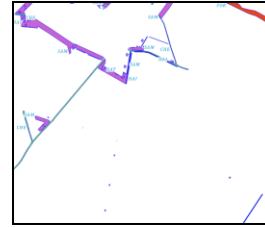


VHR orthophoto 2022



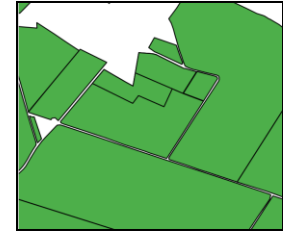
Probability map (raster, presence of buildings in 2021)

+



LPIS landscape features & non-eligible features

+



LPIS reference parcels

### Alert creation

compares probability raster (buildings) and the database (LPIS reference parcels, LPIS landscape features and non-eligible features, and creates alerts if inside LPIS parcel:

- a building is detected and there is no overlapping building feature polygon (creation alert)
- no building is detected despite presence of the building feature polygon (destruction alert)



### Alert post-processing

and creation of point alerts for detected change



2018



2021

Visual verification of the detected change  
on images in the process of LPIS update

# UC results

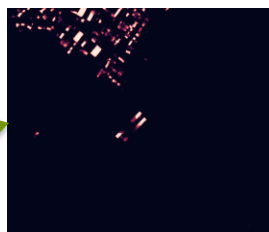
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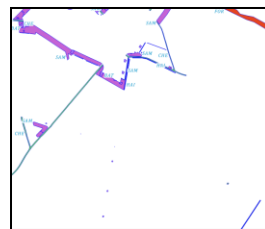
[https://gitlab.com/niva/uc5a\\_ign\\_mask\\_detection](https://gitlab.com/niva/uc5a_ign_mask_detection)

Available on  
NIVA GitLab



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VHR orthophoto 2022



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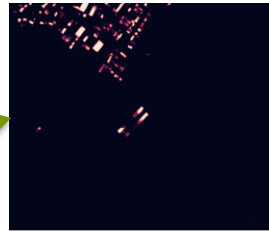
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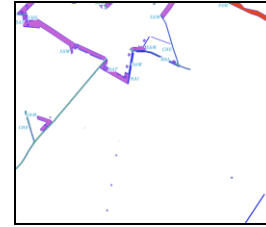


VHR orthophoto 2022



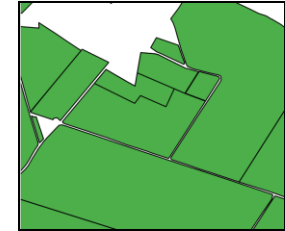
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### Alert post-processing and

creation of point alerts for detected change



2018



2021

Visual verification of the detected change on images in the process of LPIS update

Result

# UC Results

Good results on buildings, high vegetation, trees in rows, group of trees, ponds incl. brim-vegetation.

Improving needed: Artificial covered surfaces

Unsufficient output: Unfortified roads

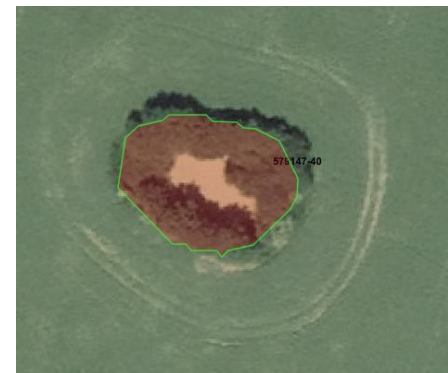
## *Danish pond incl. brim*



1 : 10.000



1 : 2.500



1 : 1.000

# UC results

## Change detection in FR - buildings

Works well for new buildings and building extensions

02



22



85



UC benefits

## UC Benefits

- Objective results
- Results that can be reproduced and repeated
- Less omission in change detection
- Accurate, up-to-date LPIS system
- Time/cost reduction in the future LPIS update process
- LPIS operators can focus on more interesting tasks
- LPIS operators will have more certainty on updating correctly
- Available for PA's to investigate



# UC challenges

NEW ACS VISION IN ACTION

# UC challenges

Change detection in FR - buildings

Challenges exemplified

Crowns



shadows



and unfortified roads



# UC challenges

Change detection in FR - buildings

Challenging false-positive alerts

**Electric lines** (→ mask of electric lines)



**Hedges and single trees** (→ shadow mask)



**Vineyards**

→ post-processing  
filtering  
based on crop type for  
quick results, automatic  
detection to be integrated  
in the future (dedicated  
project is ongoing)





# UC challenges

Change detection in FR - buildings

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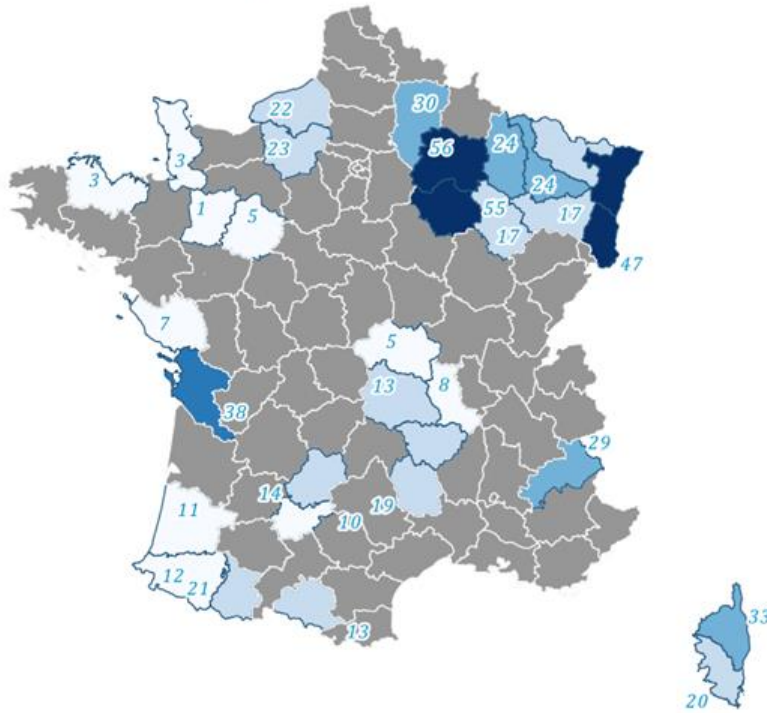
**Detailed analysis of the  
results,  
alert statistics and  
reporting  
are foreseen before the  
end of the NIVA project**

# UC challenges

Challenge	Ideas and follow-up
Numerous false-positive alerts	Tuning of the model and alert creation
Shadows and covering surfaces where there is agricultural production underneath	Tuning of the algorithms and more training data
Challenge to process “exhaustive” change detection (for all elements present in the national specifications)	Fitting the change detection process to the national needs and LPIS design
Adding one more step (change detection calculation which is dependent on the ortho-photo acquisition) into an already tight schedule for the LPIS update yearly task.	Use of VHR satellite images could be part of the solution?
Maximizing the reduction of burden and cost	Detect parcels that with sufficient certainty did not change?
Knowledge can be kept internally in member states / regions	<ul style="list-style-type: none"><li>• Continue to work on LPIS change detection</li><li>• Continue to feed LPIS “agencies” with good EU solutions</li><li>• Share our work with other partners / agencies</li></ul>



# LPIS Change detection beyond NIVA



Detect parcels that with sufficient certainty did not change →

Map presenting the percentage of parcels without LF nor artificial surface in selected Departments in France → Focus on where the added value lies!

Linking change detection projects with other large-scale national land cover projects:  
Artificial intelligence data used to describe land cover— an IGN project on soil artificialization monitoring, following the **OCS GE** classes nomenclature

Both France and Denmark will introduce the tools developed in NIVA for the annual update of LPIS to improve the quality of LPIS, but also for cost reduction for the Paying Agencies

# THANK YOU!



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