



Key information derived from multi-source optical imagery for supporting coastal territories management

Sébastien DELBOUR

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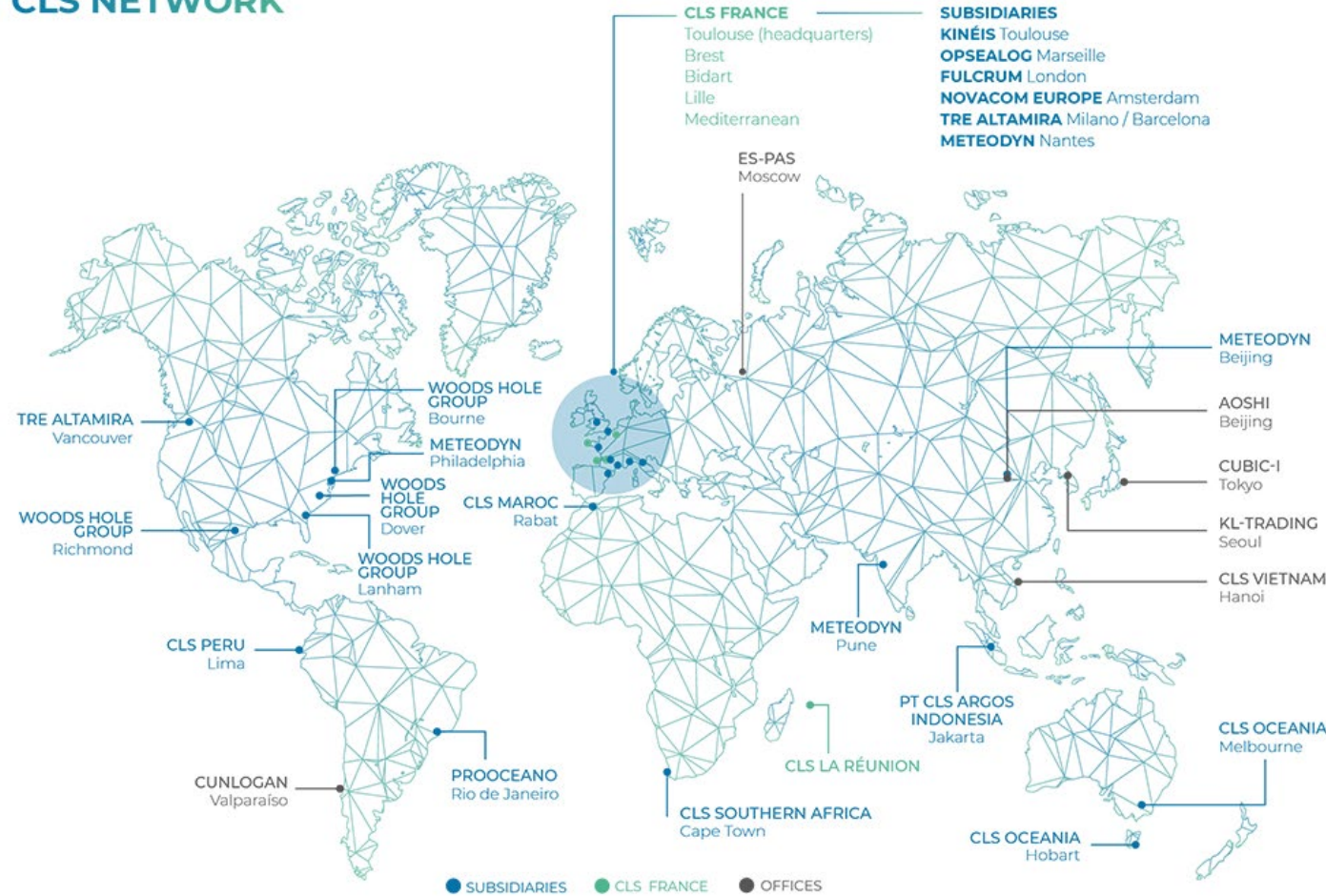
OUR VISION

CLS is a **global** company sharing a common **passion**:

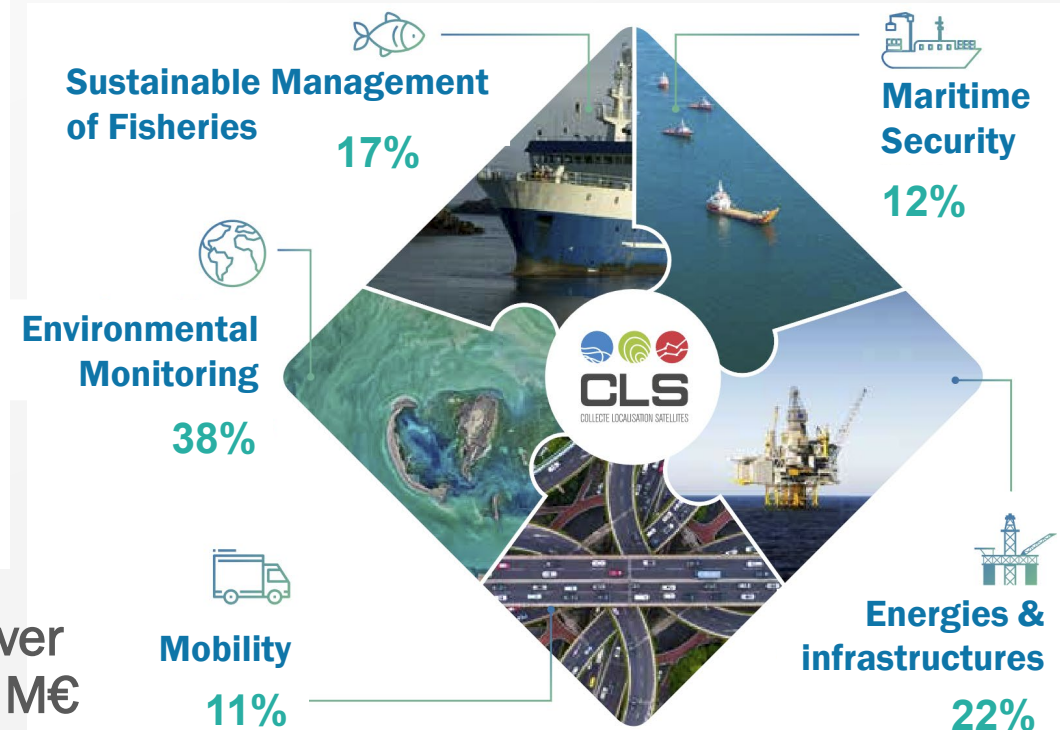
to design and deploy **space-based solutions** so that we can **understand** and **protect** our planet and **manage its resources sustainably**.

CLS in a nutshell

CLS NETWORK



- Subsidiary of the French Space Agency (CNES) since 1986
- 900 employees & 34 locations worldwide
- 90% of CLS activities are directly linked to achieving UN Sustainable Development Goals (SDGs).



Turnover
152.7 M€

Environmental & Climate Change Monitoring

AGRICULTURE



FOREST



HYDROGRAPHY



URBAN PLANNING



RISK MANAGEMENT



ENVIRONMENT



Project description

Aim: Mapping the land cover changes in the region of Nouvelle Aquitaine (France) including the coastline

EO-based product: Land Use / Land Cover (LU/LC) and LU/LC Change maps which describe the physical coverage on the ground and its use

Surface area: 13,000 km²

Reference dates: 1985-2000-2009-2020

Thematic nomenclature: 61 classes

(level 1: urban, agricultural, natural and water)

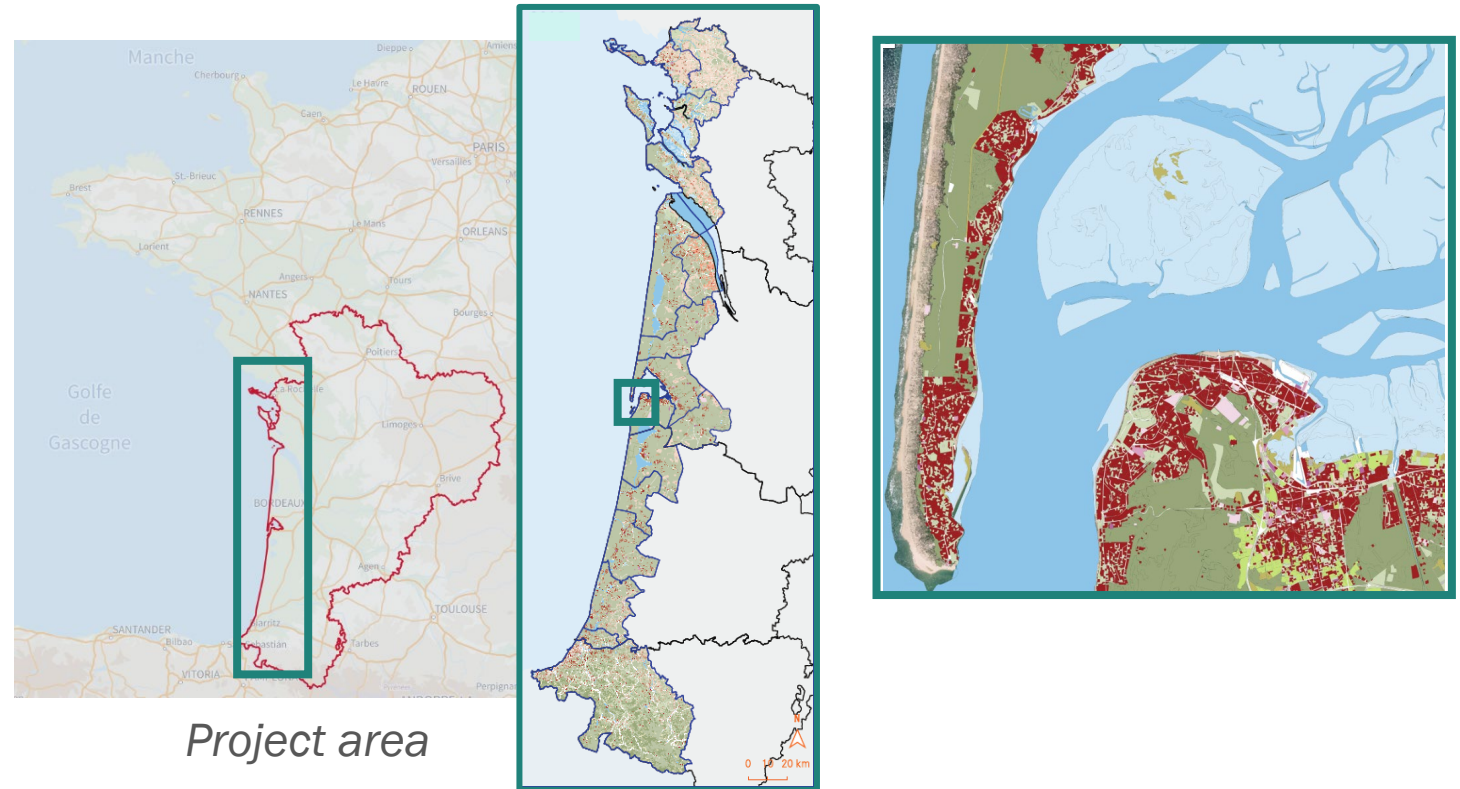
Production support : Aerial and satellite imagery

Minimum Mapping Unit (MMU):

500 m² in urban area / 5,000 m² elsewhere

Scale of analysis:

1:2000 in urban area / 1:5000 elsewhere



Project area

Main input data: high resolution optical images



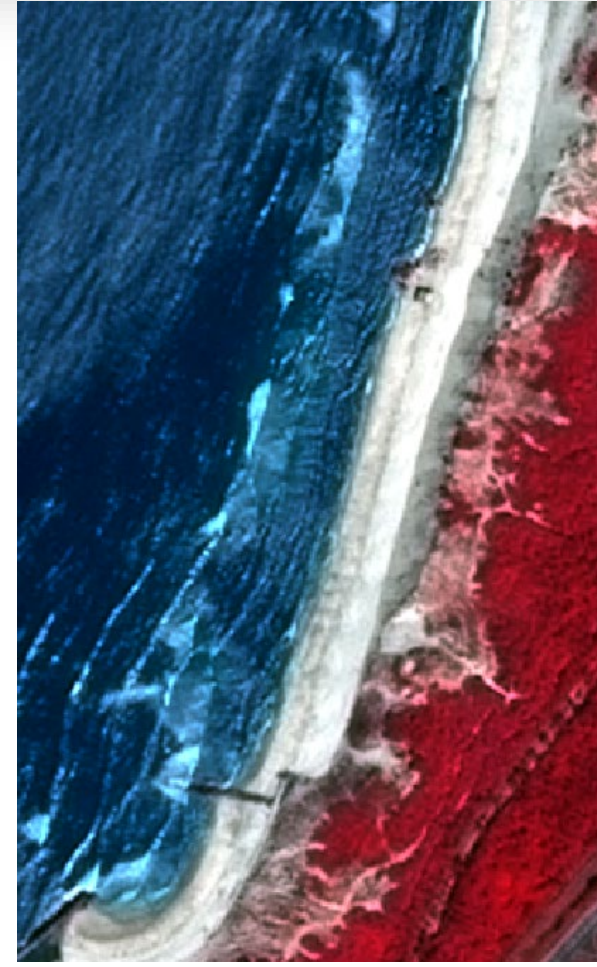
Panchromatic aerial image
(1980) 0.5m



Infrared aerial image (2000)
0.5m



Multispectral aerial image
(2009) 0.5m

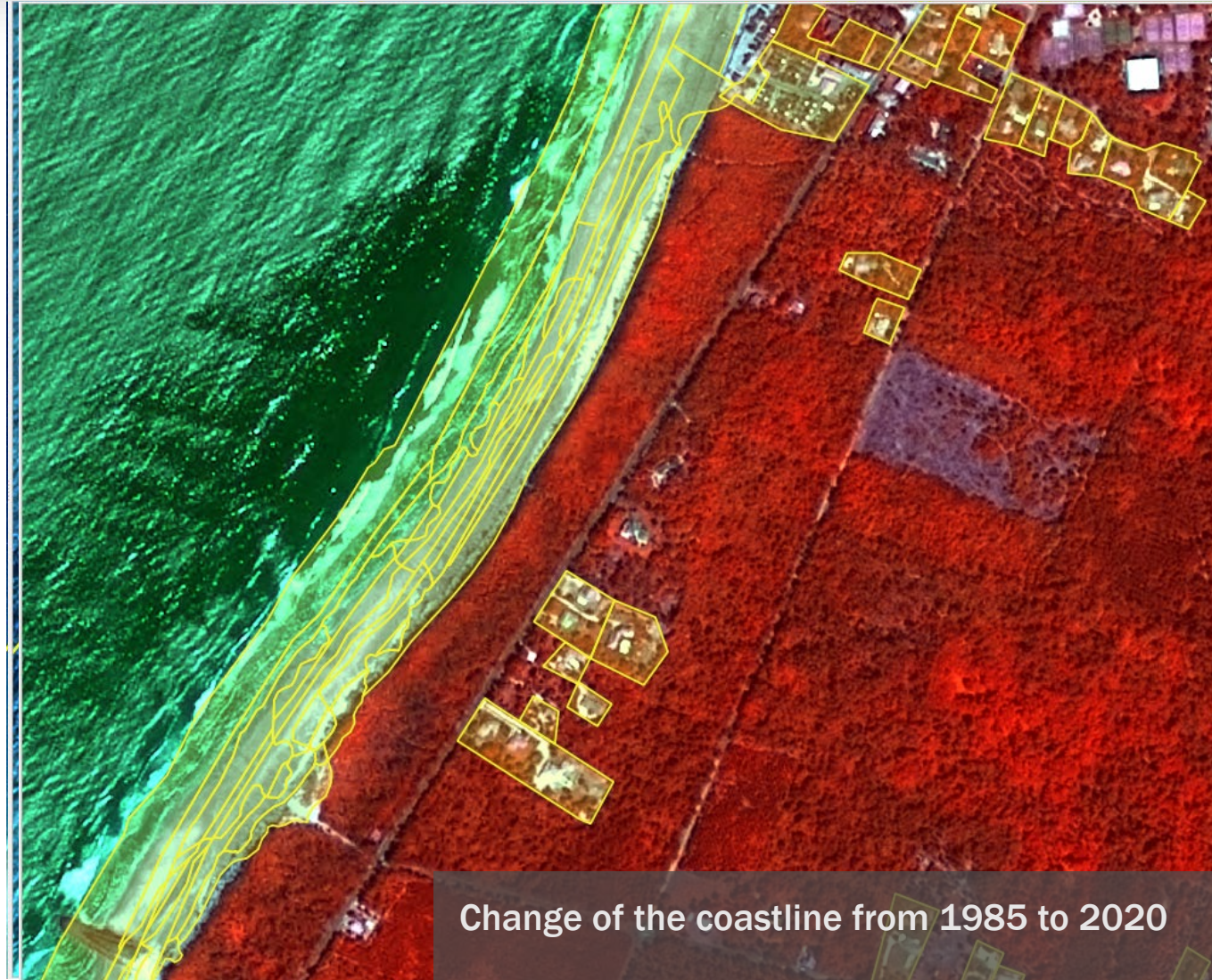


Infrared satellite image
(2020) SPOT 1.5 m

Main results: urban sprawl (*Saint-Jean-de-Luz, Basque Coast*)



Main results: coastline retreat (*Soulac-sur-Mer, Gironde*)



Comparison between SPOT satellite and aerial images: Focus on wetlands and coastal mapping

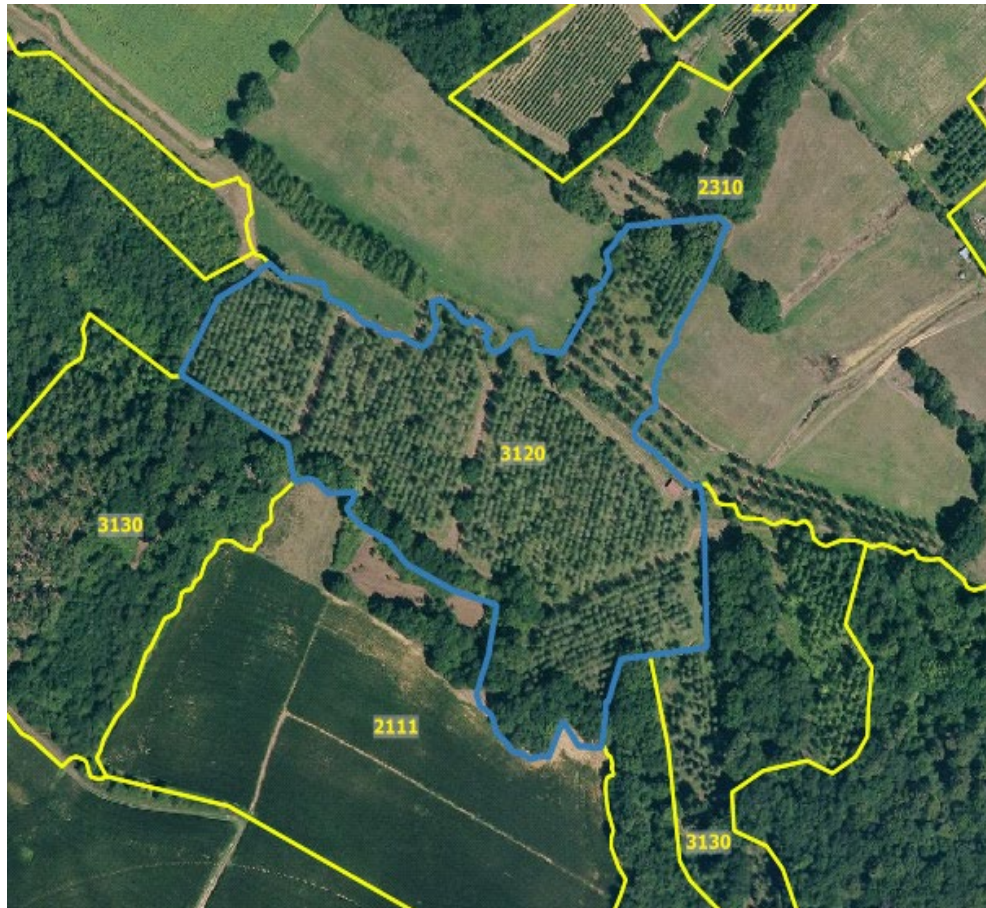


Aerial images 2009



Satellite images 2020

Comparison between SPOT satellite and aerial images: Focus on forest and other natural area mapping



Aerial images 2009



Satellite images 2020

Comparison between SPOT satellite and aerial images: Focus on urban area mapping



Aerial images 2009

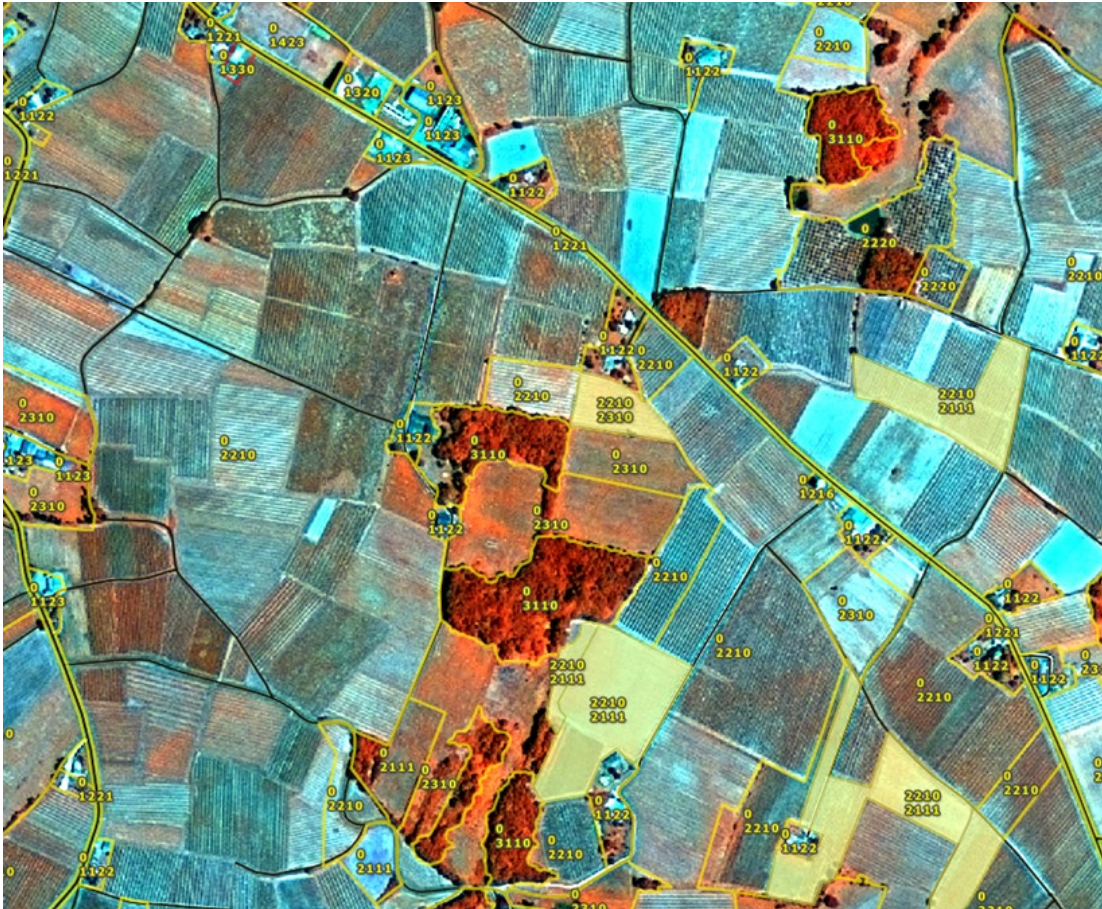


Satellite images 2020



Focus on new buildings

Comparison between SPOT satellite and aerial images: Focus on agricultural area mapping



Satellite images 2020 (vineyards in grey/blue)



Satellite images 2020 (vineyards in grey/blue)

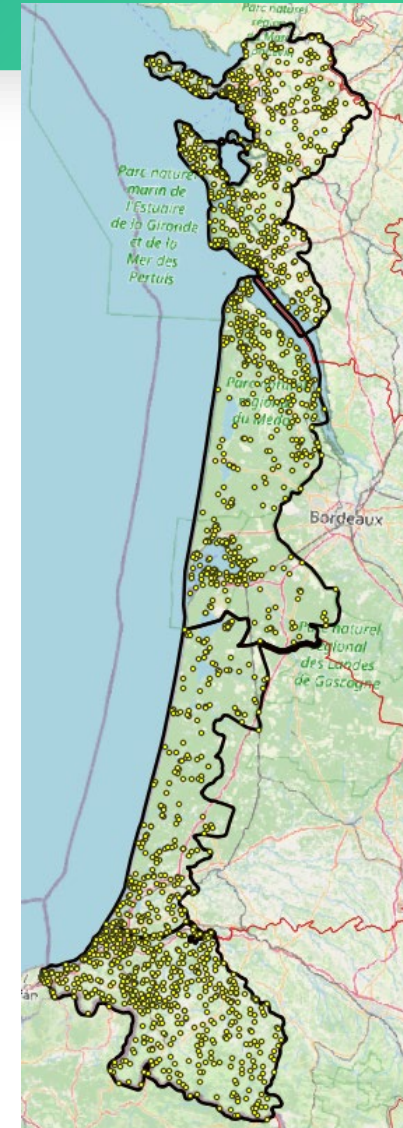
Methodology and thematic accuracy assessment

Methodological process

- Automatic generation of level-0 map using existing GIS datasets
- Thematic information extraction (LU/LC and changes) by means of visual interpretation and comparison of the optical images

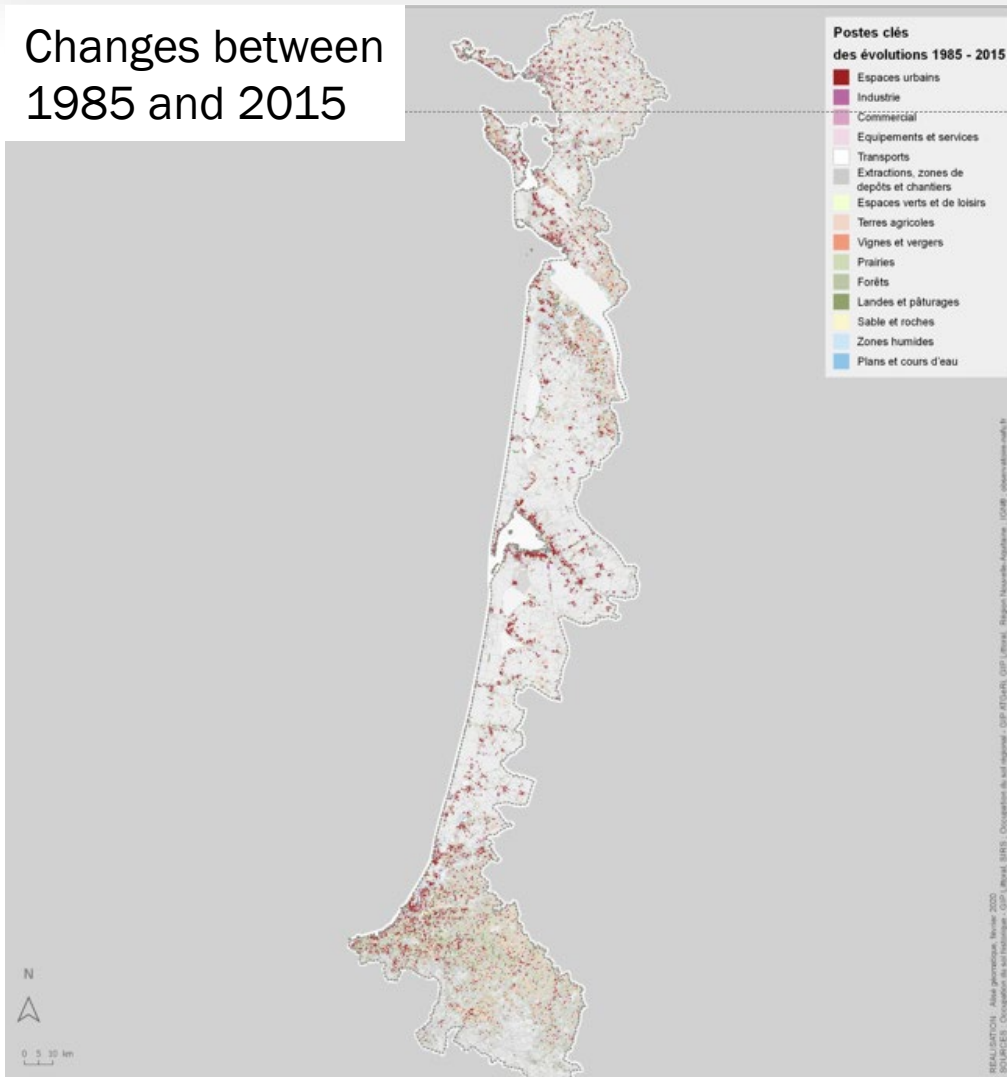
Quality Check (QC)

- Single-stage stratified random sampling strategy
 - Strata corresponding to the nomenclature classes
 - Sampling population close to 2,000 points
- Sampling response: reference dataset generated by using the same images but independently from the production
- Analysis
 - Confusion matrix generation and calculation of accuracies per class
 - **Overall thematic accuracy higher than 90%**



Overall results about LU/LC Change map (*focus on Landes department*)

Changes between 1985 and 2015

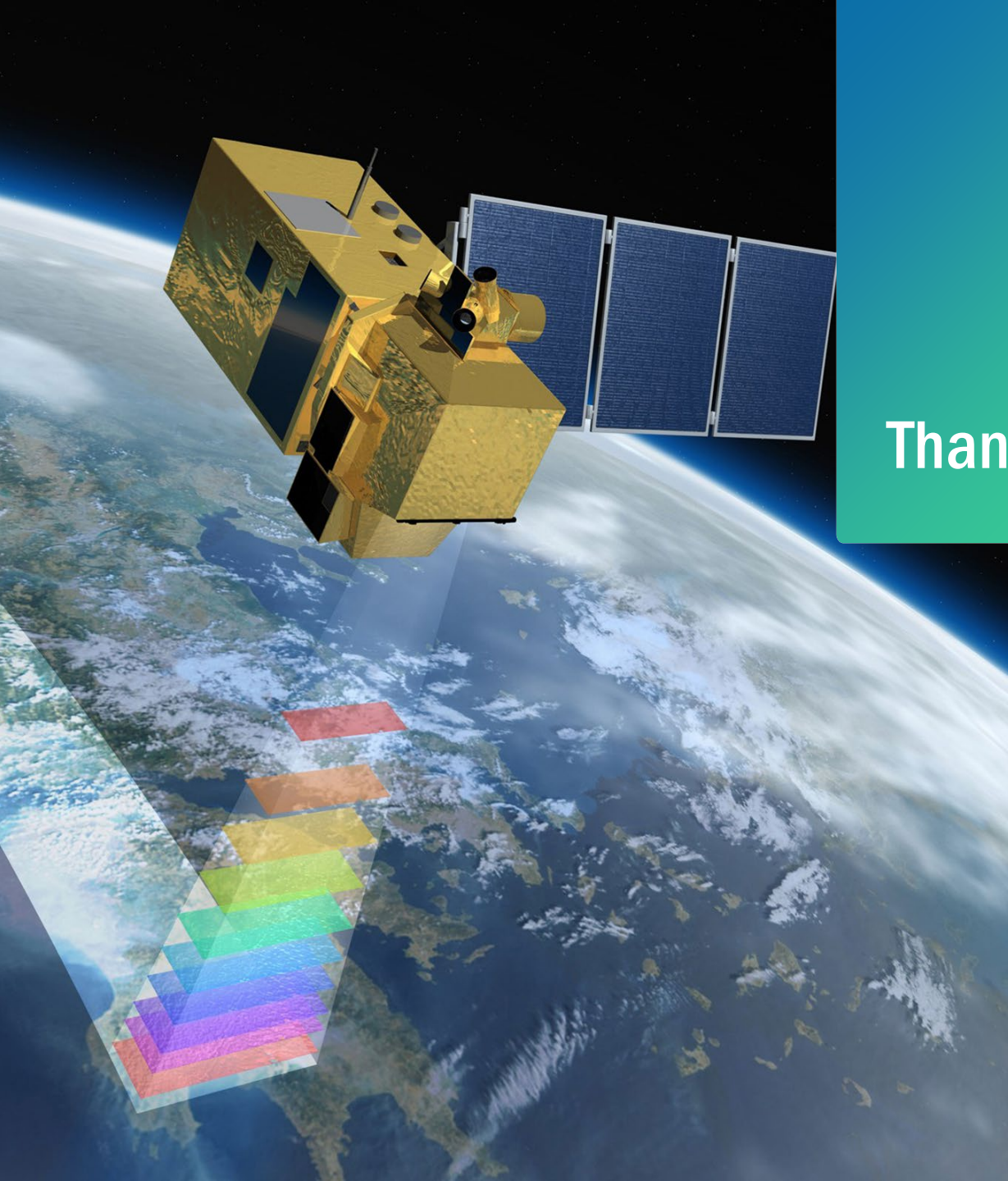


Summary of evolution per class between 1985 and 2015

OCS	Solde d'évolution 1985 - 2015	Solde annuel 1985 - 2015
Espaces urbains	12496	417
Industrie	1174	39
Commercial	634	21
Equipements et services (universités, hopitaux)	954	32
Transports	1030	34
Extraction, zones de dépôts et chantiers	-15	-1
Espaces verts artificiels	1723	57
Terres agricoles	989	33
Vignes et vergers	1316	44
Prairies	-10184	-339
Forêts	-9404	-313
Landes et pâturage	-181	-6
Sables et roches	-220	-7
Zones humides	-1267	-42
Plans et cours d'eau	962	32

Conclusion

- ✓ Using high resolution optical images for LU/LC mapping over time enables an efficient and precise monitoring of coastal areas.
- ✓ Satellite images even with a lower resolution than aerial ones (but still better than 2m) makes possible to monitor changes over large areas with a good compromise between quality, accuracy and cost.
- ✓ Some difficulties can be encountered only to identify specific assets in urban areas, but ancillary datasets can help to overcome them.
- ✓ **Satellite images allow to monitor regularly and efficiently (i.e. saving time & money) coastal changes (including erosion) over large areas.**



Thank you

CLS website

<https://www.cls.fr/en/>

CONTACTS

Sébastien Delbour, Head of Rapid Mapping Unit & Project Manager
sdelbour@groupcls.com

Konrad Rolland, Head of Land & Hydrology Division
krolland@groupcls.com

Anne Colliez, Thematic Expert & Project Manager
acolliez@groupcls.com