



Operational services for water management

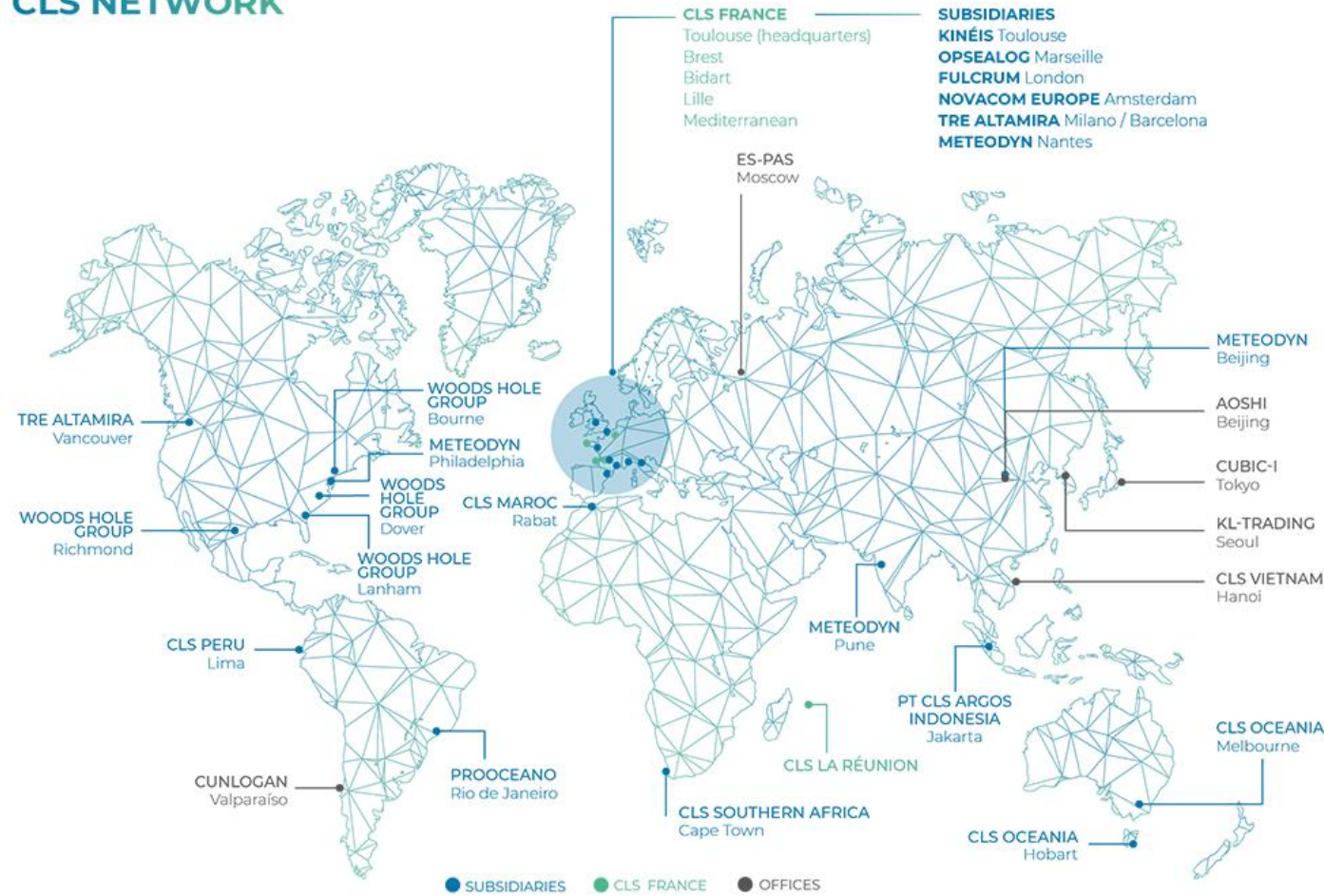
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CLS in a nutshell

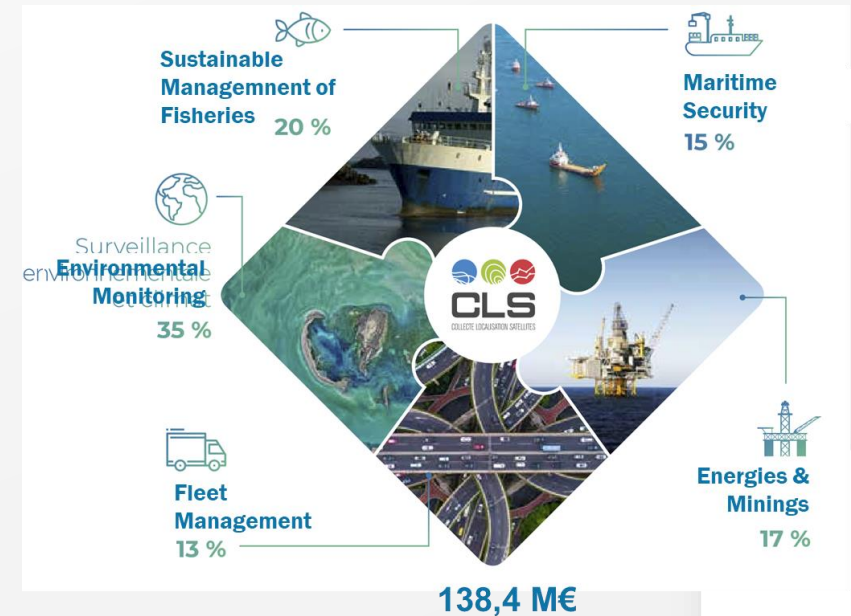
CLS NETWORK



- Subsidiary of the French space agency - CNES
- 800 employees, 30 locations worldwide

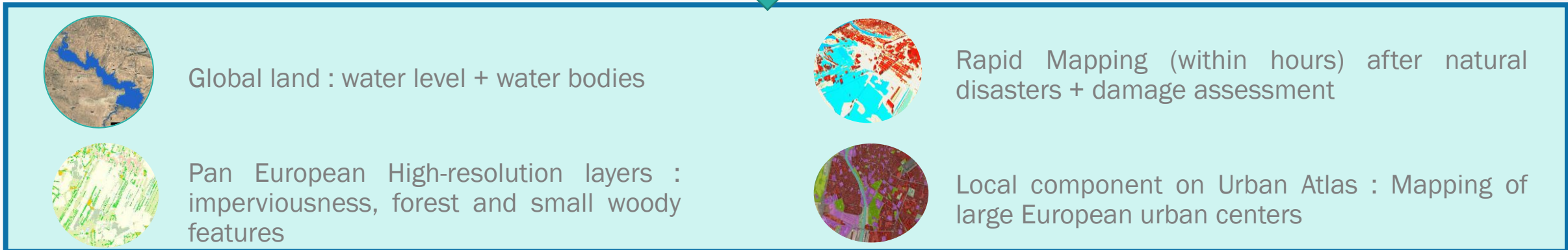
Our Vision :

- Design and deploy **space-based solutions** to understand and protect our planet and manage its resources sustainably.
- **87%** of our activities are directly linked to achieving SDGs.



Operational services and the Copernicus program

- Involved in **5 out of 6 Copernicus services** : water as a cross-cutting theme

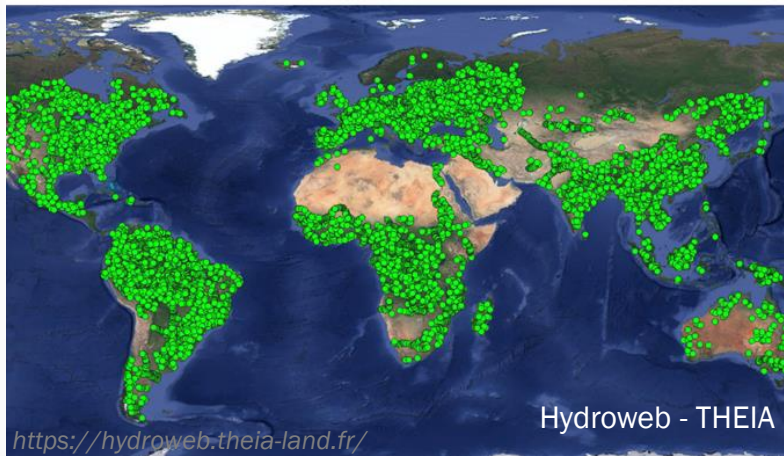


Water resources management

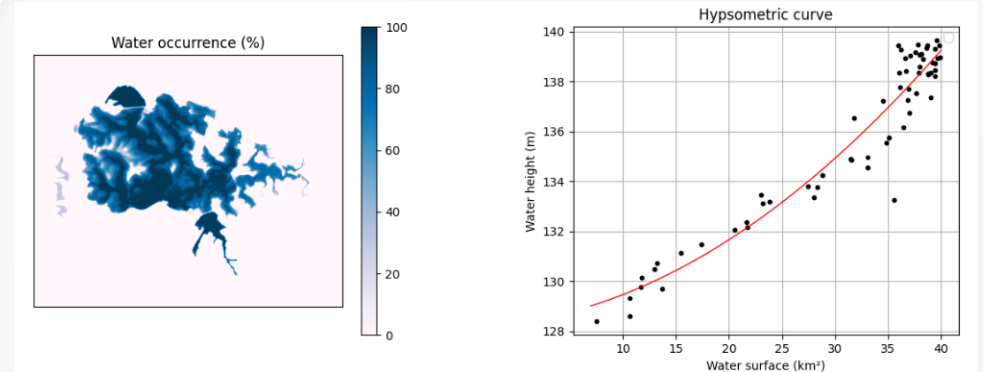
→ How much water is available?



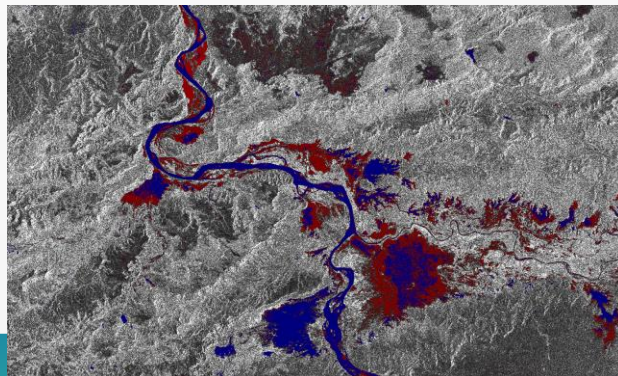
Water level + water body extent



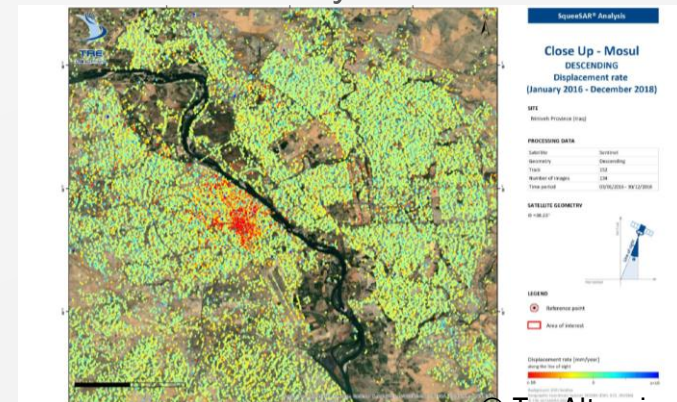
Water volume changes - discharge



Extreme events (drought and floods)



Land movement and subsidence → aquifer pumping and water scarcity



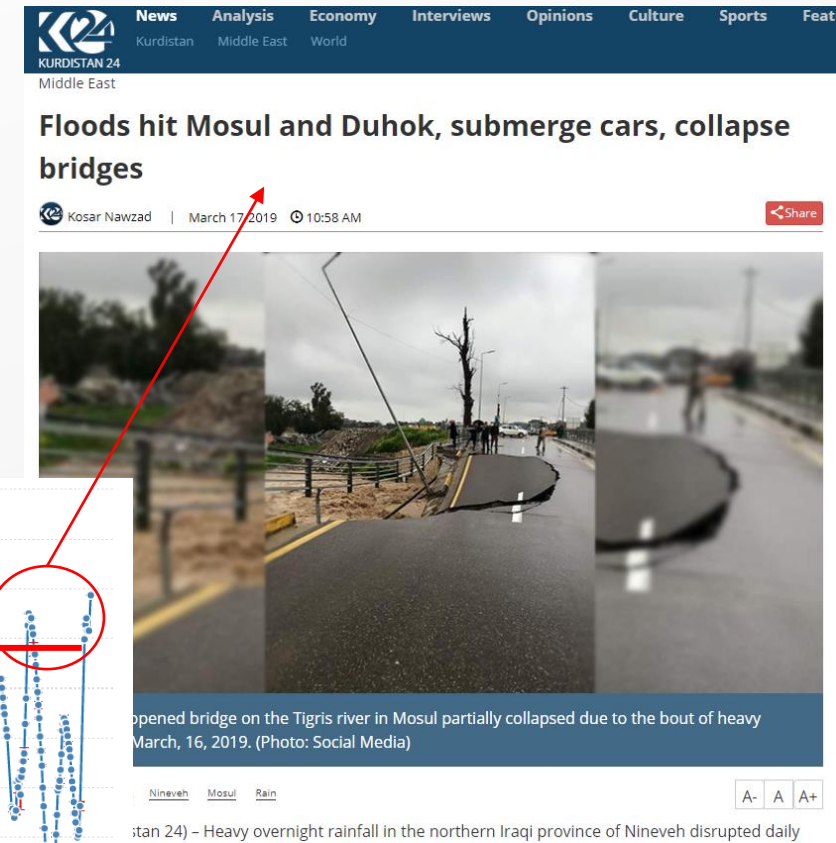
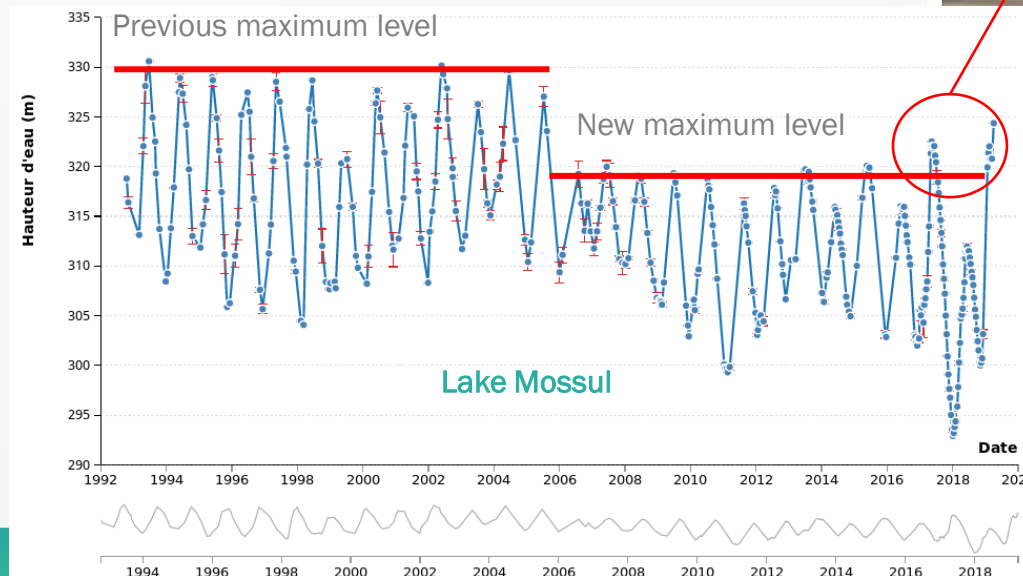
Monitoring dam with satellite altimetry – example of Mossul Lake



- Built on water permeable rock, inherent instability of the Mosul dam
- In 2003 the government decided to lower the maximum water level from **330 to 319 metres**.
- ➔ Dam break would have severe impacts downstream (including Baghdad)



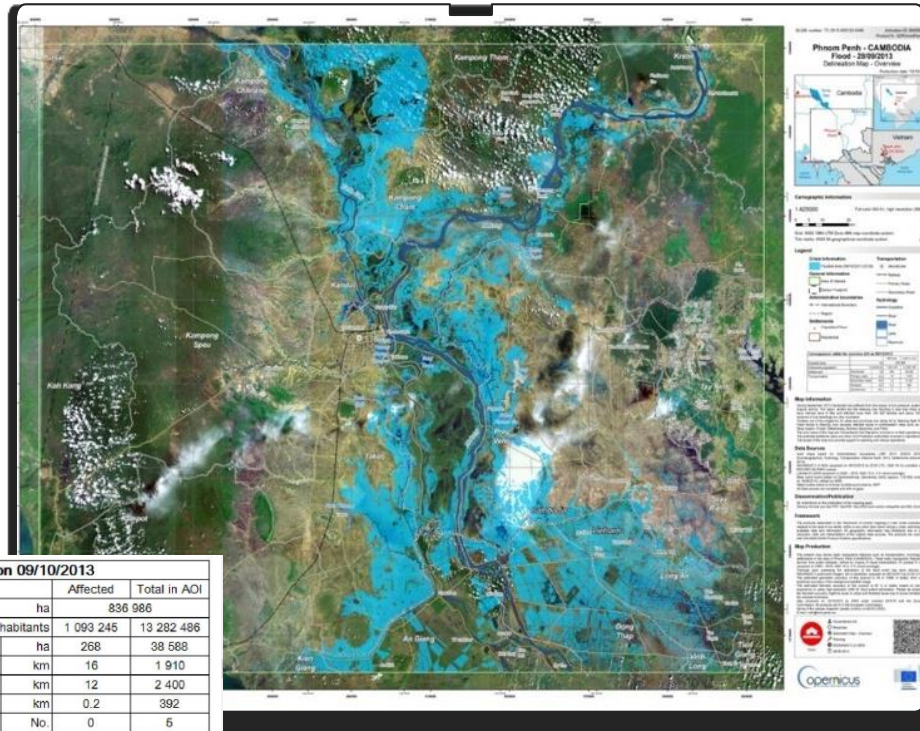
— Sentinel 3 B
— Jason 3



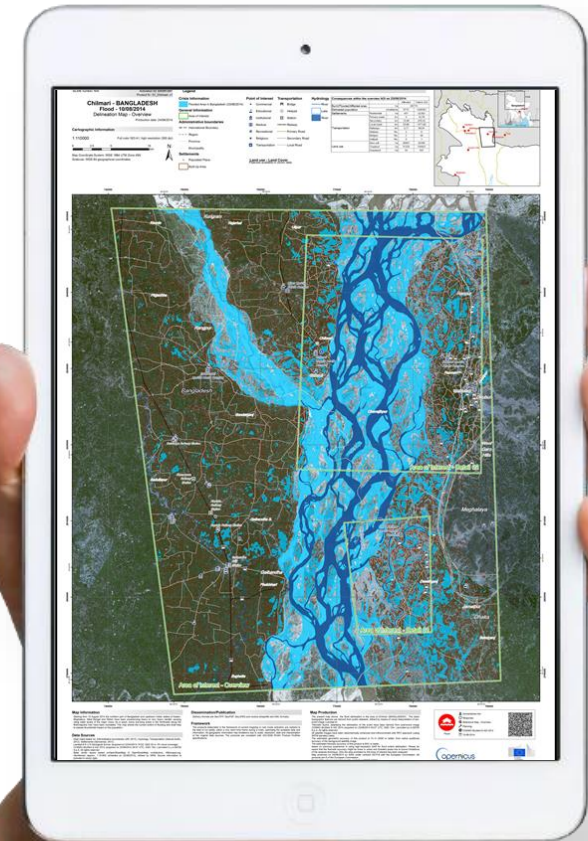
Flood extent monitoring in NRT mode for emergency situations

Rapid mapping - Copernicus EMS operated with European partners since 2012

- › Multi-sensor acquisition and processing capabilities
- › Multi-scale event mapping and daily monitoring to support planning and rescue operations
- › Impact and damage assessment on land use / land cover,



Consequences within the overview AOI on 09/10/2013			
		Affected	Total in AOI
Flooded area		ha	836 986
Estimated population		Inhabitants	1 093 245
			13 282 486
Settlement	Residential	ha	268
			38 588
Transportation	Primary roads	km	16
			1 910
	Secondary roads	km	12
			2 400
	Railways	km	0.2
			392
	Aerodromes	No.	0
			5



Emergency
(EMS)

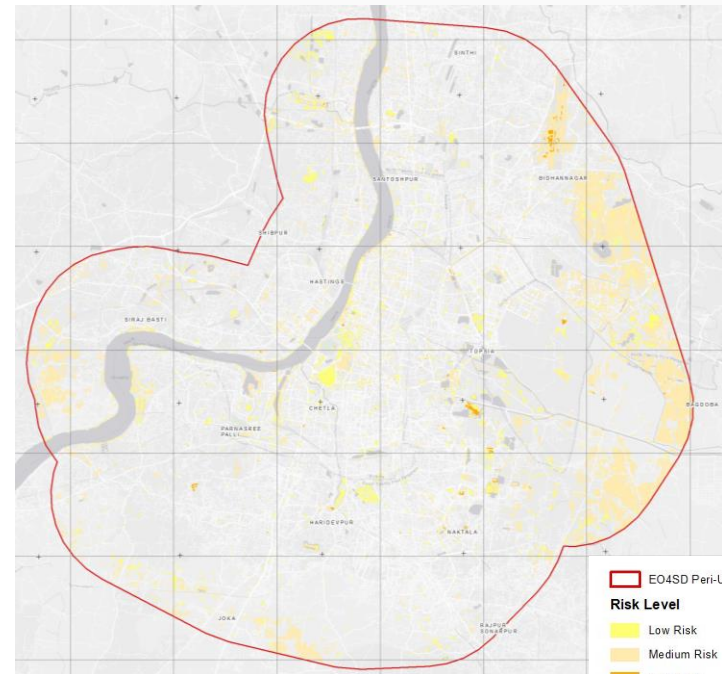
Phnom Penh floods
2013/09/28

Chilmari, Bangladesh

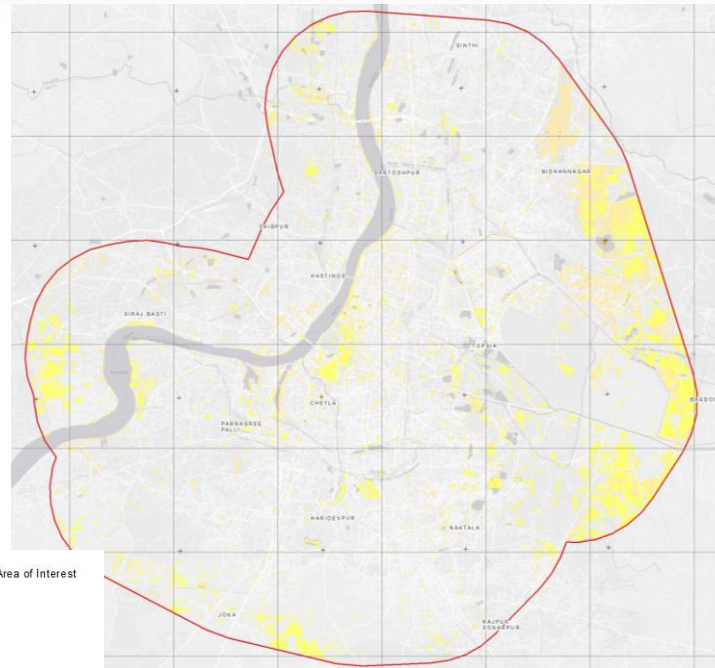
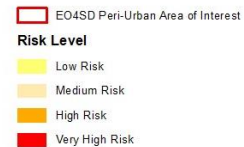


CLS
COLLECTE LOCALISATION SATELLITES

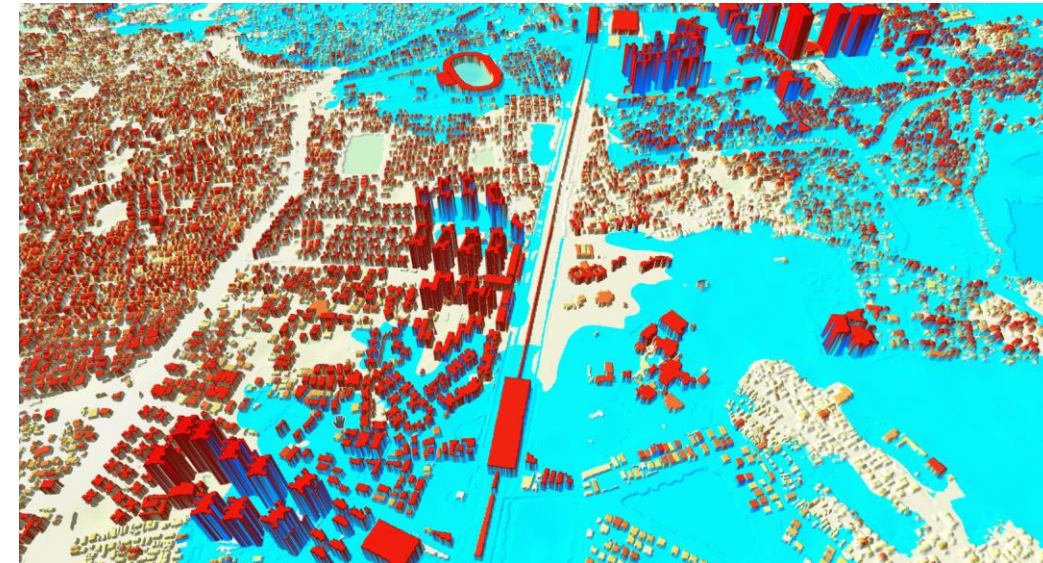
Risk assessment - Historical flood mapping , Kolkata, INDIA



Flood risk mapping from 1991-2017 inventory



Flood risk mapping from 2004-2018 inventory



Flood simulation (filled DTM)

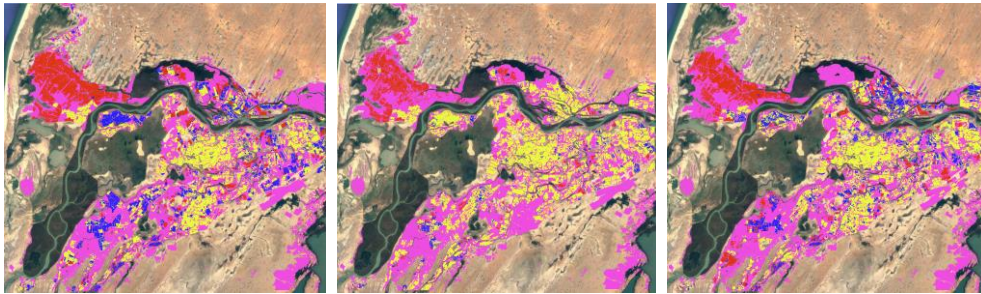
Support to natural resources management and climate change - Senegal

End-user= Centre de Suivi Ecologique - Senegal

Objective: Monitor the impact of climate change to have better natural resources management

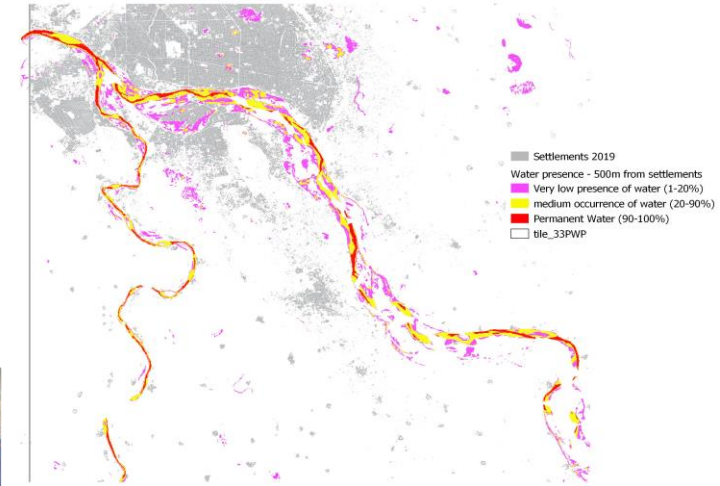
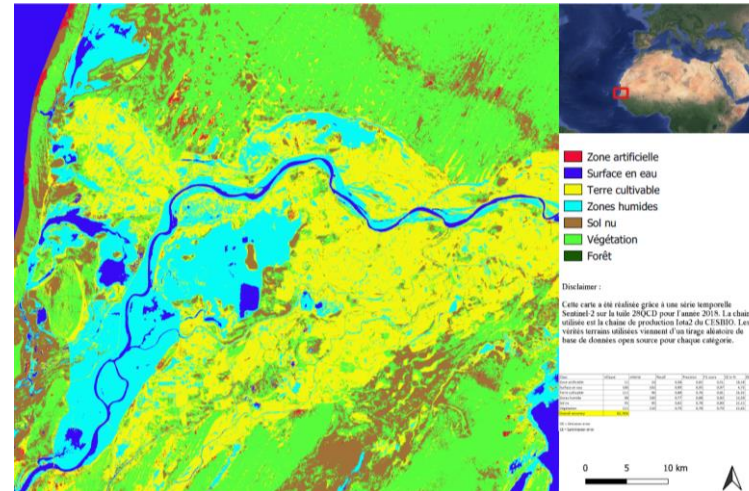
EO service provided: Land Use Land cover maps, water surface delineation + indicators of changes

Seasonal land changes from year to year, agricultural yield & leaching after salinization of agricultural parcels,



■ Saison Jan-Juin
■ Saison Juil - Dec
■ Double saison
■ Non utilisé

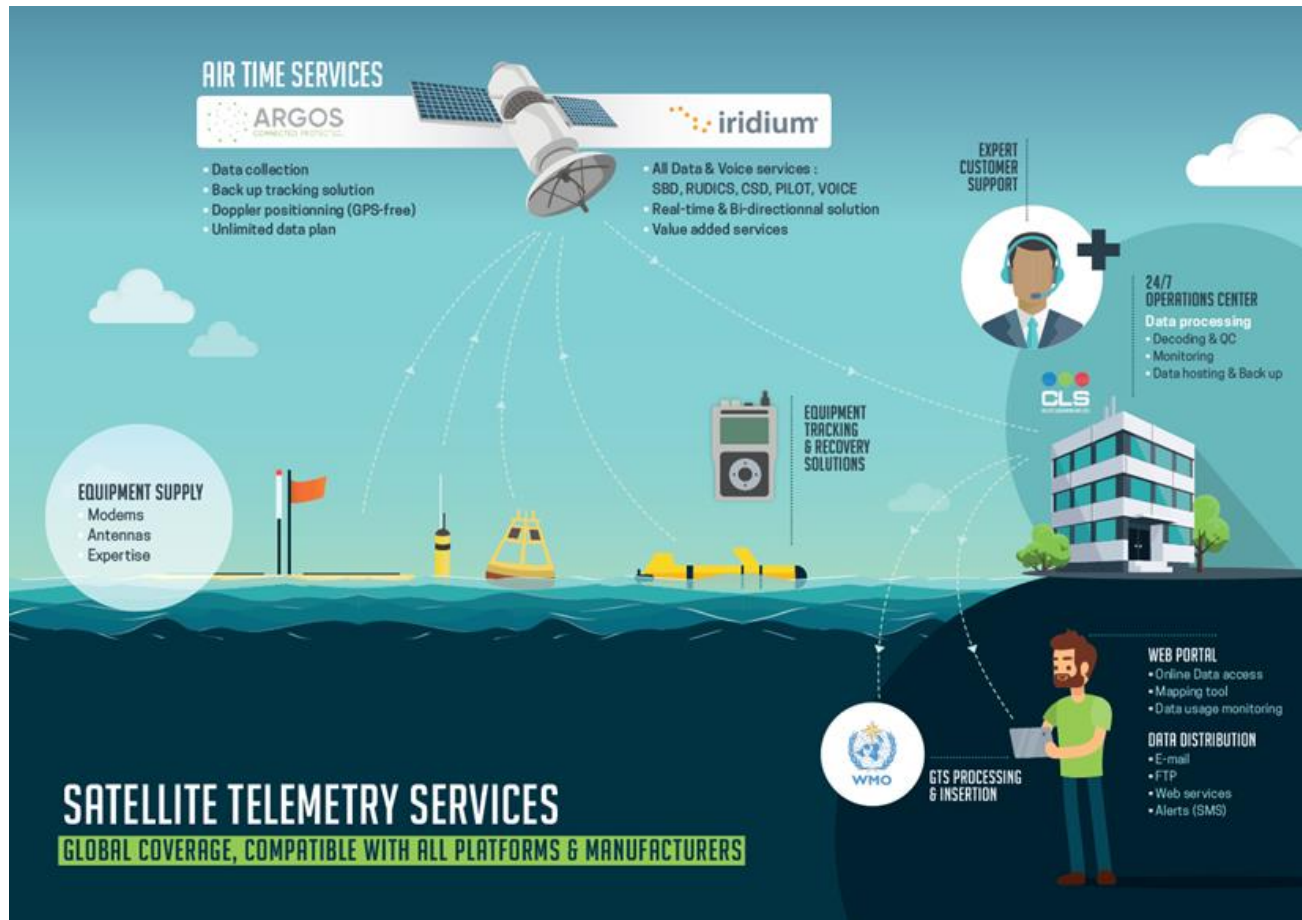
Land Cover maps



Environmental impact of urban areas on permanent and seasonal water surfaces



In-situ measurement accessible everywhere – the ARGOS - KINEIS system



- Global coverage
- Low transmission power <math><1W</math> (long lifetime autonomy)
- Decreasing revisit time : ~15min everywhere
- Capacity to transmit more data
- 2-ways communication guaranteed

Example :

Hydrolink project - water level GSM +IoT spatial



To sum up

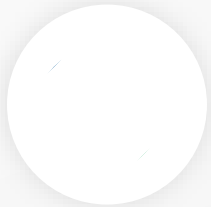


Operational processing capabilities and services,
Monitoring of water quantity available in rivers and lakes.



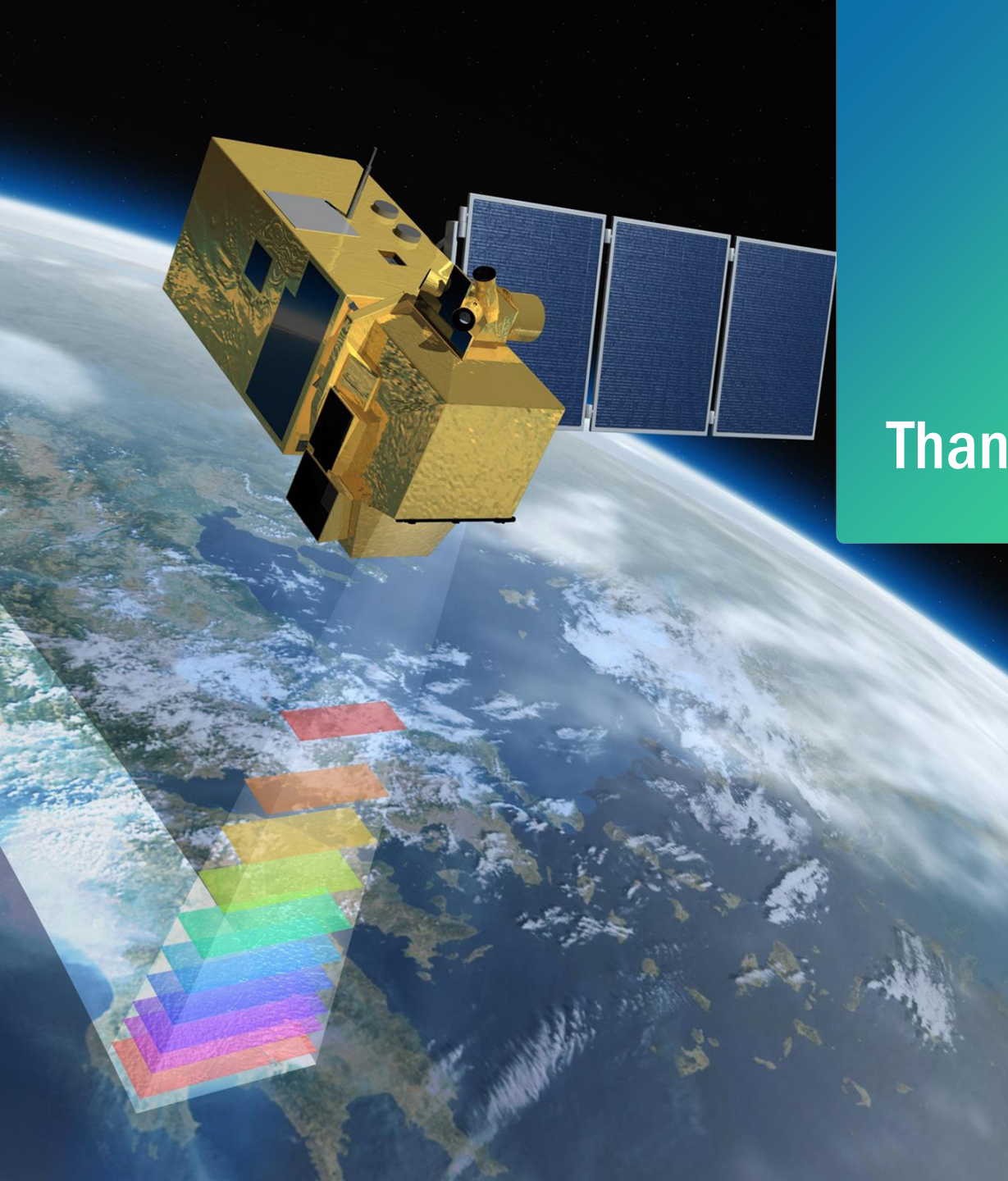
New perspectives with future EO missions (SWOT, TRISHNA, CO3D, etc.)

→ All components of water cycle accessible by EO



Impact on water usage (irrigation, agriculture) and water quality





Thank you

CLS website:

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

CNES website:

<https://www.cnes.fr>

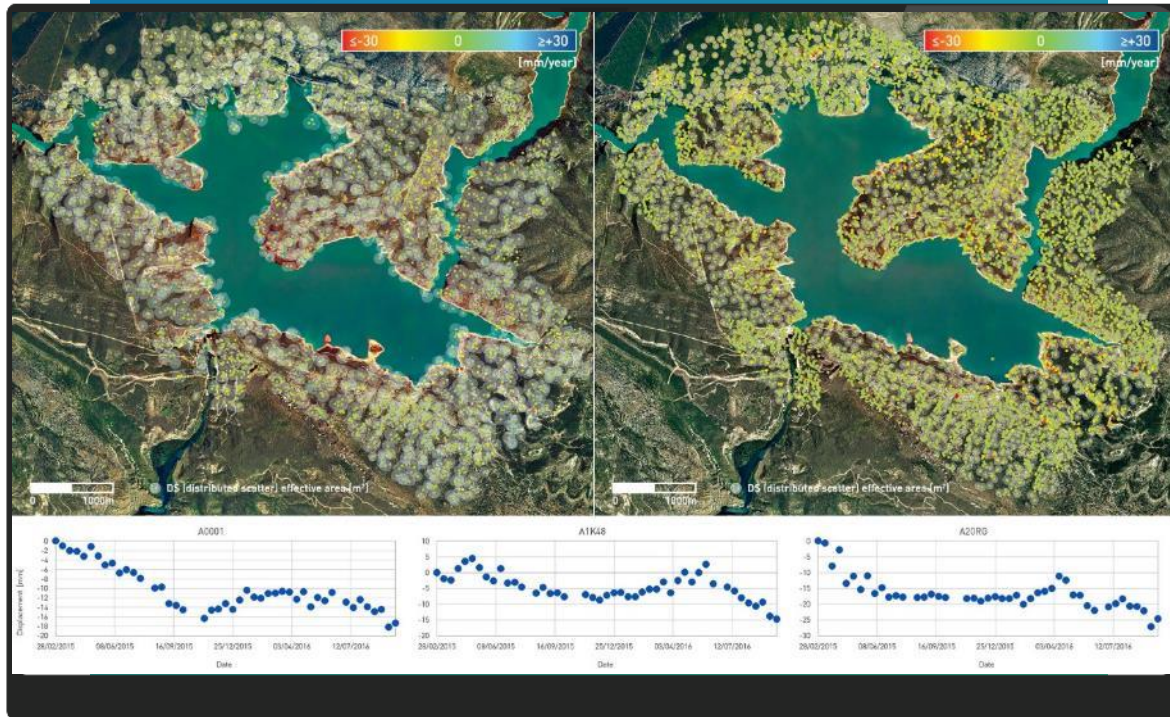
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MONITORING HYDRAULIC INFRASTRUCTURE



Built in the 1950s, the Canelles Dam is located on a tributary of the Ebro River in the Iberian Peninsula. With a capacity of 108 MW, the dam plays a major role in the river's south-eastern hydropower system. The dam is 140m high and 200m long with a reservoir capacity of 912.6 hm³ and a total surface area of around 1,800 ha.



CLS: Stability Surveys

Two InSAR surveys were conducted on an area of complex relief with a steep slope, covered by rocky outcrops, bushes and forest:

- The first historical survey analysed the ground stability of the water reservoir between 2003 and 2010.
- A second monitoring program covered the period between 2015 and 2016.