

From GlobWetland II to GlobWetland Africa

STRP 18, Gland, September 2014

Marc Paganini,
European Space Agency
Directorate of Earth Observations Programs

Where can EO technology play a role?



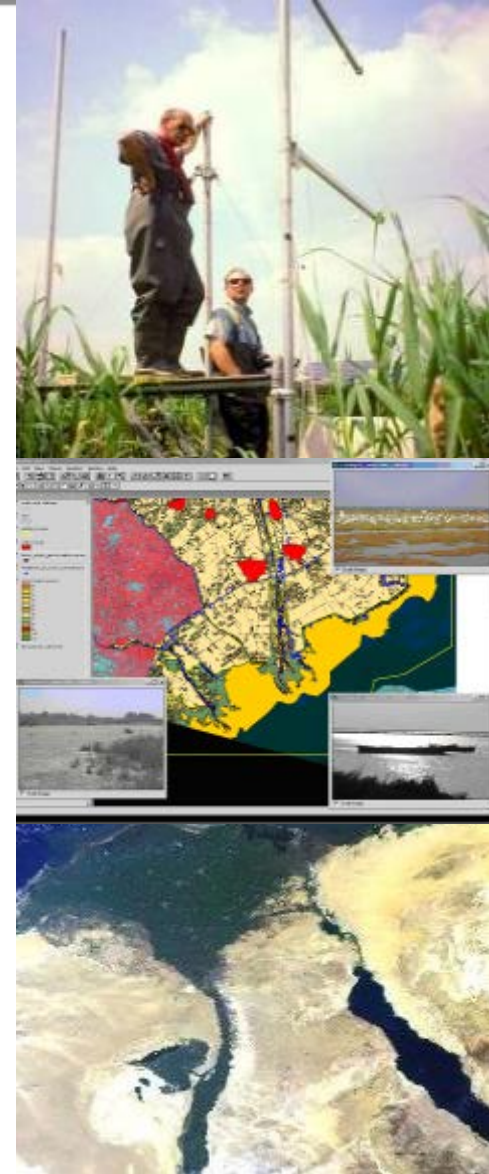
Wetlands Inventory: The collection and/or collation of **core information** for wetland management, including creation of an information base.

Wetlands Assessment: The identification of the **status** of, and **threats** to, wetlands as a basis for the collection of more specific information through monitoring activities.

Wetlands Monitoring: Regular collection of specific site information for **management purposes**.

With the ultimate goal to

- Increase **scientific knowledge**;
- Support **efficient management**, conservation, restoration and wise use of wetlands;
- Contribute to **improve the performances** (reporting obligations) of the Ramsar Contracting Parties;



GW-I, pilot EO products for wetlands monitoring

"GlobWetland, looking at wetlands from Space" symposium, Oct '06

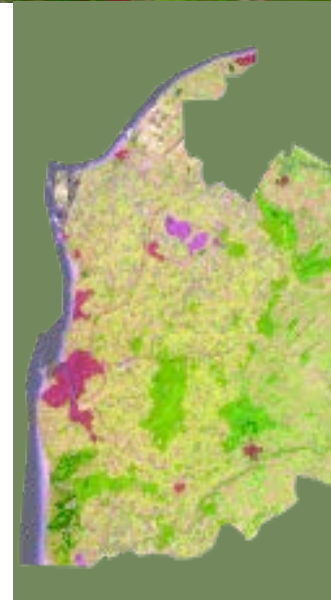
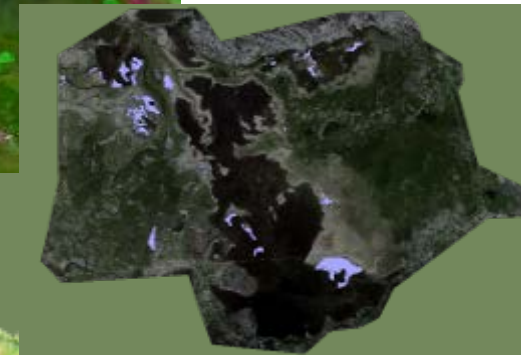
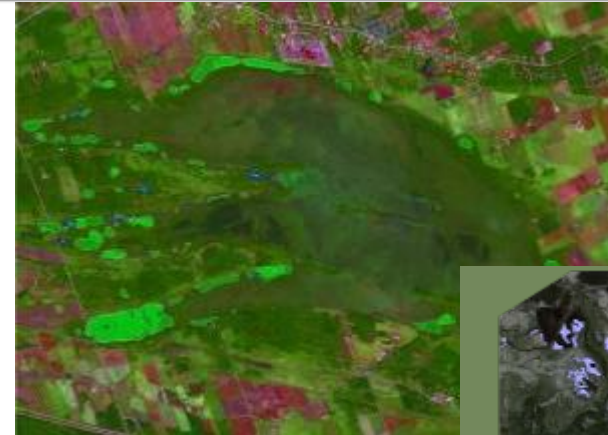


Mature products:

- **Land Use and Land Cover maps**,
(including wetlands typologies)
- **Change Detection Maps**
(on Land Use / Land Cover)
- **Water Cycle Regimes**
(seasonal and annual variations)

R&D products:

- **Wetland Identification and Delineation**
(support to wetlands inventory)
- **Water Quality**
(dissolved organic matters, suspended sediments, chlorophyll concentration)



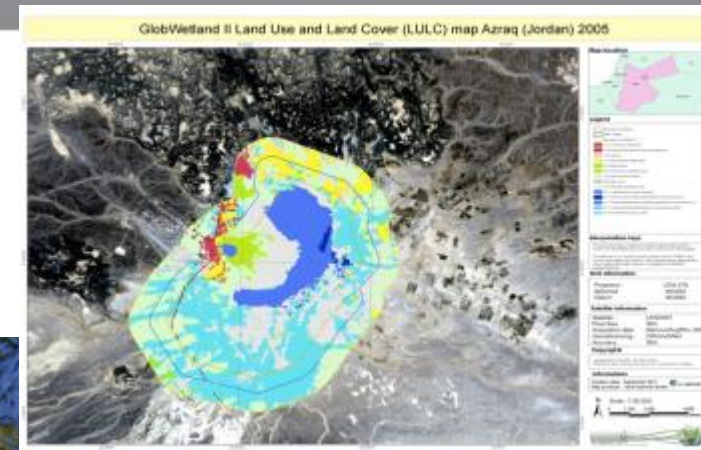
GlobWetland II, a regional GWOS pilot project of the Ramsar convention on wetlands



*Change
Detection
maps*



*Land Use
Land Cover
maps*

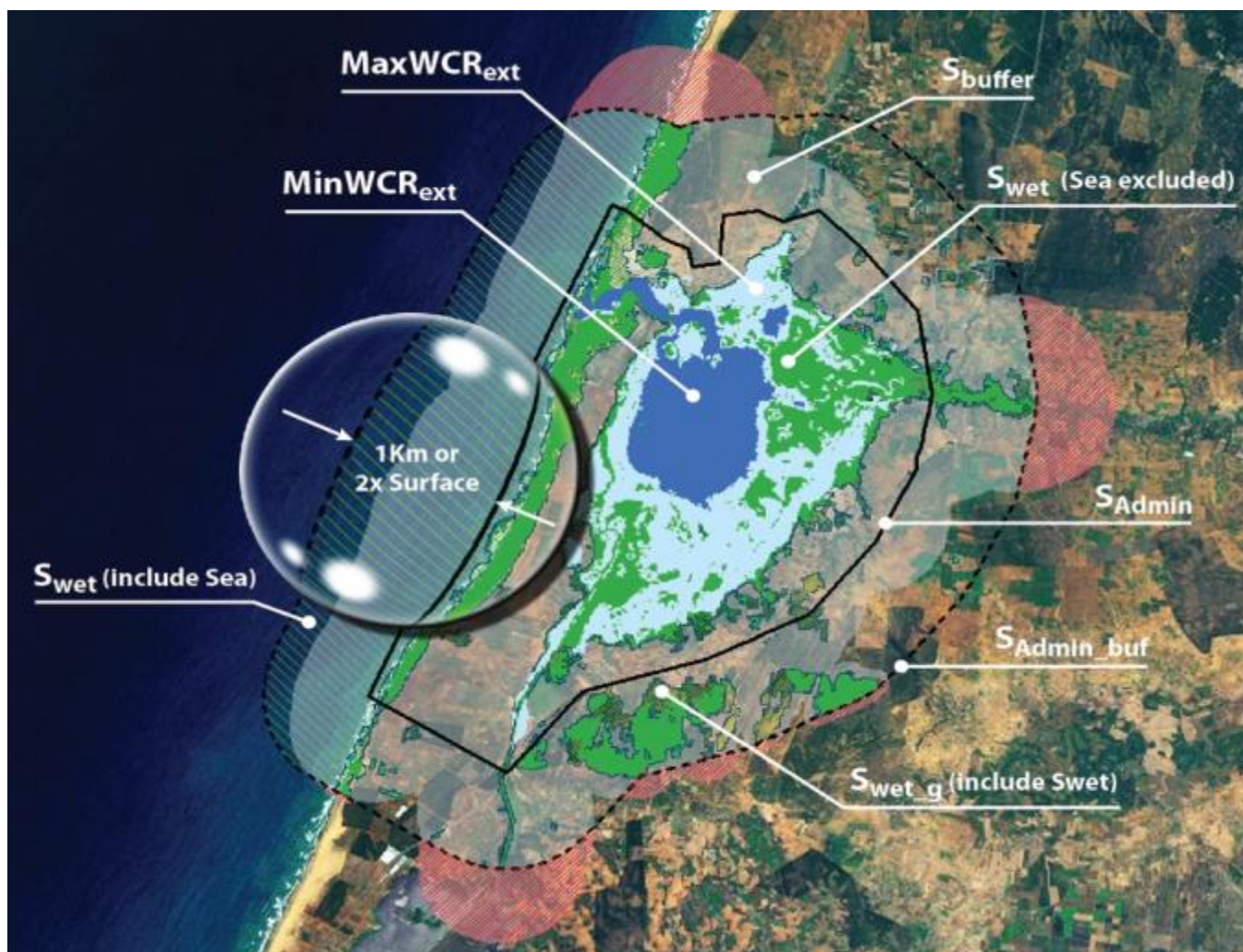


*Water Cycle
Regimes*



- 200 wetland sites mapped, 3 points in time (75, 90, 05)
- In partnership with the Ramsar Secretariat and the Mediterranean Wetland Observatory hosted by TdV
- 10 countries involved from the Southern Mediterranean
- Pilot project of the Global Wetland Observing System (GWOS) for the State of the World Wetlands (SOWW)

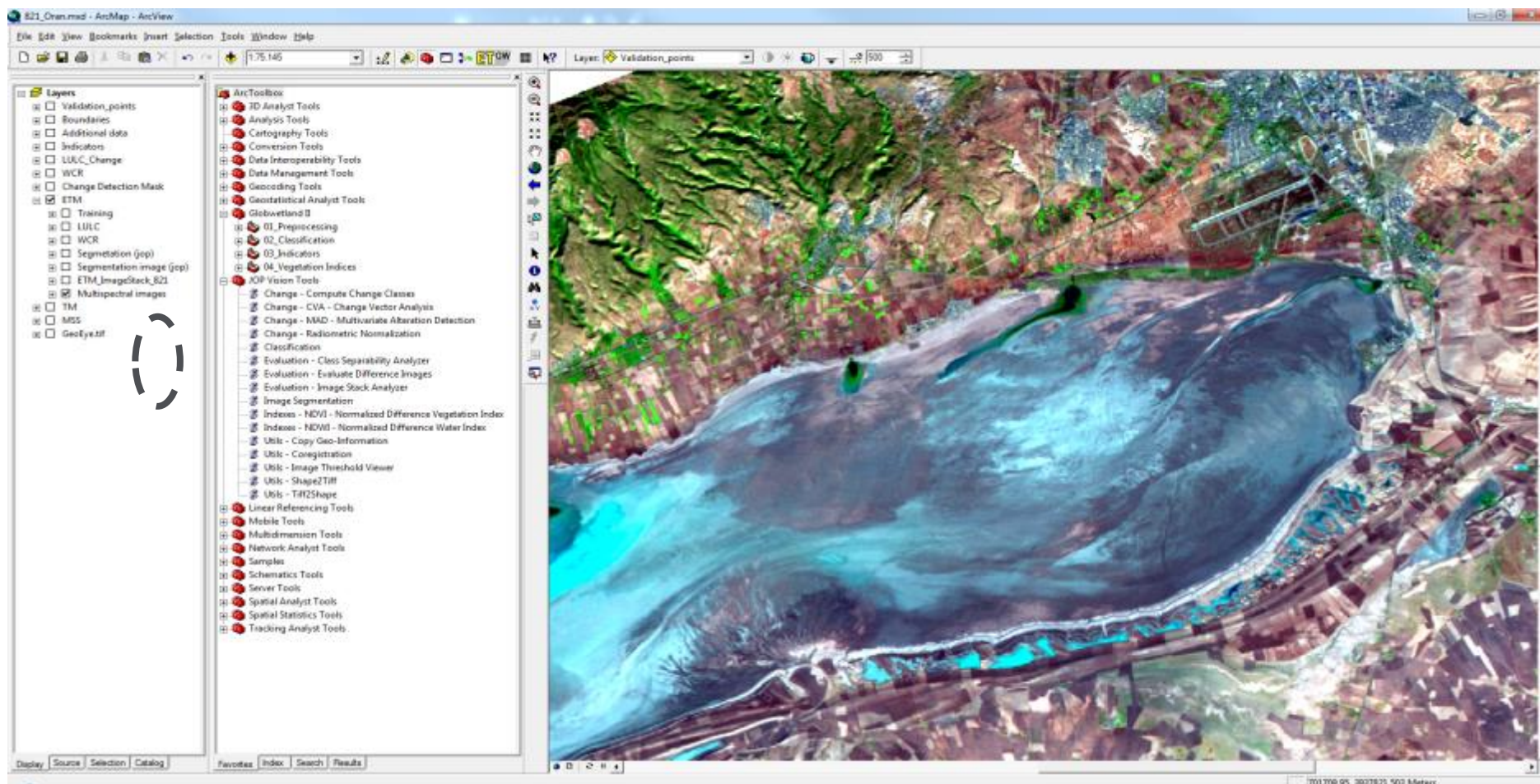
Can we derive wetland indicators ?



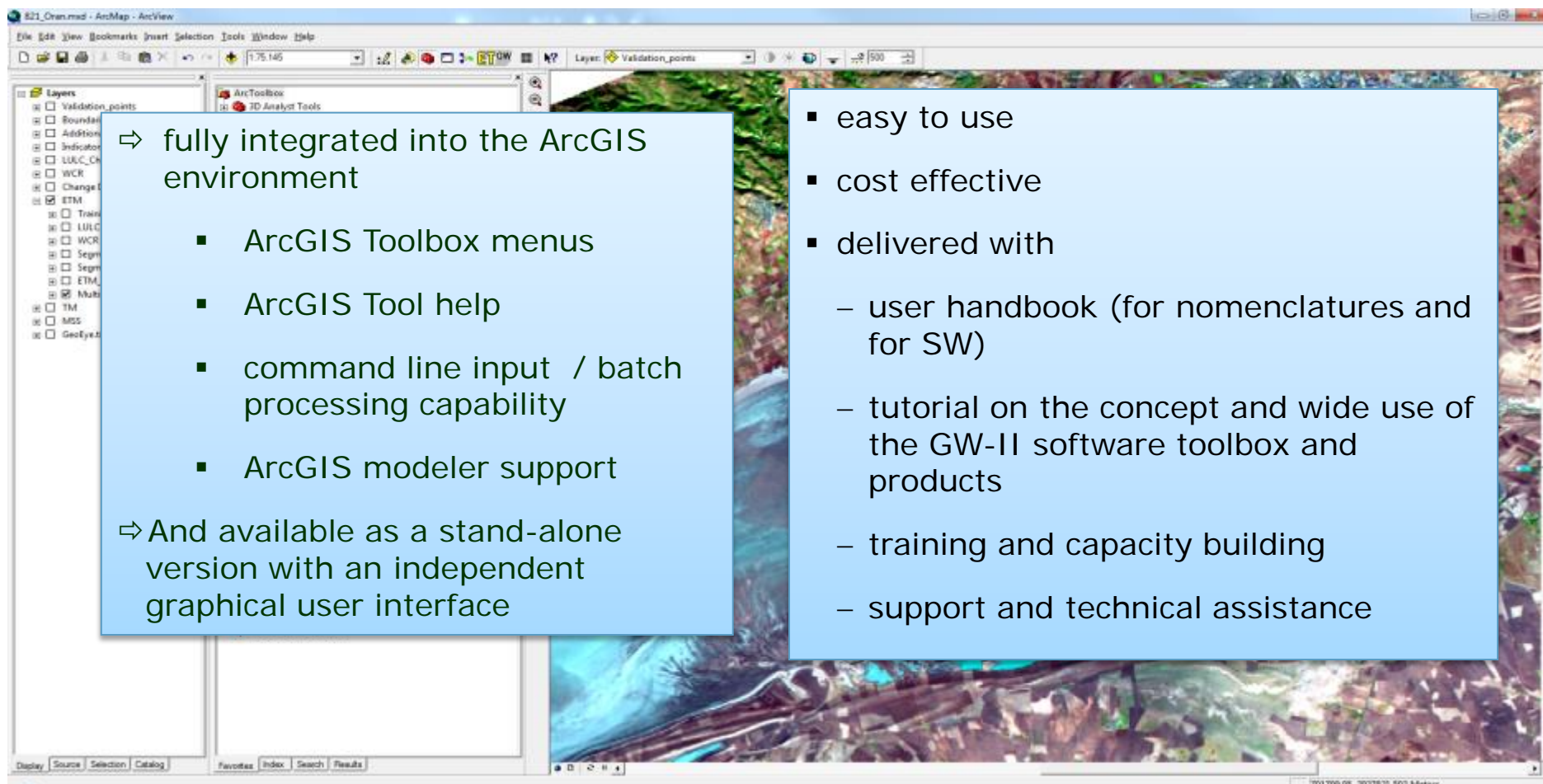
Four indicators:

- 1) changes in wetland areas
- 2) changes due to agriculture & urbanization
- 3) changes to the inundation of the ecosystem
- 4) status and trends of Wetland

The GW-II software toolbox



The GW-II software toolbox



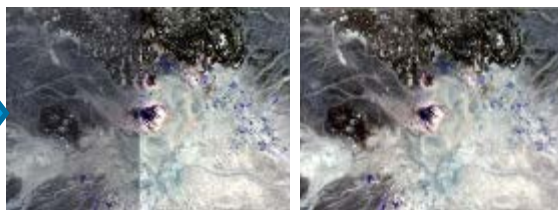
The GW-II software toolbox, S/W tools for the end-to-end production of maps & indicators



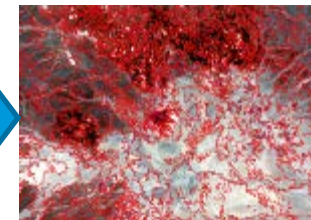
Satellite input images



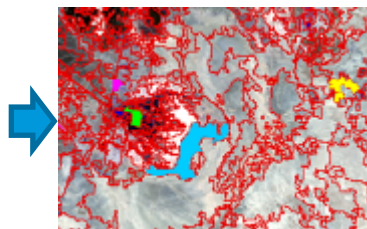
Radiometric and geometric pre-processing



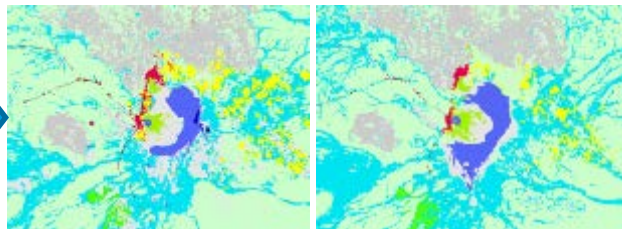
Segmentation



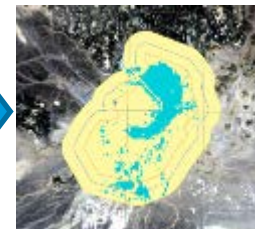
Training for classification



LULC classification result of 2 different years



WCR classification



Just one software system for all map and indicator production steps !!

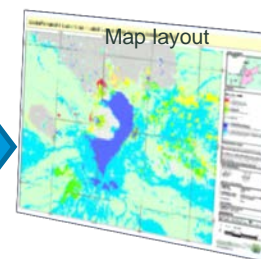
Change / no-change masking



Post classification change



Map layout



Indicator computation

OID	Level	Index Level	Index
1	Agricultural areas	Artificial surfaces	0.01
2	Agricultural areas	Forests and semi-natural areas	0.31
3	Agricultural areas	Water bodies	0.25
4	Agricultural areas	Wetlands	0.06
5	Artificial surfaces	Agricultural areas	0.01
6	Artificial surfaces	Wetlands	0.01

The GlobWetland II WebGIS



GlobWetland II WebGIS

webgis.jena-optronik.de

ESA VPN1 ESA VPN2 Google Maps TO DO LIST ESRIN Apple YouTube Wikipedia News Popular My sites

GlobWetland II WebGIS

GlobWetland II WebGIS

Settings
Opacity of all maps: (+) (-) 80%

Maps

- Location and Delineation
- Landsat derived maps
 - Algeria
 - Egypt
 - All Wetlands of Egypt
 - LULC
 - 0 1975 (+) (-) 80%
 - 0 1990 (+) (-) 80%
 - ✓ 2005 (+) (-) 80%
 - LULCC
 - WCR
 - 601 Bitter Lakes
 - 602 El Malaha
 - 603 Idku
 - 604 Manzala
 - 605 Maryut
 - 606 Zaranik
 - 607 El Qatta
 - 608 El Dillingat
 - 609 Faraontya
 - 610 Sinnera & Sanel Hagar
 - 611 Miheishar
 - 612 Timsah
 - 613 El Qantara
 - 614 Bardawil
 - 615 Burullus
 - 616 Quseima
 - 617 Wadi El Natrun
 - Israel
 - Jordan
 - Lebanon

615 GlobWetland II Land Use Land Cover (LULC) Burullus (Egypt) 2005

604 GlobWetland II Land Use Land Cover (LULC) Manzala (Egypt) 2005

614 GlobWetland II

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Lon = 30.49310, lat = 30.46701
© OpenStreetMap contributors

Extension to the GW-II geographical coverage



Extension to the north shore of the Mediterranean (15 countries) done by the **Mediterranean Wetland Observatory** of the MedWet initiative

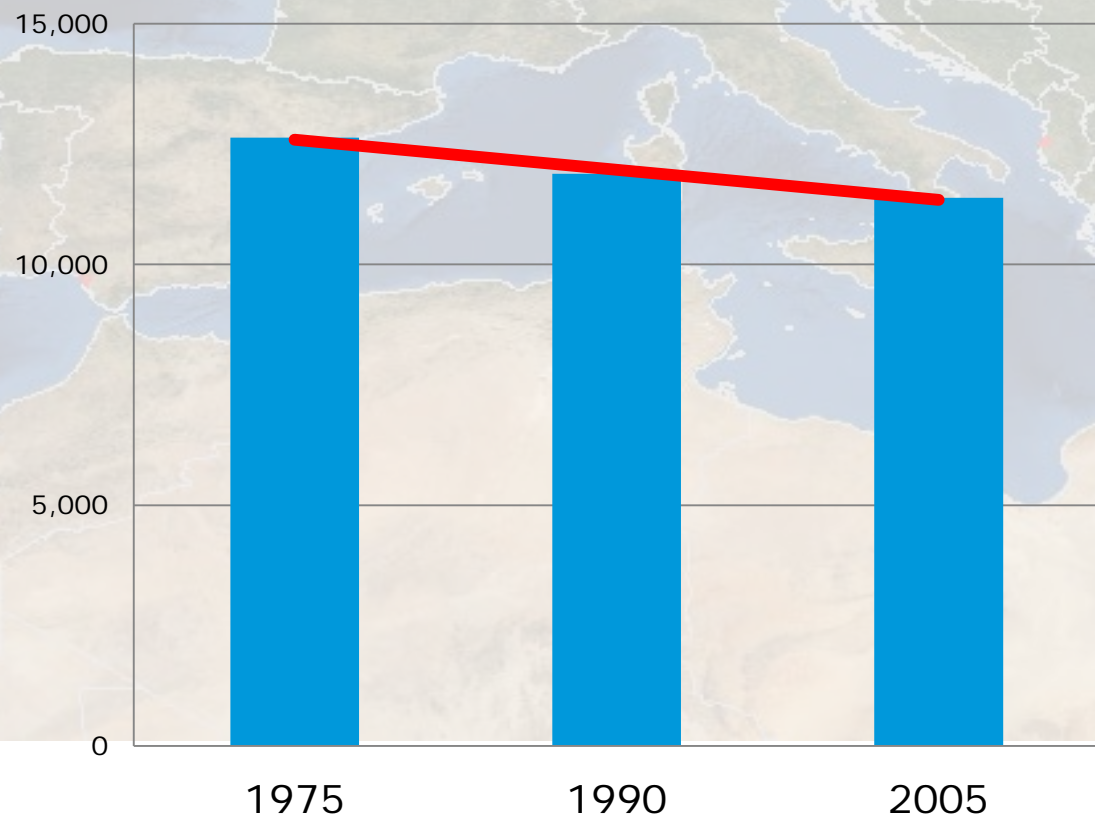


10 countries in the southern countries of the Mediterranean done by GlobWetland II

Loss of natural wetlands in the Mediterranean



**Natural wetlands surface
(km²)**



Loss of 10% between
1975 – 2005
(~ 1248 km²)

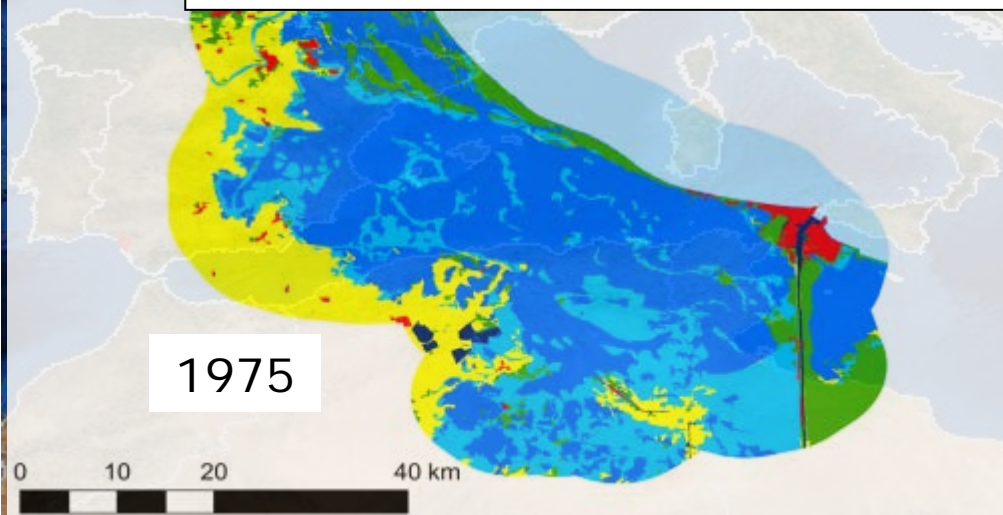
Loss of natural wetlands in the Mediterranean, Manzala (Egypt)



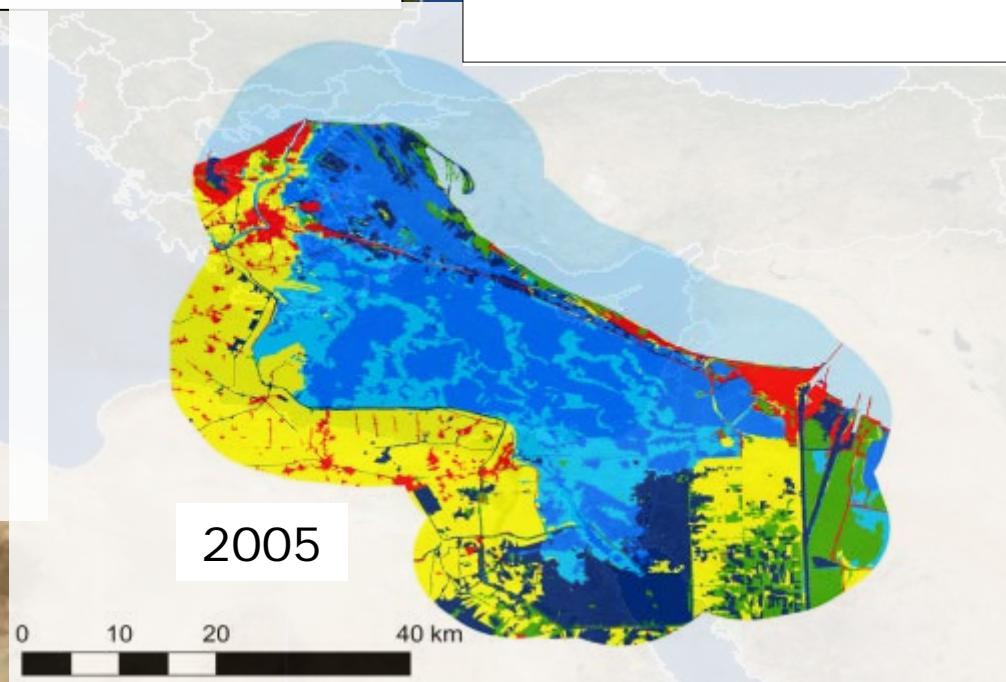
Some habitats are more threatened than others... **lagoons**

A loss of **398km²** of lagoons surface
in the Nil Delta sites
between 1975 - 2005

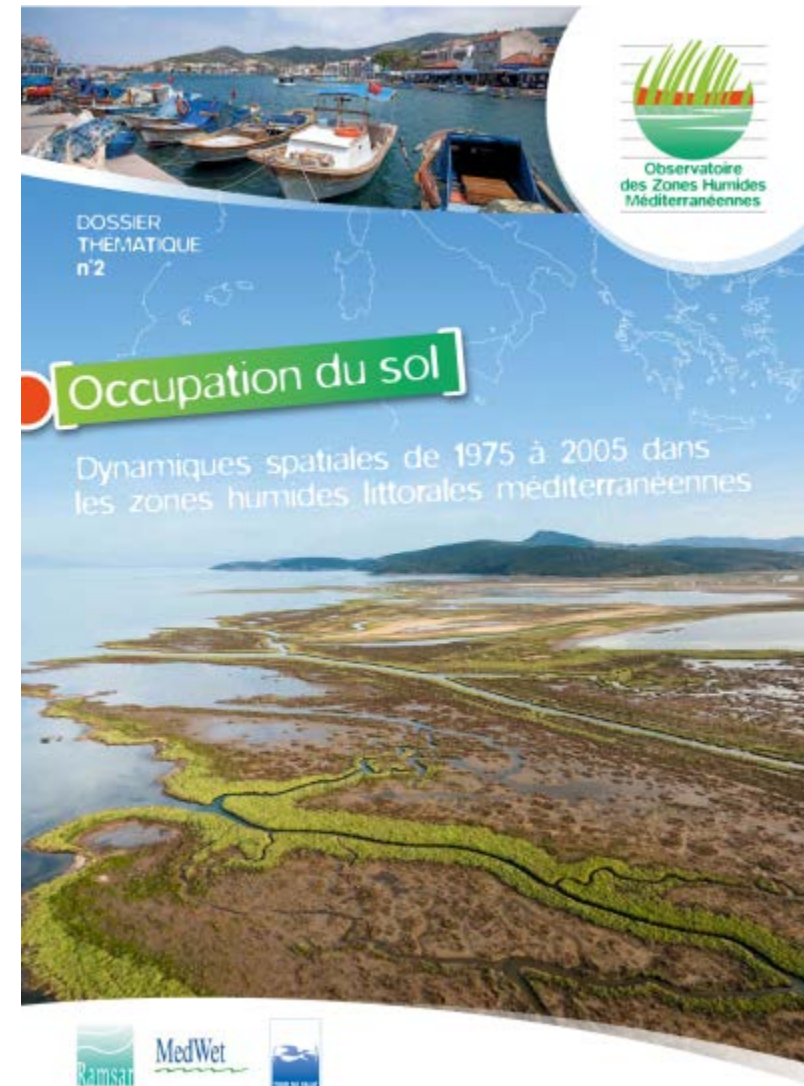
1975



2005



- 2nd Thematic Report of the Mediterranean Wetland Observatory
- 1st report in 2012: "Biodiversity, status and trends of species in Mediterranean wetlands"
- 2nd report in 2014: "**Land Use, Spatial and Temporal Dynamics from 1975 to 2005 in the Mediterranean coastal Wetlands**"
- **214 sites** studied from **22 Mediterranean countries**
- **3 points in time:** 1975, 1990 and 2005



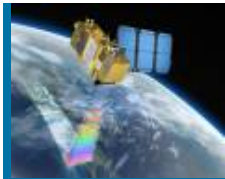
The European Copernicus initiative, satellite data access on the long term



Sentinel 1 – SAR imaging

All weather, day/night applications, interferometry

2014 / 2015



Sentinel 2 – Multi-spectral imaging

Land applications: urban, forest, agriculture,...
Continuity of Landsat, SPOT

2015 / 2016



Sentinel 3 – Ocean and global land monitoring

Wide-swath ocean color, vegetation, sea/land
surface temperature, altimetry

2015 / 2016



Sentinel 4 – Geostationary atmospheric

Atmospheric composition monitoring, trans-
boundary pollution

2019



Sentinel 5 & precursor – Low-orbit atmospheric

Atmospheric composition monitoring
(S5 Precursor launch in 2016)

2019



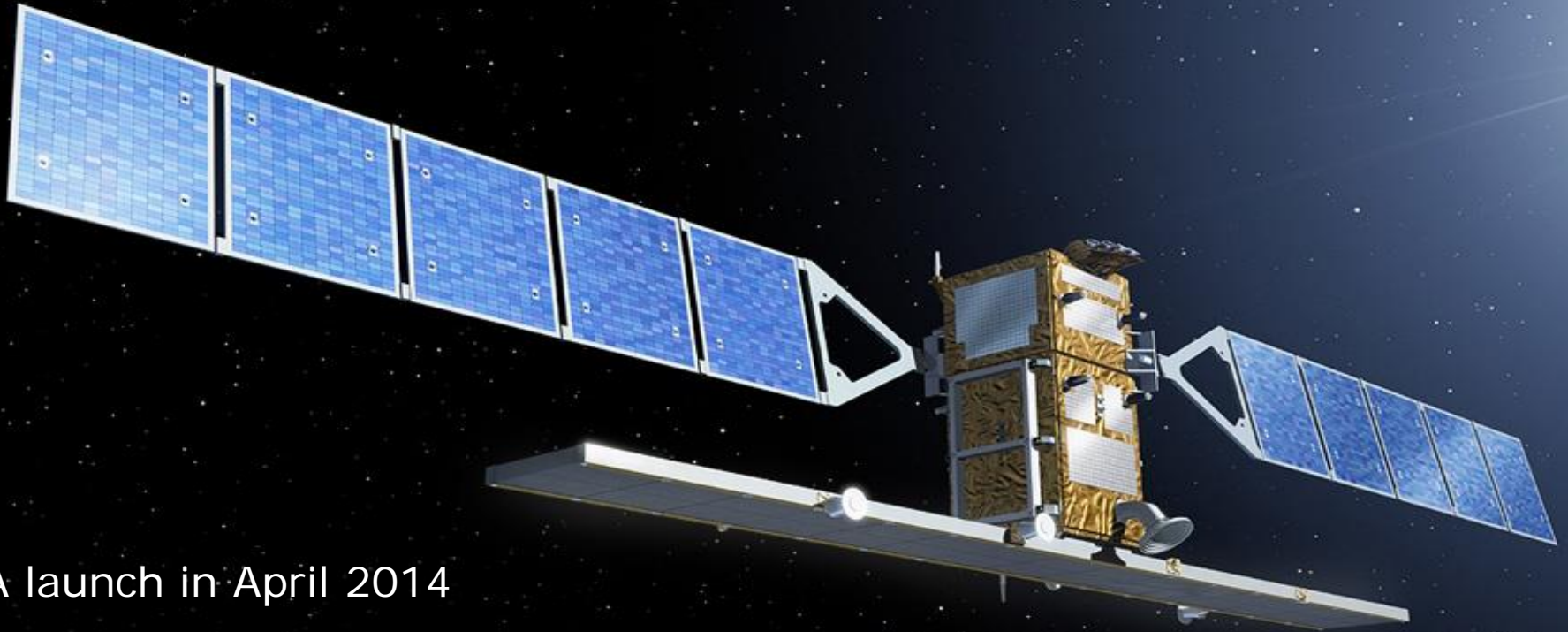
Long term
EO data
to better
monitor
our Planet



European Space Agency

* Joint EU/ESA Data Policy Principles adopted by ESA Council and by EU Parliament and Council (Nov 2013).

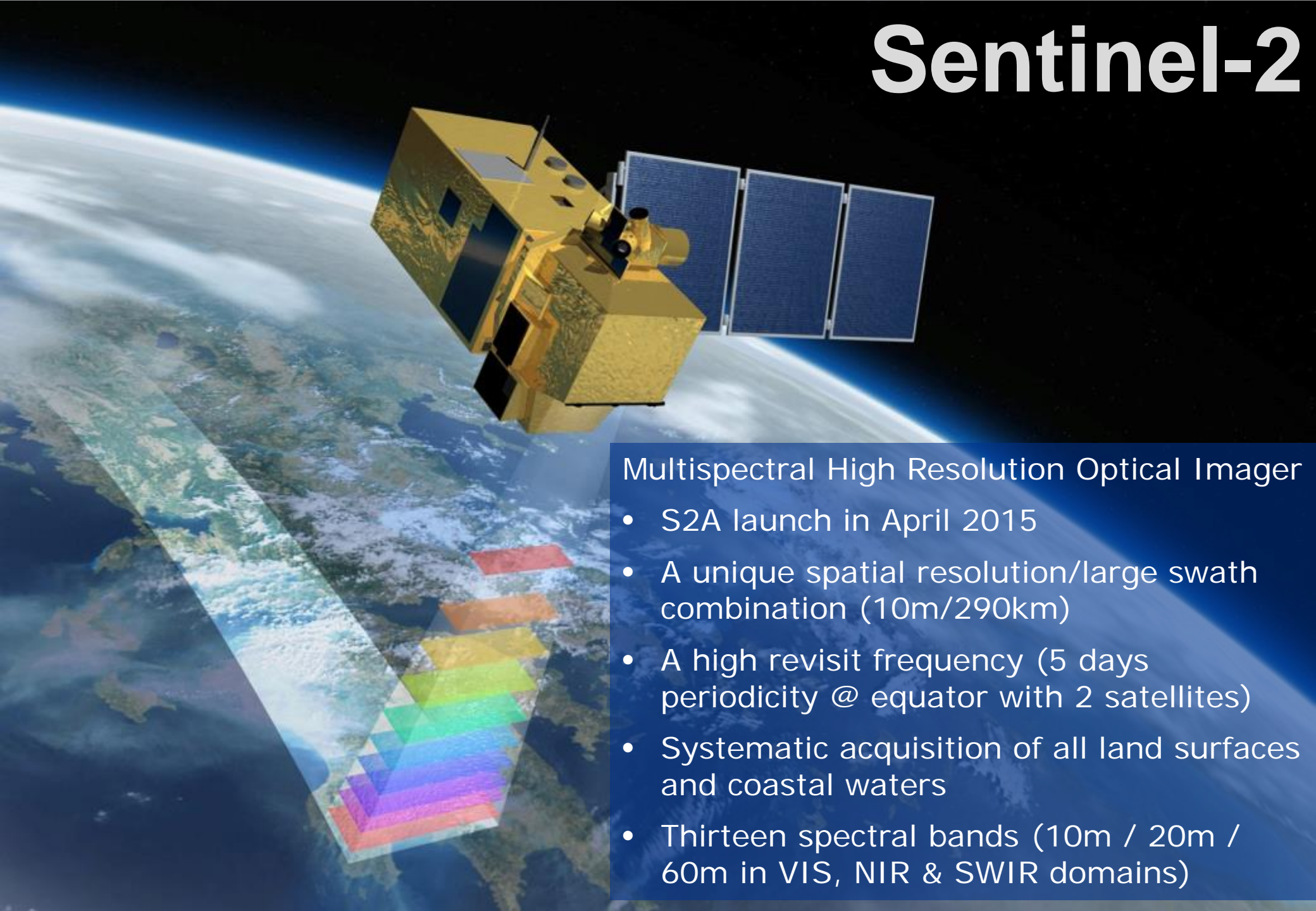
Copernicus Sentinel-1



- S1A launch in April 2014
- Constellation of two satellites
- C-Band Synthetic Aperture Radar, weekly coverage (2 satellites)
- Nominal lifetime in orbit of 7 years (max. 12 yrs)
- Sees through cloud cover!



Sentinel-2

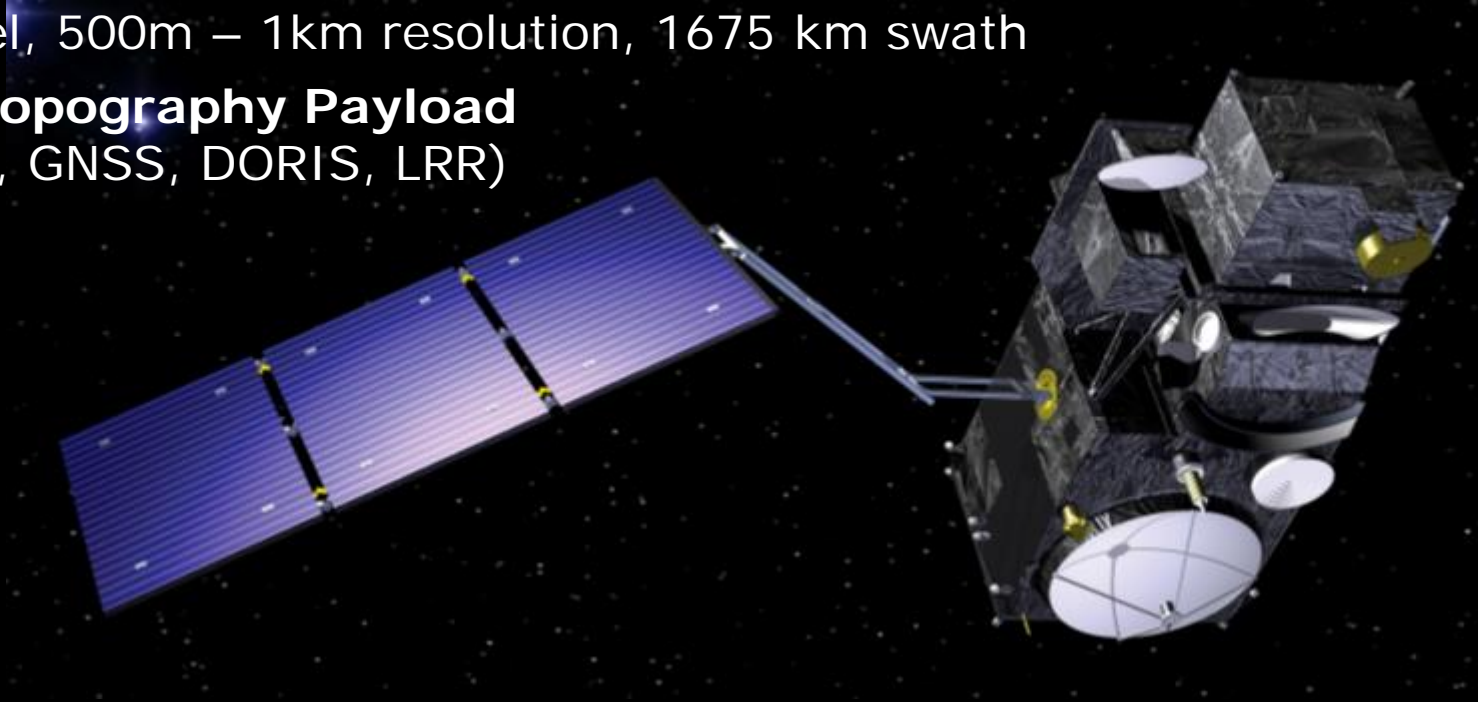


Multispectral High Resolution Optical Imager

- S2A launch in April 2015
- A unique spatial resolution/large swath combination (10m/290km)
- A high revisit frequency (5 days periodicity @ equator with 2 satellites)
- Systematic acquisition of all land surfaces and coastal waters
- Thirteen spectral bands (10m / 20m / 60m in VIS, NIR & SWIR domains)

Sentinel-3

- **Ocean and Land Colour Instrument (OLCI)**
 - 21 channels, 300 m resolution, 1270 km swath
- **Sea and Land Surface Temperature Radiometer (SLSTR)**
 - 9 channel, 500m – 1km resolution, 1675 km swath
- **Sea & Ice Topography Payload**
(SRAL, MWR, GNSS, DORIS, LRR)



- Launch: 2015, 2016
- Revisit at equator = 2 days (or daily with 2 satellites)
- 7 year lifetime (max. 12 yrs)

Copernicus Constellations Deployment Schedule



Legend:

- Qualification Acceptance Review (QAR)
- Flight Acceptance Review (FAR) or PreStorage Review (PSR)
- On-ground Storage
- Tentative launch date
- In-orbit Commissioning

Status: April 16, 2014

Legend:

- Delegated agreement
- Operational phase

GlobWetland Africa

Towards a Global Wetland Observing System in Africa

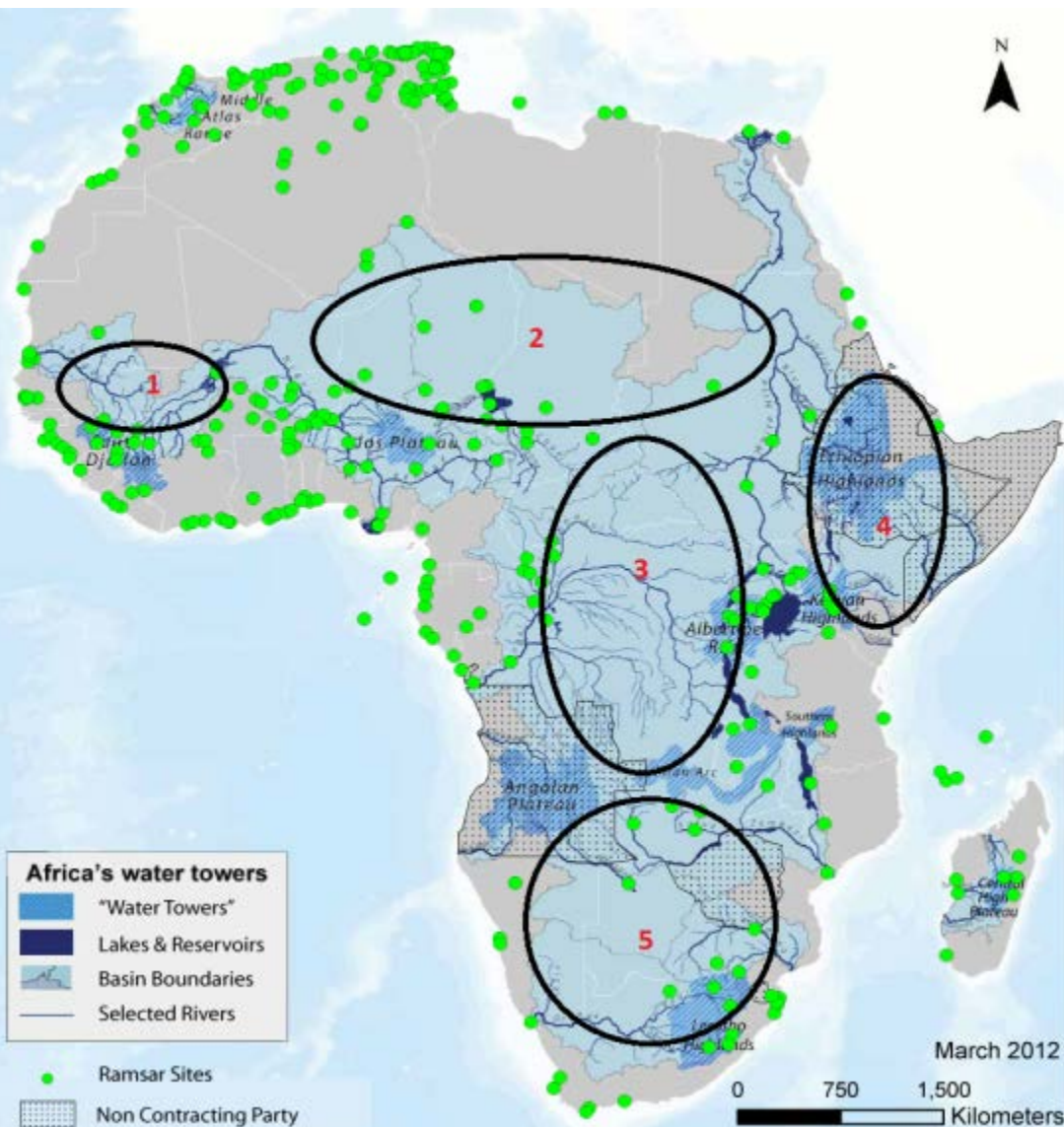


A satellite map showing the continent of Africa and parts of Europe. The map uses a color-coded system where green indicates forested or vegetated areas, yellow and tan represent arid or semi-arid regions, and blue shows water bodies. The Mediterranean Sea is visible between Europe and Africa. A semi-transparent grey box is overlaid on the map, containing text.

GlobWetland Africa overall goal

Facilitate the exploitation of satellite observations to support effective management of wetlands and the wise use of associated resources in Africa

Ramsar and the African wetlands



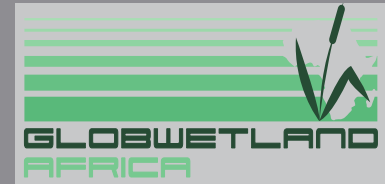
- 350+ Ramsar sites (over 40% of the total areas if Ramsar sites)
- 50 contracting Parties (30%)
- But only 15 countries have achieved their wetland inventories.

Programme of designation and monitoring of Ramsar Sites in the catchment areas of the "water towers" of lakes and reservoirs

Five priority areas: framework for the support of Ramsar to the conservation and rational use of water throughout Africa.

Goal: by 2021, water availability is stable or increasing in the five priority areas

GlobWetland Africa in a nutshell



- to provide African countries and international organisations active in Africa, with **EO methods and tools** to better assess conditions of wetlands under their areas of jurisdiction/study, and better monitor their trends over time.
- **enhance the capacity** of the African stakeholders to develop national and regional **wetland observatories**
- **exploiting the increasing EO capabilities** (in terms of satellite data and EO techniques) for the inventory, assessment and monitoring of wetlands.
- fully **exploit the freely available satellite data** available from the **most recent and innovative EO assets** (Sentinel missions of the Copernicus initiative and the USGS Landsat 8 mission).

- 1,500,000 EUR project , 100% funded by ESA (90% for European partners)
- 3 years duration (2015 to 2017)
- Exploitation of full-fledged Sentinel 1 and Sentinel 2 operational capacities.

ITT planned in Oct 2014

FACTS

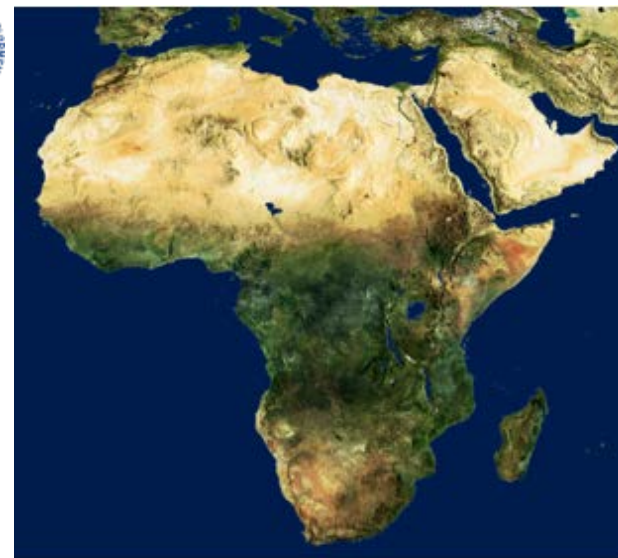


→ **GLOBWETLAND III USER CONSULTATION WORKSHOP**

Towards the Global Wetlands Observing System (GWOS)

16–19 July 2013 | ESA-ESRIN | Frascati (Rome), Italy

- **ESA launched TIGER in 2002** as a CEOS response to World Summit on Sustainable Development in Johannesburg.
- **TIGER objective:**
“assist African countries to overcome problems faced in the collection, analysis and dissemination of water related geo-information by exploiting the advantages of Earth Observation technology”.
- TIGER involves more *than 150 African experts in 42 countries* who actively participate in **TIGER development projects and capacity building actions**;
- **Key partners** includes CEOS (with a strong support from the CSA), the *African Ministerial Council on Water, the African Development Bank, the African Union Commission and the UN-Africa Water Group (UNESCO, UNECA), DWAF, R. of South Africa.*



GlobWetland Africa, 4 cardinal requirements

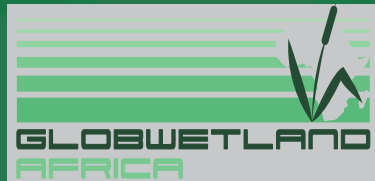


DEVELOP

To develop **an end-to-end S/W toolbox** for the production of a number of EO geo-information maps on wetland sites and wetland-prone areas, and for the generation of indicators on the status and trends of wetlands.

DEMONSTRATE

To demonstrate the **adequacy of the GW-A Toolbox** for African stakeholders to monitor the status and trends of their wetlands and fulfill their pledges towards the Ramsar Convention, by producing and validating pilot products.



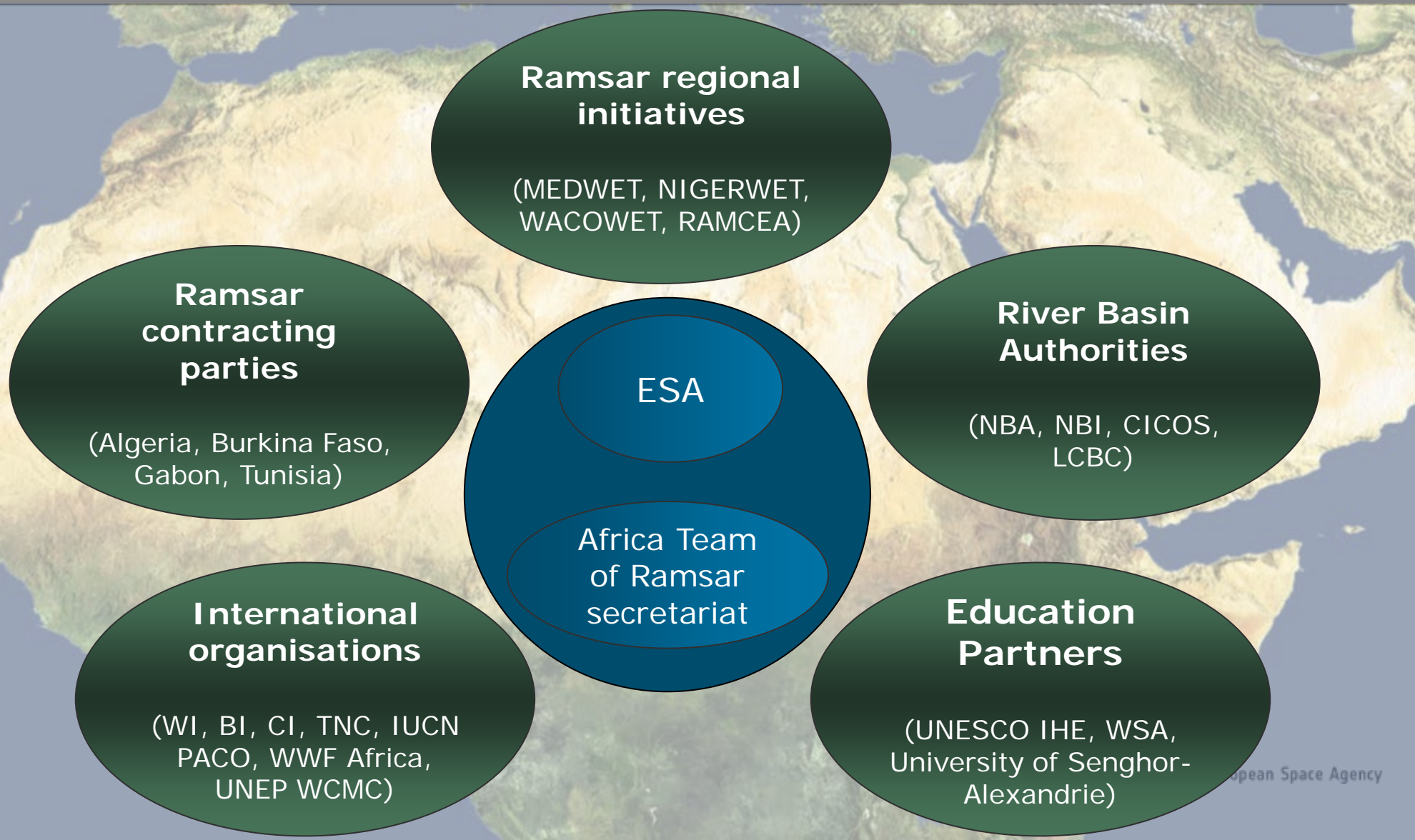
ASSIST

To assist the African organisations by providing **technical assistance** during a period long enough for an appropriation of the GW-A methods, tools and products by the partner organisations.

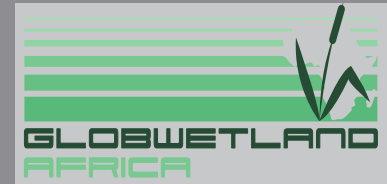
DELIVER

To deliver **license-free GW-A Toolbox** to partners organisations, with adequate training courses and education toolkits for transfer of know-how on the use of EO technology for wetland management.

The GlobWetland Africa Partnership



GlobWetland Africa, a RS toolbox for a wide range of wetland applications



Wetland inventory,

identification and delineation of wetland areas over large river catchments in support to national wetland inventoring campaigns;



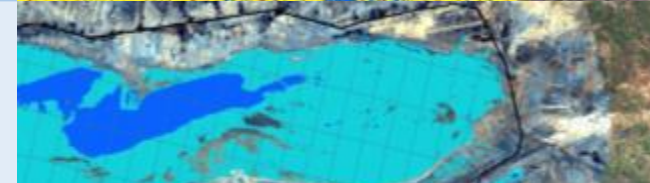
Wetland habitats maps,

for the assessment of the wetland status and for long-term change and trend analysis, inside and around Ramsar/wetland areas;



Water cycle regimes,

for the analysis of the intra- and inter-annual variations of the water tables, inside and around Ramsar/wetland areas;



Water quality parameters

such as turbidity, suspended solids and chlorophyll concentration, for the monitoring of the aquatic contamination and physical disturbances of the wetland ecosystem;



River basin hydrology

for the modelling of the water balance and the impact of/on wetlands within river catchments;

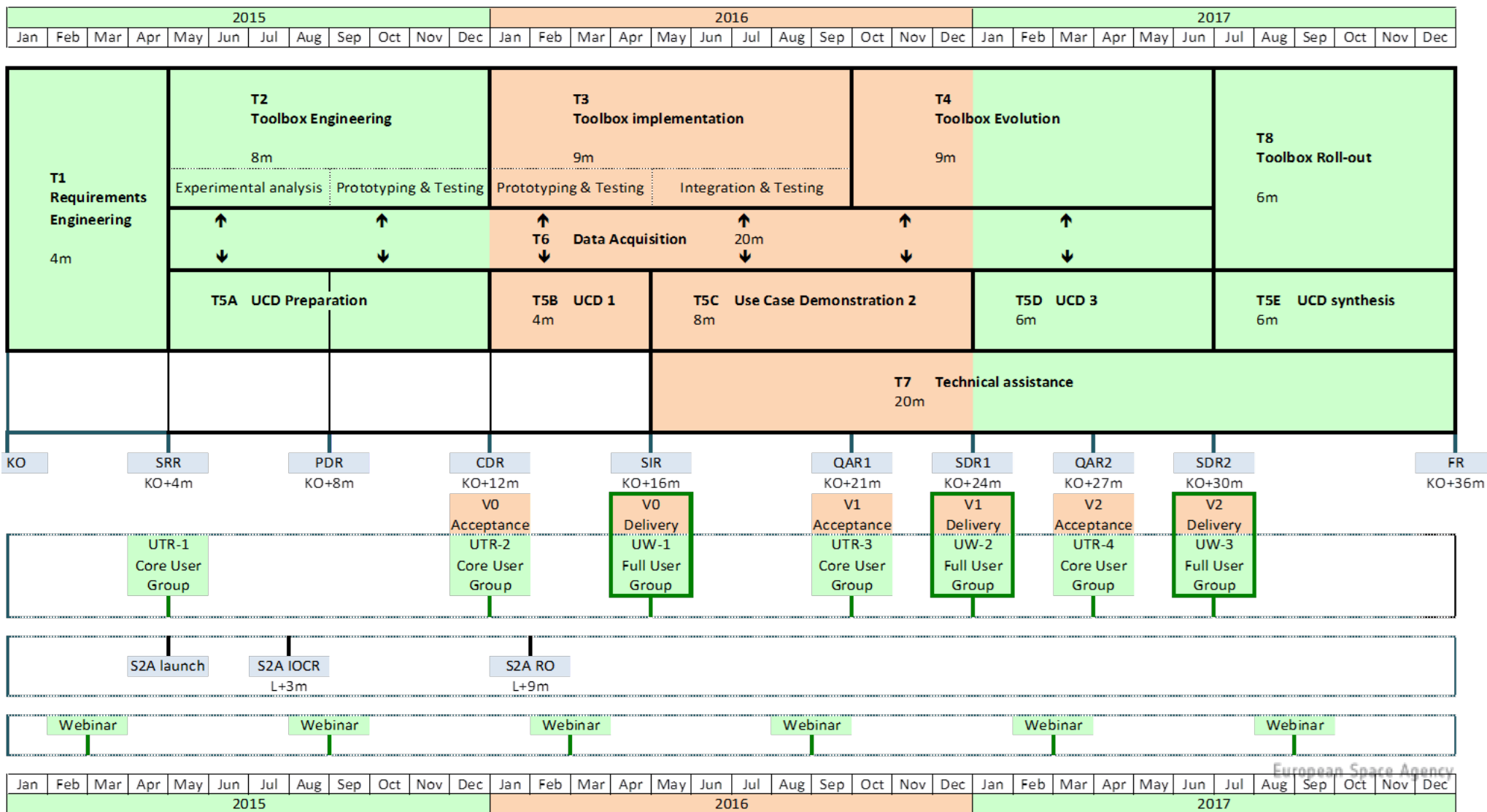
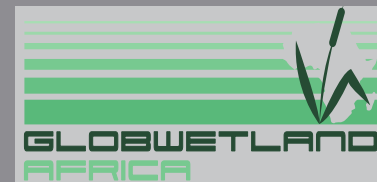


Mangroves mapping

for the assessment of the status and trends of tropical mangroves.



GlobWetland Africa, a stringent planning on a 3-year time frame



For more information



- The GlobWetland II project www.globwetland.org
- The GlobWetland WebGIS webgis.jena-optronik.de
- The GlobWetland Africa User Consultation
<http://due.esrin.esa.int/meetings/meetings310.php>
- The ESA Tiger Initiative www.tiger.esa.int
- European Copernicus Initiative www.copernicus.eu
- The Sentinels sentinel.esa.int

Thanks for your attention



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