Applications of Earth observations for water resource management and SDG monitoring

FUTURE EARTH WATER-ENERGY-FOOD NEXUS WORKSHOP

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Christian Tottrup, Senior Project Manager

DHI GRAS

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- Part of DHI - International consultants group specialized in water environments
- Specialized in Earth Observation (EO) applications

esa

water resources management
eo4sd

Mainstream and transfer EO into operational working processes of Official Development Assistance (2016-2019)

GLOBWETLAND AFRICA

EO in support of inventroying, mapping and monitoring of Wetlands (2015-2018)

TIGER NET

IWRM with Water Observation and Information System (2012-2015)

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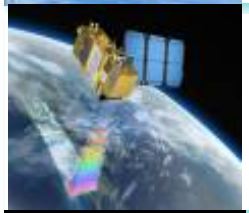
Sentinels – New Era of Observations

- Long-term Continuity & Access to Earth Observation data with increasing spatial and temporal resolution
  - Free and open data policy

Sentinel 1 – SAR imaging
All weather, day/night application e.g. **floods, water bodies, wetlands**

2014 & 2016



Sentinel 2 – Multi-spectral imaging
Land applications: urban, forest, **agriculture**
Continuity of Landsat, SPOT

2015 & 2017

Sentinel 3 – Ocean & global land monitoring
Wide-swath ocean color, **global vegetation**, land/sea surface temperature, **altimetry**, **lake water quality**

2016 & 2017


The Water Cycle
in the Sustainable Development Goals
6 CLEAN WATER AND SANITATION
6.5
Water resources management
6.4
Water use and scarcity
6.6
Ecosystems
11.5
Water-related disasters
6.a-6.b
Cooperation & participation
6.3
Water quality and wastewater
6.1
Drinking water
6.2
Sanitation and hygiene
UN WATER
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

6.3.2 Water quality

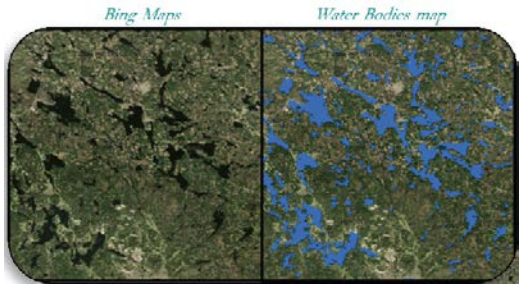
Previously restricted to coastal waters and large lakes but now feasible also for inland water bodies and river systems

Relevant parameters:

- Chlorophyll concentration
- Turbidity
- Secchi disc depth
- Water surface temperature

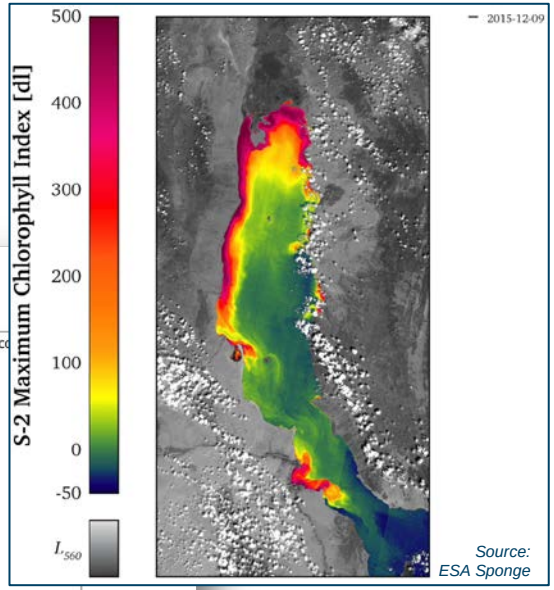
+ Water surface delineation

EO can also be used to monitor pollution sources and points of discharge into water bodies (cf. Target 6.3.1)



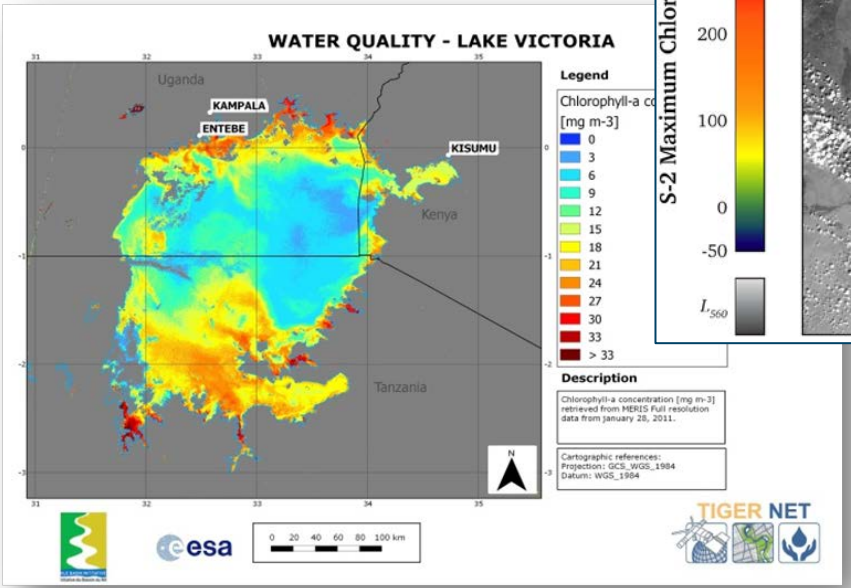
Source: ESA CCI

Sentinel-2: 10 m resolution



Source: ESA Sponge

MERIS: 300 m resolution



Source: DHI GRAS

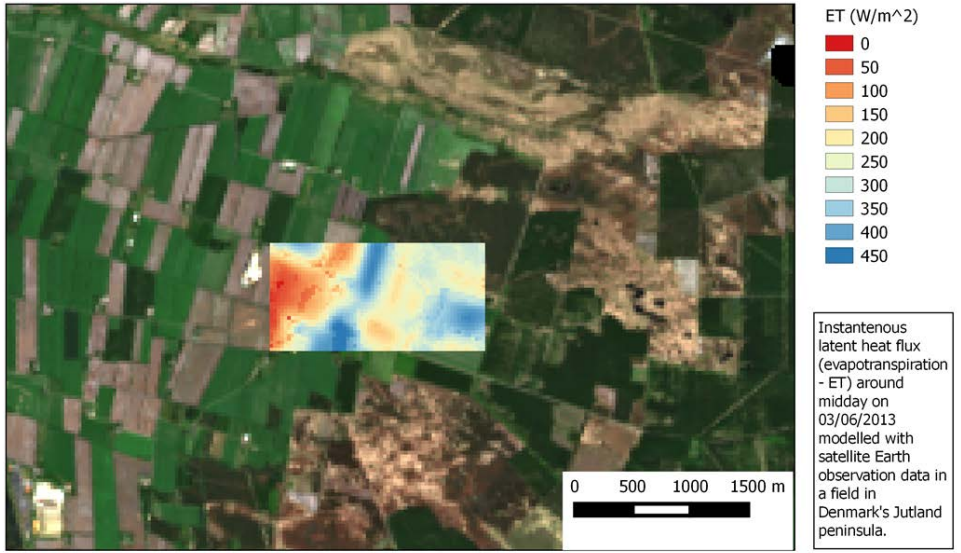
6.4.1 Water use efficiency (in irrigation)

- EO support mapping of:
  - Evapotranspiration
  - Irrigated crop area
  - Crop productivity

$$WE = A_{we} + I_{we} + S_{we}$$

Where

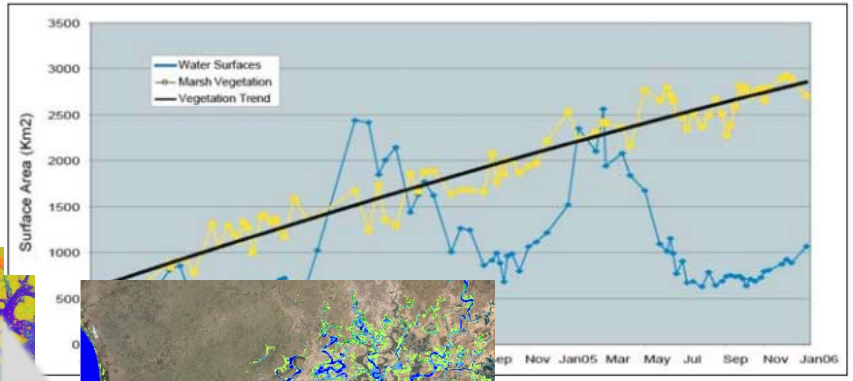
WE	=	*Water efficiency*
A_{we}	=	*Irrigated agriculture water efficiency [USD/m³]*
I_{we}	=	*Industrial water efficiency [USD/m³]*
S_{we}	=	*Services water efficiency [USD/m³]*



Source: DHI GRAS

6.6.1 Mapping wetland extent

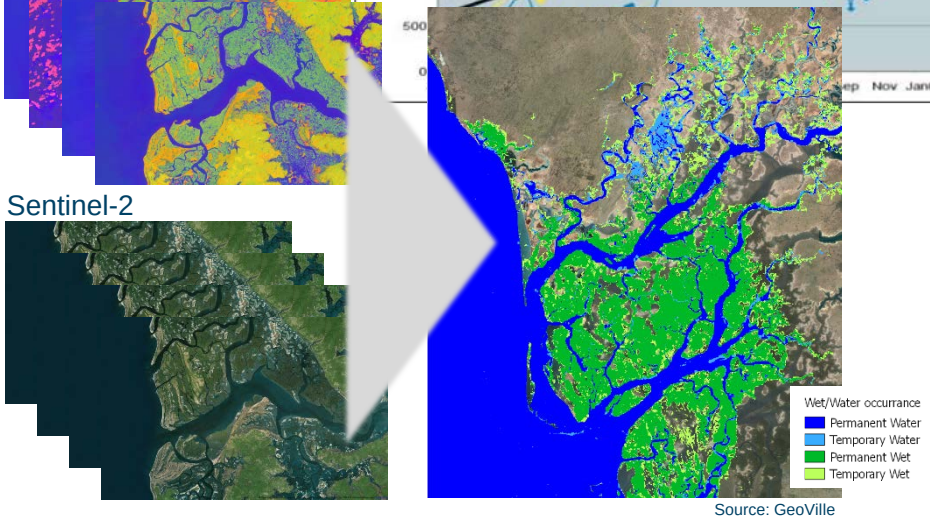
- % of change in the extent of wetlands over time can be measured globally by earth observation looking at vegetation cover, soil moisture and inundation frequency
- More robust inventories expected when using a combination of multi-temporal optical- and radar derived indicators
- In addition the higher frequency of observation will contribute to the monitoring of seasonal dynamics which will help to provide a more accurate delineation of wetland areas



Source: UNEP

Sentinel-1

Sentinel-2



Source: GeoVille

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Enabling EO based national monitoring

- Member States own SDG monitoring and reporting but lack of data, appropriate information and challenges in human and institutional capacity put a serious constraint on effective monitoring and tracking of progress for SDGs in many low- and lower-middle income countries
- There is a need to recognize the critical importance of supporting developing countries in strengthening the capacity of national statistical offices and data systems to ensure access to high quality, timely and reliable and data
- Flexible methodologies for Member States to enter monitoring in line with national capacity and resource availability i.e. start simple and advance progressively as capacity and resources increase (cf. progressive monitoring)

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Development of open source tools

- Enable African water authorities to improve IWRM by exploiting Earth Observation (EO) technology
  - Transboundary Observation Capacity
  - Transparent tool for Reporting & IWRM
  - Sustainability through Open Source & CB

- End-to-end image processing capabilities support of inventorying, mapping and monitoring of Wetlands
- Focus on capacity building to allow for a full transfer of the methods, tools and products

Conclusion and recommendations

- Earth observations can be used for cost-effective monitoring of many indicators needed to monitor the progress of targets under SDG 6 on Water and Sanitation
- Earth Observation is especially usefull in many developing countries where reliable water information is scarce
- To ensure the sustainability at the national level there is a need to develop and building capacity in using best practice methodologies and tools which can be operated and maintained within the institutional, technical and financial means of low-income countries