

The first 10 years of TIGER

Looking after Water in Africa

Benjamin Koetz

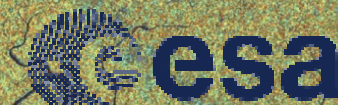
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**TIGER
AFRICA**



ESA is an intergovernmental organisation with 20 Member States

ESA purpose: *"...provide for and to promote, for exclusively peaceful purposes, cooperation among European States in **space research and technology and their space applications"***

Article II of the ESA convention

ESA achieves this through:

- Space activities and programmes
- Implementing a long term space policy
- A specific industrial policy
- Coordinating European with national space programmes
- Builder and operator of the GMES space segment





The TIGER Initiative: Origin & Objective

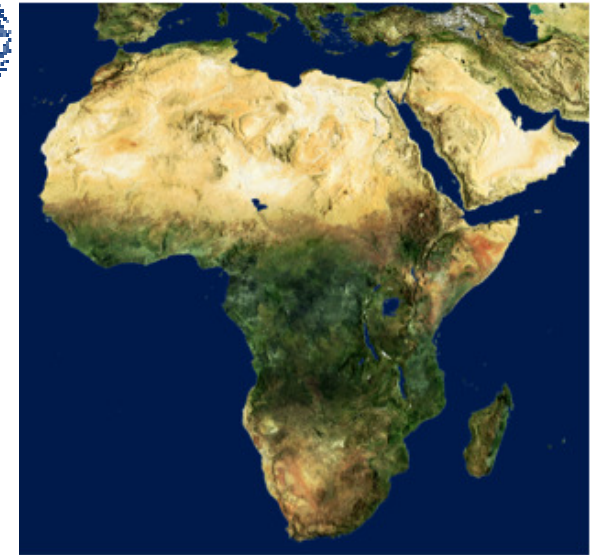


- **ESA launched TIGER in 2002** as a CEOS response to World Summit on Sustainable Development in Johannesburg.



- **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 **200 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, GEOSS.*





TIGER History: Johannesburg to RIO+20



Launch following the WSSD

Endorsement by AMCOW

Recommendation at 1st African Water Week

AARSE Resolution

Launch of TIGER-NET



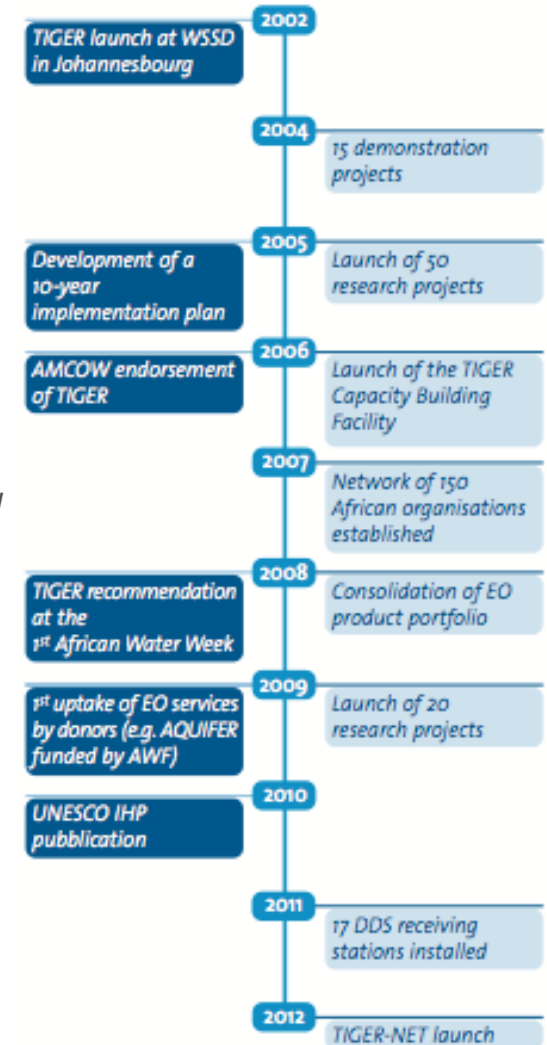
“Initiatives such as TIGER, which will deliver enhanced and timely information for water resource management, are therefore of critical importance to developing nations.”



“International initiatives like TIGER which provide useful tools to the countries to strengthen their capacities for ensuring water security should be encouraged and supported”



THE TIGER INITIATIVE MILESTONES AND ACHIEVEMENTS





TIGER Achievements in 10 years

Development Model & Action Lines



Improving Access to EO data

>10.000 satellite scenes delivered

Capacity Building & Training

200 Africans trained

Information and Knowledge Networking

Develop EO-based geo-Information Services for IWRM

Research
70 research projects

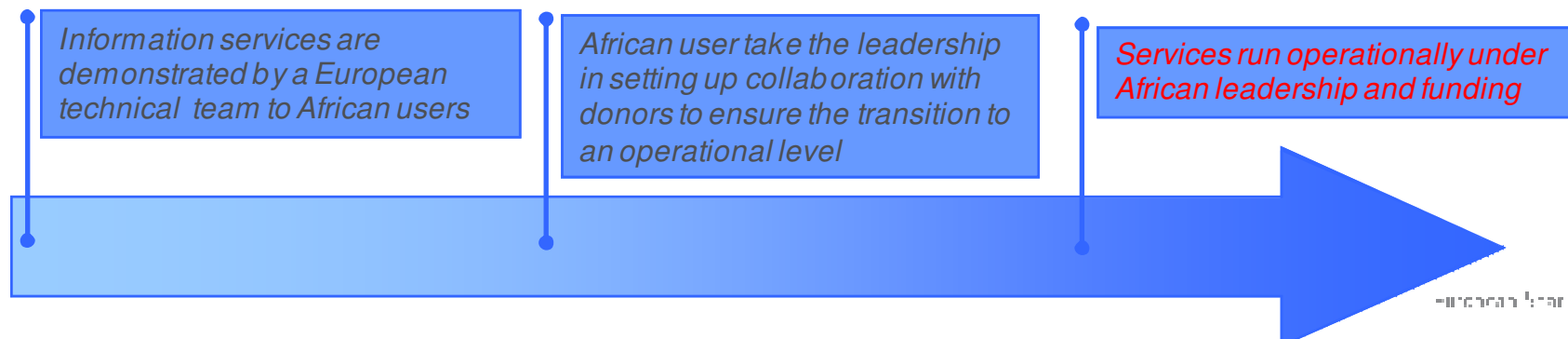
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Operational
Stage

- ❖ TIGER is based on a **user driven approach under African leadership**
 - ❖ The African Ministerial Council On Water (AMCOW) endorsed the initiative in 2006
- ❖ Assist African scientist, technical centres and water authorities to **develop the tools, the knowledge and the capacity** to exploit EO technology for the monitoring and management of water resources;
 - ❖ Enable African water authorities at national and trans-boundary basin scale to lead the transition from a demonstration stage **towards operational EO information services**;

Towards Operation under African Leadership





Transfer of EO services to local stakeholders

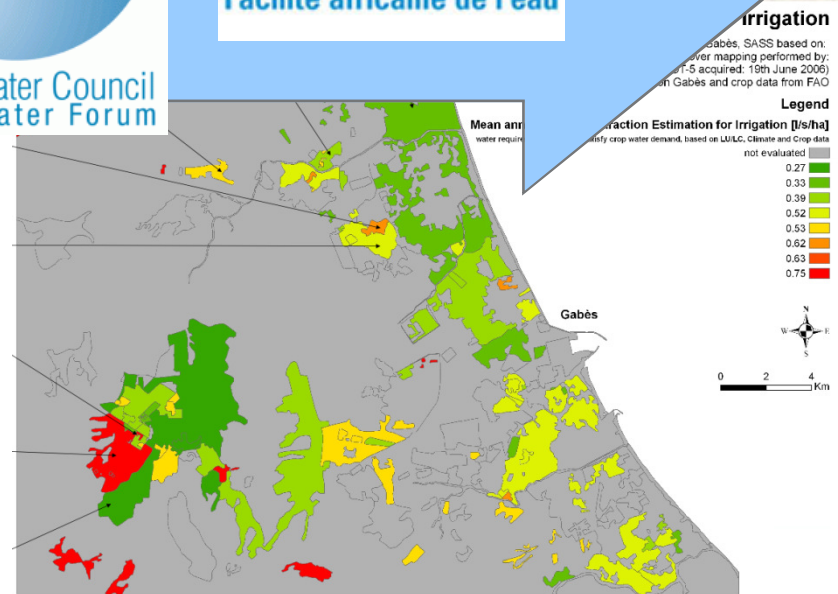


demonstration project within ESA's TIGER initiative

- Develop and demonstrate **EO products to support the management of trans-boundary aquifers in Africa** (SASS North-Western Sahara Aquifer System area);
- Users: Ministries in Algeria, Libya, Mali, Niger, Nigeria, Tunisia; OSS



- Co-funded by AWF (African Water Facility) & executed by OSS (Sahara and Sahel Observatory)
- Transfer the EO based decision making system to local service providers and promote local operations;
- Follow-on grant of 487.800 € by the AWF

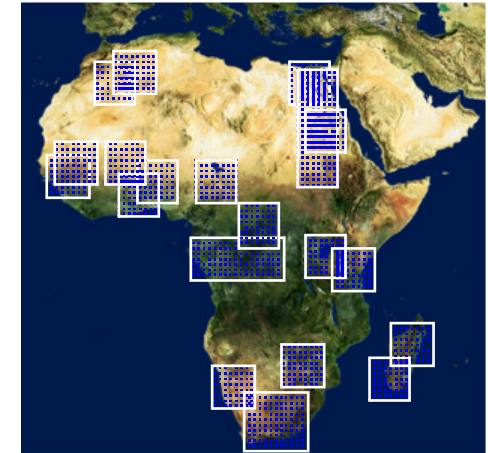




TIGER Capacity Building Facility (TCBF): Developing Knowledge and Scientific Capacity



- TCBF (lead by ITC) created in 2006 offering:
 - Dedicated courses (at ITC and in Africa) & E-learning;
 - Tailored technical support and research stages;
- Water Research Component
 - Support to 50 & 20 selected research projects in Africa
 - Regional Centres: AGHRYMET (Niger), RCMRD (Kenya), WRC (SA), OSS (TU);
 - Free EO data



6th World Water Forum, 2012 - France



TIGER workshop 2011, South Africa



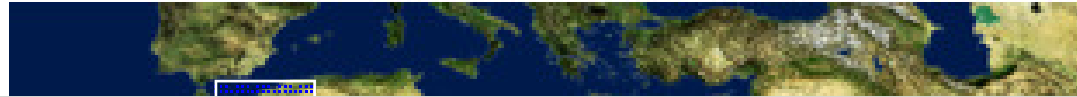


TCBF - Capacity Building of People





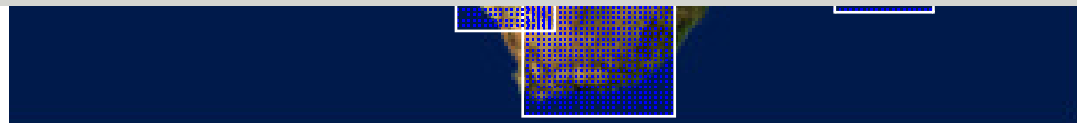
TIGER Phase - Research Component: 20 Research Projects



The El Jadida Declaration – outcome of the AARSE2012 conference (2nd November 2012)

Recognising the importance and success of continued long term **collaboration between European Space Agency and African scientists** within the TIGER initiative on Earth Observation techniques related to water resources management;

To support the dedicated activities in the TIGER Capacity Building Facility and within the new TIGER-NET project as essential component to **prepare the African water resources expert for the exploitation of African National satellites and the upcoming SENTINEL satellite fleet** of the European Space Agency





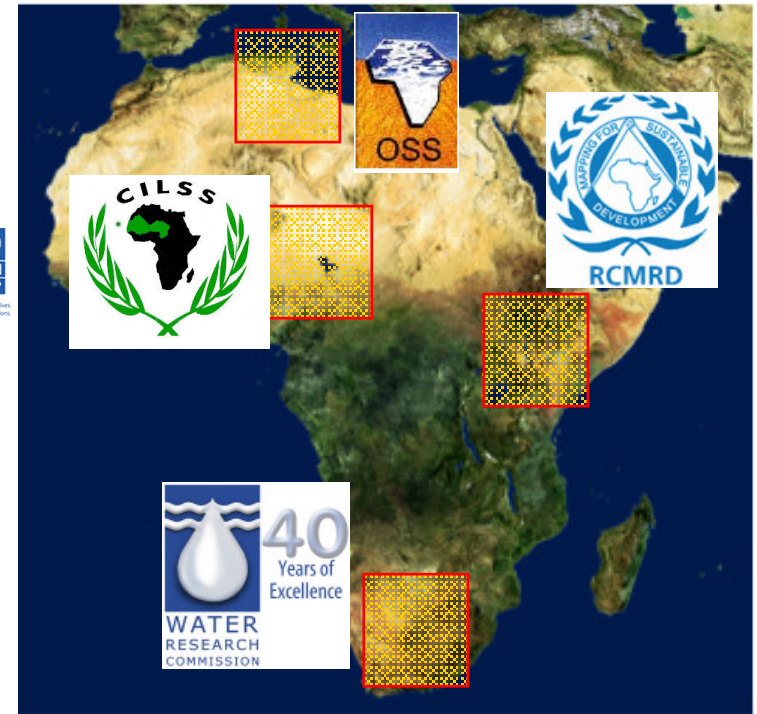
TIGER Capacity Building Facility:

TCBF activities for 2012-13



Empowerment of Regional Centers:

- Focus on the TCBF Regional Centers: AGHYMET (Niger), RCMRD (Kenya), WRC (South Africa), OSS (Tunisia)
- Partnership with Cap-Net/UNDP for Training of the Trainers
- Preparation for an African Capacity Building programme for EO in collaboration with the African Water Facility



Zambia Training

EMWIS workshop



Training Kit



- Project Extension:
- 350 k€ budget
 - KO July 2012



TIGER Fellowships

African – European research collaboration



International Research Studies

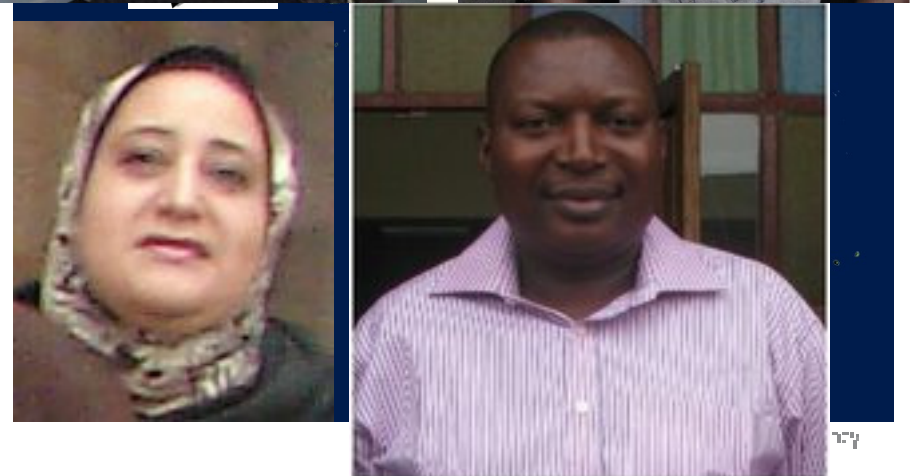
- Collaboration between African scientists and European research institutes
- 1 year scientific visits

Water Management Focus:

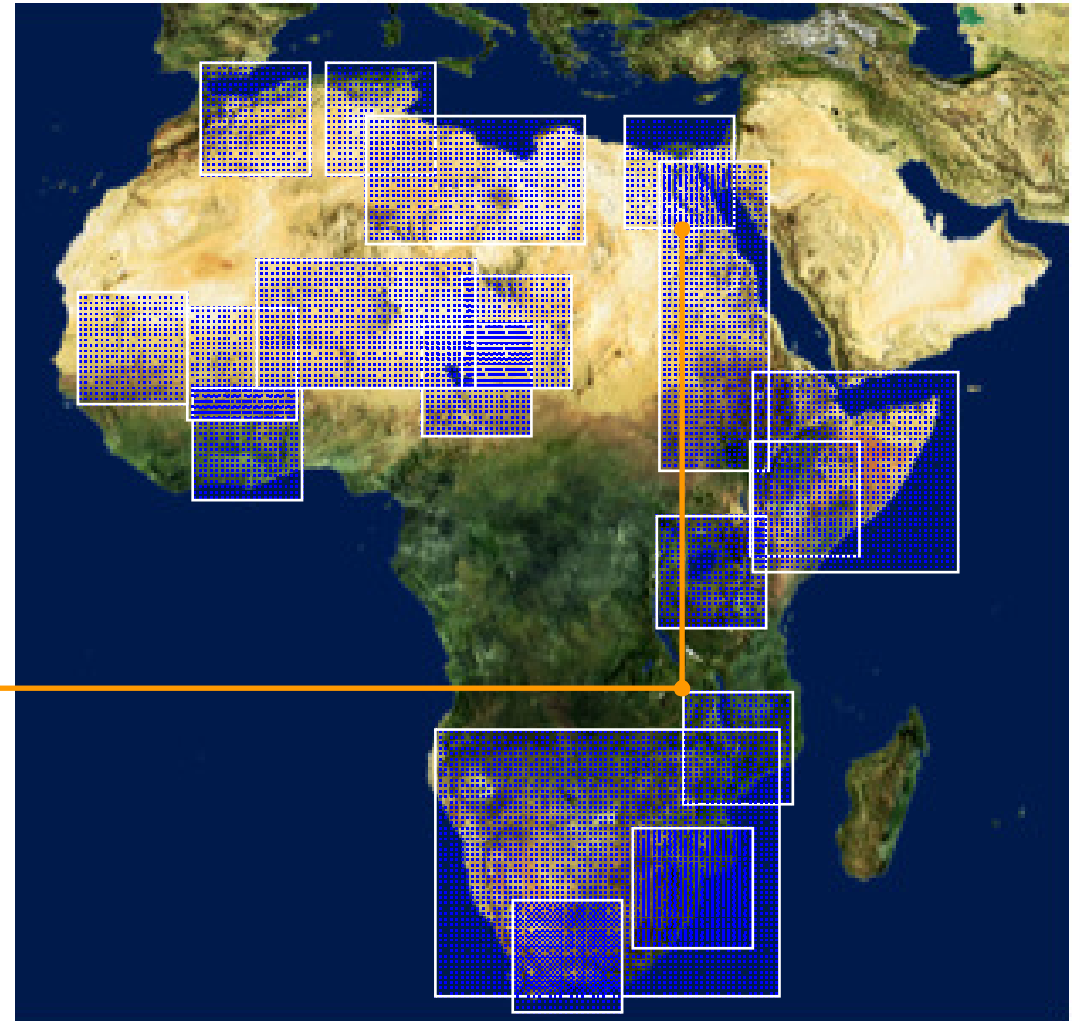
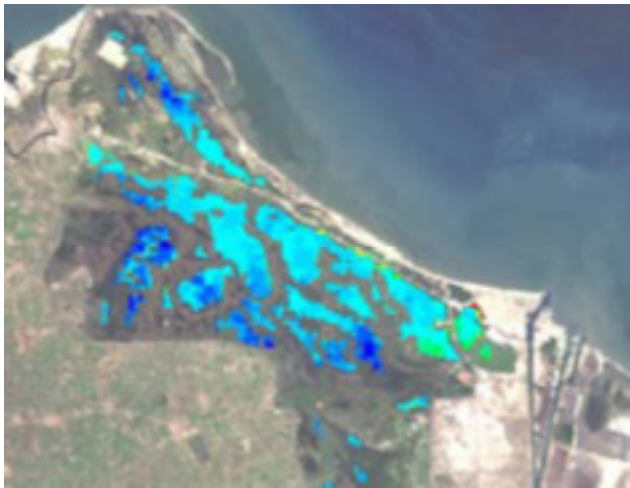
- Water quality & reservoir monitoring
- Irrigation monitoring
- Ecological & hydrological modeling
- Integrated Water Resource Management

Implementation:

- Funded by the ESA Alcantara studies
- In 2012 6 studies funded each 100k€



- Base mapping: e.g., surface waters;
- Water quality;
- Soil moisture information service
- Water levels information service;
- Catchments characterisation;
- Ground water exploration;
- Water consumption: e.g., irrigation;





EO for Integrated Water Resource Management in Africa



Objective:

- **Enable African institutions to improve Integrated Water Resource Management (IWRM) by exploiting the advantages of Earth Observation (EO) technology**

Main Activities:

- Develop and complement **Water Observation and Information Systems** for monitoring water resources with EO
- **Capacity building and training of African water authorities** and technical centres

Steering Group:



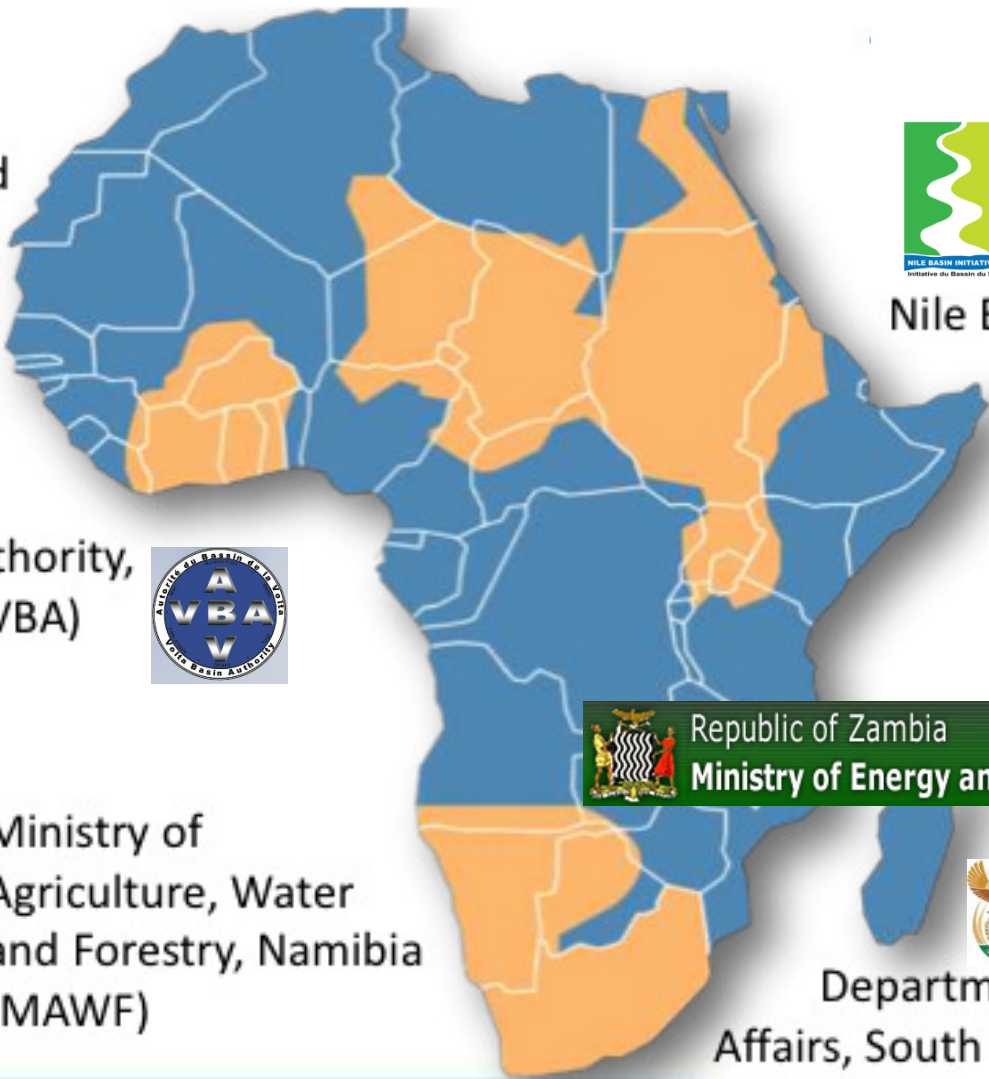
Project:

- 36 months, 2 project cycles
- 1.5 M € total budget
- Started in 2012
- Technical Team:





TIGER-NET Users: African Water Authorities



Lake Chad Basin
Commission, Chad
(LCBC)



Nile Basin Initiative,
Uganda (NBI)



Volta Basin Authority,
Burkina Faso (VBA)



Republic of Zambia
Ministry of Energy and Water Development



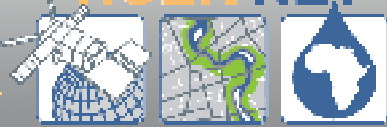
Ministry of
Agriculture, Water
and Forestry, Namibia
(MAWF)



Department of Water
Affairs, South Africa (DWA)



TIGER NET



User Requirements Consultation



Collection of user requirements:

- Dedicated visits and workshops at each user premises:
 - Understanding current practices, information needs, decision process
- Intensive common workshop for consolidation (hosted by SANSA)
 - Defining EO products, WOIS functionalities
- Development of **demonstration cases** for each user



LCBC



MAWF



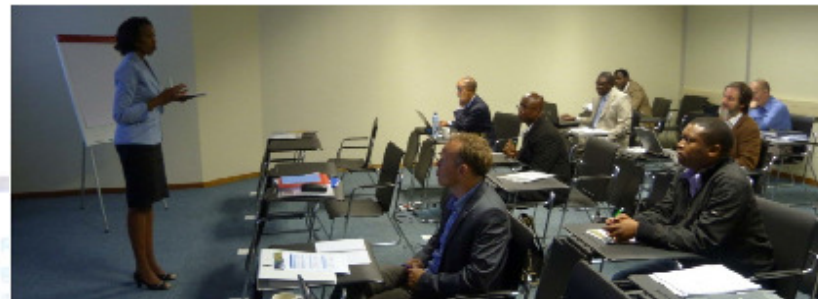
DWA



NE



VBA

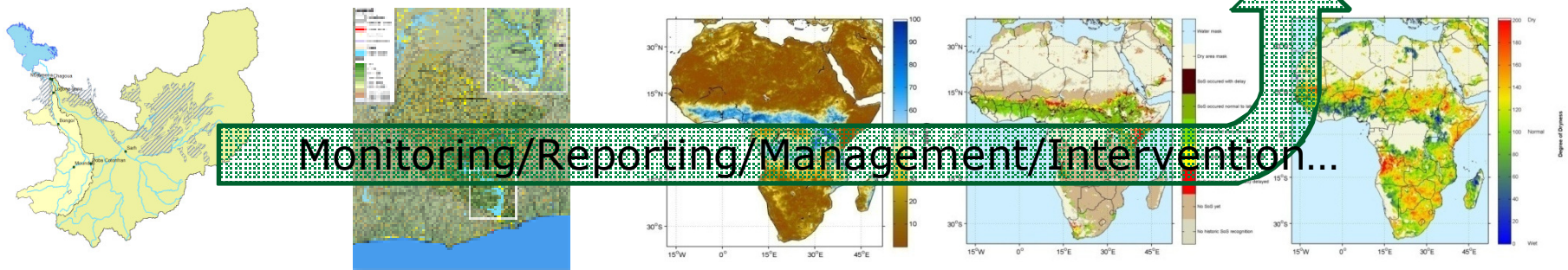


LAKE CHAD BASIN CHARACTERIZATION

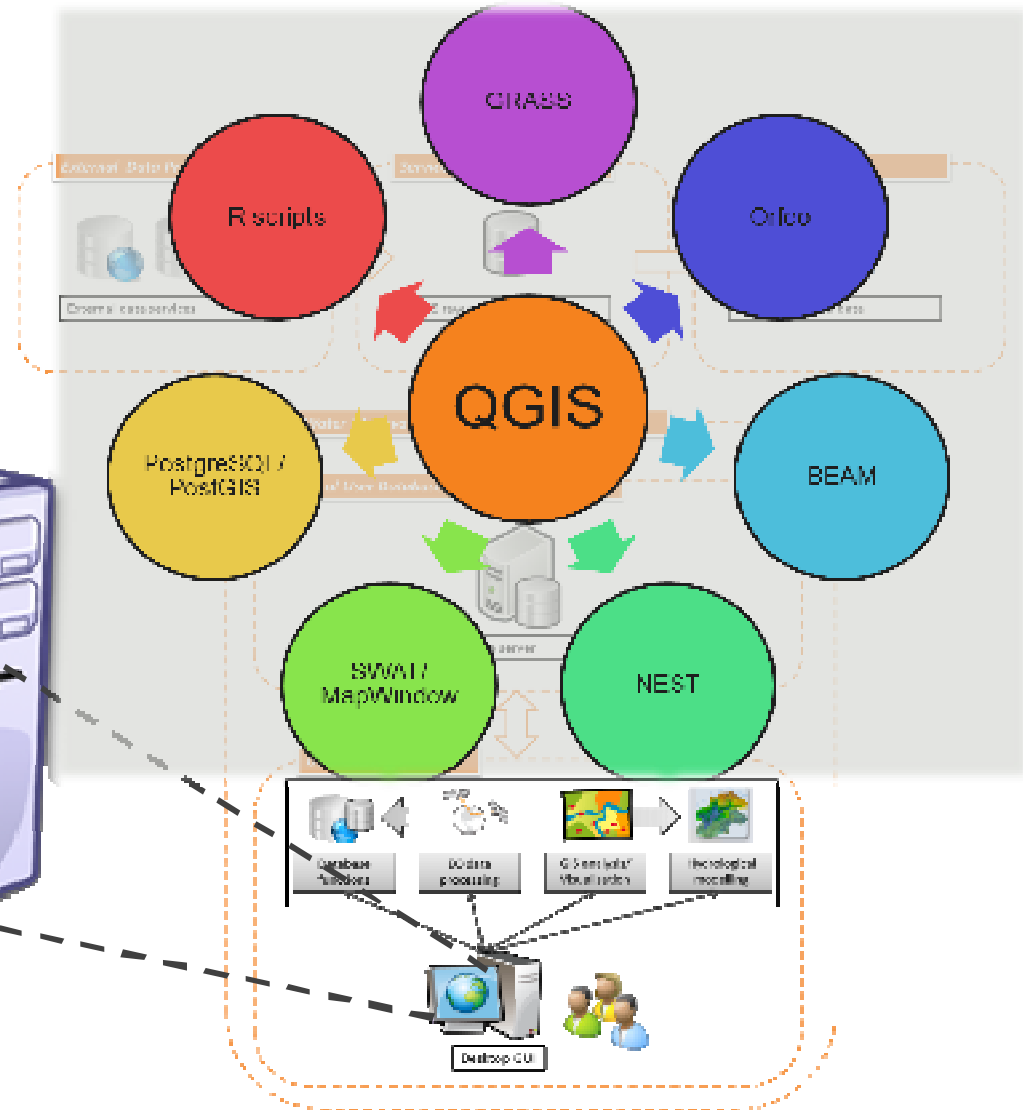
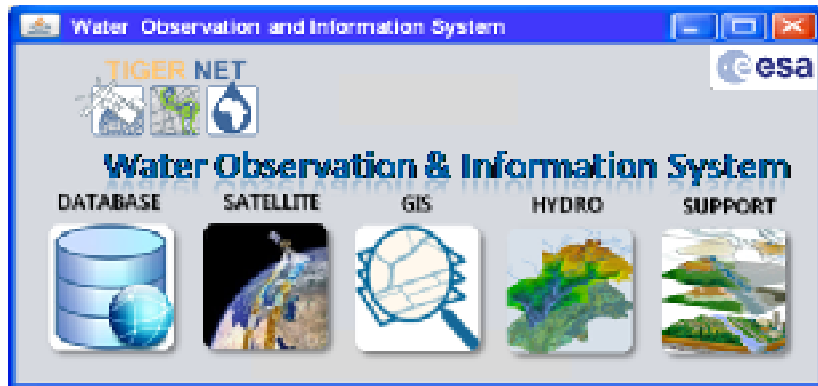
Provide operational capacity to establish water related information / summary reports (Map and Tabular) per sub-watershed for IWRM:

- hydrological network
- Land cover, seasonal and long-term map of changes
- Drought condition and water stress anomaly
- other operational EO products (precipitation, etc.)

	Lake Chad Basin	Lake Chad Monitoring	River Chari Sub-basin	River Logone Sub-Basin	Ndjamena City	Kano City	Total	ESA contracted for all	Discrepancy
Land degradation and desertification	1,293,589						1,293,589	1,200,000	-1,053,505
Medium resolution land cover and land use	1,293,589	22,965	516,157	89,680			1,922,391	1,200,000	-1,750,962
Seasonal land cover changes and landscape dynamics	1,293,589	22,965	516,157	89,680			1,922,391	6,000,000	-1,065,248
Long-term full basin change analysis	1,293,589	22,965	516,157	89,680			1,922,391	6,000,000	-1,065,248
Drought condition	1,293,589						1,293,589	6,000,000	-426,446
Water quality		22,965					22,965	1,200,000	ok
Lake water level		22,965					22,965	1,200,000	ok
Water Balance Model		22,965					22,965	na ?	
Hydrological model			516,157	89,680			605,837	1 x Basin per user	ok
Dynamic flood mapping			516,157	89,680			605,837	5,000,000	NAM
Mapping of flood affected areas			516,157	89,680			605,837	1,500,000	-391,551
Open Water bodies and seasonal changes			516,157	89,680			605,837	25,000	-602,266
Sanitation planning map					110		110	600	ok
Water supply planning map						110	110	na ?	



Monitoring/Reporting/Management/Intervention...

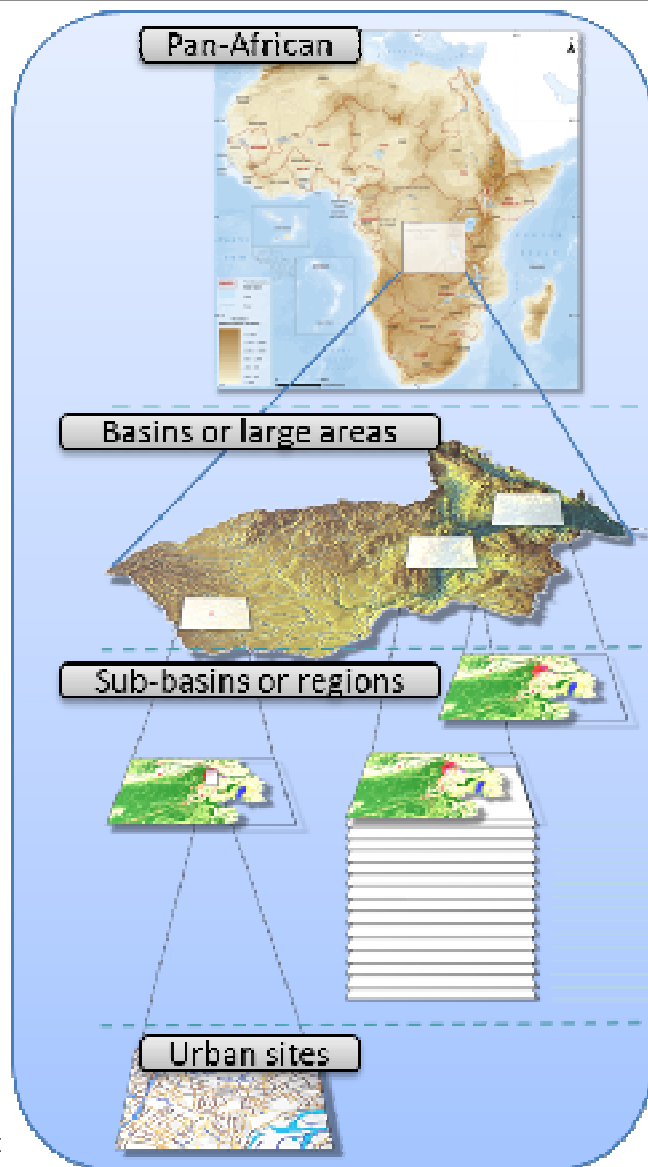




TIGER NET



TIGER-NET: Earth Observation Products



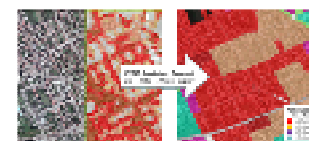
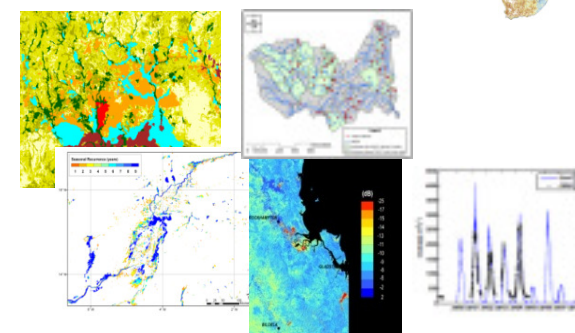
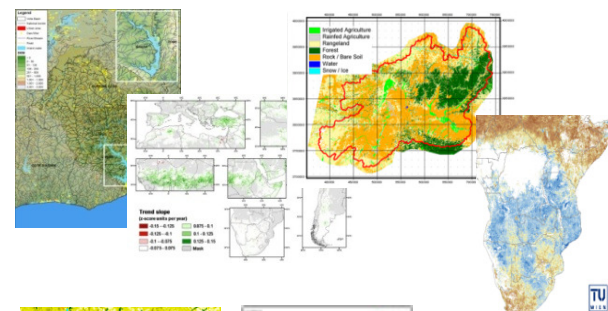
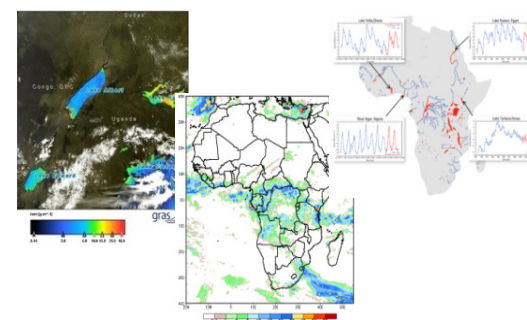
EO products

- Large lakes water quality and water levels
- Evapotranspiration
- Precipitation
- Soil moisture

- Medium resolution land degradation index
- Medium resolution land cover characterization

- High resolution land cover characterization
- Small water bodies
- Flood mapping system
- Hydrological modeling

- Water supply and sanitation planning support





Conclusions: after 10 years of TIGER



- ❖ Capacity building of EO know-how within an African wide network of water authorities, universities & technical centres
- ❖ Development & Demonstration of EO products & applications for water resource management
- ❖ Facilitation of EO data access (bottleneck) & processing
- ❖ **Good Basis for the development of EO applications under African Leadership**
Specifically with operational & free observations coming from the Sentinels...

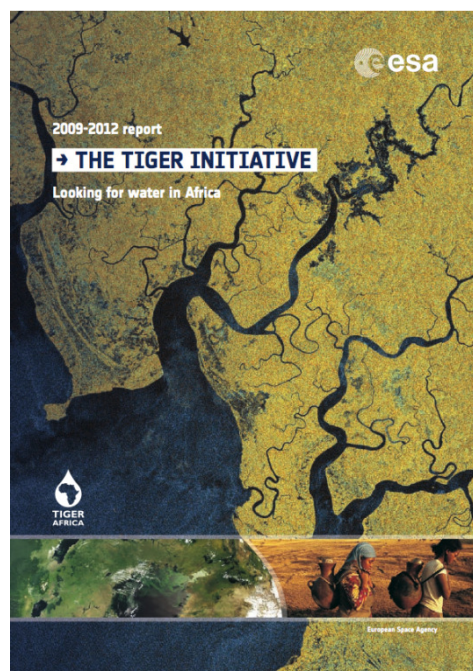


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Website:

<http://www.tiger.esa.int>



**Latest Publication:
TIGER report 2012**

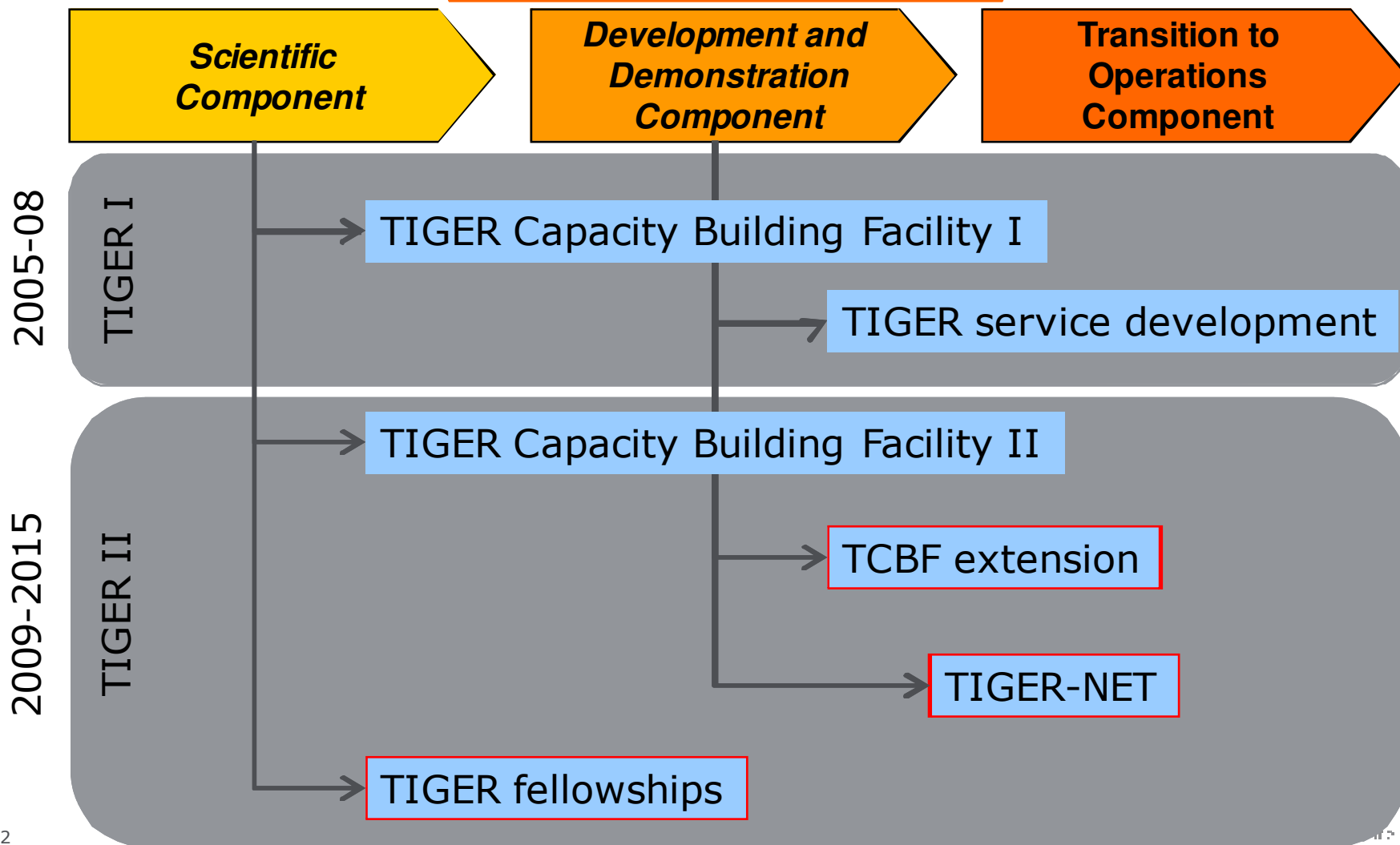


TIGER – Current & Planned Activities

Development of African capacity in Water Management



Development Line of TIGER



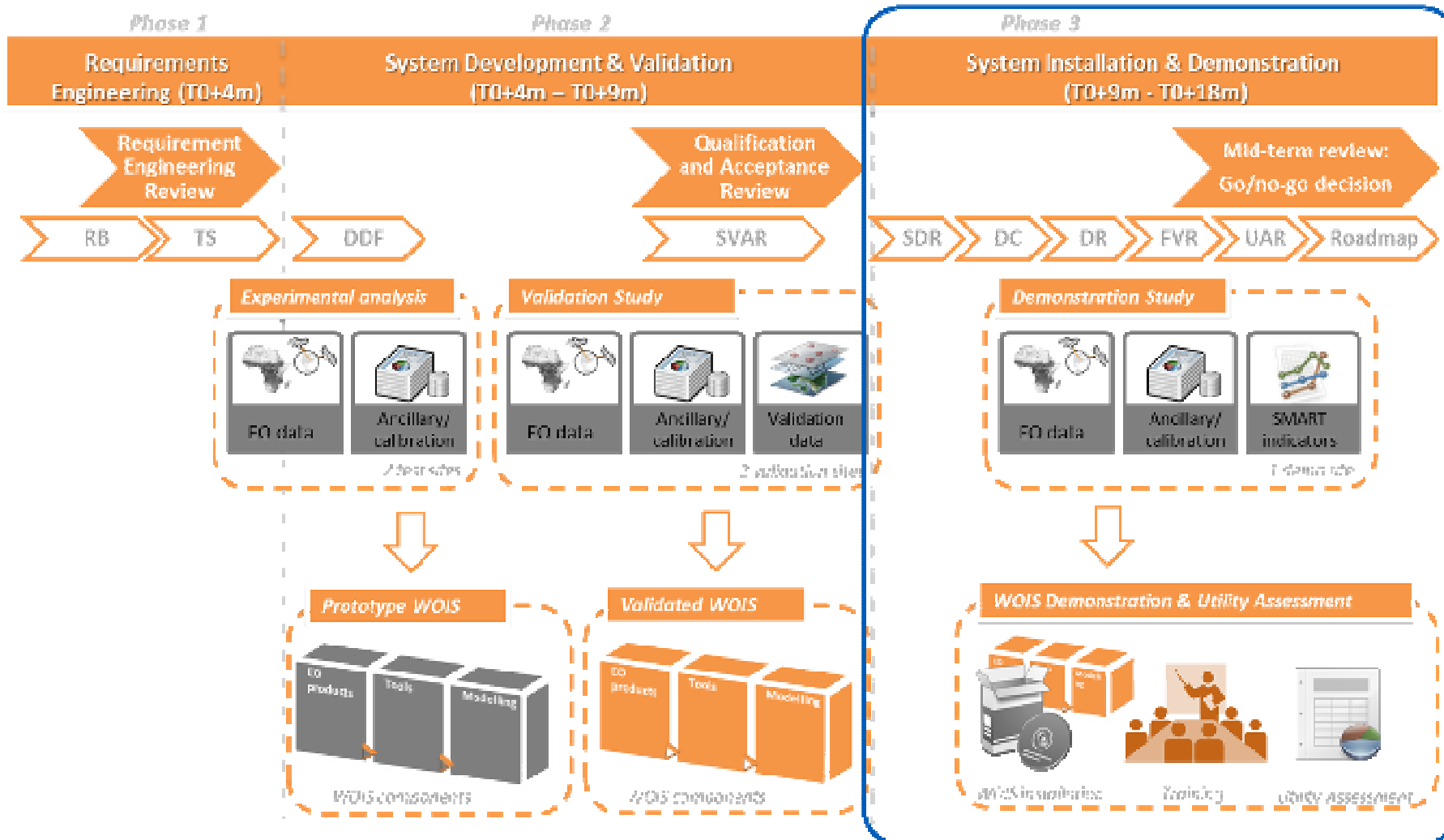
System Installation and Demonstration

- Start: March 2013 – ongoing

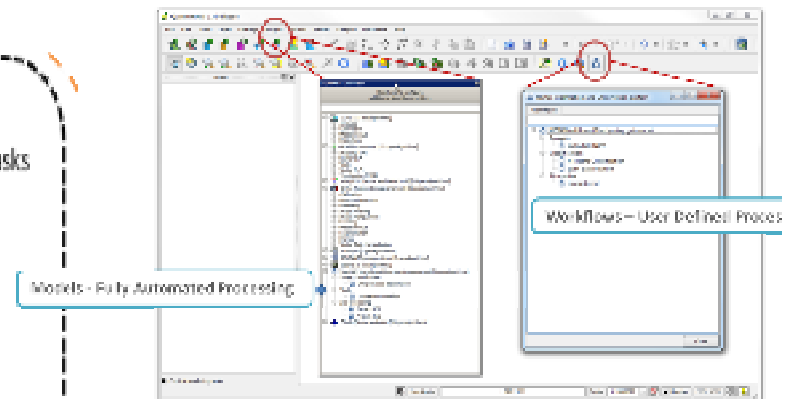
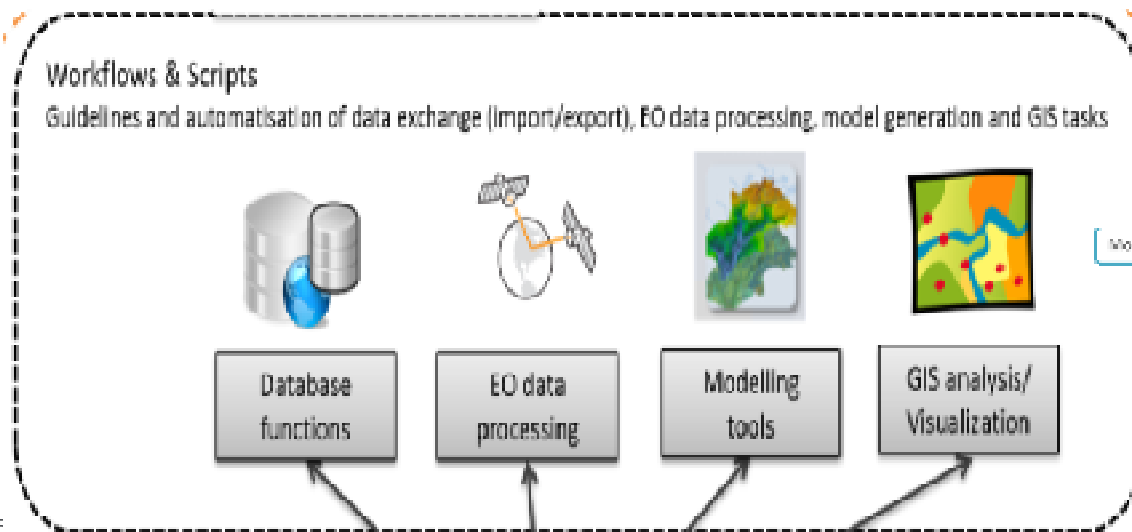
Tasks

- System Installation and training;
- Demonstration Cases Execution, Validation, Training
- Utility Assessment & Training;

Year																												
Month	April				May				June				July				August				September							
Week#	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
VBA		Installation											Demonstration												Utility assessment			
LCBC			Installation											Demonstration											Utility assessment			
NBI				Installation												Demonstration										Utility assessment		
DWA							Installation													Demonstration							Utility assessment	
MAWF								Installation												Demonstration							Utility assessment	



- Provide step-by-step guidance for the processing of the TigerNet EO product portfolio
- One stop resource for integrated EO processing and GIS analysis
- Works seamlessly with various algorithm providers



QGIS Interface



TIGER NET



Developed Demonstration Cases



FRESH WATER SUPPLY

HYDROLOGIC ANALYSIS

FLOOD MONITORING

DROUGHT MONITORING

INFRASTRUCTURE PLANNING

Legend

- DC01: Zambezi Flood plains (Caprivi)

Legend

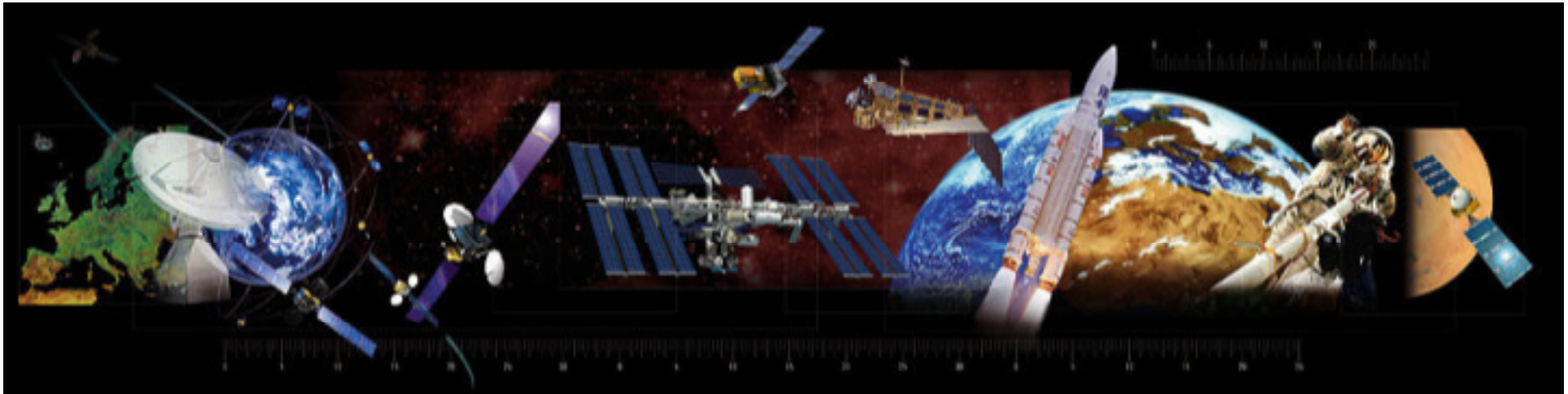
- DC07: Lake Chad basin
- DC08, DC11 & DC12: Lake Chad

Legend

- DC20: Lake Victoria
- DC21: NEL region
- DC21: Eastern Nile flood prone areas
- DC21: Eastern Nile Basin
- DC22: Sudd subarea (test & validation)
- DC22: Sudd, Baro-Akobo-Sobat & Kagera wetlands
- DC23: Test & Validation
- DC23: Demonstration

40+ years experience
5 centres in Europe
2200 staff members

4 billion Euro per year
70+ satellites developed
20+ satellites in operation



- Space science
- Human spaceflight
- Exploration
- Launchers
- Earth observation

- Navigation
- Telecommunications
- Technology
- Operations



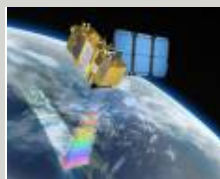
GMES dedicated missions: Sentinels ESA/EC co-funded programme



Sentinel-1 (A/B) – SAR imaging

All weather, day/night applications, interferometry

2013/2015



Sentinel-2 (A/B) – Multi-spectral imaging

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

2014/2016



Sentinel-3 (A/B) – Ocean and global land monitoring

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

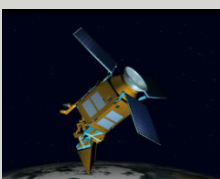
2014/2017



Sentinel-4 (A/B) – Geostationary atmospheric

Atmospheric composition monitoring, trans-
boundary pollution

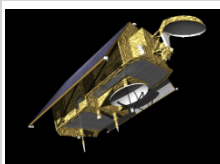
2019/2027



Sentinel-5 precursor/ Sentinel-5 (A/B) – Low-orbit atmospheric

Atmospheric composition monitoring

2015/2020/2027



Jason-CS (A/B) – Low inclination Altimetry

Sea-level, wave height and marine wind speed

2018/2023

