



Indian EO data for Europe and International Technical Assistance

An EO Consulting Industry Perspective

ISPRS TC V, IPAC-2 Session: International Cooperation

Dehradun, November 20th, 2018

Antje Küpper



Overview

- GAF – a longstanding Antrix/ISRO partner
- Indian EO Data in EU Programmes and Technical Assistance
- International cooperation: current needs and future directions

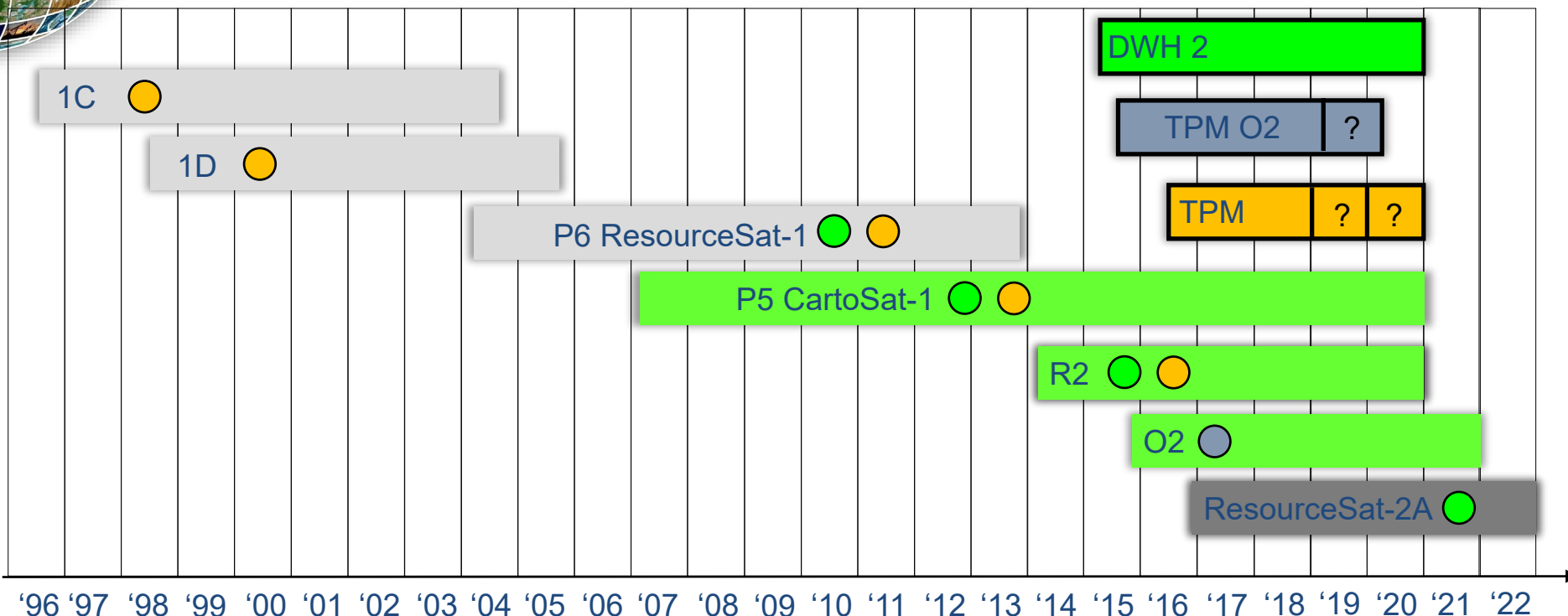


- Active in the sector since 1986, based in Munich and Neustrelitz (North of Berlin)
- Belonging to a group of European lead players – Telespazio/Space Alliance (Leonardo/Thales)
- Revenues € 30 million, EBIT >10%, 230 staff, growth 10% over last 10 years
- Main customers in Germany, EU, International
- Strongest markets served: Defence, Agriculture, Forest, Mining ...
- 90% revenues with public institutions, 10% with commercial clients
- Key industrial player in the European Copernicus programme
- Key player in the International Development Consulting Arena
- Working successfully with Antrix since >20 years, directly and through former Euromap
- Working with all major and medium-sized EO data suppliers (Airbus, DG, Planet...)

www.gaf.de



IRS Downlinks through GAF & Contracts



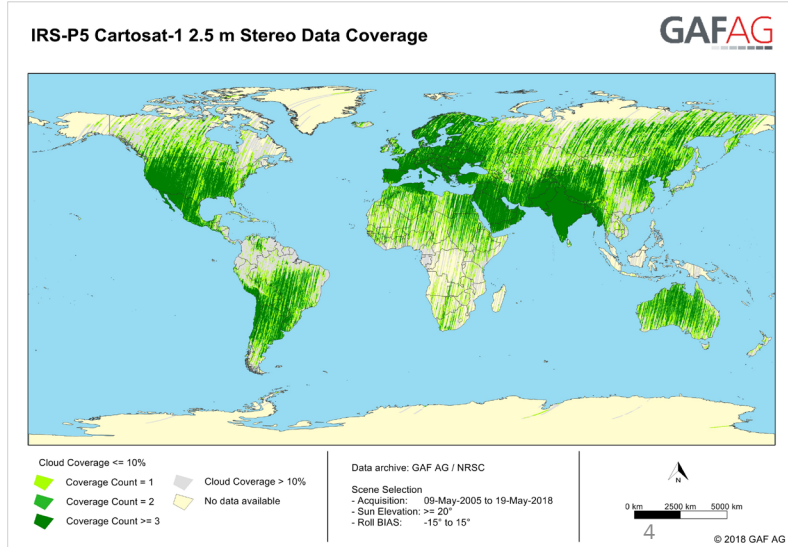
Earlier downlinks

Current downlink contract

Potential mission

ESA contract

○ Reference to ESA contract





Upcoming Indian missions are of great interest!

For example:

Cartosat-3

- Unique selling points for clients and applications in as well as outside Europe: hyperspectral, resolution, improving availability of VHR data
- paramount: quick & easy access to archive, fast and virtual tasking, quick delivery,

Resourcesat-3S

- Great advantages for DEM generation for larger surfaces: swath, 3D capacity, multi-spectral based 3d visualisation, GSD for multi-stereo DEMs

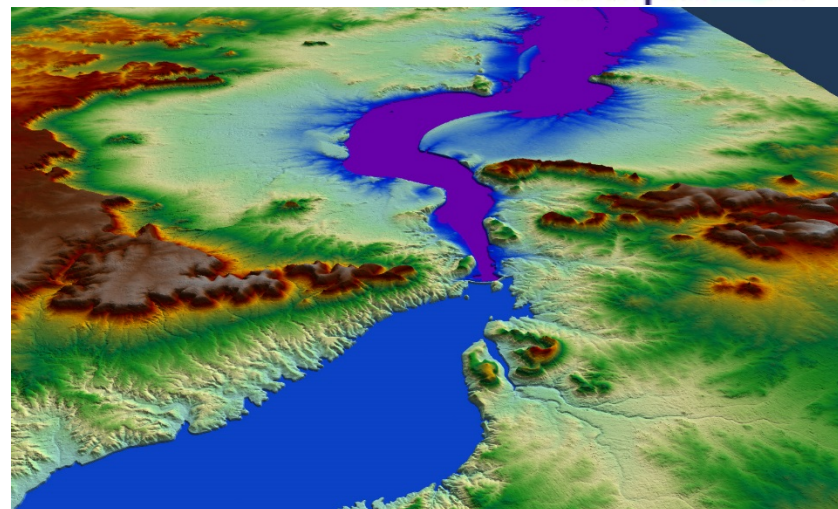
...and more

A Trans-National High-Resolution Digital Surface Model

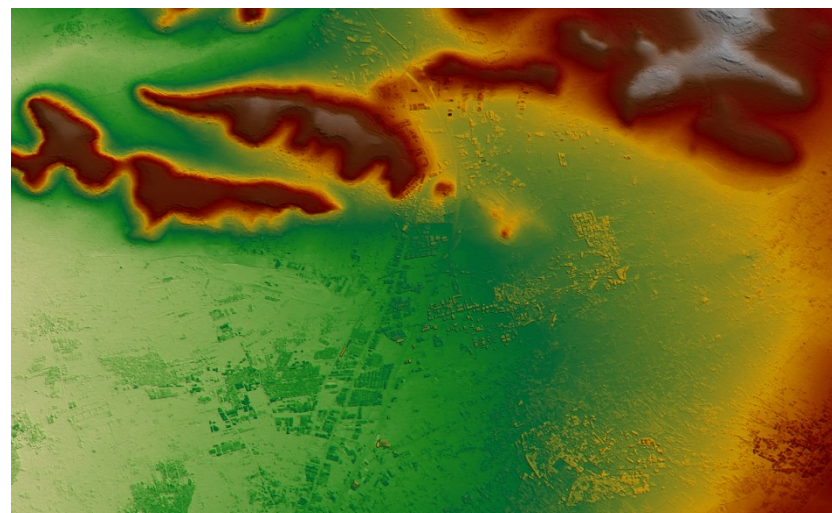
Post spacing	5 m
Spatial reference system	DD or UTM / WGS84
Height reference system	EGM96
Absolute vertical accuracy	LE90 5-10 m
Absolute horizontal accuracy	CE90 5-10 m
Relative vertical accuracy	LE90 <2.5 m
Base data	IRS-P5
Ortho layer pixel size	2.5 m

Digital Surface Model (incl. ortho image layer, quality and traceability layers)	Price per sqkm
Product < 50,000sqkm	€ 7.50
Product > 50,000sqkm	€ 4.50

- **Reliable through usage of multiple optical stereo pairs**
- **Homogeneous through a standardized and automated workflow**
- **Transparent through several quality- and traceability layers**
- **Detailed representation of surface by using a sophisticated and tailored algorithm based on Semi-Global-Matching**



River Euphrat, Syria © 2014, GAF AG, includes Antrix material



Damascus, Syria © 2014, GAF AG, includes Antrix material



Multi-Stereo VHR DSMs in the GAF Elevation Suite

Horizontal Resolution	0.3 m
Absolute horizontal accuracy	CE90 < 2.5 m (no GCI)
Absolute vertical accuracy	LE90 < 3.5 m (no GCI)
Minimum Order Size (data)	100 sq.km (new acquisition) 25 sq.km (archive)
Base data	Worldview--3/-4



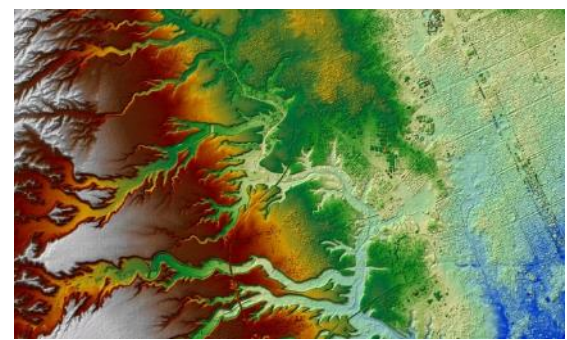
Tri-Stereo DSM Muscat, Oman © 2016, GAF AG, includes DigitalGlobe material

Horizontal Resolution	0.5 m
Absolute horizontal accuracy	CE90 < 2.5 m (no GCI)
Absolute vertical accuracy	LE90 < 3.5 m (no GCI)
Minimum Order Size (data)	100 km ² (new acquisition) 25 km ² (archive)
Base data	Pleiades, Worldview-1/-2/-3/-4; GeoEye-1



Tri-Stereo DSM Cape Town, South Africa © 2015, GAF AG, includes Airbus material

Horizontal Resolution	2 m
Absolute horizontal accuracy	CE90 < 5 m (no GCI)
Absolute vertical accuracy	LE90 < 5 m (no GCI)
Minimum Order Size (data)	500 km ² (new acquisition) 100 km ² (archive)
Base data	SPOT-6/-7



Tri-Stereo 2.0 DSM Riyadh, Saudi Arabia © 2015, GAF AG, includes Airbus material

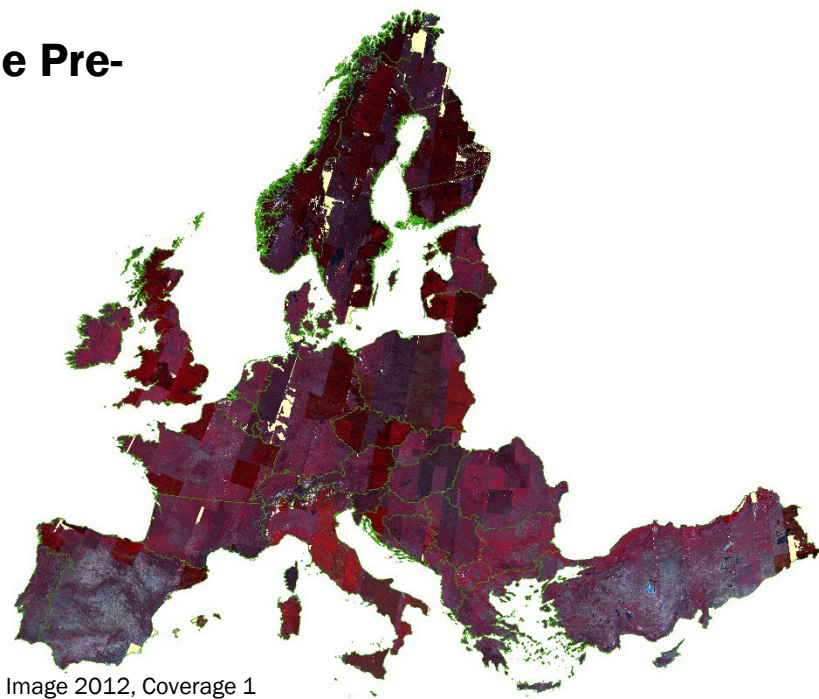


(Indian) EO Data in EU Programmes and Technical Assistance



ESA IRS Coverages for Data Warehouse in the Pre-Sentinel Era of Copernicus Services

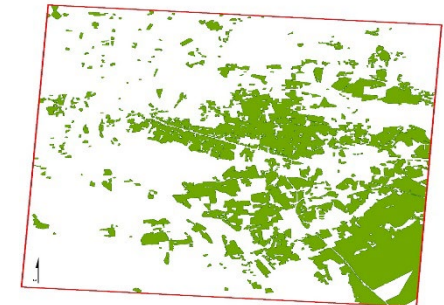
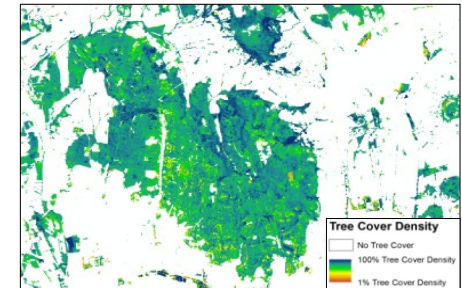
- Provision of several pan-European orthorectified HR coverages towards Copernicus
- Development of interfaces
- Close cooperation with German Aerospace Center (DLR) Neustrelitz
- Applications (in combination with other data sources):
 - Corine Land Cover (CLC) (44 classes, 25 ha MMU), regular updates since 1990
 - Thematic High Resolution Layers (HRL): Forest, Imperviousness, Grassland, Water & Wetness



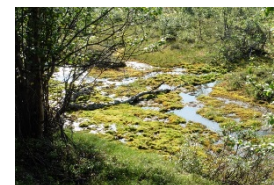
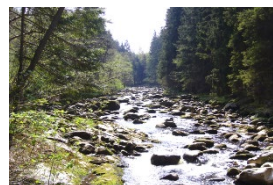
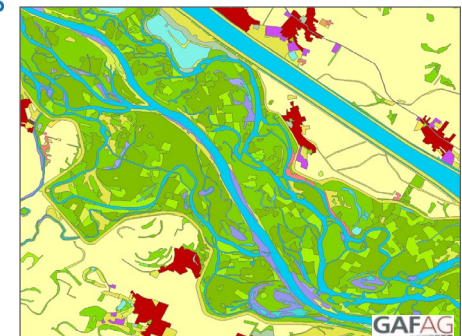
ESA Dataset description	GAF Publication / GAF Press Note	Access		Application	Comment
		ESA	Copernicus		
IMAGE 2006	2010/06 , Sect. 4.1 2010/10 , Sect. 3.1	How to Access Data	view	CLC, HRL	via a sub-contract with Spot Image
DAP_MG2-3_01 (Image 2009)	2010/06 , Sect. 4.2 2010/10 , Sect. 3.1		view		as the main provider
DWH_MG2_CORE_01 (Image 2012)	2013 , Sect. 4.1 11/2011		view		GAF provided first coverage
HR_IMAGE_2015 (Image 2015)	2016 , Sect. 4.1 05/2015		view		GAF provided majority data for both coverages

- Provision of operational HR/VHR land cover/use mapping/characterisation products since 2011
- Industrial consortia of operational service providers
- Continental LMCS Component:
 - **HR Layers 2012:** Forest & Imperviousness, 2 Lots
 - **HR Layers 2015:** Forest & Grassland (Lead); Imperviousness & Water/Wetness & Small Woody Features (Contrib.)
- Local LMCS Component:
 - **Riparian Zones (2012 + Extension + Update 2018):** VHR LC/LU along major and medium EU rivers. > 80 classes +attributes (e.g. tree cover density)
 - **Natura 2000 (2006-12 + Extension):** VHR LC/LU changes and related pressures/threats in selected Natura2000 areas

European Environment Agency

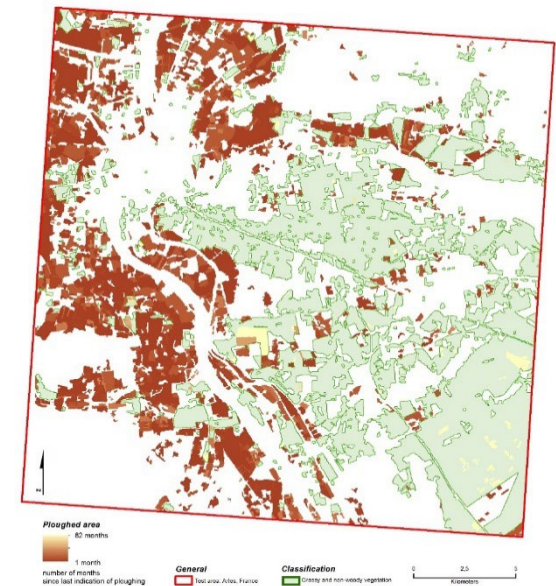


Riparian Zones

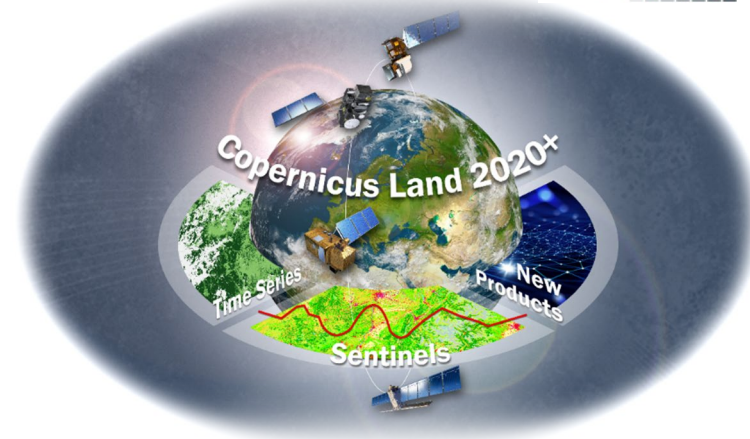


- Exploiting full potential of time series analysis: Sentinel-1/-2, Landsat, CCMs
- Combined optical/SAR solutions
- Allowing to retrieve:
 - new types of products, e.g. HRL Grassy & non-woody vegetation, HRL Water/Wetness
 - Improved product quality & time consistency

- **Horizon2020 R&D** project **ECoLaSS**
(Evolution of Copernicus Land Services based on Sentinel data); Start: 01.01.2017
 - Next generation of continental/global LMCS services from 2020+
 - Higher automation levels & precision
 - Improved change detection & incremental updates



HRL GRA - Ploughing Indicator





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Copernicus is a European system for monitoring the Earth. Data is collected by different sources, including Earth observation satellites and in-situ sensors. The data is processed and provides reliable and up-to-date information in six thematic areas: land, marine, atmosphere, climate change, emergency management and security. The land theme is divided into four main components:



Global

provides a series of bio-geophysical products on the status and evolution of the land surface at global scale at mid and low spatial resolution



Pan-European

provides information about the land cover and land use (LC/LU), land cover and land use changes and land cover characteristics



Local

focuses on different hotspots, i.e. areas that are prone to specific environmental challenges and problems



Imagery and reference data

satellite imagery forms the input for the creation of Copernicus land products. In order to ensure an efficient and effective use of satellite data the Copernicus land monitoring service needs access to in-situ data

Latest news

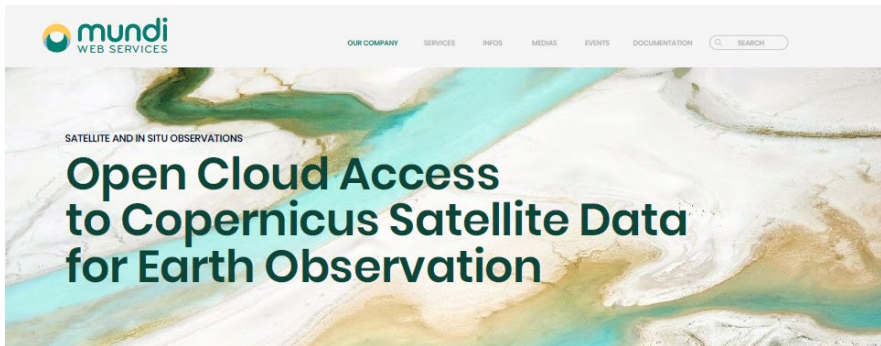


Natura 2000 (N2K) product now updated

17/08/2018



Mundi Web Services – Cloud Platform solution for EO data and processes Ease and extend close cooperation with partners and clients



GAF AG Key Business Development partner for Mundi in close collaboration with T-Systems and ATOS to

facilitate access to Copernicus data and information from the Copernicus services world wide alongside processing resources → IaaS provided by T-Systems (OTC), PaaS and SaaS provided by ATOS, GAF, i.a.



COPERNICUS ?

Copernicus capitalizes on millions of daily observations from a dedicated constellation of satellites, as well as a global network of thousands of land- air- and marine-based sensors to create the most detailed pictures of Earth. The vast majority of data and information delivered by the Copernicus Space Infrastructure and the Copernicus services are available and accessible to any citizen and any organization around the world on a free, full and open access.

COPERNICUS AND ITS SENTINELS



GAF is supporting Mundi Help Desk Services and developing

Front Office Services for the Key segments (e.g. Agriculture, Forestry) using fast access to EO and other data and powerful, scalable cloud processing capabilities



Your one-stop shop for setting up an Earth Observation service <https://mundiwebservices.com/>

EO Data in Technical Assistance

- “classical” TA with geospatial components
- IFI’s – ESA Funded for Key Users
- Copernicus Transfer



Inventory and MIS for sustainable NR management and environmentally and ecologically viable planning in Darfur for the Darfur Land Commission of the GoS

- **Water Resources:** testing of new data sources and methods
- **Geology:** base mapping, geo-chemistry & geochronology, mineral potential
- **Geomorphology, soils & suitability** assessment
- **Socioeconomics & Livelihoods:** access to NR
- **Vegetation, Wild Life, Land Cover, Land use & Agriculture:** map & change
- **Urban Land Cover/Use & Infrastructure:** VHR mapping
- Map compendium 250k for Darfur, selected areas at 50k and 5k, MIS
- Extensive capacity building & training



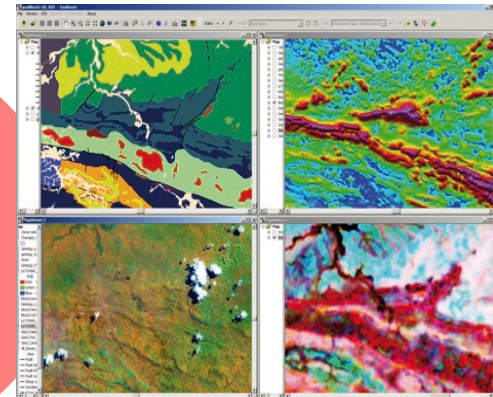


Socio-economic survey sample households: rural, urban, IDPs, nomads



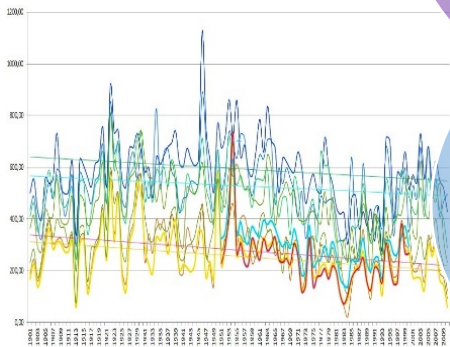
Existing data digitised and archived

EO based mapping core themes, multi-temporal



NRDB Darfur

Meteorology analysis



Extensive Field work




Water point monitoring



Supporting EO data: Landsat MSS, TM, ETM, LS8, IMS, ALOS AVNIR, PRISM, WV2, Pleiades, MODIS, Palsar, GPCC, TRMM, TAMSAT, ERA-Interim

CAT - Climate, Agriculture & Risk Transfer – BMUB/giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH Foster Resilience of the Peruvian Agricultural Production to Climate Change

Component 2: Improvement of the Agricultural Information System for MINAGRI, the Agrarian Banking and Insurance Sector

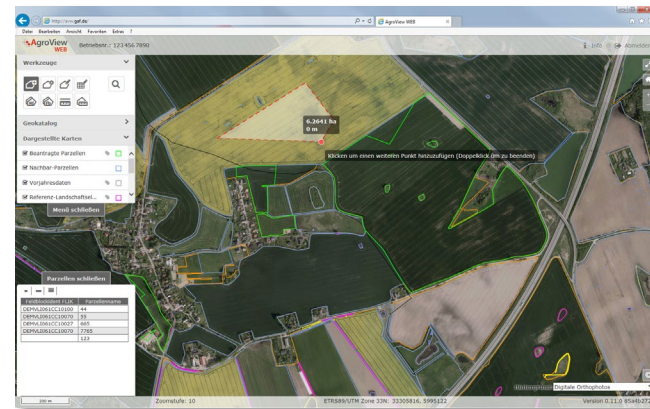
Duration: 06.2016 - 12.2018; Partner: 

- A) Improvement of the **agricultural statistics system**
- B) Implementation of a collaborative **web platform**
- C) Provision of **training** in the use of modern technology



National Production Data –
Analysis & Improvement incl. RS&GIS

21.11.2018



Agricultural web-GIS developed by GAF AG

ESA Funded Development of Product Portfolio for Key Users

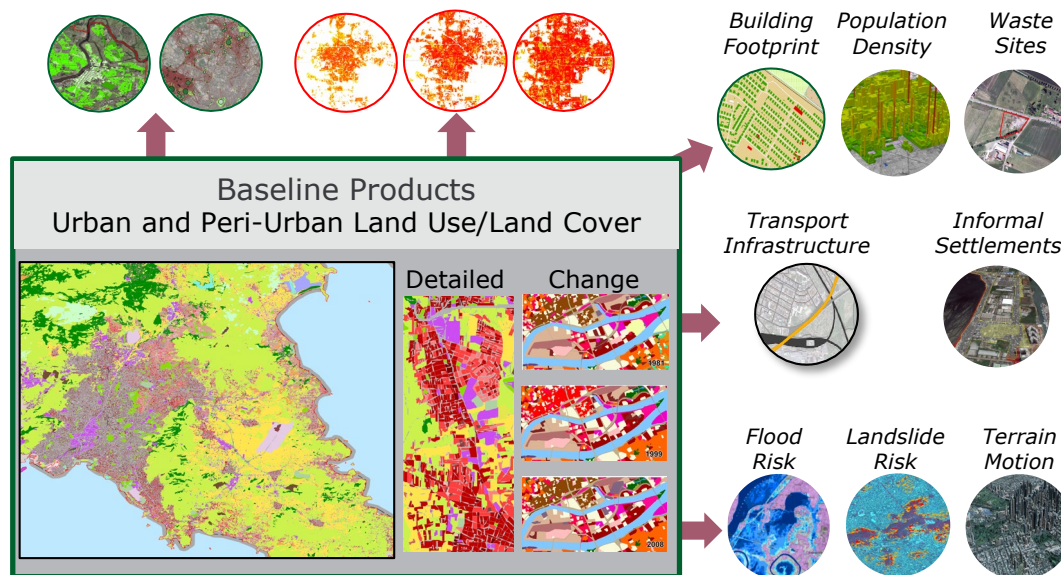
Project:  **Earth Observation for Sustainable Development – Urban Cluster**

- 40 cities in Asia, Africa & Latin America

- Funded by:



- Key users:



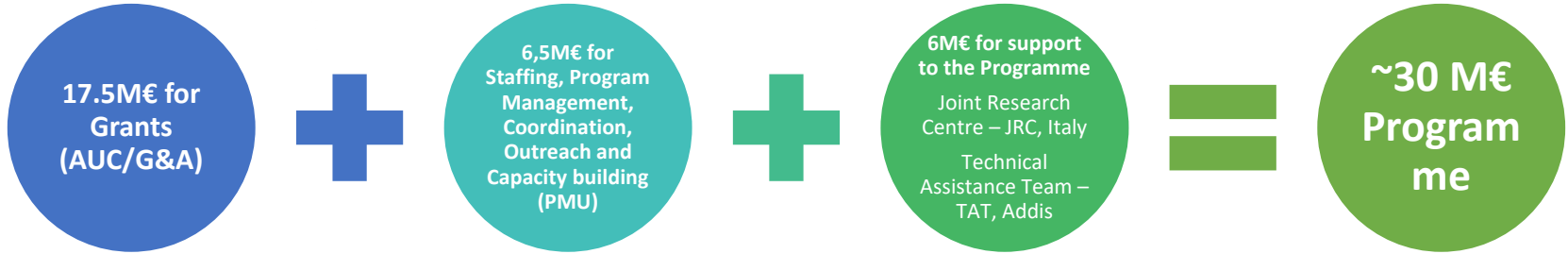


GMES AND AFRICA = Copernicus and Africa



GMES AND AFRICA

A JOINT AU-EU INITIATIVE RESULTING FROM A LONG STANDING COOPERATION



DATA & INFRASTRUCTURES

PRODUCTS & SERVICES



CONTINENTAL



COMMUNICATION & AWARENESS RAISING

TRAINING & CAPACITY BUILDING



REGIONAL, NATIONAL, LOCAL

- 13 CONSORTIA
- 13 LEADERS
- 72 PARTNERS,
- 53 ASSOCIATES
- 46 AFRICAN COUNTRIES
- 6 EUROPEAN COUNTRIES

AFRICAN UNION
COMMISSION
HUMAN RESOURCES
SCIENCES AND
TECHNOLOGIES
GMES AND AFRICA
SUPPORT
PROGRAMME



**GMES
AND AFRICA**



**THE 13
CONSORTIA OF
GMES & AFRICA
AND THEIR
GEOGRAPHIC
COVERAGES**





Massive Changes

- Flood of EO data
- EO market is not growing tremendously
- Complex data analytics, cloud technology and AI are important
- BD & AI - new challenges: expertise & access
- From data and maps to intelligent information for practitioners and decision makers

EO Use in TA Sector - Benefits not exploited

- EO information is not used systematically
- Lack of awareness of potential and utility
- Lack of acceptance & experience how to use EO as a source
- Lack of local operational capacities
- How to serve SDG's, how to support for "rapid, far-reaching and unprecedented changes in all aspects of society" (IPCC 2018)
- Challenges & needs at governmental, decision maker and end user level
- How to trigger change?

...but not quite as radical

- EO is one element of many sources.
- Foster an organic growth; EEA39, Copernicus and ESA supranational projects will teach a lot
- yet will not achieve accuracies needed for complex requirements,
- Establish data democracy, standards in SDIs, quality, best practice, governmental policies,
- Still not self-evident: user centric approaches, *experiences in EO4SD, Copernicus, G&D, ...*

Mainstream EO Use!

- EO information should be integral part of the entire project life cycle
- Lobby EO as standard tool
- Raise IFIs' & clients' acceptance & understanding: methods, guidelines, standards, best practice
- Know-how transfer
- Inclusive earth observation frameworks that respond to overall needs of environmental management and climate change
- Need for extensive vertical and horizontal training programmes