



Earth Observation for Sustainable Development

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ESA/ESRIN

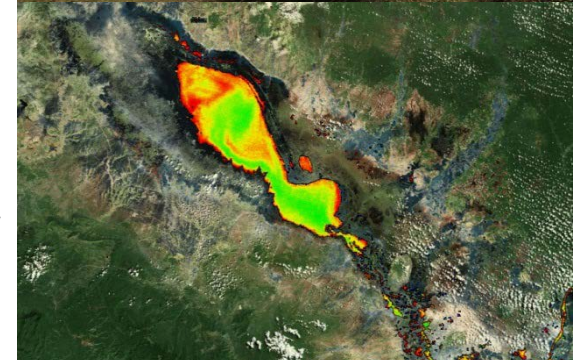
National Copernicus Forum, 05 Nov 2015, Berlin

www.esa.int

Environmental Monitoring from Space



- **Continuous data acquisition:** Earth Observation satellites allows continuous observation of the Earth surface and its changes on a regular basis.
- **Long term archive:** The existing archives of Earth Observation data allows an historical view of environmental issues (30+ years).
- **Multi-scale capabilities:** The different type of Earth Observation systems allows the observation of the Earth at global, regional, national and local scales.
- **Multi-sensor information:** The synergic use of optical and radar systems allows different types of environmental parameters and processes to be observed and monitored.



*EO Technology is an important tool to support the Contracting Parties,
and local, national and international bodies involved in the
implementation of the Conventions*

Sentinels – New Era of Observations

EU-ESA Copernicus Space Programme



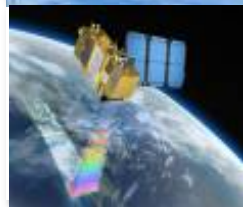
Long-term Continuity & Access to Earth Observation data

- Free and open data policy*



Sentinel 1 – SAR imaging

All weather, day/night application e.g. **floods**, **ice bodies**, **wetlands**



Sentinel 2 – Multi-spectral imager

Land applications: **urban**, **agriculture**, **forests**
Continuity of Landsat



Sentinel 3

Monitoring **ocean colour**, **sea surface temperature**, **land/sea ice**, **water quality**

2015 & 2016

2015 & 2016



OPERATIONAL

* Joint EU/ESA principles adopted by ESA member states in Sep '09, EU announced in Nov. 2013

ESA working with International Environmental Conventions



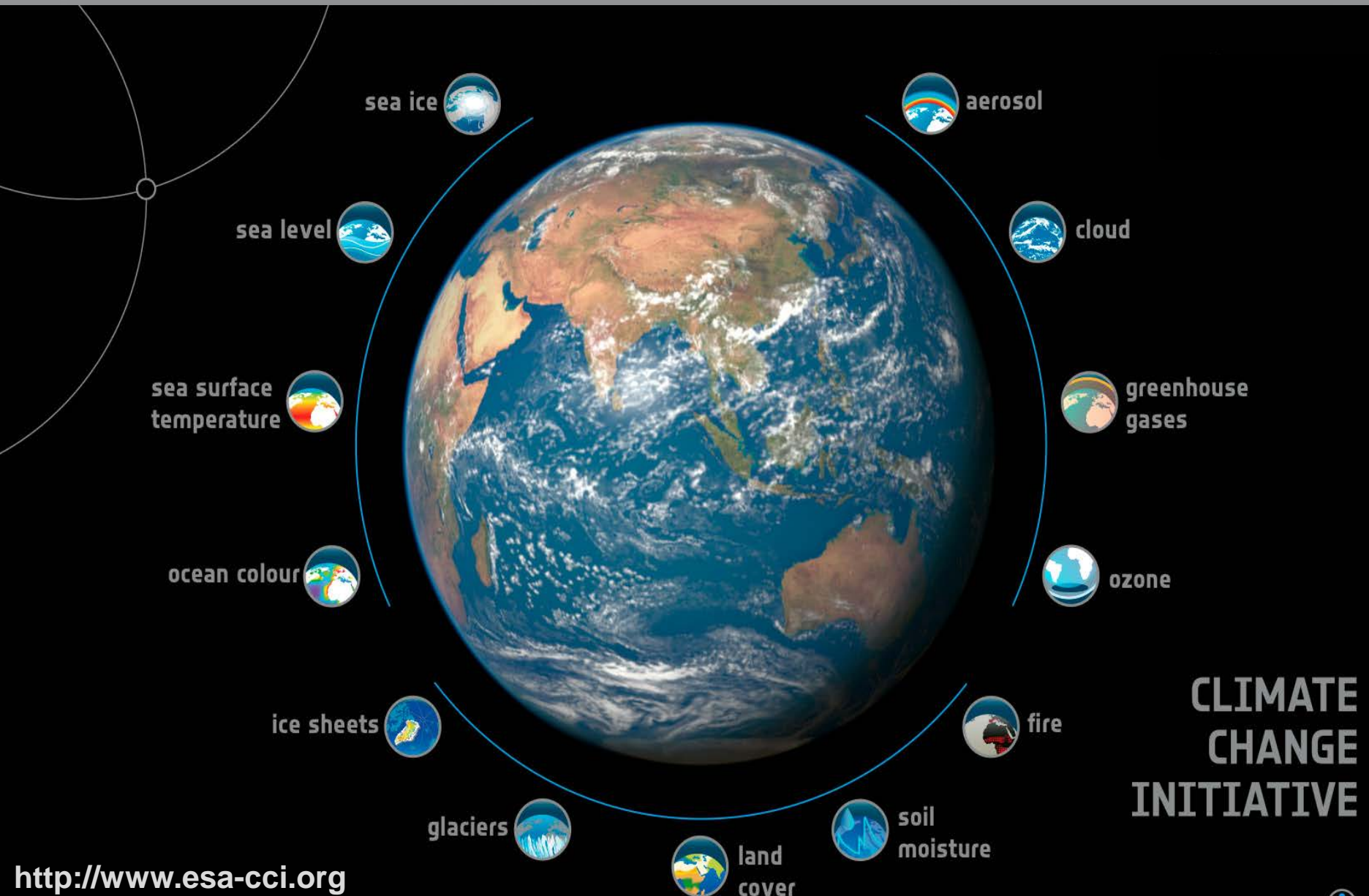
- ***UNFCCC*, UN Framework Convention on Climate Change**
- ***UNCCD*, UN Convention to Combat Desertification**
- ***CBD*, UN Convention on Biodiversity**
- ***Ramsar*, Intergovernmental Convention on Wetlands**



Building
long-term relationships with
environmental communities that
can benefit from
Earth Observation Systems

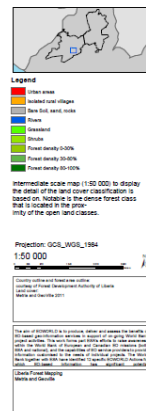
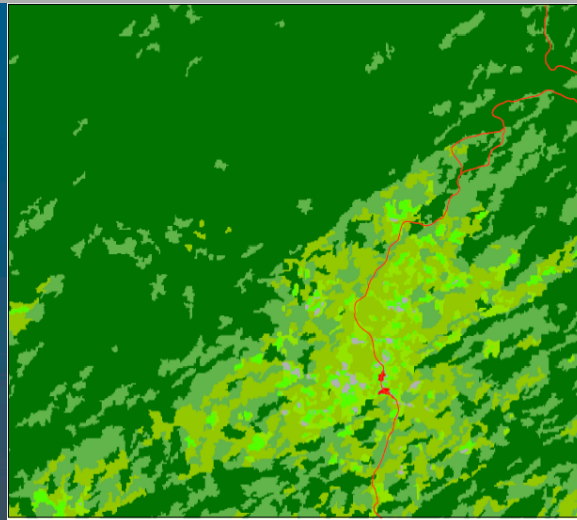


The ESA Climate Change Initiative (CCI) Essential Climate Variables



Multiyear global land cover mapping and characterization for climate modelling

National Forest mapping in Liberia



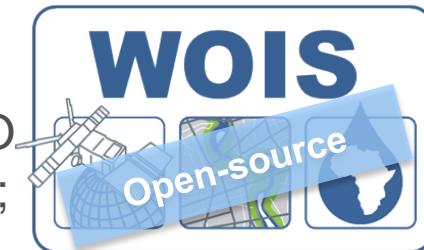
The TIGER Initiative: Looking after Water in Africa



- TIGER is based on a **user driven approach under African leadership**
- Endorsed by the African Ministers' Council On Water (AMCOW)
- Launched in 2002 responding to World Summit on Sustainable Development



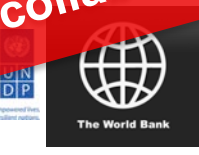
- Assist African scientists, technical centres and water authorities to **develop the tools, the knowledge and the capacity** to exploit EO technology for the monitoring and management of water resources;



- **African Community:**

TIGER involves more than **150 African institutions** in 42 countries who participate in **development projects** and **capacity building** actions;

New TIGER research call for EU-Africa collaboration, Nov. 2015



Role of Earth Observation for Global Sustainable Development



New 17 SDGs with 169 targets + indicators
Make development increasingly measurable

GOAL 6

UN WATER

SDG 6 Targets (with proposed 12 core indicators):

- 6.1 by 2030, achieve universal and equitable access to safe and affordable drinking water for all
- 6.2 by 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the

Example: Core Indicator 6.3.2

Percentage of water bodies with good ambient water quality

- 6.3 by 2030, **improve water quality** by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% globally
- 6.4 by 2030, substantially **increase water-use efficiency** across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity
- 6.5 by 2030 implement integrated water resources management at all levels, including through trans-boundary cooperation as appropriate
- 6.6 by 2020 **protect and restore water-related ecosystems**, including mountains, forests, **wetlands**, rivers, aquifers and lakes

International Development Initiative Mainstreaming Earth Observation



- EO informing Development activities & investments
 - planning, design, implementation & monitoring
- Transfer of EO into working practices of International Development (ODA)

The screenshot shows the top of the World Bank website. The header includes the World Bank logo and the tagline "Working for a World Free of Poverty". Below the header is a navigation bar with links: ABOUT, DATA, RESEARCH, LEARNING, NEWS, PROJECTS & OPERATIONS, PUBLICATIONS, COUNTRIES, and TOPICS. The main content area features a large red banner with the title "Satellite Data Informs Development" under the heading "TECHNOLOGY". The text on the banner describes a partnership between the World Bank Group and the European Space Agency (ESA) to use satellite data for various development goals. Below the banner is a video player showing a satellite map. At the bottom of the banner, there are four small images with captions: "Satellite Data for Development", "Innovation in Poland", "Getting Water on Tap", and "Fund for the Poorest".

THE WORLD BANK
Working for a World Free of Poverty

English | Español | Français | العربية | Русский | 中文

ABOUT DATA RESEARCH LEARNING NEWS PROJECTS & OPERATIONS PUBLICATIONS COUNTRIES TOPICS

TECHNOLOGY
Satellite Data Informs Development

A World Bank Group partnership with the European Space Agency is using satellites to gather a wide variety of information about climate change, water quality, coastal erosion, flooding, urban growth, and more. It has been particularly useful in conflict zones, where data can be difficult to gather.

► Satellite Success Stories | Website

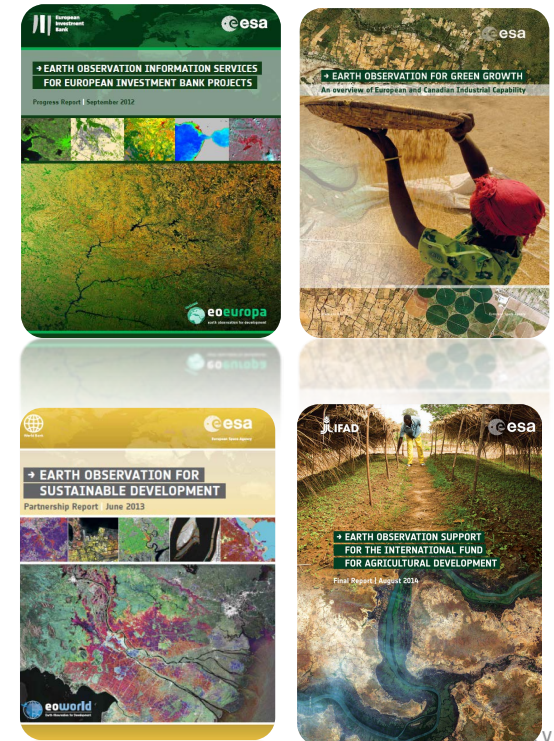
Satellite Data for Development Innovation in Poland Getting Water on Tap Fund for the Poorest

RESOURCES Civil Society Governments Businesses Investors Job Seekers Journalists Students

WHAT'S NEW RELEASE

BLOGS Why Vehicle Safety Matters

2013 Annual Meetings



Multi-lateral Development Banks (MDB): How could they use EO ?



Information Drivers

- **Green Growth**
 - Environmental impact / sustainability of economic development investments
- **Climate Resilience / Proofing**
 - Long-term durability of development investments
- **Natural Capital Valuation**
 - Economic valuation of Ecosystems for National and Global accounting (GDP)
- **Open Development**
 - Increasing drive towards transparency in knowledge resources

Information Uses

- **In support directly to Programs / Projects**
 - concept definition, planning, implementation
 - close-out and remission
 - as part of capacity-building in developing countries
- **In support of Monitoring & Evaluation (M&E) methodologies**
 - as *best-practice* to harmonize M&E tools:
 - Feasibility
 - Environmental Impact Assessments
 - Audits
- **In support of policy & planning**
 - sectorial analyses
 - country development planning
 - recent financial approaches to valuation of natural capital



THE WORLD BANK

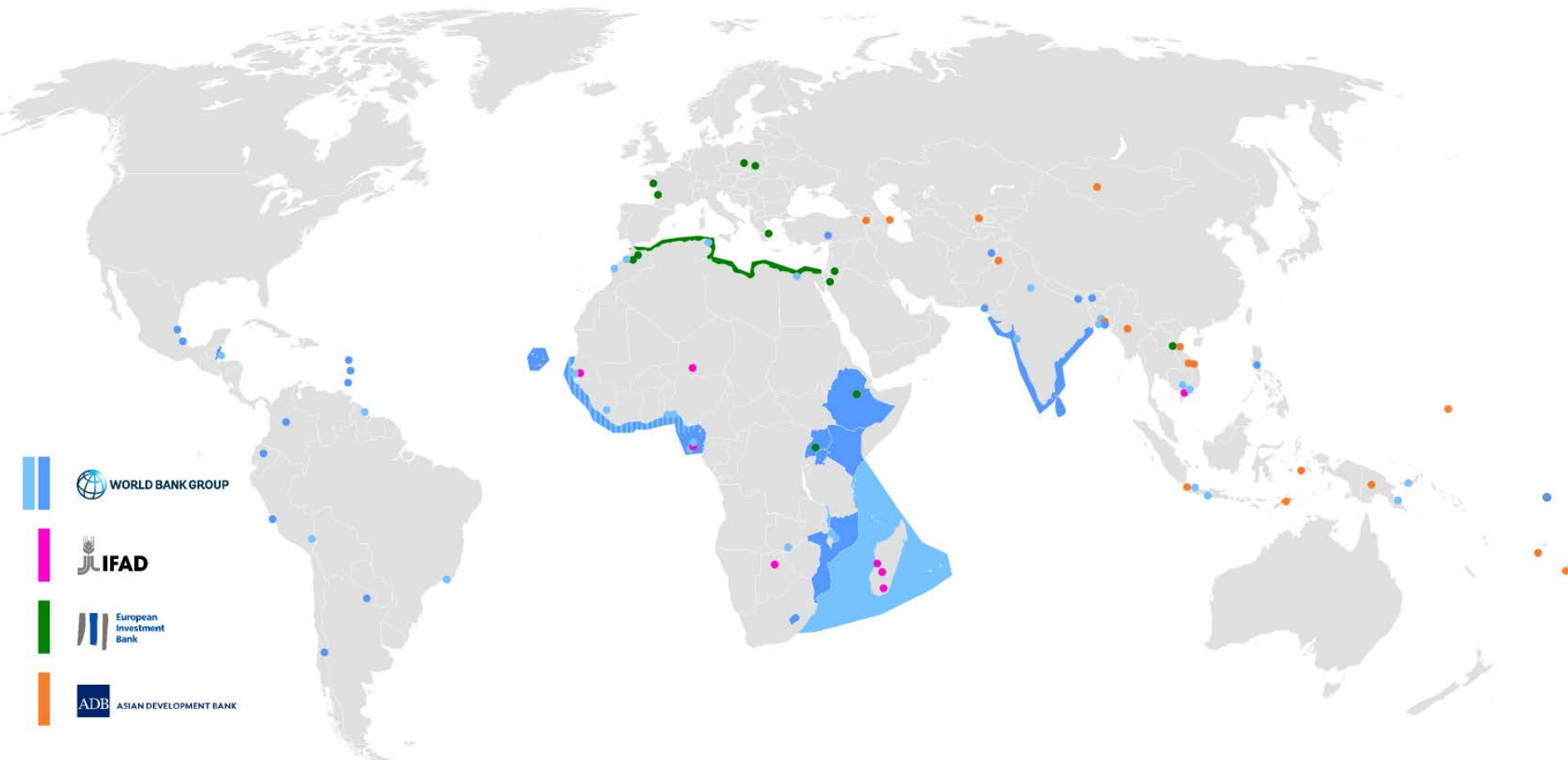


65 small-scale demonstrations :

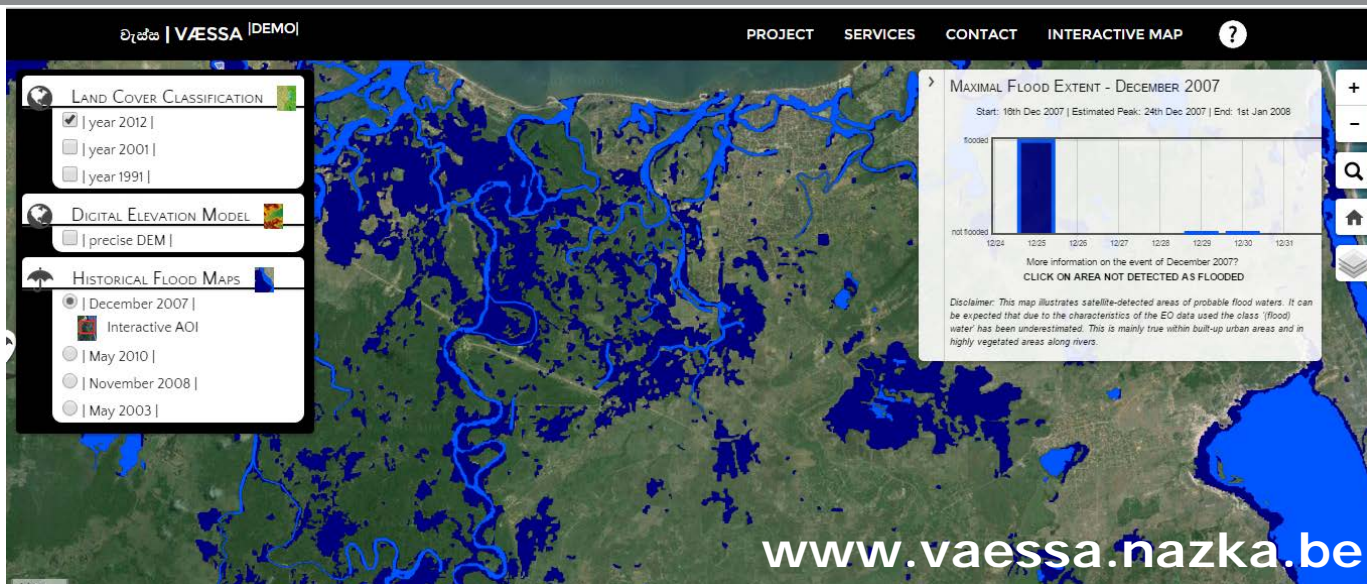
Responding to specific geospatial information needs



- **Land** Urban Infrastructure, Land Cover, Forest, Crops, Soil erosion, In-land Water,
- **Marine** Oil-spill, Fishing, Coral Reef, Coastal Change, Sea-level Height, Ocean Currents,
- **Risk** Floods, Land Motion Histories for subsidence, landslides, seismic,



Support to World Bank project – Climate Resilience: Interactive Flood Hazard Mapping



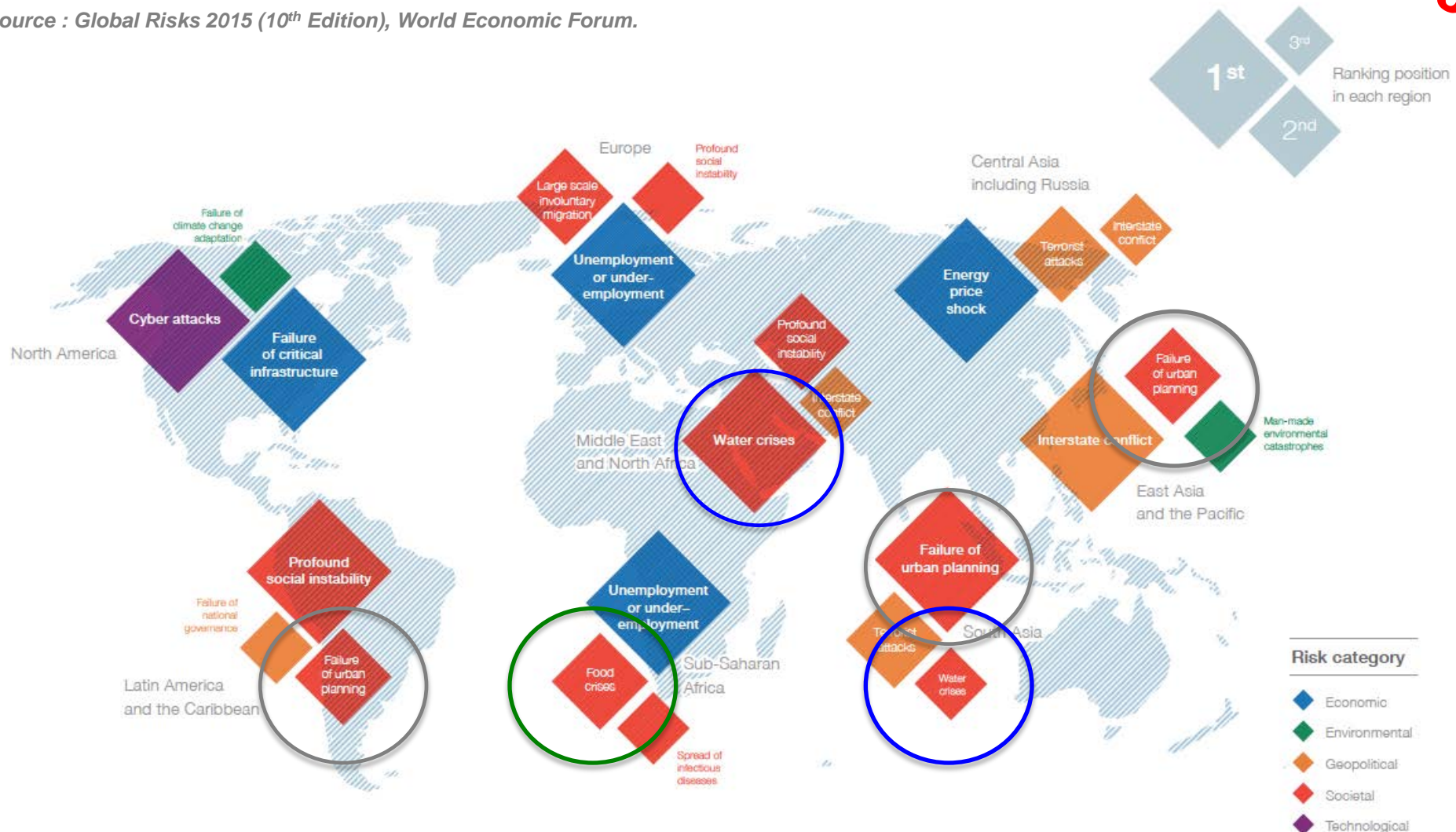
classified –

Initial Large Scale Activities For which Global Risks least prepared ?

Start 2016

Societal Challenges : **Water, Urban, Agriculture**, ...

Source : Global Risks 2015 (10th Edition), World Economic Forum.



Implementation : Water Resources Management



Main Thematic Issues

- Water supply and sanitation, irrigation, hydropower, drainage and risk management (e.g. flood protection)

Geographical focus areas

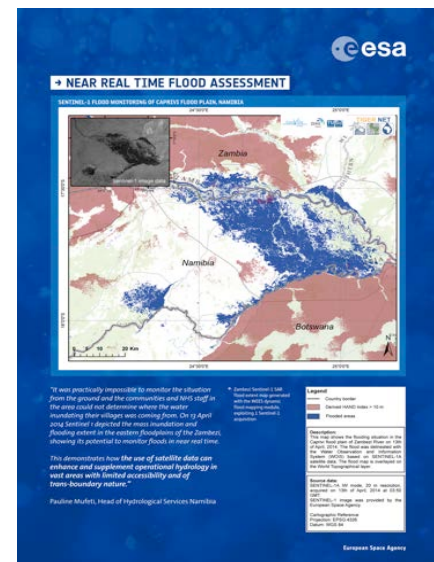
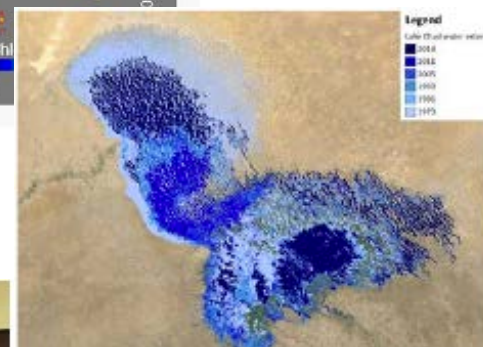
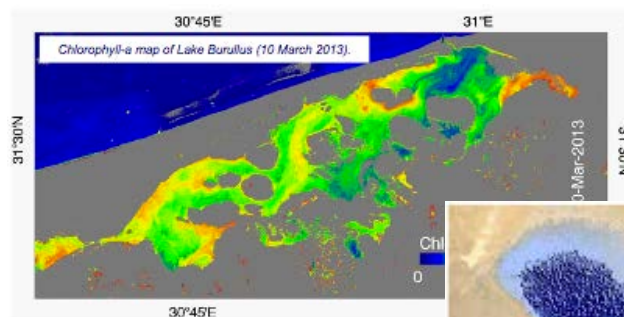
- Africa (e.g. Nile Basin)
- SE-Asia (e.g. Mekong Basin)

Main stakeholders

- Mandated Water Authorities at national & transboundary level

Existing Initiatives and Platforms

- World Bank Water Practice, e.g. Water Partnership Program,
- International Waters of the Global Environment Facility,
- EC-AUC: GMES & Africa.



Main Thematic Issues

- Increased productivity of key agricultural commodities, land degradation neutrality, climate-smart agriculture.

Geographical focus areas

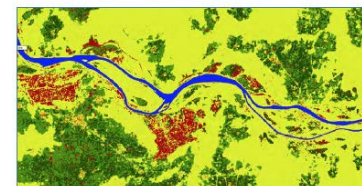
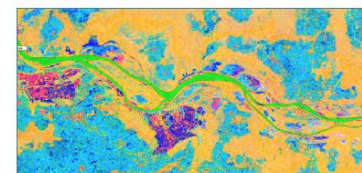
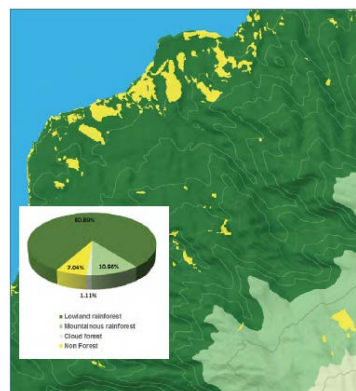
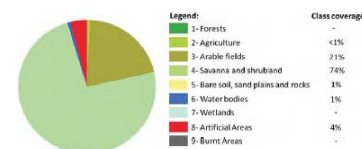
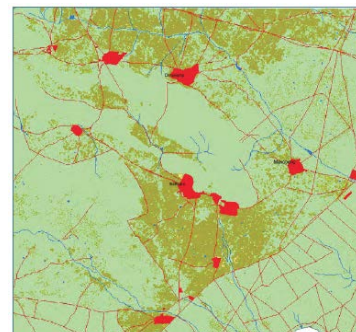
- Africa (e.g. Sahel, E. Africa Highlands, Horn of Africa, Southern Africa)
- SE-Asia (e.g. Vietnam, Mekong Basin, China Hunan),
- Latin America (e.g. Bolivia, Nicaragua, Honduras, Brazil, Argentina, Uruguay).

Main stakeholders

- IFAD, GEF, World Bank Group, IADB, ADB, UNCCD and their DMCs (Developing Member Countries),

Existing Initiatives and Platforms

- WB Sahel & West Africa program (SAWAP),
- UN Land degradation Neutrality (LDN) project,
- WB Global Agriculture and Food Security program,
- Comprehensive Africa Agriculture development program,
- Global Alliance for climate-smart agriculture.



Implementation : Urban Development



Main Thematic issues

- Managing coherent, sustainable, liveable urban development (water, sanitation, transport, waste, pollution, infrastructure)

Geographical focus areas

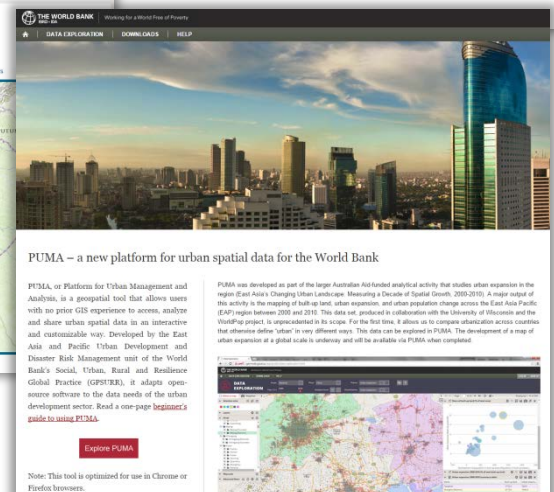
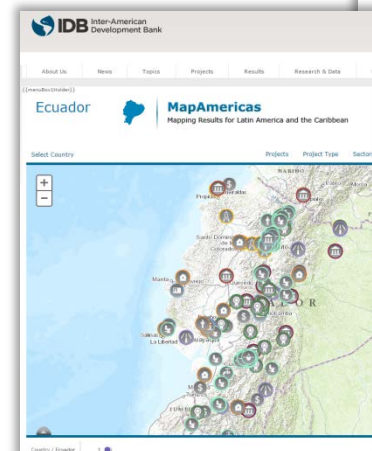
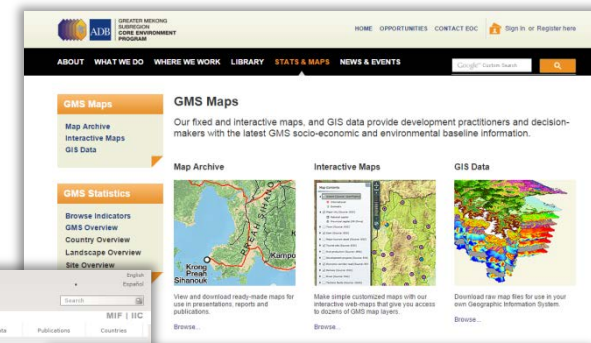
- Urban areas in Asia, Africa and Latin America, especially in low-income countries,
- Selected megacities and their hinterlands,
- Secondary (emerging) cities (between 250,000 and 3 million pop).

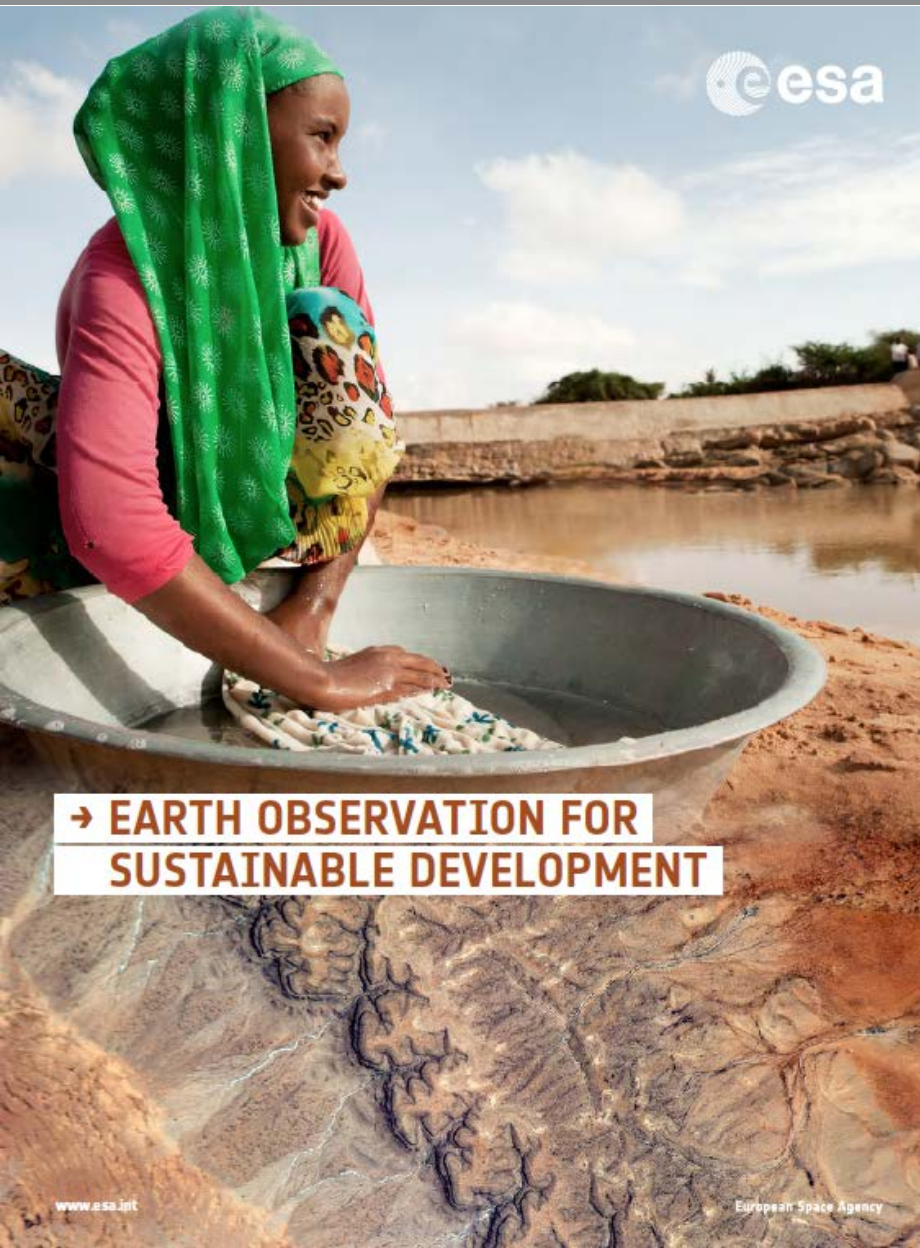
Main stakeholders

- National urban development investments, both IFIs and national governments through relevant country partnership strategies & operational plans.

Existing Initiatives and Platforms

- World Bank Global Urban Growth Data Initiative,
- ADB Greater Mekong Sub-region Environment Operations Center,
- IADB Emerging and Sustainable Cities,
- Cities Alliance.





- **Mainstream & Transfer EO** into operational working processes of international development – in countries & Multi-lateral Development Banks
- **EO As 'best-practice' source of environmental information** in EIA, M&E methodologies
- **Priority thematic areas :**
Urban, Marine, Agriculture, Risk Management, Energy, Water, Forest, Ecosystems, Fragile States, Climate Resilience & Proofing.



Earth Observation
A Necessity

Additional Slides on Service Clusters

Implementation : Larger-scale activities

Preliminary breakdown of work



- **Phased approach**; set-up activities (1st year, 2016) followed by development & demonstration activities (next 2 years, 2017/18),
- **Strategic Planning & Stakeholder Engagement**
 - Engage IFI's and prepare cross-IFI exchange network,
 - **Engage key stakeholders in IFI client states**,
 - Elaborate obstacles for sustainable transfer of EO and define common actions to address issues across the project life-cycle,
 - Elaborate and prepare the EO demonstrations required (European data access, service clusters, support tools, capacity-building).
- **Service Demonstration & Transfer Preparation**
 - **Develop EO service clusters, and execute/scale-up EO service demonstrations**,
 - Connect EO based information services to existing international thematic networks and development support initiatives,
 - Implement **cooperative training and capacity building**, both within IFI (for project preparation) and IFI Client countries (project implementation); priorities : SE Asia, LAC, Africa,
 - Prepare the **sustainable transfer of EO services into the routine working practices** of large scale international development programmes and projects.

EO Service Cluster : Water Resources

Preliminary composition



Service Cluster	Service Cluster Components
Water Resources Management	Water Quality Monitoring
	Watershed Land Use and Land Cover Change Mapping
	Wetland Extent and Status Mapping
	Water Reservoir Mapping
	Aquifer Status Assessment
	Hydropower Resource Assessment
	Settlement Characterization and Change Assessment (Urban demand assessment)
	Crop Mapping for Agricultural Demand Assessment
	Hydrological Network Mapping (drainage, navigation, erosion)
	Industrial Activity Assessment (freshwater fisheries, aquaculture, hydropower)
	Soil Moisture Mapping and Vegetation Stress Assessment
	Flood Risk Assessment

EO Service Cluster : Agriculture & Rural

Preliminary composition



Service Cluster	Service Cluster Components
Agriculture and Rural Development	Crop cover mapping and crop status assessment
	Yield estimation
	Ground water mapping
	Precipitation monitoring
	Landscape level classification and change map (including fragmentation)
	Above ground biomass mapping and change monitoring
	Vegetation Stress Map
	Land degradation and soil cover map
	Soil moisture mapping
	Transport network mapping

EO Service Cluster :Urban

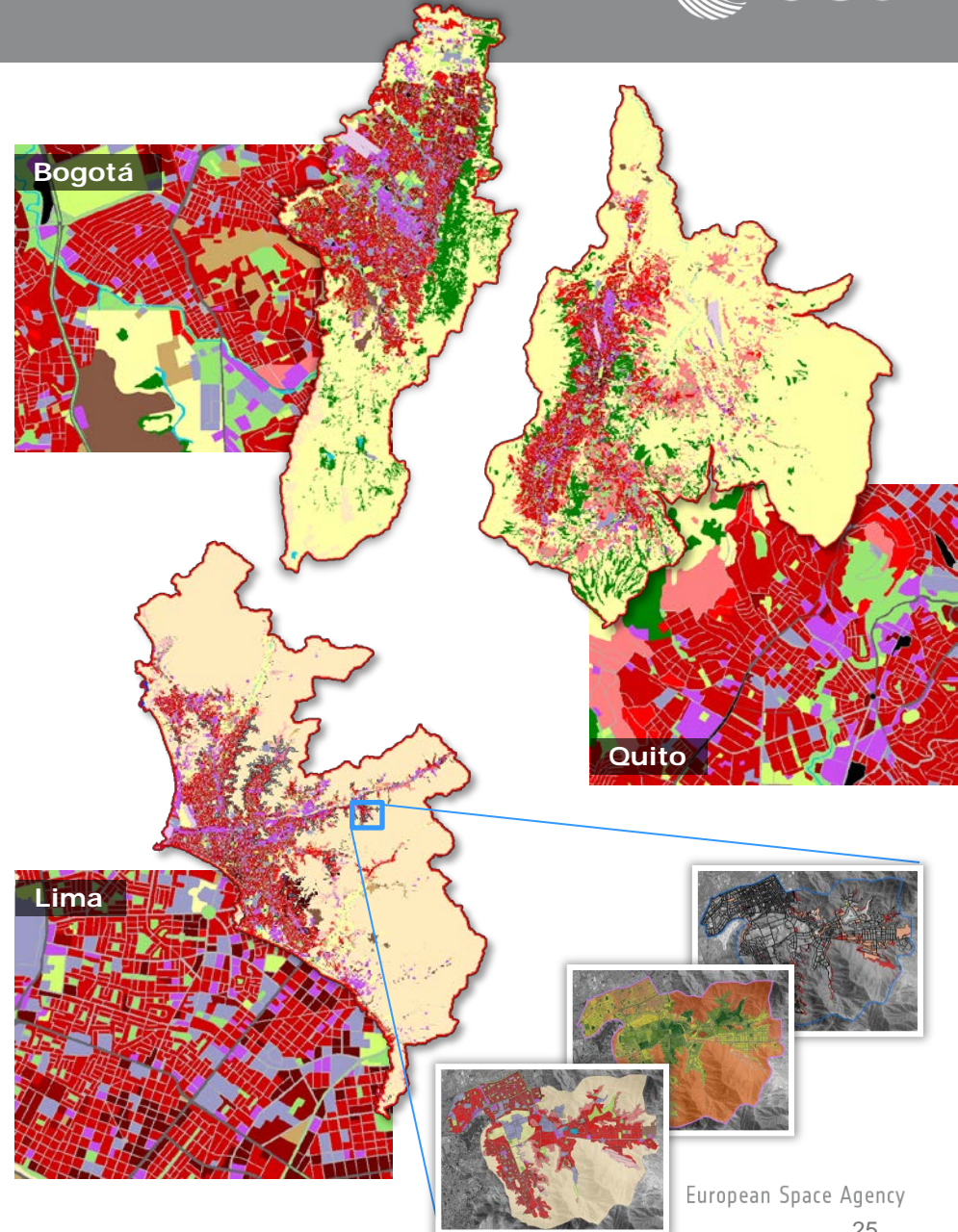
Preliminary composition



Service Cluster	Service Cluster Components
Urban Development	Urban/Rural land use change mapping
	Impervious Area and Soil Sealing mapping
	3D City Mapping
	Population Density Mapping
	Informal settlement mapping and evolution characterization
	Exposure mapping of urban infrastructures
	Customized terrain deformation map (e.g. urban subsidence in coastal lowland)
	Critical infrastructure network maps and status assessment
	Illicit Waste Mapping
	Urban public health assessment (air quality, heat island characterization)
	Water and Energy Infrastructure Access Assessment
	Ecosystem Status Assessment for Hinterland

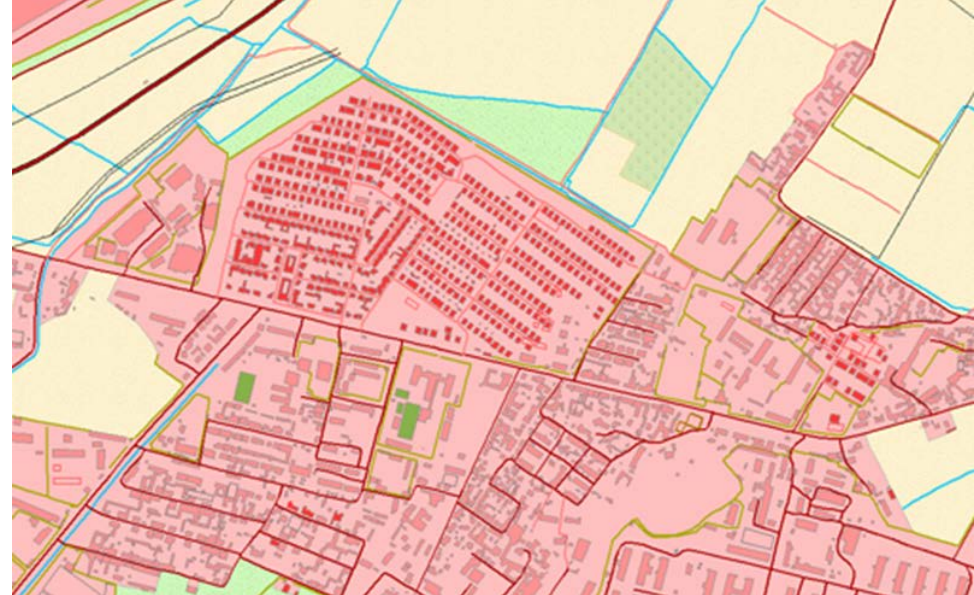
Monitoring Urbanization in Latin American Metropolitan Areas

- Supporting World Bank analytics to:
 - create standardised diagnostics of factors driving spatial development in metropolitan areas across countries
 - assess spatial planning challenges and provide appropriate policy recommendations
 - develop indicators and rankings that would allow cities to monitor and benchmark their performance and progress over time
 - produce associated statistical information used to calculate and understand evolution of different land use classes and subsequent correlations with economic and social data



Integrated Rural Development in Uzbekistan

- Supporting a large-scale national residential construction program that is a high priority component of Uzbekistan's Welfare Improvement Strategy
- The EO-based service provides
 - For individual housing complexes:
 - prior-to-construction site suitability verification
 - construction progress verification
 - post-construction benefits and impact evaluation
 - analysis of spatial development trends within the greater Tashkent area



→ GLOBWETLAND AFRICA

Towards satellite-based Wetland Observing Systems in Africa

GLOBWETLAND AFRICA IN A NUTSHELL

- Exploit increasing capabilities of satellite observations for wetlands inventory, assessment and monitoring
- Develop EO methods and tools to better assess conditions of wetlands and monitor trends over time
- Enhance capacity of African stakeholders to develop national and regional wetland observatories
- Access “freely available” satellite data from the Sentinel missions of the European Copernicus initiative

Potential role of German EO Value Adding Industry



Preliminary analysis of main capabilities of relevance in German Value Adding Sector

	Urban Development	Agriculture & Rural Development	Marine resources	Risk Management & Disaster Reduction	Energy	Water Resources Mngament	Forest Management	Ecosystems	Fragile States	Climate Resilience & Proofing
Airbus Defence & Space	●	●		●	●	●	●	●		
Brockman Consulting		●		●	●		●		●	
Definiens	●	●	●			●	●	●		
DLR	●	●	●	●	●		●		●	
EFTAS	●	●		●	●		●			
EoMap		●		●	●		●			
GAF	●	●		●	●	●	●	●	●	
IABG	●	●		●		●	●	●		
Jena Optronik	●	●			●	●	●			
MeteoControl				●					●	
Planquadrat GeoInformation									●	
Remote Sensing Solutions	●	●		●	●	●	●			
Spatial Business Integration		●				●				
VISTA	●	●	●	●	●	●	●		●	
	●	Primary Capability			●	Secondary Capability				