



Space for Blue Growth

A glimpse at the ESA-WB partnership focusing on marine and coastal resources management

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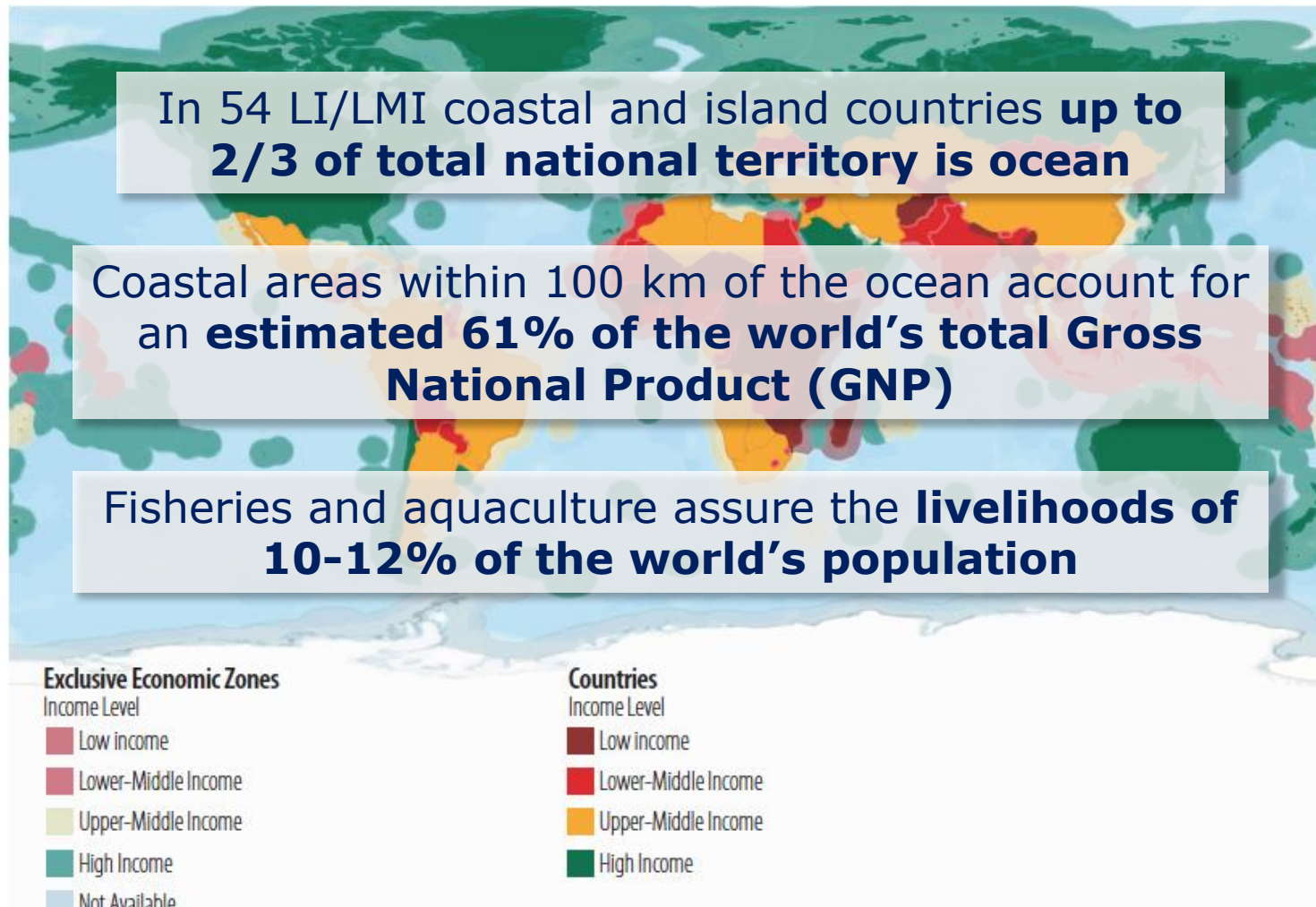
Senior Geospatial Specialist | ESA Representative at the World Bank

GEO Blue Planet Symposium 2017 | College Park, MD, 1 June 2017

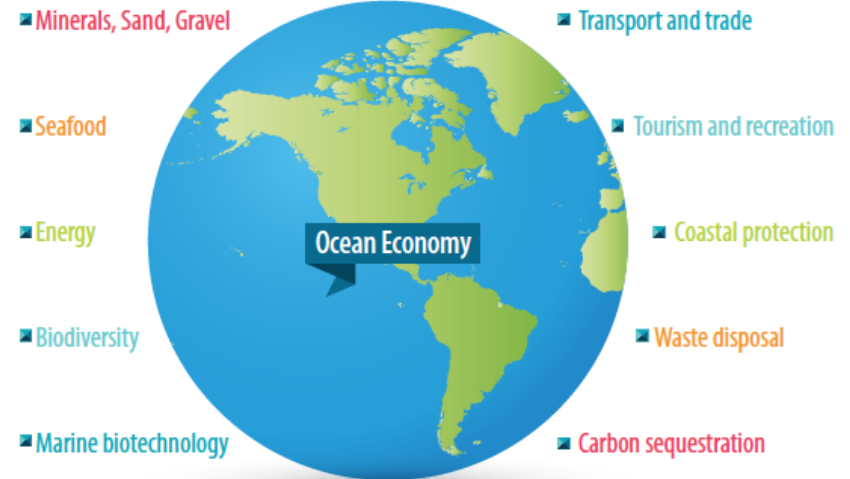
Introductory Keynote

www.esa.int

The ocean in a development context



The WB and the Ocean/Coast Economy



- Coastal and marine activities are **major contributors to the economies** of coastal states in developing countries
- Opportunities for expanding coastal and marine economies increasingly important to **support economic growth**
- Expansion in marine/coastal economic activities must be **sustainable**
- **Long term benefit** from marine & coastal ecosystems requires
 - Robust, reliable planning
 - Comprehensive and effective monitoring and assessment
 - Inclusive management of the resources

The WB and the Ocean/Coast Economy



Global Practices

Equitable Growth,
Finance and Institutions

Human Development

Sustainable
Development

Cross Cutting Solution Areas

Regions

- Africa
- East Asia & Pacific
- Europe & Central Asia
- Latin America & Caribbean
- Middle East & Northern Africa
- South Asia

'Blue Growth' Portfolio



- Agriculture
- Climate Change
- Energy & Extractives
- Environment & Natural Resources
- Public-Private Partnerships
- Social, Urban, Rural & Resilience
- Transport & ICT
- Water

The WB and the Ocean/Coast Economy



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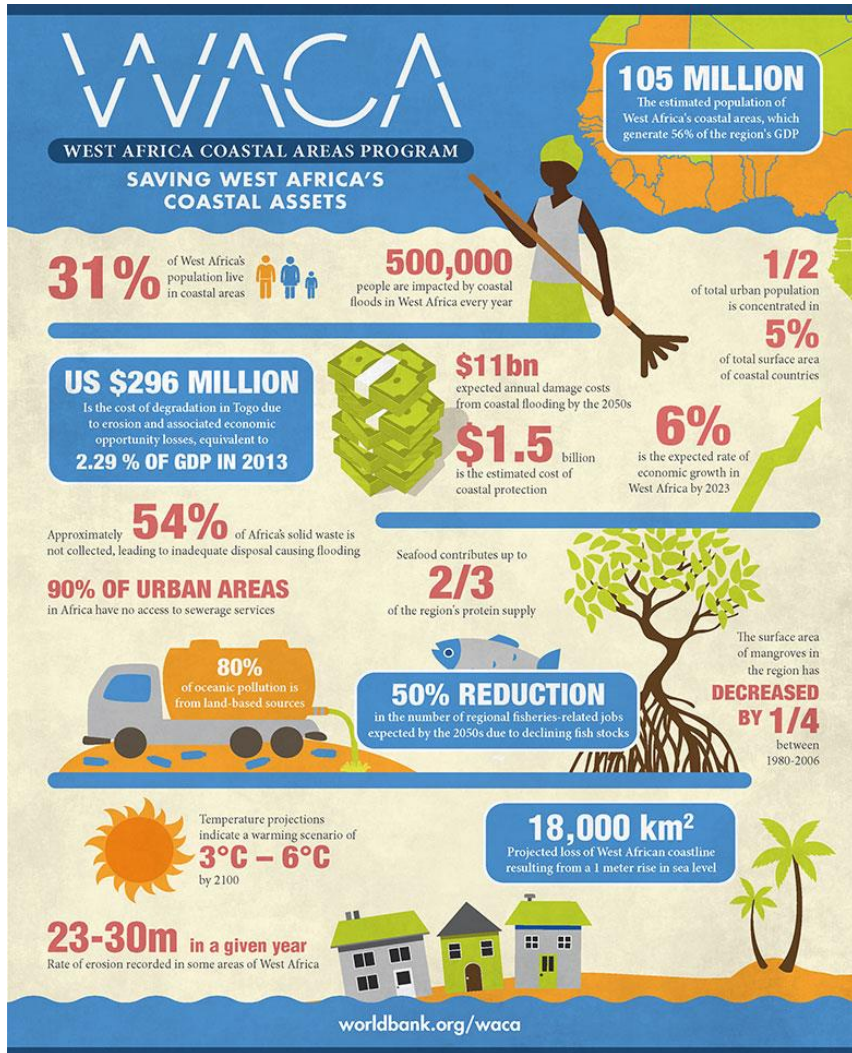
US\$ 6.4b

- \$1b financing for sustainable fisheries and aquaculture, and for efforts to conserve and enhance coastal and ocean habitats
- \$5.4b for coastal infrastructure such as waste treatment, watershed management and other activities that help reduce coastal pollution

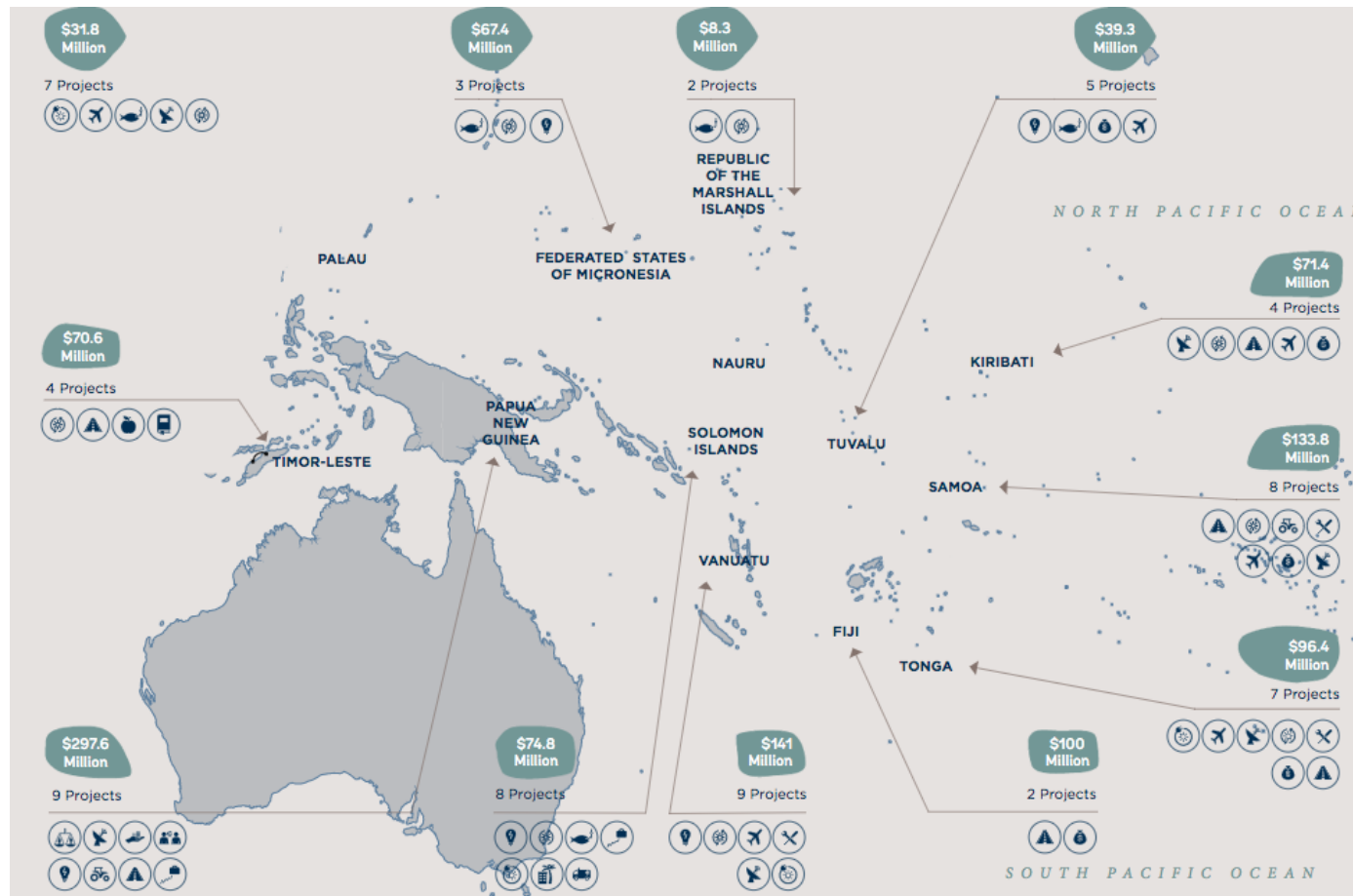
'Blue Growth' Portfolio



The WB and the Ocean/Coast Economy



Pacific Islands Oceanscape Program



Fisheries Management

Climate Resilience

Protection of critical fisheries habitats

Regional monitoring & assessment

Caribbean Blue Economy Development

Governance for a Blue Economy

Ocean Principles for Investment in a Caribbean Blue Economy

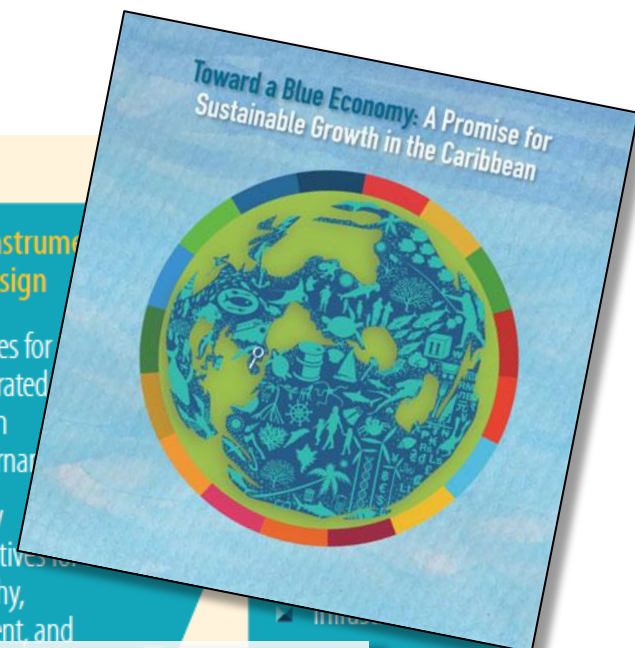
- Principle 1: Sustainable Development/Sustainable Livelihoods
- Principle 2: Marine Ecosystem Health
- Principle 3: Integrated Ocean Governance
- Principle 4: Science-based, Precautionary, and Adaptive Decision Making
- Principle 5: Duty of Care and Accountability
- Principle 6: Inclusive and Transparent Decision Making
- Principle 7: Ecosystem-based Management
- Principle 8: Risks and Allow the Development of Climate Change-Related Opportunities
- Principle 9: Sharing of Benefits from the Ocean Economy
- Principle 10: The Right to Development

Policy Instrument Design

- Policies for Integrated Ocean Governance
- Policy objectives for healthy, resilient, and productive environment

- Investment
- Research and Development
- Business Development and Sustainable Finance

“Investing in ocean health is synonymous with generating ocean wealth”
 (World Bank & Nature Conservancy, 2017)



Direction of time from design to delivery

Space for Oceans and Blue Growth



→ THE ESA EARTH OBSERVATION PROGRAMME



Sentinel-3 scanning Earth's color

The Sentinel Family

-  S1A/B
-  S2A/B
-  S3A/B
-  S4A/B
-  S5P
-  S5A/B/C
-  S6 J-CS A/B



Meteorological Missions driven mainly by Weather forecasting and Climate monitoring needs. These missions developed in partnership with EUMETSAT include the Meteorological Operational satellite programme (MetOp), forming the space segment of EUMETSAT's Polar System (EPS), and the new generation of Geostationary Meteosat satellites (MSG & MTG satellites).

Copernicus Sentinel Missions driven by Users needs to contribute to the European Global Monitoring of Environment & Security (GMES) initiative. These satellite missions developed in partnership with the EU include C-band imaging radar (Sentinel-1), high-resolution optical (Sentinel-2), optical and infrared radiometer (Sentinel-3) and atmospheric composition monitoring capability (Sentinel-4 & Sentinel-5 on board Met missions MTG and EPS-SG respectively).

Earth Explorer Missions driven by Scientific needs to advance our understanding of how the ocean, atmosphere, hydrosphere, cryosphere and Earth's interior operate and interact as part of an interconnected system. These Research missions, exploiting Europe's excellence in technological innovation, gave the way towards new development of future EO applications.

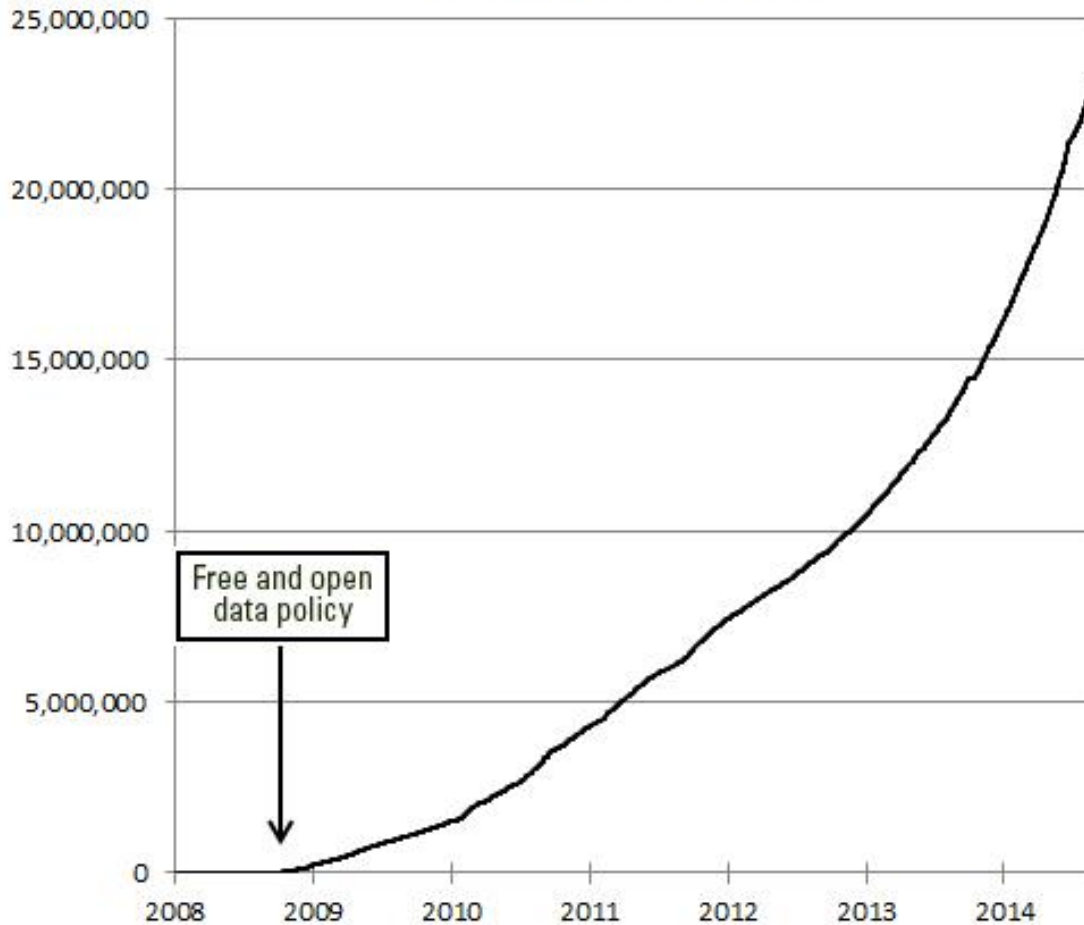
Missions With Partners
 EOP
 Operated Missions

Long-term (decadal) continuous, consistent data

Open access makes a difference



Landsat Scenes Downloaded from USGS EROS Center (Cumulative)



Open Data Policy:

Before: 53 scenes/day

After: 5,700 scenes/day

Annual Economic Benefit (2011)

USA \$1.80 B

Global total \$2.19 B

*Credit: USGS, NASA, GEO
Loomis et al. (2015) PE&RS*

Open access **is not the ultimate goal**



Open **Data** \neq Free **Info**

"Making free data cheaper"

Jed Sundwall

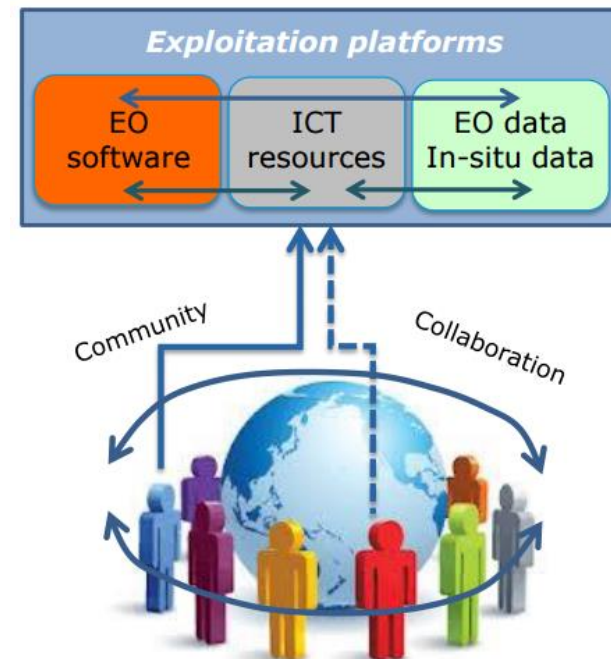


"Bringing the people to the data"

- Simplify the extraction of information from EO data
 - Enable large scale exploitation of EO data
 - Stimulate innovation with EO data
 - Maximize impact of European EO assets



food security (coming soon)
tep



Towards efficient data exploitation



food security (coming soon)
tep

The screenshot displays the tep platform interface with several components:

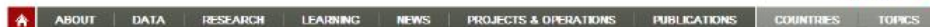
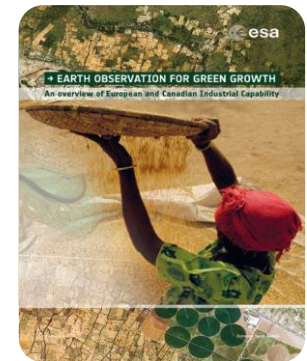
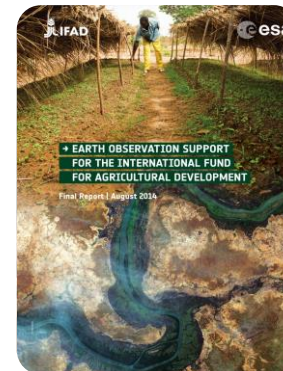
- Match-up Chart:** A scatter plot showing the relationship between Log(Prof) and Chlorophyll-A Globcolour. The regression equation is $\text{Log(Prof)} = 1.05 \cdot \text{Log(Sat)} + 0.22$ with $R^2 = 0.771$. The legend includes *lovbio015c*, *lovbio063c*, *lovbio072c*, *spgbio002b*, *Y=K*, and *Reg*.
- Chlorophyll-A Map:** A satellite-derived map of Chlorophyll-A concentration in the ocean.
- Time Series Plot:** A line graph showing Chlorophyll (µg/m³) from 2007/10 to 2008/10 for various sensors: *lovbio015c*, *lovbio063c*, *lovbio072c*, and *spgbio002b*.
- Product List Table:**

Product Images	Title	Short Description	Rating
	Arctic Region Satellite AIS	<ul style="list-style-type: none"> Ship Tracking in the Arctic using AIS Revisit time: 45 minutes Latency: <60 minutes 	★★★★★ Too few votes yet QUOTE
	exactAIS Density Maps™	<ul style="list-style-type: none"> Visualise large sets of shipping data in minutes Completely Customizable Available for Your Area of Interest... 	★★★★★ Too few votes yet QUOTE
	Global Satellite AIS	<ul style="list-style-type: none"> SpaceQuest Ltd Satellite Automatic Identification System (AIS) Data Feed with Global Coverage of Ocean and Inland... 	★★★★★ Too few votes yet QUOTE
	Global Satellite AIS of LNG Vessels	<ul style="list-style-type: none"> Tracking of liquid natural gas vessels around the globe using AIS 	★★★★★ Too few votes yet QUOTE

Promoting geo-data literacy and use in **international development**



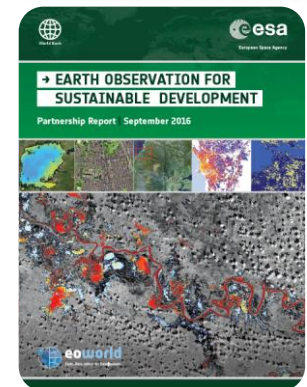
- 65 small-scale demonstrations of EO services in support of IFI projects since 2008



TECHNOLOGY
Satellite Data Informs Development

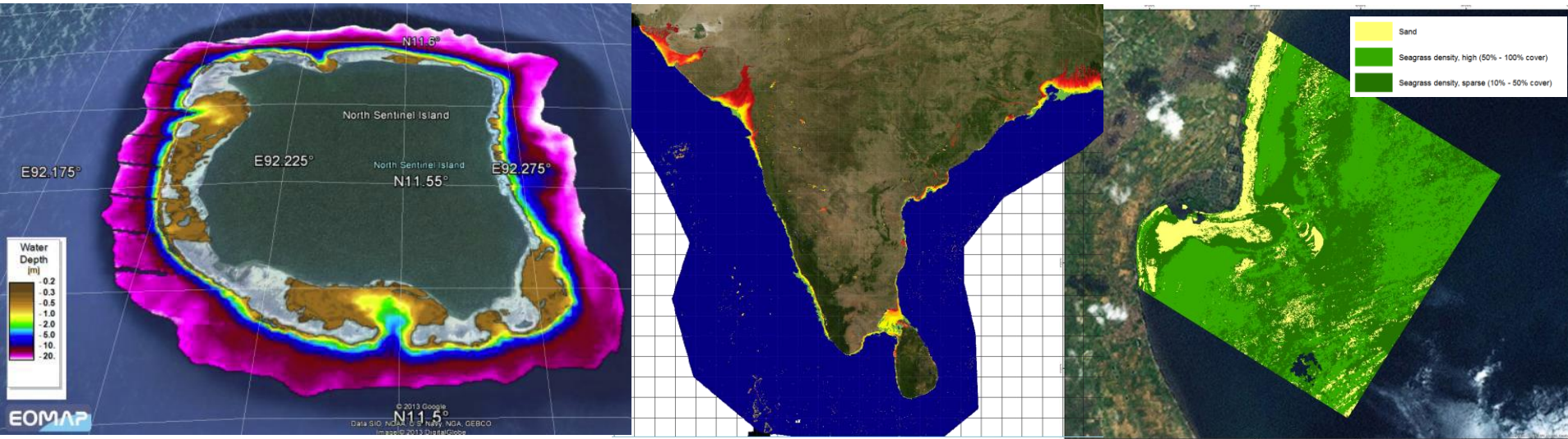
A World Bank Group partnership with the European Space Agency is using satellites to gather a wide variety of information about climate change, water quality, coastal erosion, flooding, urban growth, and more. It has been particularly useful in conflict zones, where data can be difficult to gather.

▶ [Satellite Success Stories](#) | [Website](#)



India Coastal Zone Management

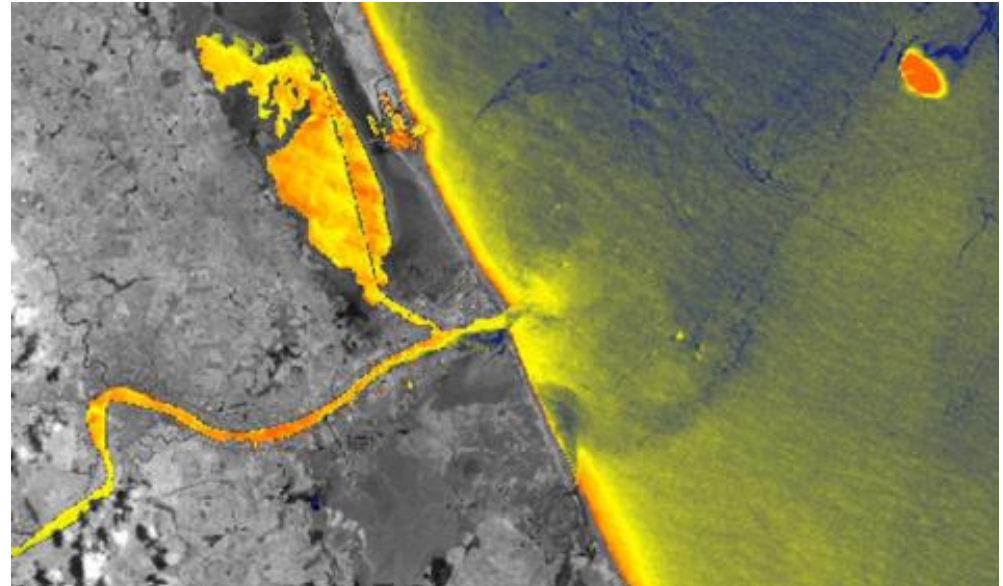
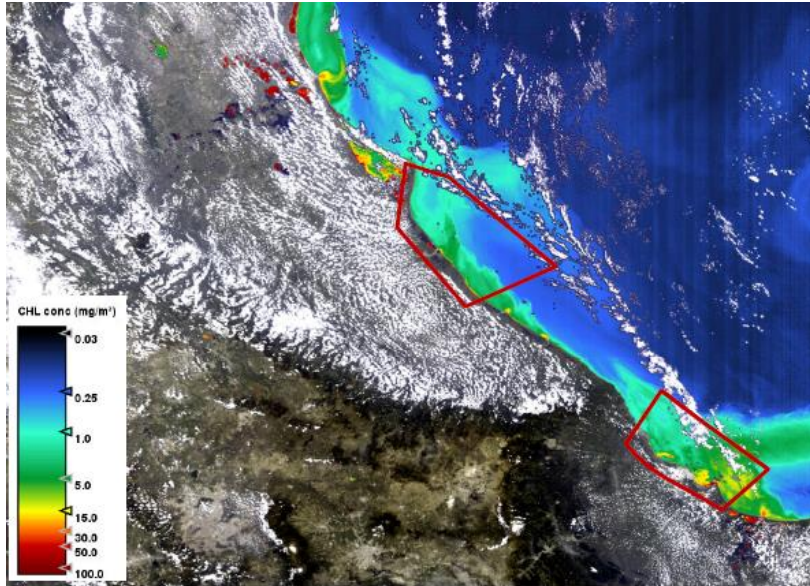
Benthic habitat status, sediment transport



Project objective: Implement measures to protect Eastern Indian coastal areas and implement **sustainable coastal management practices**

EO contribution: Unique capability to map **status of natural coastal protection resources** and characterize **changing coastal erosion/coastal flooding risk**

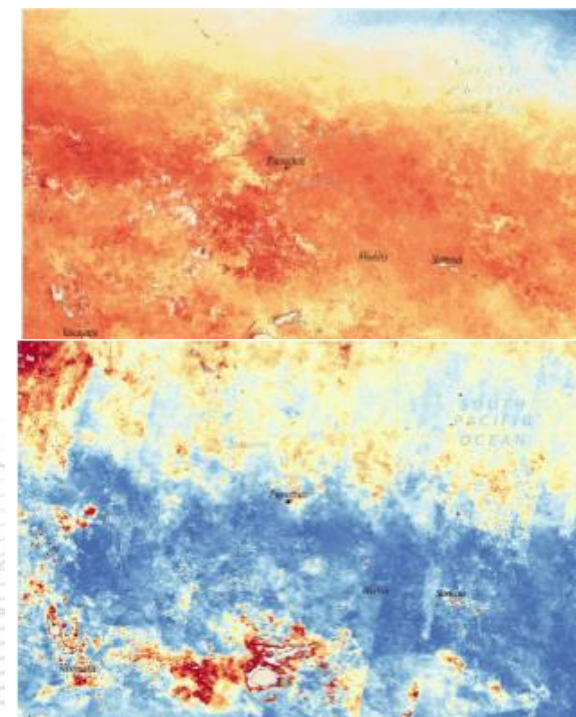
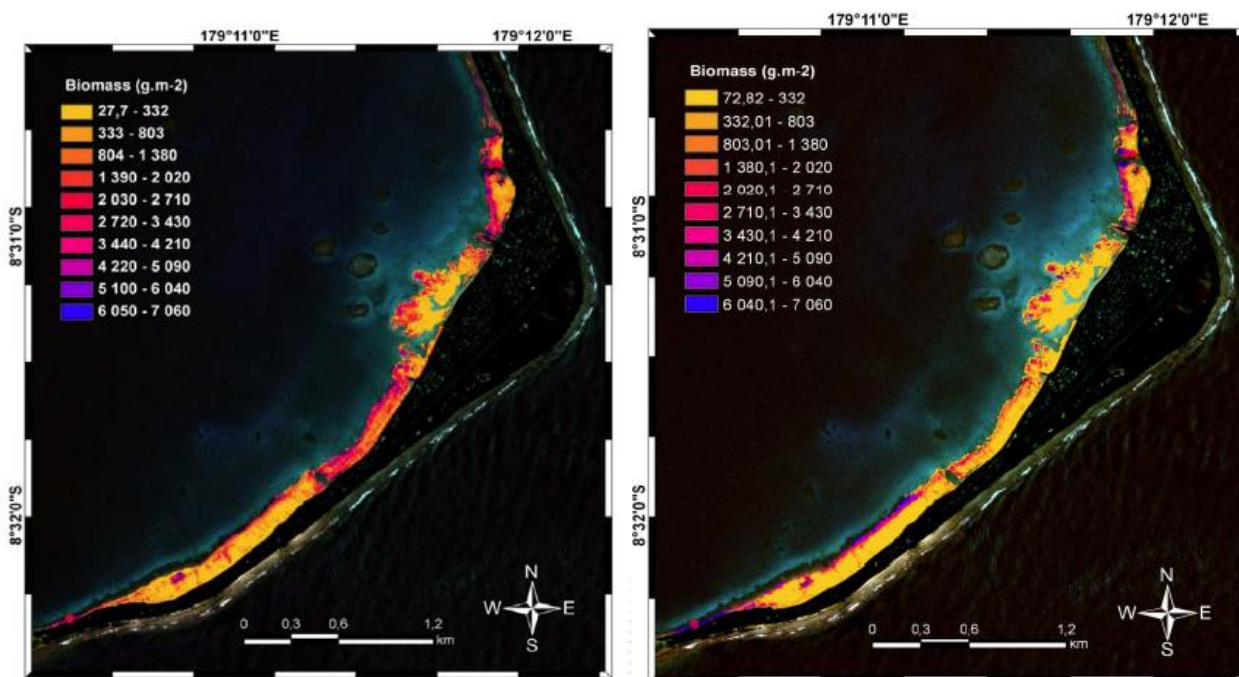
Mexican Coastal Watersheds



Project objective: Preserve the ecosystems in priority coastal areas of global importance in terms of biodiversity, and to protect them from the effects of climate change

EO contribution: Unique capability to provide homogeneous integrated monitoring and assessment from drainage network to coastal zone

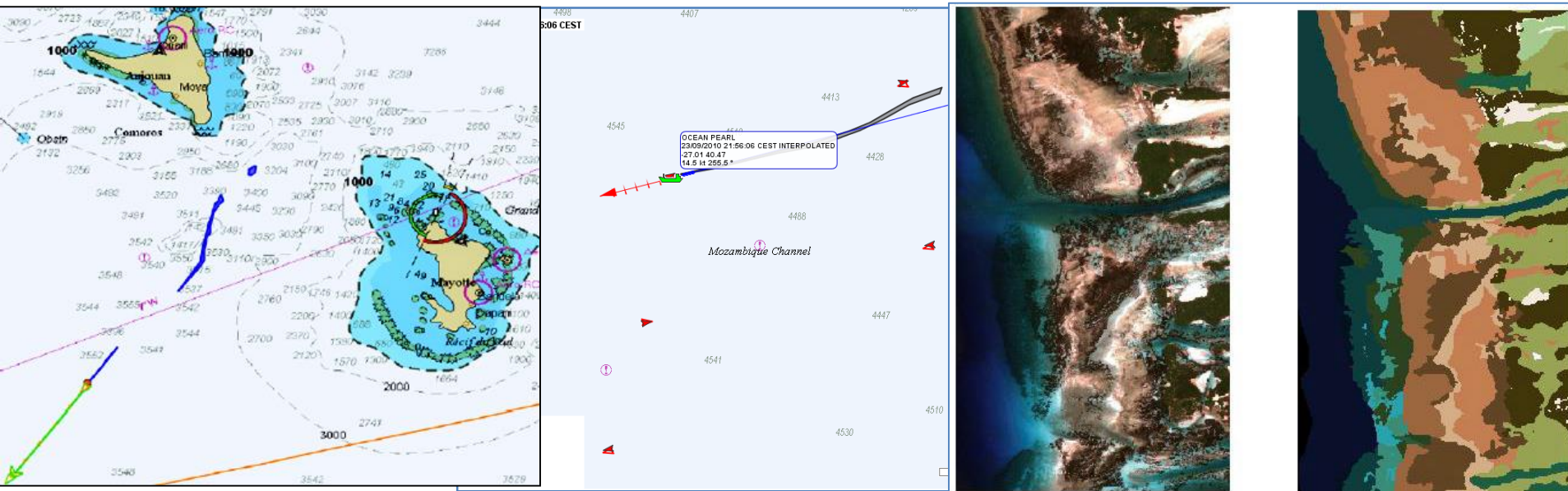
Analyzing coral degradation in Tuvalu



Project objective: Support Tuvalu in assessing pressures and drivers on coral reef degradation

EO contribution: Unique capability to combine oceanographic and land cover data to understand dynamics of coral degradation

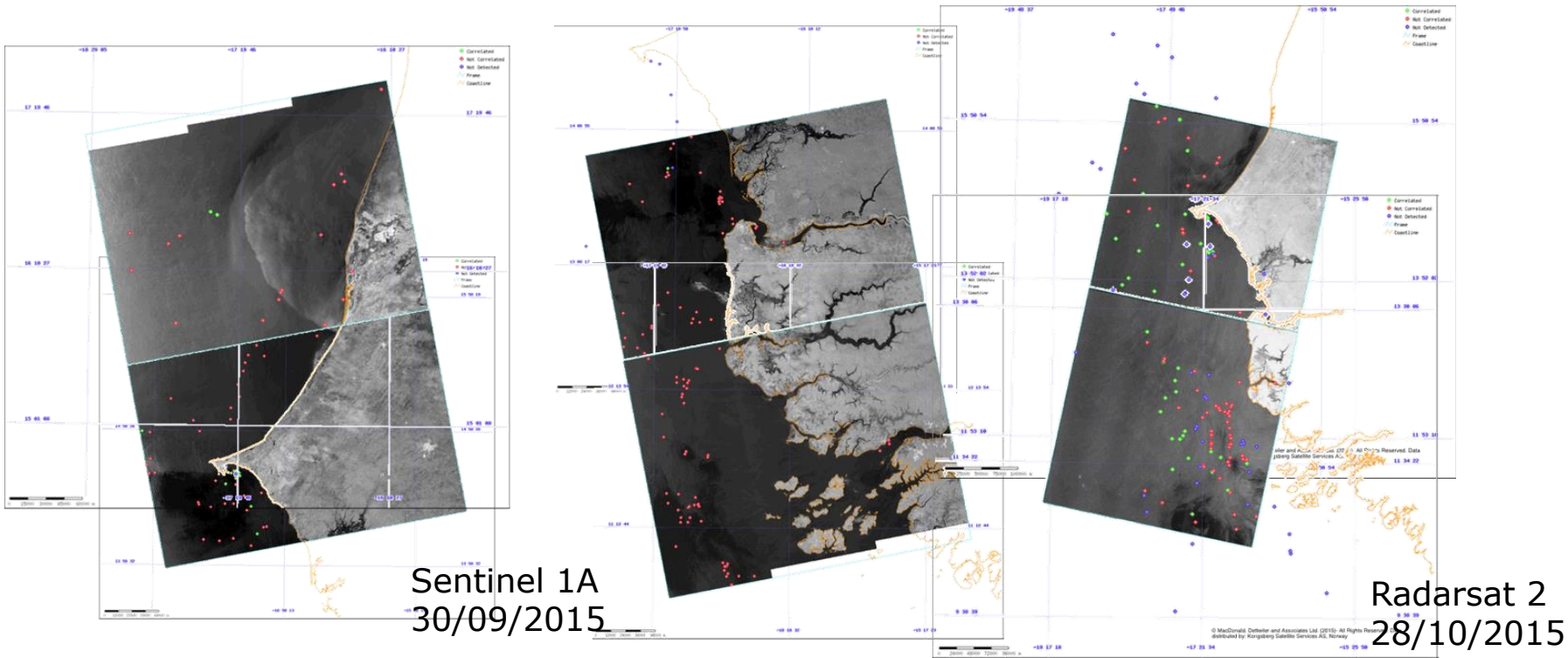
Western Indian Ocean Marine Highway



Project objective: Improve **safety of navigation** for commercial shipping south of Madagascar and **minimize associated environmental risks**

EO contribution: Unique and effective **demonstration of oil slick detection and polluter identification capability**, cost effective **monitoring of coral reef degradation status**

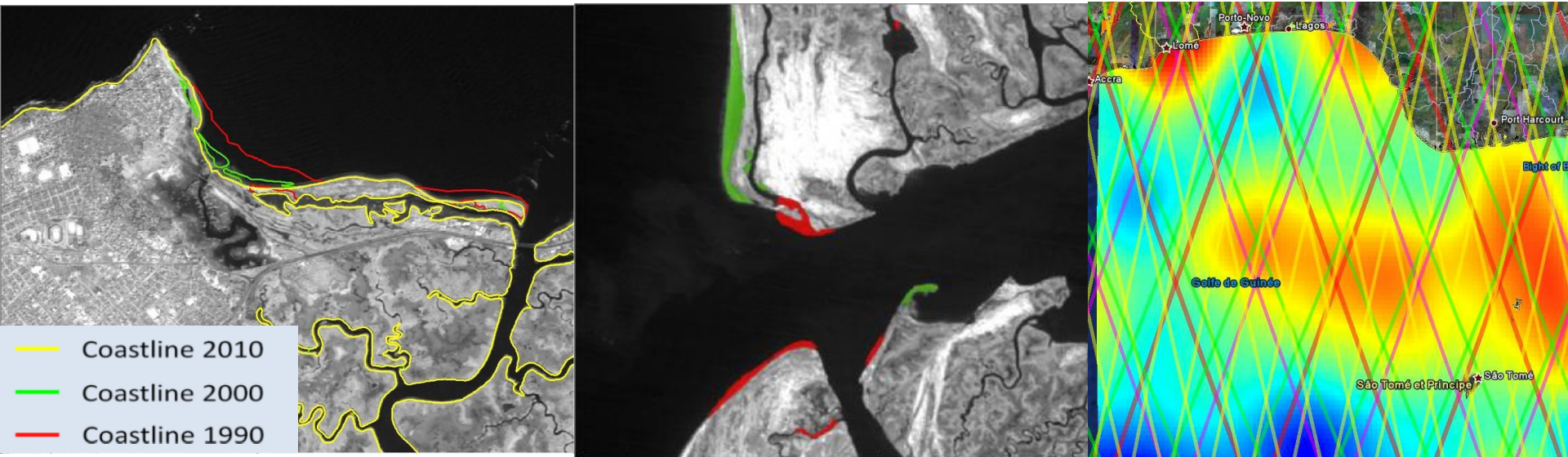
West Africa Regional Fisheries Program



Project objective: Improve management of West African EEZs and **reduce levels of IUU fishing**

EO contribution: Cost effective surveillance tool to **detect vessels engaged in fishing and integrate with transponder and license data**; additional capability to **detect pollution** highly appreciated

West African coastal erosion



Project objective: Conduct systematic assessment of **status and rate of change of coastal erosion** in West Africa to support **climate resilience planning**

EO contribution: Unique opportunity to combine oceanographic trends with land use change and coastline change information to **understand pressures and dynamics of coastal erosion**

Promoting geo-data literacy and use in **international development**



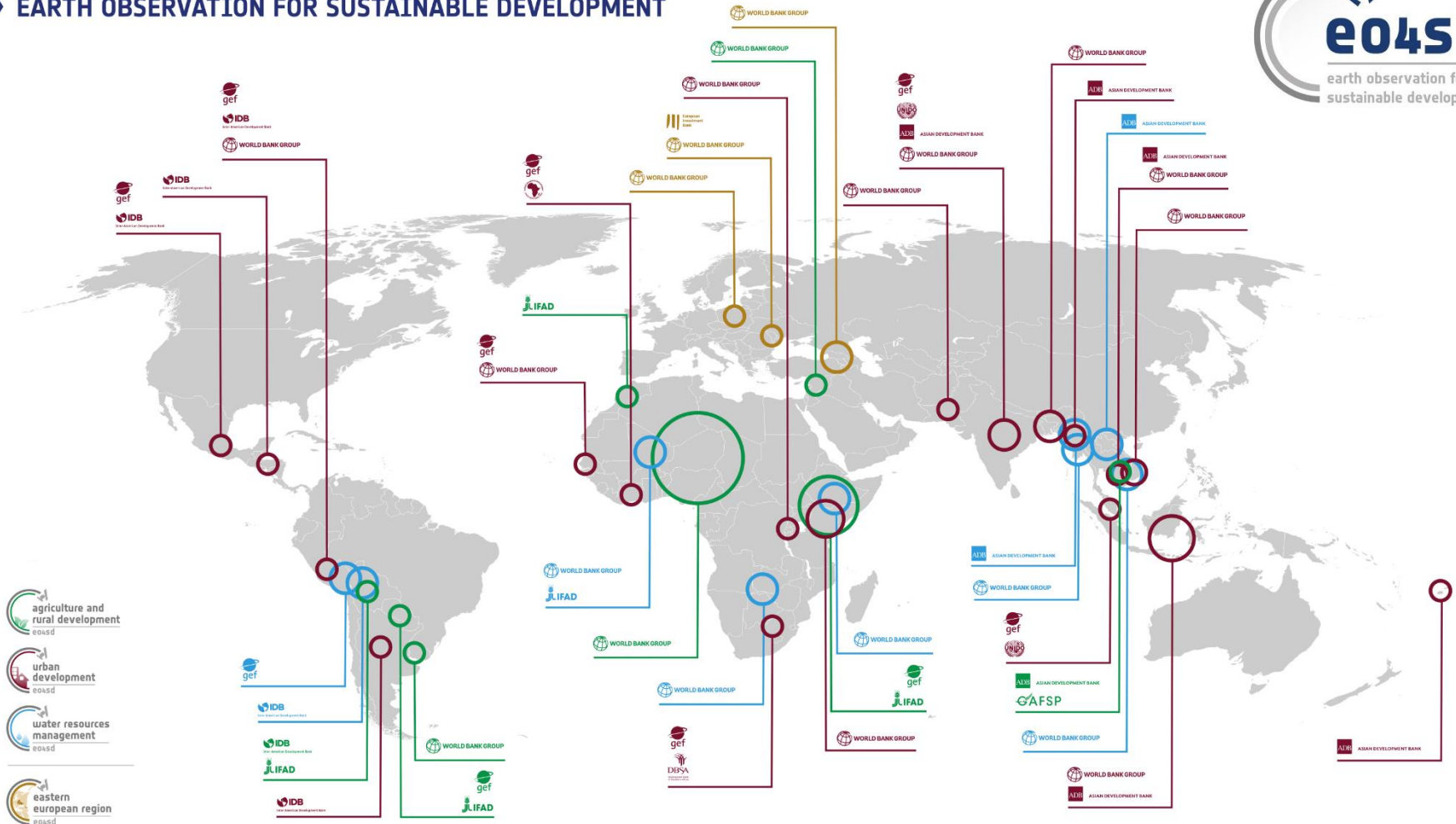
- **Mainstream & transfer EO** into operational working processes of international development – in countries & Multi-lateral Development Banks
- **EO as ‘best-practice’ source of environmental information** in Environmental Impact Assessment (EIA), Monitoring & Evaluation (M&E) methodologies
- **10 thematic priority areas:**
Urban, Agriculture, Water,
Disaster Risk Reduction, Fragile States,
Climate Resilience & Proofing, Marine,
Forest, Ecosystems, Energy



Promoting geo-data literacy and use in international development



→ EARTH OBSERVATION FOR SUSTAINABLE DEVELOPMENT





Earth Observation: A Necessity

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ESA/ESRIN – World Bank

Input from G. Campbell and P. Patil to this presentation is acknowledged and much appreciated