→ EARTH OBSERVATION FOR SUSTAINABLE DEVELOPMENT

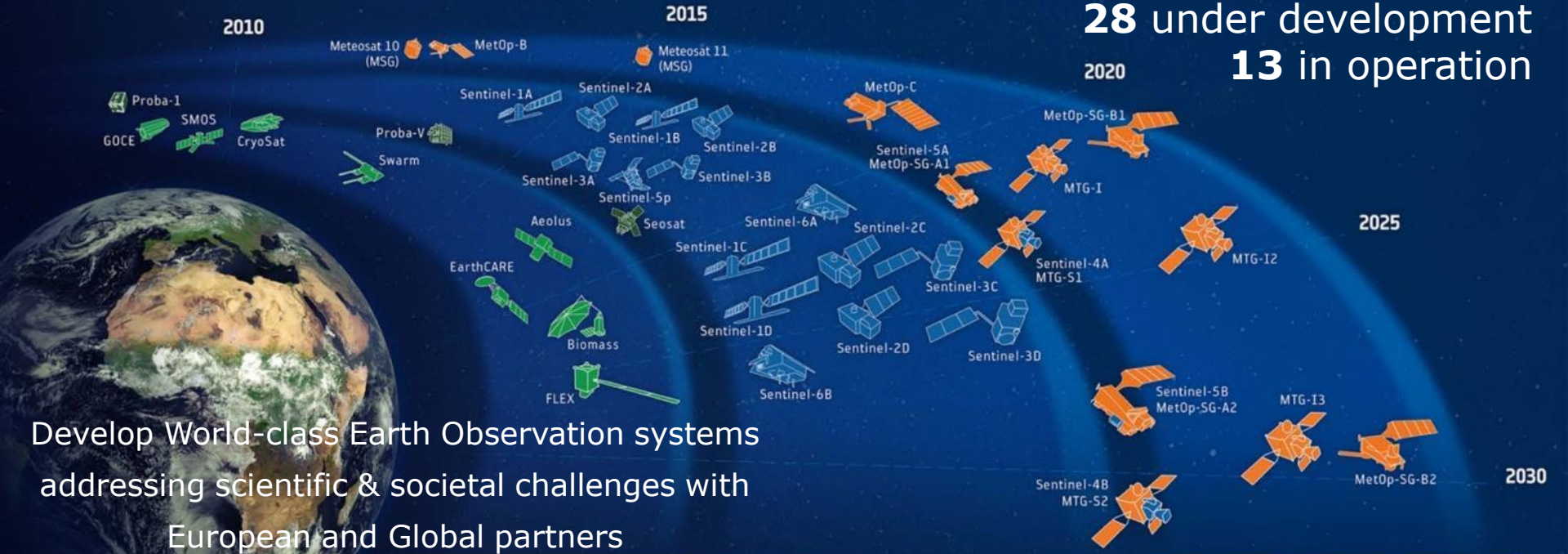
Climate Resilience

Earth Observation: the new frontier in climate resilience

climate resilience
eo4sd

ESA-DEVELOPED EARTH OBSERVATION MISSIONS

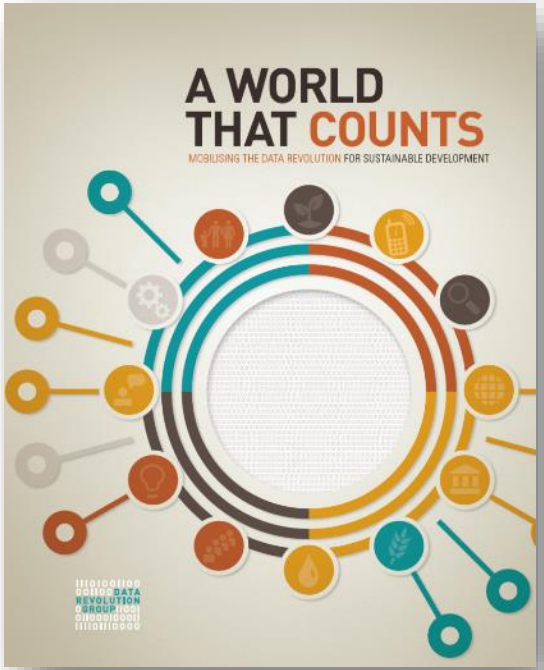
Satellites
28 under development
13 in operation



Develop World-class Earth Observation systems addressing scientific & societal challenges with European and Global partners

Science | **Copernicus** | **Meteorology**

Mobilizing the Data Revolution for Sust. Dev.



UN SG Independent Expert Advisory Group, 11/2014

*"**Data** and evidence are the foundation of development **policy** and effective program **implementation**. "*

Mahmoud Mohieldin, SVP, World Bank

Role of EO Data supporting this Revolution

SUSTAINABLE DEVELOPMENT GOAL 17
Strengthen the means of implementation and revitalize the global partnership for sustainable development

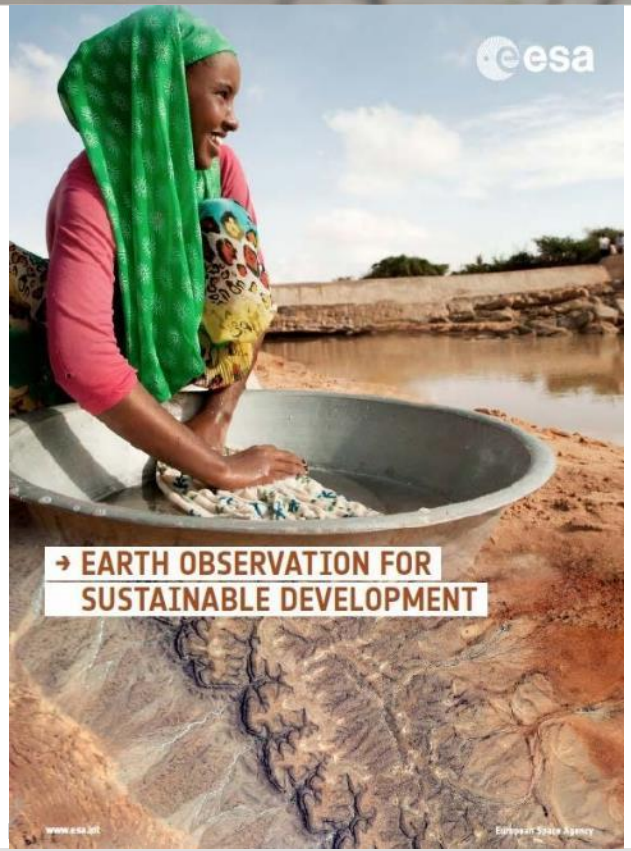
2030 Agenda for Sustainable Development, Article 76:

… We will promote transparent and accountable scaling-up of appropriate public-private cooperation to exploit the contribution to be made by a wide range of data, including Earth observation and geo-spatial information, while ensuring national ownership in supporting and tracking progress.

" ***Earth Observation*** *provides […] an unbiased, consistent and timely perspective that can inform* ***data-driven decision-making****. It therefore helps us to achieve our core mission at the World Bank […], and to* ***better serve our clients****."*

Laura Tuck, VP, World Bank

Earth Observation for Sustainable Development



- **Phase 1** (3 years):
  Consolidate Requirements, engage stakeholders (IFIs & Client States) via regional demonstrations of EO.

- **Phase 2** (5 years): **Mainstream & Transfer EO** into operational working processes & financing of development aid as 'best-practice' source of environmental information in Environmental Safeguards Systems (ESS) and Monitoring & Evaluation (M&E) methodologies, SDGs reporting.

Thematic priority areas:

2016: Agriculture, Urban Development, Water Resources,

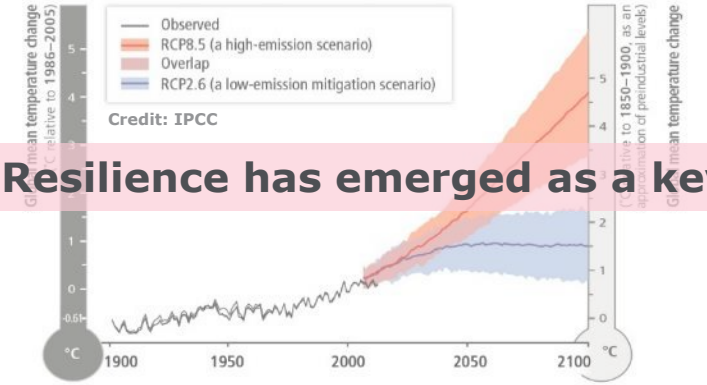
2018: Marine & Coastal, Disaster Risk Reduction, Fragile & Conflict States, **Climate Resilience**,

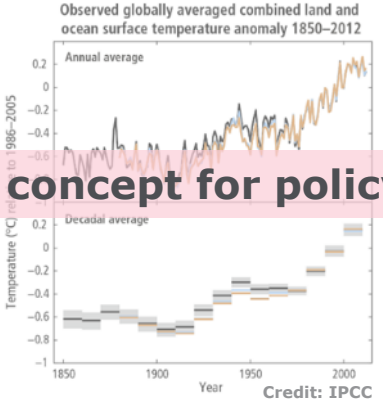
2019: Forestry

Climate resilience for sustainable development

Climate change

- One of the most important human-induced global changes
- Interactions between climate impacts and socio-economic systems
- Increasing pressure on the livelihoods of poor countries





Resilience has emerged as a key concept for policy and programme development.

EO4SD Climate Resilience cluster

Main aim: Demonstrate the potential for EO data to support climate resilient decision making at regional and national scales, in collaboration with key International Financial Institutions (IFIs)/ Multi-lateral Development Banks (MDBs) and their client states.

Highly experienced team with skills in **geospatial analysis, EO data, climate resilience and capacity building**

Phase 1: Strategic planning and stakeholder engagement (2018-2019)

Provision of customised climate services through:

- *EO-based service portfolio*: enhancing climate resilience in IFI/ MDB projects/programmes
- *EO-based climate information platform*: with specific applications for climate resilience

Phase 2: Service demonstration & transfer preparation (2019-2021)

How can EO-based information help foster climate resilience?

- Information plays a **crucial role in sustainable development and climate resilience**
- Proven its value across many sectors of society (e.g. agriculture, forestry, urban planning)

Monitoring climate-induced changes

Complement existing data

Consistent data streams

Targeting specific challenges

Hazard & Exposure information

Supplementing data gaps

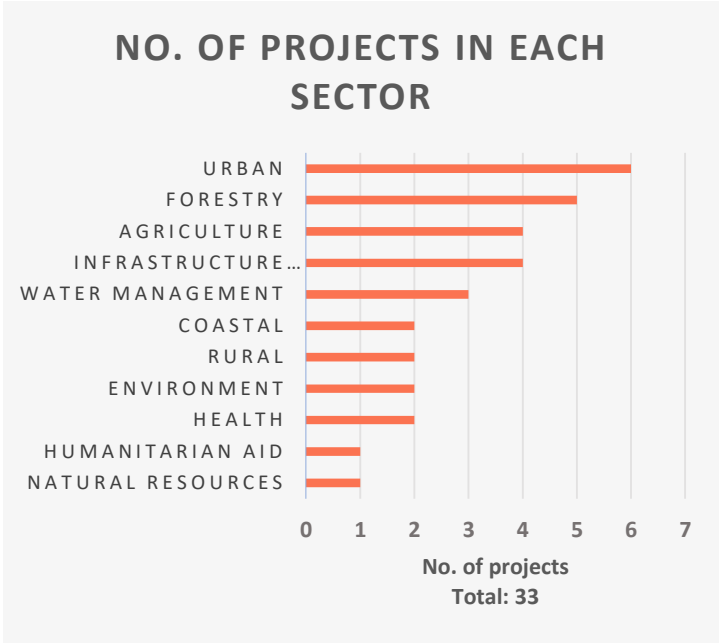
Evidence-based climate resilience decision making

Countries and regions of interest

After initial engagement with IFI/ MDBs, **33 development projects were proposed as candidates** for EO4SD CR, across 5 regions

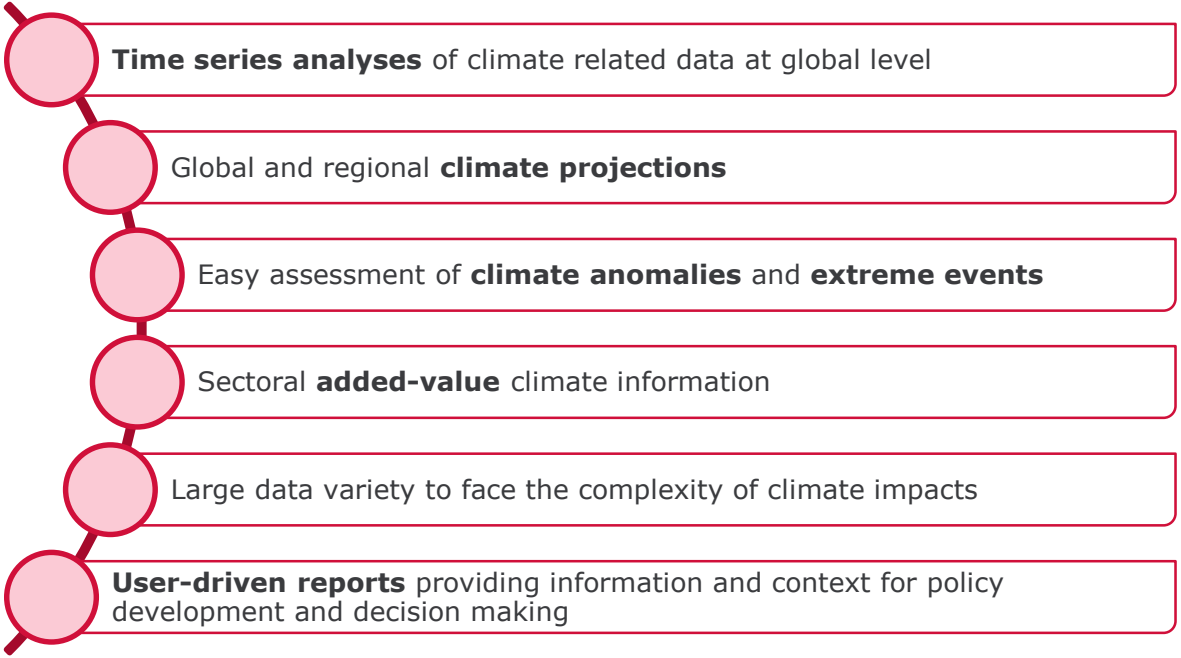
Currently working with: World Bank, International Finance Corporation (IFC), Asian Development Bank (ADB), Multilateral Investment Guarantee Agency (MIGA), Inter-American Development Bank (IDB), African Risk Capacity (ARC)

10 projects taken forward in Phase 1 based in technical feasibility, relevance to CR, timing, etc.



EO-based climate information platform

The project aims to develop an **EO-based integrated platform** for the **provision of climate services**, including the screening of **climate indicators** and **assessment of climate change risks**.



Case Study in the Atlantic

Case 1: Monrovia

Collaboration with the **World Bank**: Monrovia Integrated Development Project & Greater Monrovia Urban Review Project

Case 1: Monrovia
What are the climate-related challenges?

Climate risk analysis conducted for Monrovia in support to World Bank projects: Monrovia Integrated Development Project & Greater Monrovia Urban Review Project

1. **Analysis of socioeconomic challenges**
2. **Analysis of climate hazards and impacts** based on Climate Projections (CMIP5)
3. **Identification of climate adaptation solutions**

World Bank project objectives:

- Identify pragmatic spatially integrated, and location specific interventions that contribute to service delivery, improved welfare, and the creation of jobs.
- Identify policies that can help Monrovia be better prepared to absorb urban growth in a context of extreme poverty/informality, fragility and increasing risks from climate change

Climate risks in Monrovia (I)

Socioeconomic challenges include extreme poverty, high population density, informal settlements, under-developed infrastructure & limited access to basic services

Projections due to climate change:

- Sea level rise (SLR) of 0.13-0.56 m by the 2090s.
- Average daily max temperatures likely to increase by +1.1°C (by 2035).
- Average daily rainfall: -14.6% (April) to +59.2% (December) (by 2035).
- Water stress projected to increase by 2.8x or greater (by 2035).

Source: OpenDRI.org

Climate risks in Monrovia (II)

Socioeconomic challenges combined with climate change pose risks to Monrovia:

- Since 2013 sea level rise and coastal erosion displaced 6,500+ people & destroyed 800 houses (in West Point)
- Estimated additional 30,000 families at risk of coastal erosion

Employing a mix of EO, climate projections and socioeconomic data can help integrate climate resilience into investments under the Greater Monrovia Urban Review project

Section of Doe Community flooded year round

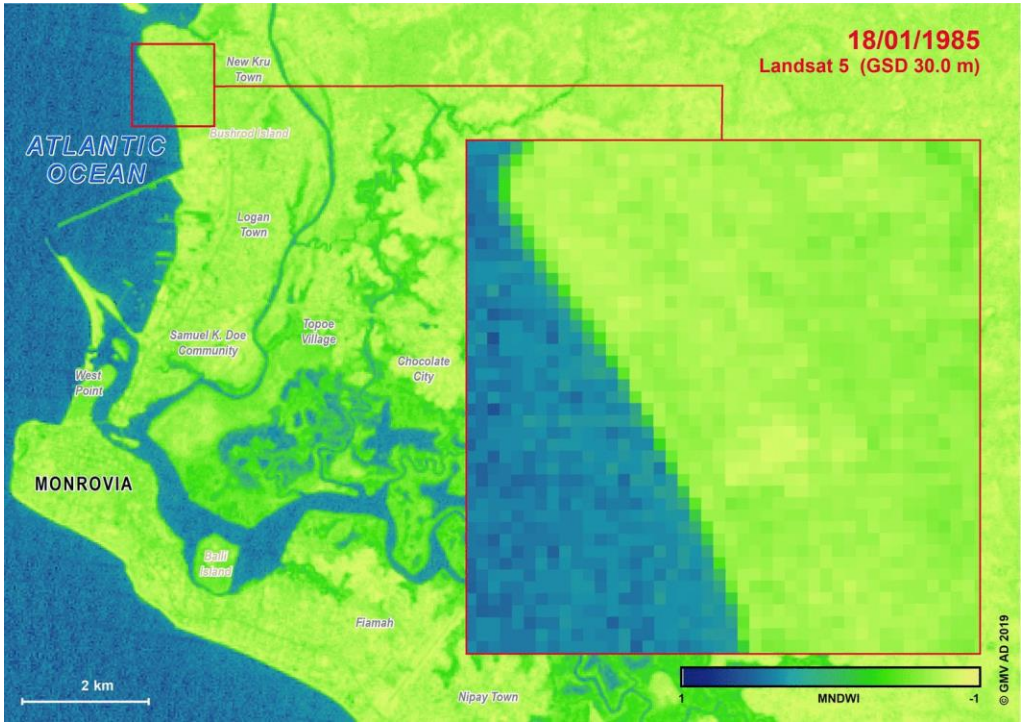
Source: OpenDRI.org

EO-based climate adaptation solutions

Flood risk model

First components identified for development of flood risk model for Greater Monrovia

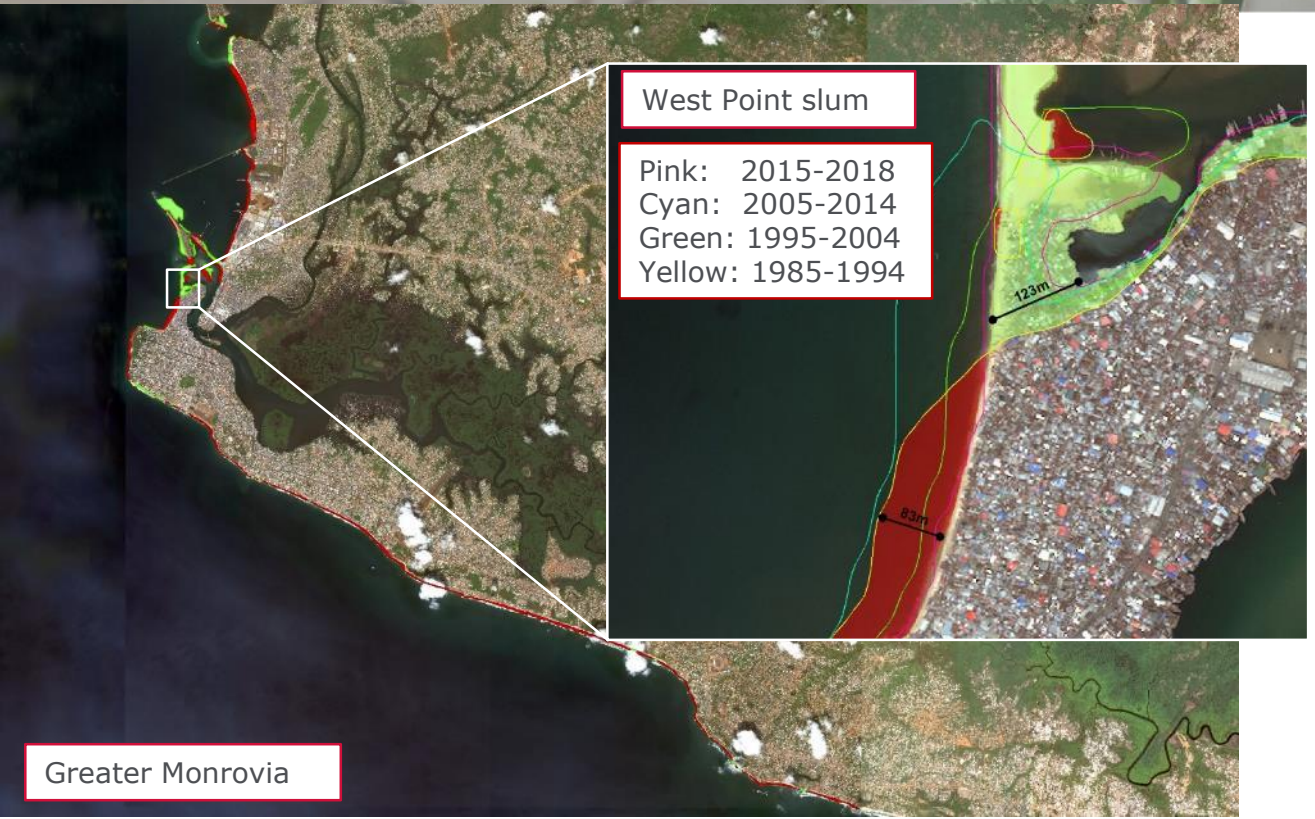
- Impact of sea level rise along the coastline (coastal erosion)
- Impact of coastal flooding due to sea level rise



Shoreline erosion and change detection

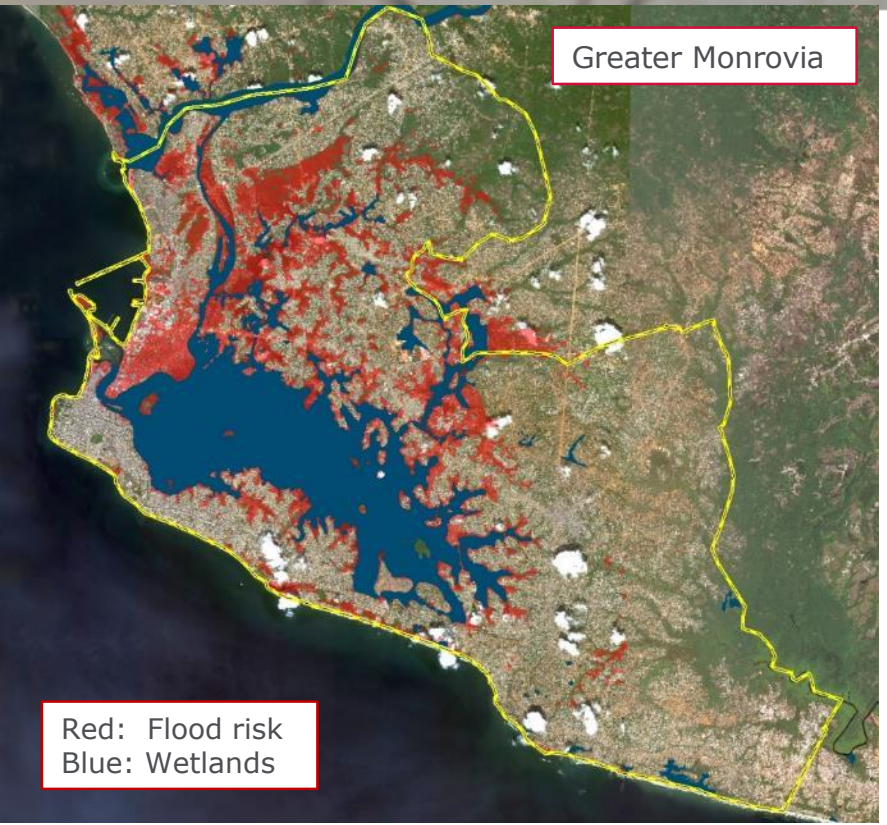
- 41km shoreline evolution monitored through a 34 year satellite series, co-registering and analysing Landsat, Sentinel-2 and Worlview-3 scenes
- Natural water flow (waves, heavy swell, tides) considered by comparing water/land pixels in images from short time periods
- Land loss area estimated from 1984 to 2019 is 0.8 km^2

Shoreline erosion and change detection

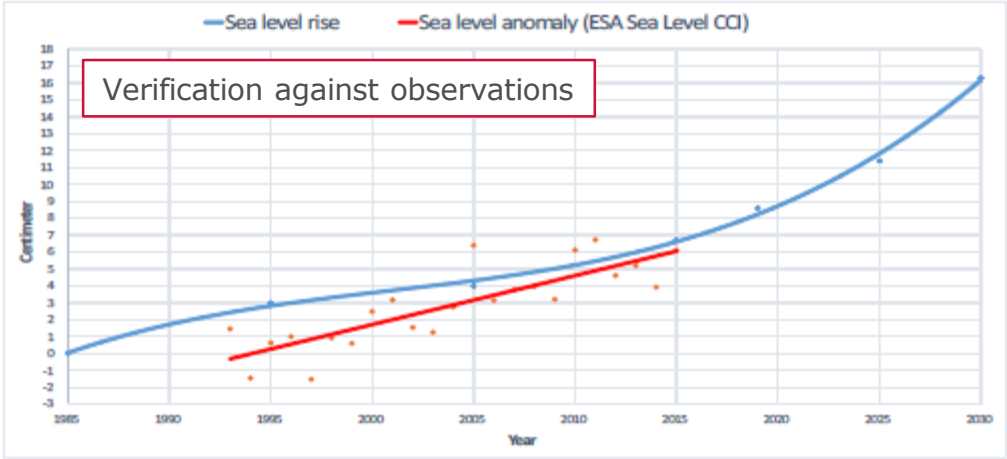


- Dwellings built in 2010, favoured by land gains due to the shoreline and river dynamics
- Mapping of the shoreline is dependent on availability of imagery. The low revisit time (16 days) of first Landsat satellites and the persistent cloud decks over Monrovia makes the time period used to estimate the shoreline in 80's and 90's of 10 years

Coastal flood risk analysis



- Sea level rise generally leads to erosion and causes the shoreline to retreat landwards
- This analysis estimates sea level increase from the shoreline retreat of the last 34 years
- Sea level rise trend projected to 2030 and mapped against a DTM to identify regions at risk of being flooded



Coastal flood risk analysis

- Potential of flood events in Clara Town is combined with the population exposure obtained from the population density (census 2007) to estimate the flood risk
- Risk severity is depicted by red gradient
- DTM used might be too coarse for estimations over coastal-flat-low-lying sites
- Knowledge of hydrological processes of the catchment areas is necessary to ascertain the extent of floods more accurately

Outlook

Flood risk modelling will be enhanced, including not only sea level rise hazard but also integrating a hydrological model, climate projections and socioeconomic data in the analysis, to better identify climate risks.

On-going work:

- Integration of the projected coastal erosion;
- Assessment of vulnerability by the analysis of critical infrastructures and assets;
- Integration of the land subsidence and analysis of the projected evolution;
- Integration of high resolution DTM and hydrological model; and
- Integration of the bathymetry map

Sea-level rise and shoreline retreat are threats for worldwide coastal regions

EO can support the implementation of **climate adaptation solutions** for regions affected by a large variety of **climate hazards**

Capacity building

- **Capacity building** to support operational institutional users
- Aims towards **self-sustainability of operations** that can be autonomously executed by local, regional and national bodies
- To be provided at two levels: to identified actors in CC (e.g. NMHSs) and to the IFIs to prepare both of them for **long-term exploitation of EO-based services** addressing climate adaptation solutions
- Provides the means to **autonomously conceive new services and products** customised to their needs

Thank you for your attention!

For more information:

Project lead: Carlos Domenech | cdomenech@gmv.com

Website: http://eo4sd-climate.gmv.com/