climate change initiative

CLIMATE–HEALTH ADAPTATION THROUGH NEW GENERATION EARTH OBSERVATIONS (CHANGE)

BREAKOUT GROUP

SubTitle

Project Objectives

- **ITT**: CLIMATE-SPACE: CLIMATE CHANGE AND HEALTH ACTIVITY
- **Timeframe**: Sept 2025 – Sept 2028
- **Goal**: CHANGE integrates satellite-derived climate data with health and socio-demographic information to understand how climate hazards (e.g., floods, droughts, heatwaves, ENSO variability) impacts health, delivering a Climate & Health Adaptation Roadmap.
- **Policy:** The project supports the UNFCCC Paris Agreement, helping address knowledge gaps identified by the IPCC, WHO, and the Lancet Countdown, and contributes scientific evidence for climate-resilient health policies and adaptation planning.
- **Website**: https://climate.esa.int/es/supporting-the-paris-agreement/CHANGE/

Overview of the approach

- **WP 100: Climate & Health Assessment Report**
  - Conduct a State-of-the-Art (SOTA) analysis, assess climate-related health impacts, EO role, identify gaps, and define scientific and technical requirements.

- **WP 200: Climate & Health Case Study and Risk Assessment**
  - Six regional use cases (UK, South Sudan, Sudan, Sri Lanka, Brazil, …) to quantify climate-related health risks

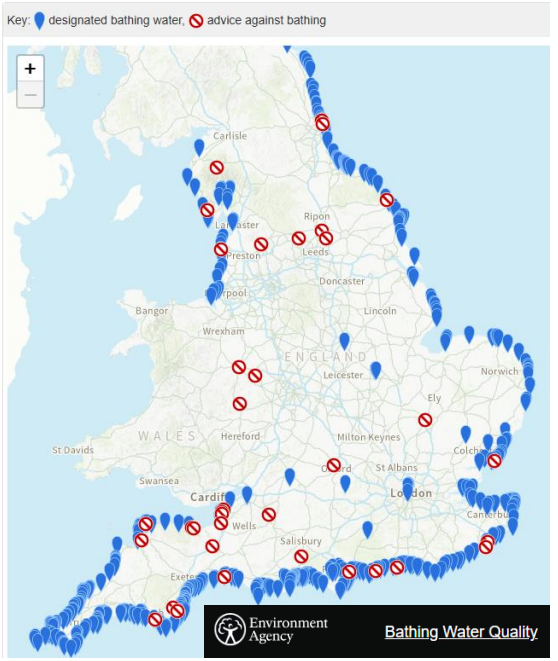
- **WP 300: Health Burden Quantification**
  - Estimation of health burden from climate change and social determinants: quantification health outcome in the real world & quantification health outcome in the counterfactual world

- **WP 400: Climate & Health Adaptation and Mitigation Roadmap**
  - Development of a roadmap showing how EO data supports adaptation and mitigation planning.

Brazil and UK

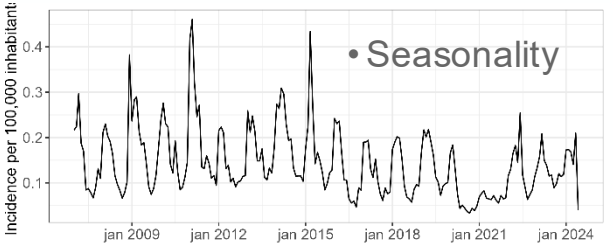
Climate change and E. Coli health risks in the UK

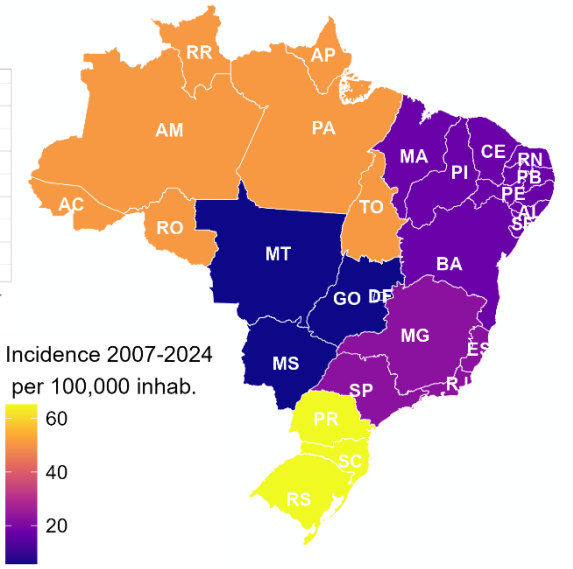
- E. coli outbreaks in the UK summer season pose a significant risk to public health.
- Developing predictive models for contamination risk, leveraging EO data including precipitation, land use, temperature and chlorophyll-a.
- Provision of health risk assessments, with potential to inform climate health risk.
- Improved forecasting of E. coli contamination will aid regulatory compliance, and mitigation strategies.



Climate change and leptospirosis health risks in Brazil

- Leptospirosis outbreaks are strongly associated with flooding and extreme rainfall, particularly in areas with poor sanitation.
- Analysis of leptospirosis incidence (2007–2024), spatial patterns, and key environmental and climatic drivers to identify vulnerable areas.



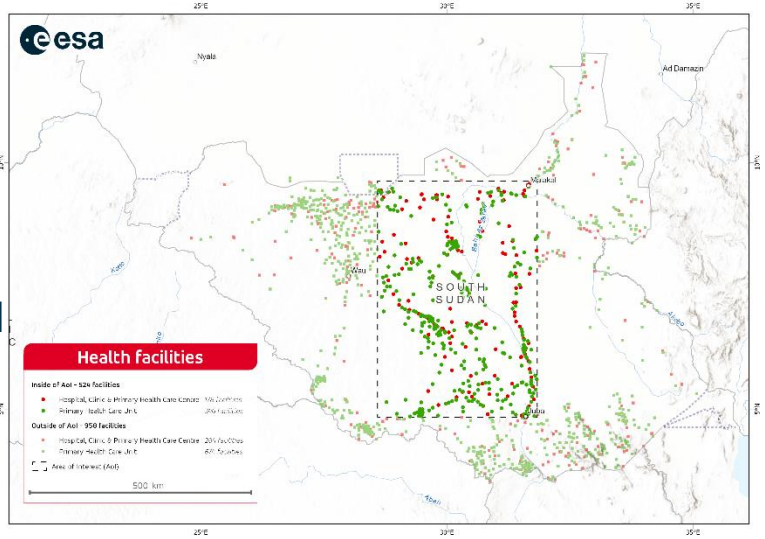


- Accumulated incidence of leptospirosis in Brazil indicates higher rates in the South and North regions.

Sudan and South Sudan

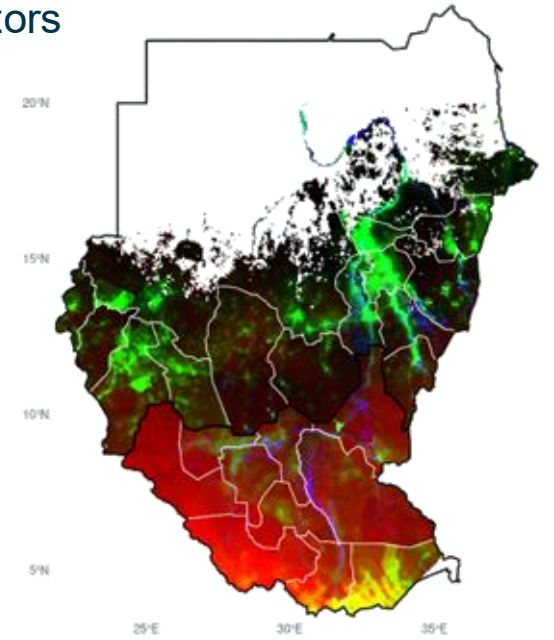
Flooding and health care service disruption in South Sudan

- Intensification of floods has displaced over 1.4 million people in South Sudan as of late 2024 and severely disrupted healthcare services.
- Quantify the impact of flooding on health infrastructures, vaccination campaigns, and healthcare services, and attribute disruptions to climate change.
- For each facility, events characterized by VIIRS and SWOT.
- Series modeled by Monte Carlo to assess vulnerability.



From EO Suitability to Malaria Risk Mapping (Sudan & South Sudan)

- Sudan is one of the most malaria-affected countries in the WHO Eastern Mediterranean Region (EMR), holding the second highest burden after Pakistan.
- Integration of ESA CCI climate variables with malaria data and socio-demographic indicators
- Transition toward dynamic early warning in collaboration with WHO

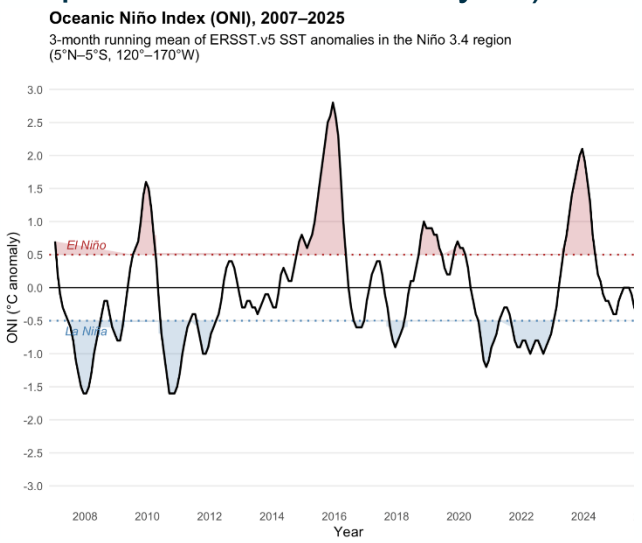


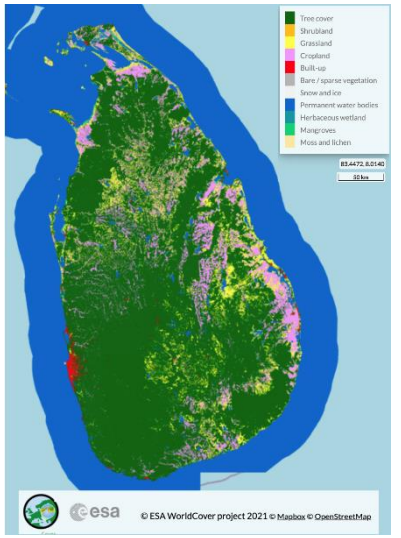
RGB composite of malaria incidence (R), population density (G) and flood occurrence (B).

Sri Lanka and global pollution

ENSO-Driven Climate Variability and Dengue & Leptospirosis in Sri Lanka

- El Niño episodes elevate leptospirosis/dengue risk; effects modulated by land cover and flooding,
- Quantify non-linear, lagged ENSO–disease associations across Sri Lankan districts
- Two-stage hierarchical DLNMs (district-specific models pooled via meta-analysis).

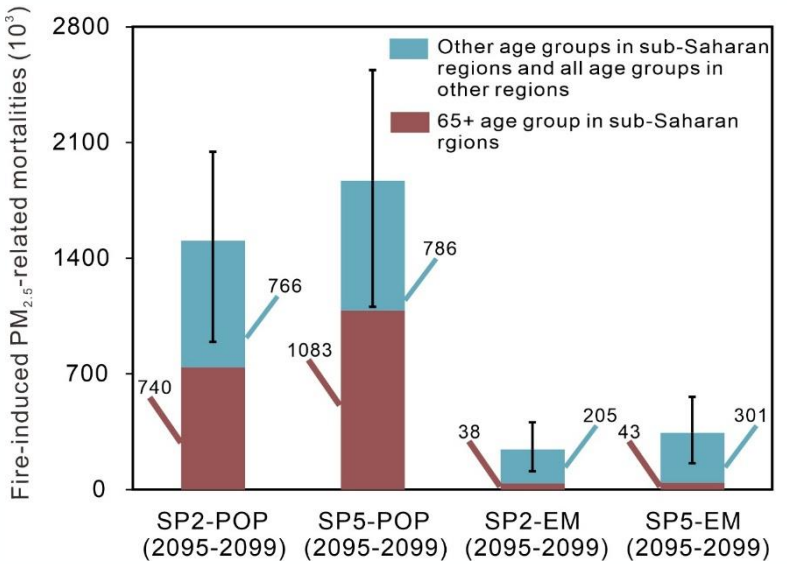




Probabilistic modelling of wildfire-related health threats under future warming

- Fire emissions increased in boreal regions from forest fires and decreased in Global South from grassland fires.
- Long range transport of PM2.5 exposes populations to degraded air quality.
- Future changes remain unknown.

Global premature deaths attributed to PM2.5 exposure resulting from fire emissions during end of the 21st century based on different sensitivity experiments for future PM2.5-related premature mortality assessment



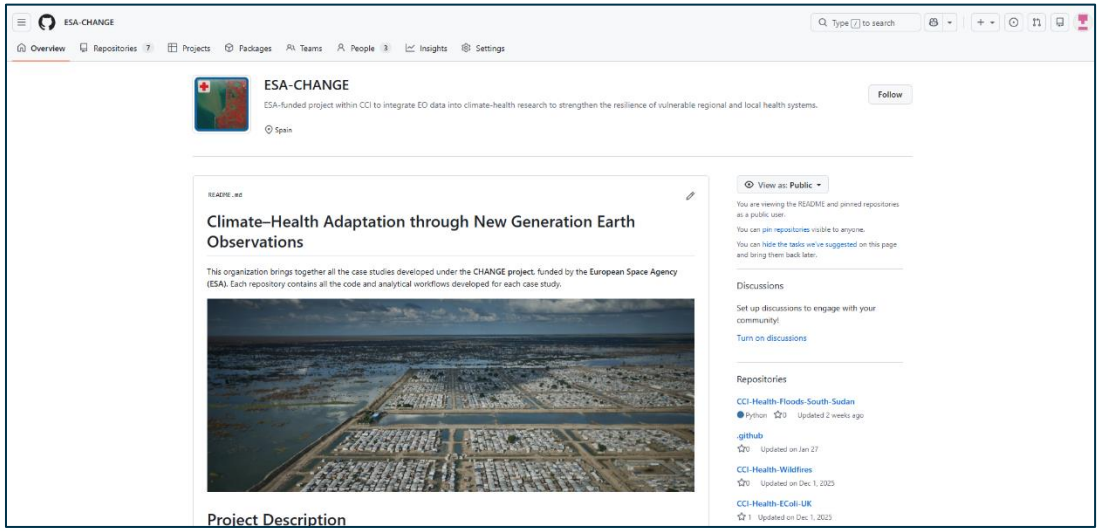
ECVs being used

- **The following CCI ECVs are being used across the different use cases:**
  - CCI SST (*leptospirosis, dengue, E. Coli*)
  - CCI LST (*leptospirosis*)
  - CCI Vegetation parameter (*malaria*)
  - CCI Land Cover (*flood-related health service disruption, malaria, E. Coli*)
  - CCI Ocean Colour (*E. Coli*)
  - CCI Fire (*fire pollutants*)
- **Wishlist**
  - Need for groundwater, humidity, precipitation, flood and surface temperature ECVs.
  - Global coverage for land cover time series products with higher-resolution would improve many climate impact applications and infectious disease modelling.
  - Development and standardisation of teleconnection indicators such as ONI, NAO, and other ENSO-related indices. Many scientific studies already used ENSO as an early warning signal for climate-sensitive diseases,

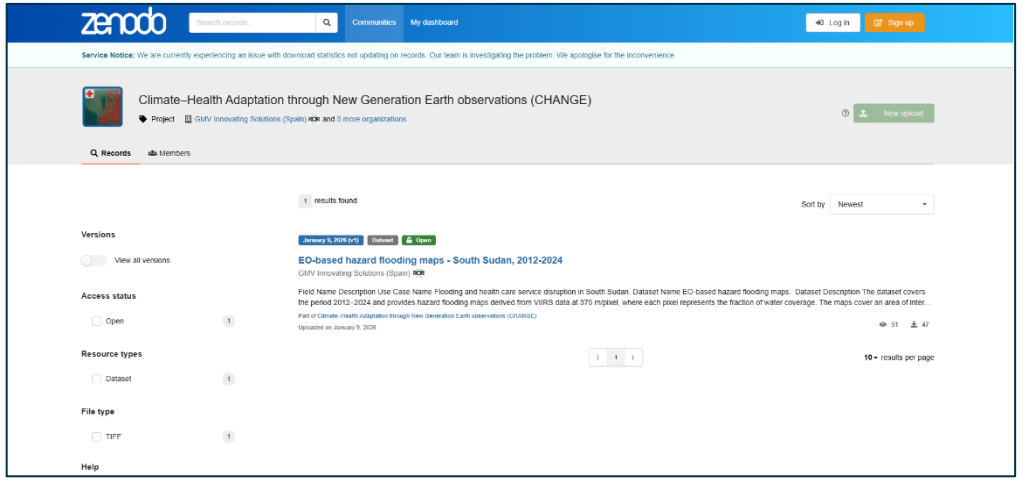
- **Long time series and global coverage**
- **Consistency and standardisation**
- **Relevance to environmental drivers of health**

Results & relevance to the CCI community

- An open-source **GitHub Organization** to host all open-source content developed within the CHANGE project.
- https://github.com/ESA-CHANGE



- **Public Zenodo Community** to host the datasets generated throughout the project.
- https://zenodo.org/communities/esa-change



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