Prague
CREDIT: Airbus DS (2022), processed by ESA

ADAPTATION FROM ABOVE:

innovative approaches to adaptation and disaster risk reduction using earth observations

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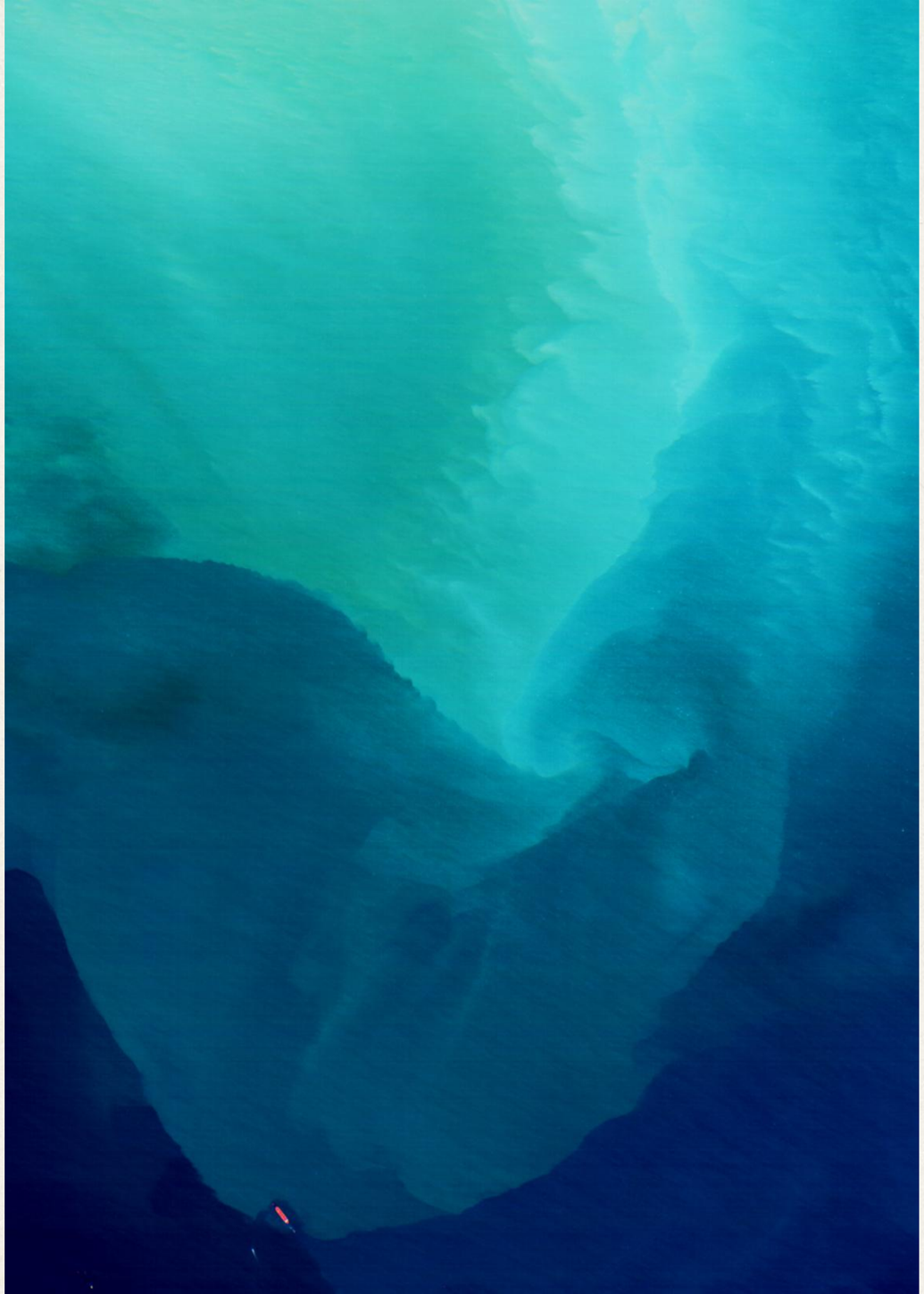
01 Adaptation is progressing but our understanding of its implementation remains limited.

02 Earth Observations provide key global data often over long timeframes.

03 EO has huge indirect value for adaptation: it provides essential inputs into reanalyses (such as ERA6 = 6th generation atmospheric reanalysis of the global climate), one of the most widely used data sources for adaptation



Overview

EO can provide unparalleled data insights on climate related processes

Image: Kuwaiti Waters

Overview

01 Risk Assessment and Mapping: e.g vulnerable areas on the coasts

02 Tracking habitat loss and/or gain, heat in cities, drought monitoring, crop optimisation, flooding, wildfires

03 Supporting different global goals e.g Global Goal on Adaptation in the Paris Agreement

EO as *one line of evidence*, need often also other type of data for climate adaptation

Not only about hazards but also exposure and vulnerability

Image: Star Cities
Credit: Airbus DS (2023) for Bourtange and Neuf-Brisach; GEOSAT (2023, 2021) for Palmanova and Almeida; processed by ESA

Global Goal on Adaptation

7 targets

COP28 decision

(a) Significantly reducing climate-induced water scarcity and enhancing climate resilience to water-related hazards towards a climate-resilient water supply, climate-resilient sanitation and towards access to safe and affordable potable water for all;

(b) Attaining climate-resilient food and agricultural production and supply and distribution of food, as well as increasing sustainable and regenerative production and equitable access to adequate food and nutrition for all;

(c) Attaining resilience against climate change related health impacts, promoting climate-resilient health services, and significantly reducing climate-related morbidity and mortality, particularly in the most vulnerable communities;

(d) Reducing climate impacts on ecosystems and biodiversity, and accelerating the use of ecosystem-based adaptation and nature-based solutions, including through their management, enhancement, restoration and conservation and the protection of terrestrial, inland water, mountain, marine and coastal ecosystems;

(e) Increasing the resilience of infrastructure and human settlements to climate change impacts to ensure basic and continuous essential services for all, and minimizing climate-related impacts on infrastructure and human settlements;

(f) Substantially reducing the adverse effects of climate change on poverty eradication and livelihoods, in particular by promoting the use of adaptive social protection measures for all;

(g) Protecting cultural heritage from the impacts of climate-related risks by developing adaptive strategies for preserving cultural practices and heritage sites and by designing climate-resilient infrastructure, guided by traditional knowledge, Indigenous Peoples' knowledge and local knowledge systems;

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Earth observations for climate adaptation: tracking progress towards the Global Goal on Adaptation through satellite-derived indicators

Sarah Connors ✉, Rochelle Schneider, Johanna Nalau, Michelle Hawkins, Sofia Ferdini, Ying Wang, Michael Rast, Kristin Aunan, Jean-Philippe Aurambout, Mark Dowell, Claire Dufau, Caroline Gevaert, Matti Goldberg, Aaron Golden, Andrew Kruczkiewicz, Thelma Krug, Timo Leiter, Tatiana Loboda, Cromwel Lukorito, Antonio Moreno-Rodenas, Naledzani Mudau, Brian O'Connor, Ana Oliveira, Louis Reymondin, ... Ambrosiol Yobánolo del Rea + Show authors

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Earth Observation can support the Adaptation Process

1. Impacts and Risk Assessment

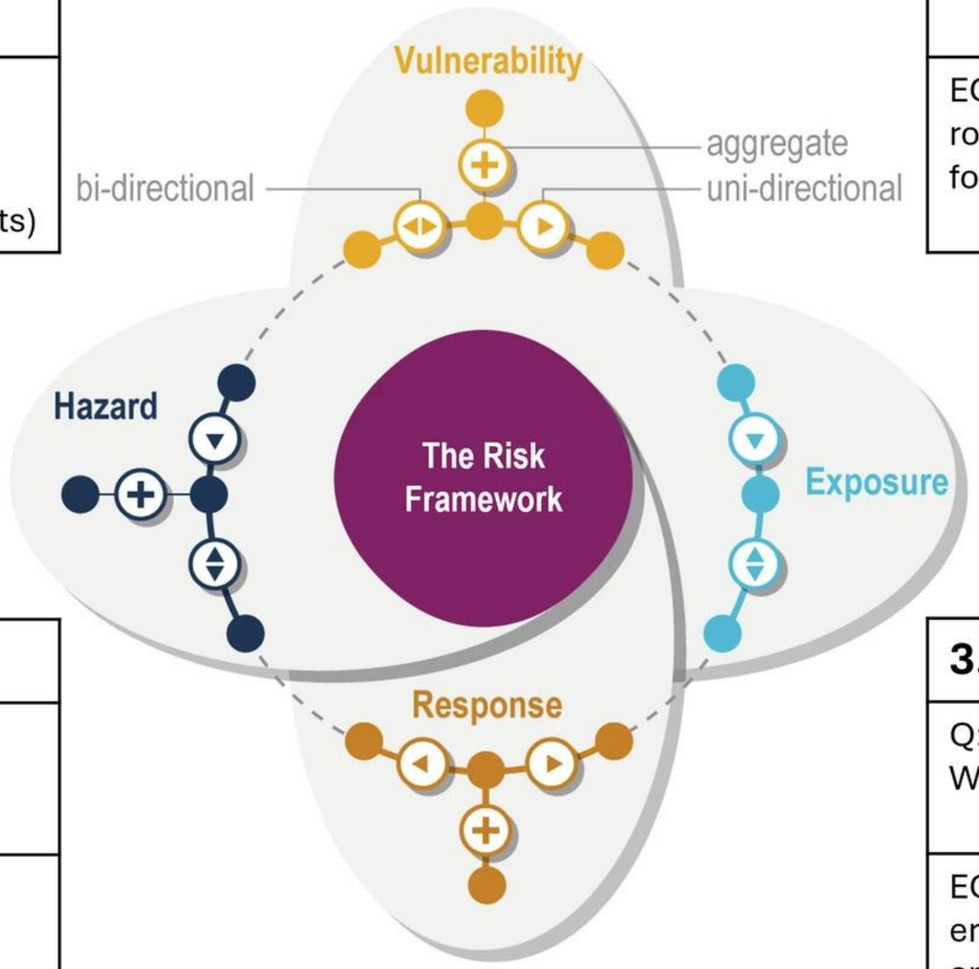
Q: What impacts are happening? How are **Hazards**, **Vulnerability** & **Exposure** changing? What are the risks? How will this change in the future?

EO examples: **Hazards** – Coastal erosion; wildfire area burnt; urban heat island index. **Vulnerability** & **Exposure** – land cover fraction (i.e., flood land, informal settlements)

2. Planning

Q: What **responses** should be implemented?
Where?
When?

EO examples: Land area suitable for new crop rotations / afforestation; urban areas suitable for solar / greening



4. Monitoring and Evaluation

Q: What effects have these adaptation **responses** had?

EO examples: Outcome indicators showing avoided impacts (i.e., crop yield change); reduction in impacts (i.e., flooded area reduced)

3. Implementation

Q: What **responses** have been taken?
Where?

EO examples: Area protected from coastal erosion; % of rooftops containing green roofs; area greened / vegetation index

International Space Science Institute workshop 2025

“Opening Up Earth Observations for Climate Adaptation”

How can EO be turned into actionable locally relevant information?

How do we address epistemic injustices?

usability, context, trust, local knowledge, and new approaches

The Dhun Life Project

Dhun Life is a groundbreaking sustainable urban development project near Jaipur, India, transforming degraded land into a thriving eco-community.

Utilising thermal intelligence to track land surface temperature patterns; applicable to understanding current adaptation outcomes for nature-based solutions

https://urban-resilience.constellr.com

Real-time satellite-based wildfire detection system (Sweden)

- https://climate-adapt.eea.europa.eu/en/mission/solutions/mission-stories-inactive/a-real-time-forest-fire-detection-system-story32

Swedish Civil Contingencies Agency (MSB) and
Swedish Meteorological and Hydrological Institute (SMHI
Visible Infrared Imaging Radiometer Suite (VIIRS) instrument on polar-orbiting satellites to detect vegetation fires; detects 90% of fires

https://www.iceye.com/solutions/government

Real-time flood and bushfire data

Synthetic Aperture Radar (SAR) satellites

Australian Partnership: ICEYE, Boustead Geospatial and Esri Australia

Flood Rapid Intelligence, Flood Insights, and Bushfire Insights as ready-to-use map layers within the ArcGIS platform.

Current projects and activities

The Committee of Earth Observation Satellites is developing a EO for Climate Adaptation Handbook 2026

EU-funded UNDERPIN Project (oUtcome iNDicators to mEasuRe Progress on climate resIlieNce) 2025-2028
Earth Observation data, citizen science & AI tools

European Space Agency (ESA) grant call 2025 on climate adaptation indicators (projects to be announced)

Partnership: Copernicus Climate Change Service (C3S), the Copernicus Atmosphere Monitoring Service (CAMS) with European Investment Bank: Climate Risk Assessment Tool, data integration for climate adaptation

Image: Lake District, UK
Credit: modified Copernicus Sentinel data (2025), processed by ESA

What does the adaptation community want to measure?

How would change manifest/be seen?

How do we know adaptation is progressing?

Can we see adaptive capacity from space?

What decisions need to have what type of data?

Image credit:
Midjourney