

Enhancing Earth Observation to Track Progress Towards the Global Goal on Adaptation



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1 What is the Global Goal on Adaptation (GGA)?

The Paris Agreement's Article 7.1 outlines the GGA of "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal" [1].

The GGA Framework was agreed in COP28 and comprises 11 global targets. 4 targets focus on the policy cycle (Target 10a-d, Figure 1) and the remaining focus on specific themes / sectors: Water (9a), Food & Agriculture (9b), Health (9c), Ecosystems and Biodiversity (9d), Infrastructure and Human Settlements (9e), Poverty eradication (9f), and Cultural heritage (9g). [2]. Governments are developing **adaptation indicators** to track progress towards the GGA framework. Selected technical experts have compiled a list of 110 indicators [4], which will be negotiated and agreed by Parties at COP30 [5].

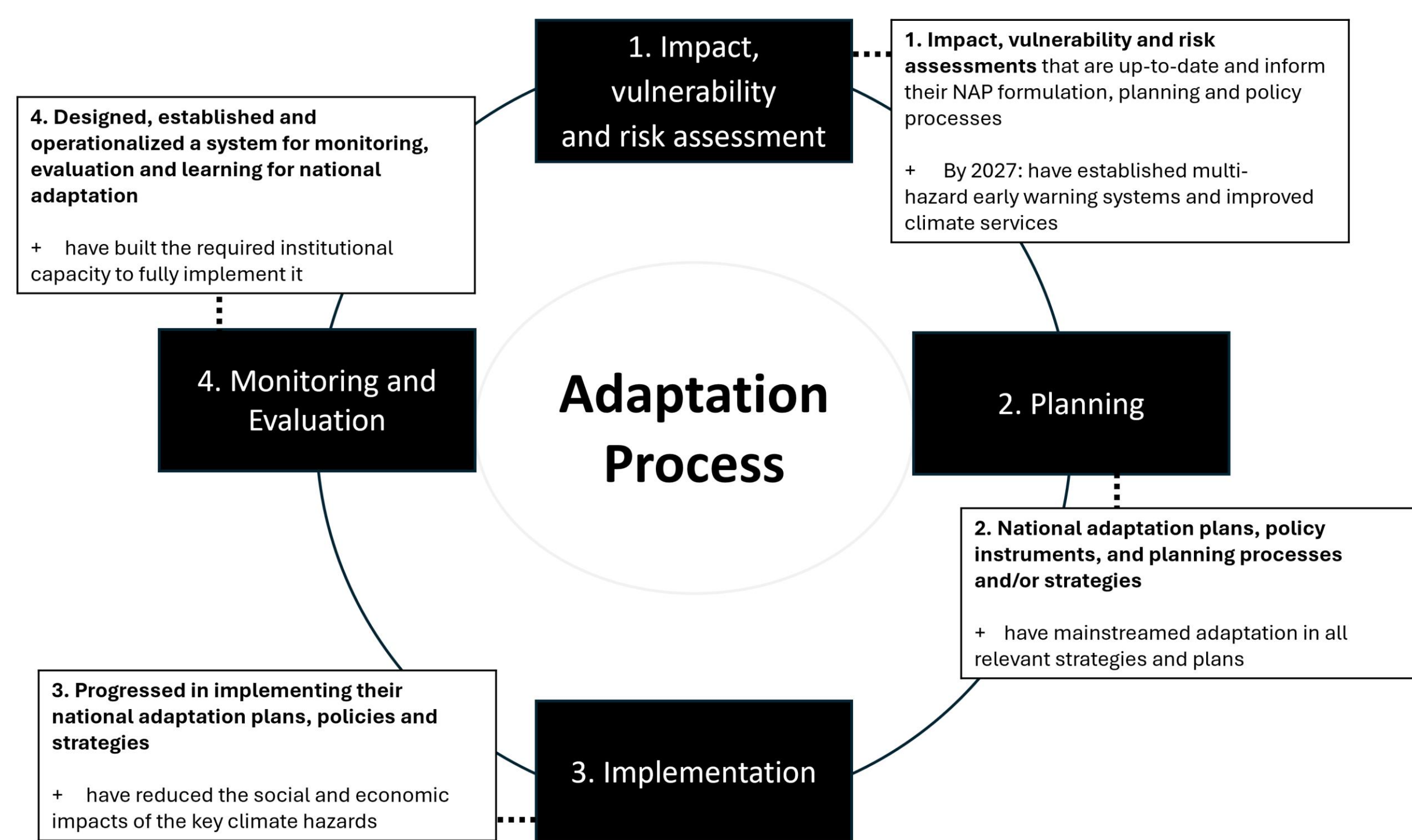


Figure 1: The Global Goal on Adaptation targets: Of the 11 Targets, four are process orientated: 1. Impact, Vulnerability and Risk Assessment, 2. Planning, 3. Implementation, 4. Monitoring and Evaluation (top); and the remaining seven are theme or sector related: Water (9a), Food & Agriculture (9b), Health (9c), Ecosystems and Biodiversity (9d), Infrastructure and Human Settlements (9e), Poverty eradication (9f), and Cultural heritage (9g). Figure drafted by Timo Leiter from [3].

GGA Indicator Examples:

- 9a05 - Water** - Proportion of total area of basins (river, lake or aquifer) and cryosphere (glacier, snow and ice) for which a climate adaptation plan is developed and implemented as part of an integrated water resources management approach
- 9b07 - Food & Agriculture** - Reduction in food and agricultural yield associated with climate-related drivers and events
- 9c01 - Health** - Change in the rate of mortality associated with heat exposure
- 9d04 - Ecosystems and Biodiversity** - Area under restoration for enhancing ecosystem resilience and services
- 9e03 - Infrastructure and Human Settlements** - Number of Parties that include coverage of (i) critical thresholds, (ii) tipping points, and (iii) adaptation limits in National Adaptation Plans and national risk assessments
- 9f01 - Poverty eradication** - Proportion of population living in multidimensional poverty in areas highly exposed to climate-related hazards
- 9g01 - Cultural heritage** - Percentage of at-risk cultural and natural heritage sites with adaptation measures implemented
- 10a08 - Impact, vulnerability and risk assessment** - Number of Parties that have established climate information services for risk reduction and systematic observation to support improved climate-related data, information and services [note: only indicator that mentions observation]
- 10b01 - Planning** - Number of Parties with adopted national adaptation plans, policy instruments, and planning processes and/or strategies
- 10c02 - Implementation** - Number of deaths and missing persons associated with climate-related hazards, per 100,000 population
- 10d02 - Monitoring, evaluation and learning** - Number of Parties that have operationalised a system for monitoring, evaluation and learning for their national adaptation efforts

2 What can Earth Observation (EO) do to support the GGA?

Traditionally, EO has been used to understand the hazard component of the Risk Framework (Figure 2), but it has many capabilities that can make it a valuable input for supporting adaptation at all stages of the policy cycle and across many, if not all, GGA Targets (Figure 2, Table 1) [3, 6, 7]. EO's strengths include its near-global coverage, its objectivity, its repeatability, its data continuity and availability.

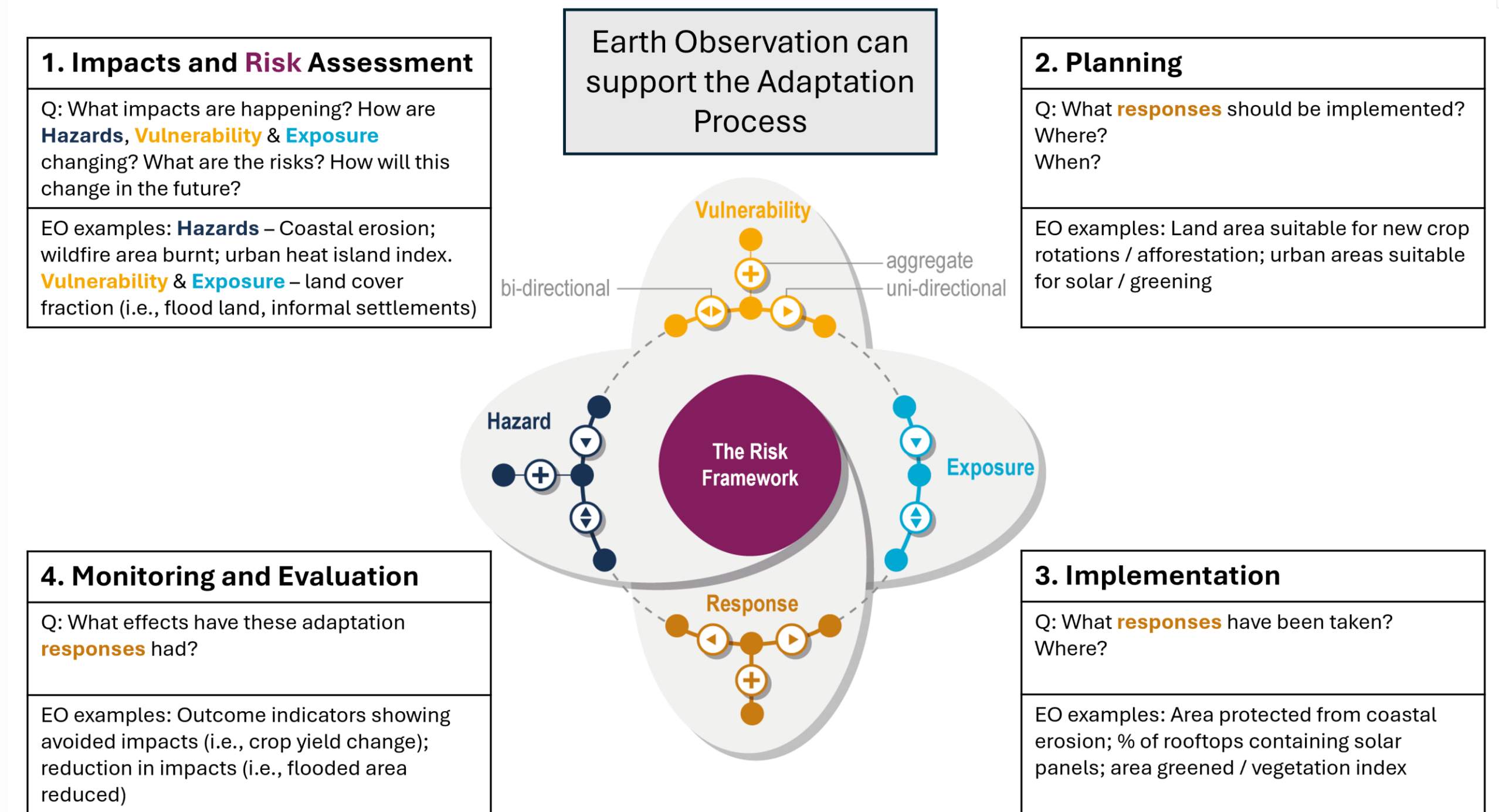


Figure 2: Overview of the adaptation process as described in the GGA framework, how it relates to the IPCC Risk Framework (centre), and examples of the potential for EO to support possible indicators. Figure from [3], adapted from Figure 1.5 from the AR6 IPCC WG2, 2022.

Table 1: Examples of EO-derived indicators relevant for GGA. Variables are mostly orientated around stages 1 and 4 of the adaptation process, e.g., monitoring avoided impacts, reduced impacts after an adaptation intervention. Many of the listed indicators are also GCOS Essential Climate Variables (ECVs). [3]

Relevant GGA Target	EO ECV quantity	Example adaptation application(s)
Biodiversity, Food & Agriculture	Fraction of Absorbed Photosynthetically Active Radiation (FAPAR)	Crop yield estimation, Drought monitoring, Vegetation photosynthetic capacity.
Biodiversity, Food & Agriculture	Leaf Area Index (LAI)	Crop yield estimation, Biomass amount.
Biodiversity, Food & Agriculture	Normalised Difference Vegetation Index (NDVI) – Often used to estimate Net Primary Production (NPP)	Vegetation presence and relative density.
Biodiversity, Food & Agriculture, Health	Burned Area / Active Fires	Wildfires
Biodiversity, Food & Agriculture	Surface soil Moisture	Drought monitoring.
Health	Surface Radiation and Turbulent Heat Fluxes (Sensible, Latent and Storage Heat Fluxes)	Assessment of excessive heat storage and human heat exposure.
Health	Mole Fraction of Tropospheric Column	Air quality monitoring (ozone, NOx, formaldehyde).
Health	Aerosol Optical Depth (AOD)	Air quality monitoring (particulate matter, combustion).
Health	Land Surface Temperature (LST)	Assessment of heat exposure.
Health	Earth surface albedo	Radiation exposure, urban greening.
Biodiversity, Health	Ocean Colour	coral bleaching / marine protection, species migration, water quality monitoring.
Water	River Discharge (derived from altimetry and near-infrared)	Flooding.
Water	Terrestrial Water storage	Flooding, drought monitoring, aquifer over abstraction.
Infrastructure	Ground subsidence	Coastal flood risk monitoring.
All GGA themes	Land Cover (derived from radar and optical image)	Multiple uses for mapping changes in area over time.

3 Funding opportunities from the ESA Climate Change Initiative

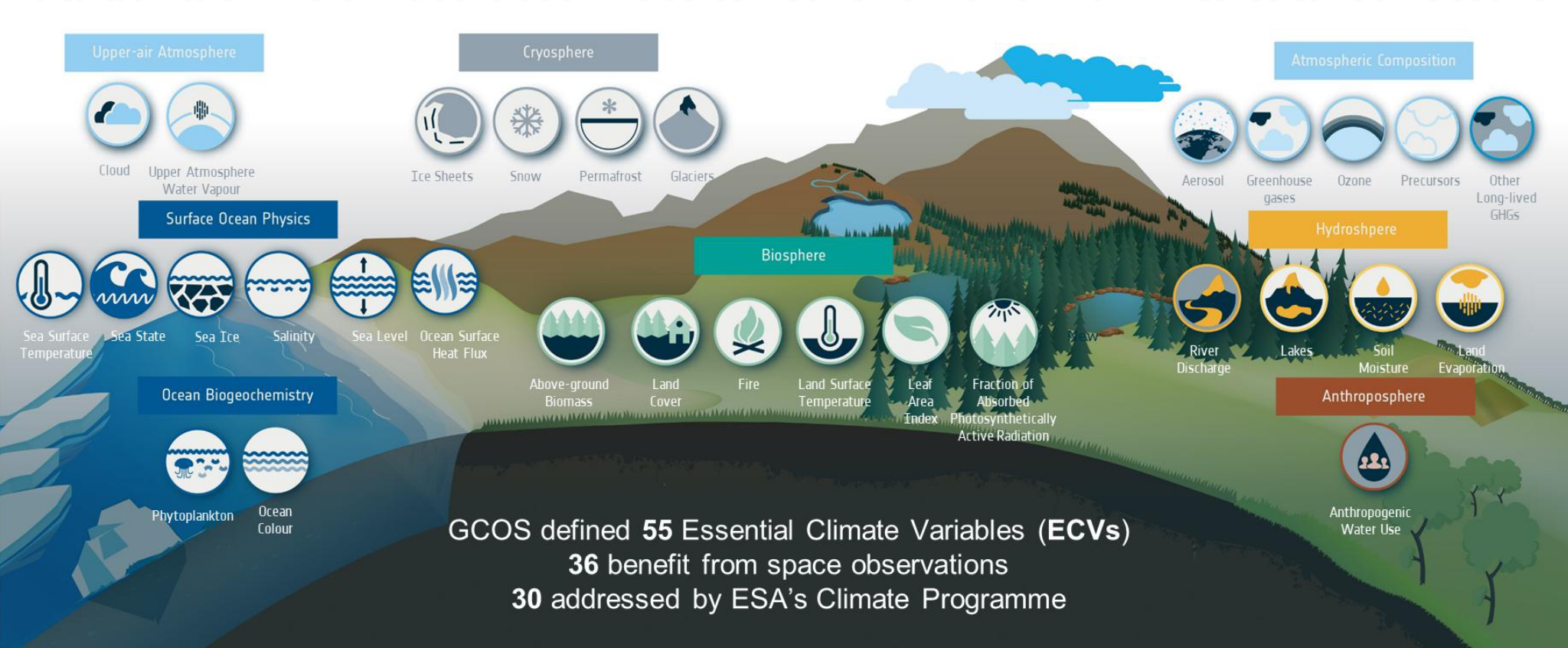


Figure 3: ESA's Essential Climate Variable projects. Each project generates Global Climate Records for a particular ECV, as defined by the Global Climate Observing System (GCOS).

ESA's Climate Change Initiative (CCI) generates global, decades-long satellite data records to track and understand key aspects of the Earth climate system, known as Essential Climate Variables (ECVs, Figure 3).

The data is used support IPCC assessments and contributes to operational climate services [8].



CLIMATE SPACE: USING EARTH OBSERVATION FOR CLIMATE CHANGE ADAPTATION - EXPRO+

Tender Action Number: 1-13048 – Activity Number: 1000044468

NEW call for tender!

- Objective:** Use EO to develop new adaptation indicators and/or risk indicators used to monitor adaptation actions.
- Three projects will be funded with a 600k Euro max budget.**
- Open NOW!**

References: [1] Paris Agreement, adopted Dec. 12, 2015, U.N. Doc. FCCC/CP/2015/L. 9/Rev/1 [2] UNFCCC. Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement 5 Agenda Item 8(a) Matters Relating to Adaptation Glasgow–Sharm El-Sheikh Work Programme on the Global Goal on Adaptation Referred to in Decision 7/CMA.3. [3] Connors et al., Earth Observations for Climate Adaptation: Tracking Progress Towards the Global Goal on Adaptation Through Satellite-Derived Indicators, Accepted for Publication in Nature Climate and Atmospheric Science. [4] UNFCCC. Final List of Potential Indicators. UAE–Belém Work Programme on Indicators. 2025. <https://unfccc.int/documents/649629>. [5] UNFCCC. Technical Report on Indicators for Measuring Progress Towards the Targets Referred to in Paragraphs 9–10 of Decision 2/CMA.5. 2025. [6] Begum, et al., 2022: Point of Departure and Key Concepts. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the IPCC AR6. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 121–196, doi:10.1017/9781009325844.003. <https://www.ipcc.ch/report/ar6/wg2/chapter/chapter-1/> [7] Stephen Plummer, Pascal Lecomte, and Mark Doherty. The ESA climate change initiative (CCI): A European contribution to the generation of the global climate observing system. Remote Sensing of Environment, 203, 2-8 (2017). <https://www.sciencedirect.com/science/article/abs/pii/S0034425717303292>. [8] <https://climate.esa.int/en/about-us-new/climate-change-initiative/>