

# GCOS Observations to Support and Monitor Responses to Climate Change

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## Context

GCOS is co-sponsored by WMO, UNEO, UNESCO and ISC. Its mandate is to ... ensure the data needs are met for climate system monitoring, for assessing the impacts of climate variability and change, and applications to national development, as well as research leading to improved understanding, modelling and prediction of the climate system (GCOS Memorandum of Understanding 1998).

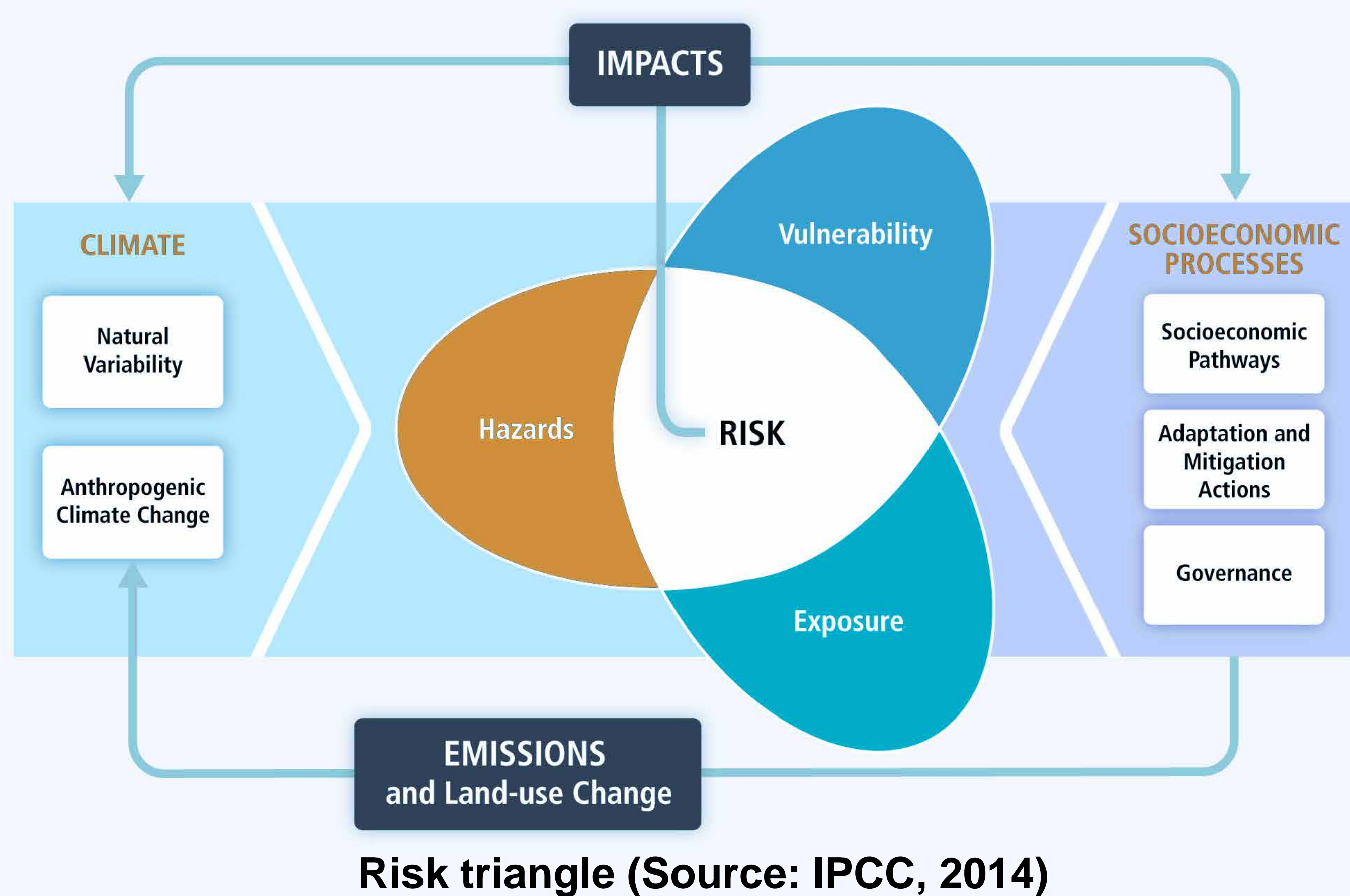
Over 50 Essential Climate Variables (ECVs) were identified based on their relevance, feasibility for observation, and cost-effectiveness of generating and archiving data. A subset of ECVs, surface temperature, atmospheric CO<sub>2</sub>, sea level, glacier mass balance, and polar sea ice extent, together with ocean heat and acidification both derived from ECV, were identified as key Global Climate Indicators. Until now, GCOS's effort has largely been in support of improved modelling and prediction and the activities of WG I of the IPCC (The Physical Scientific Basis).

## The Paris Agreement

The Paris Agreement established the Global Stocktake as a tool to track global progress on climate change, including adaptation, impacts and responses to climate change. The need for systematic observations is included. Observations also support some mitigation activities such as forestry and REDD+.

In line with its mandate, GCOS planned to

- Produce guidance and best practice for adaptation observations
- Identify indicators for adaptation and risk (GCOS, 2016)



Reducing RISK is at the core of responding to climate change. The figure above suggests that GCOS, through its ECV, can provide clear indicators about hazards and their links to exposure/risk to inform adaptation, as well as through some ECVs (or through newly developed ECVs), to directly observe the implementation of adaptation.



For example, the Brazilian NAP identifies "Poor availability of high-quality and timely data for monitoring signals and observing impacts of climate change; lack of adequate indicators and systems for monitoring the water balance, salinization and deforestation".

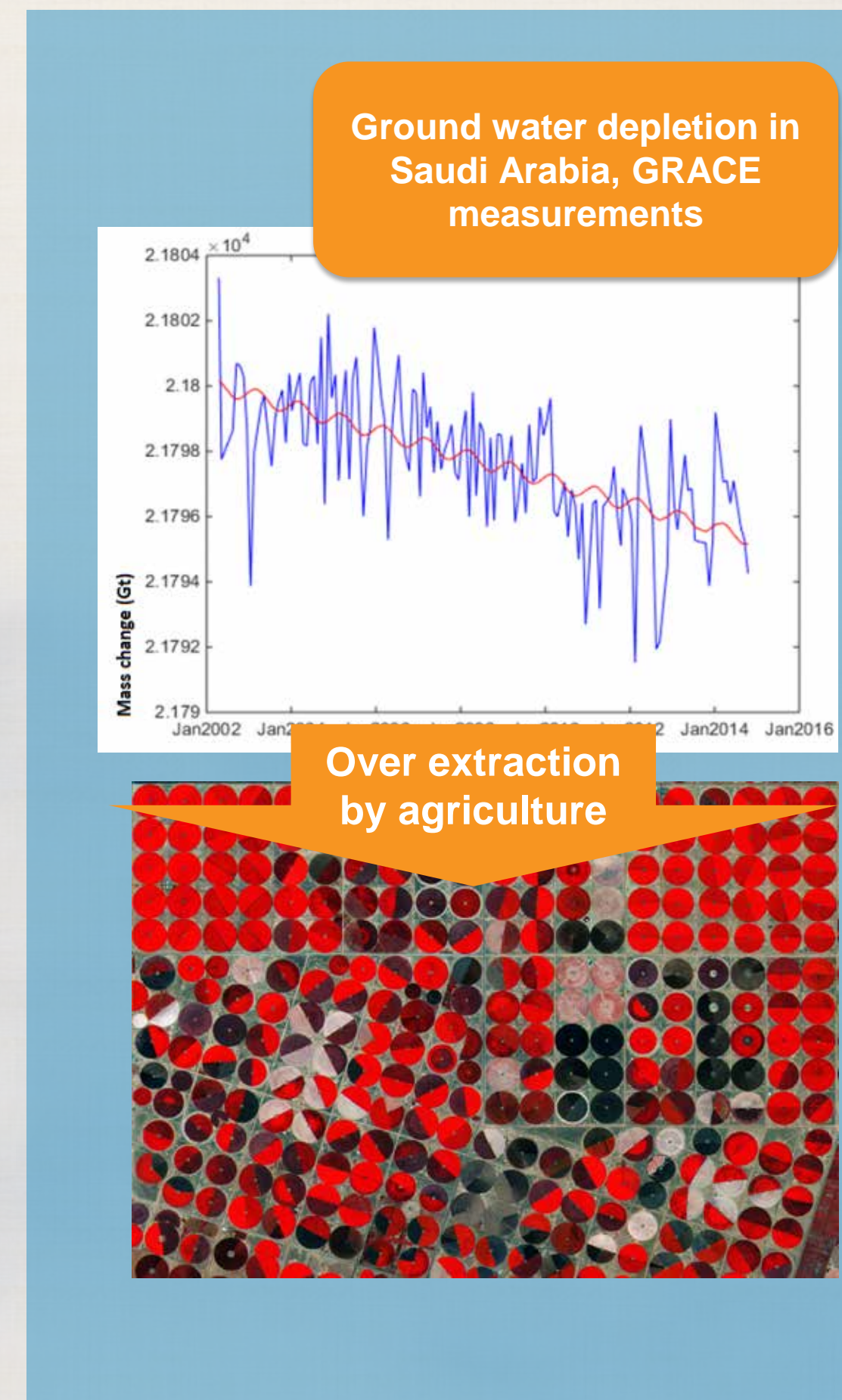
## GCOS contributions

A. Improved understanding and modelling of climate change impacts and resulting adaptation imperatives through the provision of relevant geospatial data (observations for adaptation) e.g. input to regional climate models, agro-ecological models, coastal and flood risk models (relevant ECVs would include for example sea-level, soil moisture, and land cover).

B. Improved assessment of climate-related risk and thus adaptation imperatives through provision of relevant geospatial data inputs (observations for adaptation) e.g. input of geospatial data on geographic distribution of developed land cover (described by LULUCF from the land cover ECV) subject to certain climate hazards, spatial distributions of active fire/fire burnt area (ECV), etc.

C. Use of existing ECVs (using the improved spatial and temporal resolution now available) to extract information on the spatio-temporal development of adaptation (i.e. observations of adaptation) where changes are observable through Earth Observation e.g. shifts in LULUCF (ECVs reflecting changes in agricultural patterns, urban land cover change), anthropogenic use of fire, prescribed burning (active fire ECV), etc.

D. Potential new ECV(s)/ECV products, developed in collaboration with other agencies, to provide information on human adaptation (i.e. observations of adaptation) for specific examples – these might be related to existing ECVs, or could be completely new ECVs, and may need to be combined with data that is not necessarily physically/climate related. e.g. tracking green cover in cities, tracking national budgets on adaptation, investment in coastal infrastructure, mapping development of coastal defenses, etc.



An Example of Earth Observation and Responses to Climate Change. High temperatures, heat waves, can cause excess deaths. Here average daily temperatures over 30°C lead to increased mortality. One response is to increase green areas which cool the city significantly. This can be observed from satellites.

Mortality increases with average temperature

Expected Mortality leads to Actions to cool Cities

Overall impact of these actions can be monitored remotely

Adelaide. SOURCE: modified Copernicus Sentinel data (2017), processed by ESA. CC BY-SA 3.0/IGO

## Conclusion

With current capabilities, GCOS can add much value to the Global Stocktake - and with modest enhancement of products, could add considerably more on a national and regional scale.

References  
 IPCC, 2014: Summary for policymakers. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B. et al (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.  
 GCOS, 2016: *The Global Observing System for Climate: Implementation Needs*, GCOS-200, WMO, Geneva, 325pp.