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FAIR building blocks for climate resilience information systems

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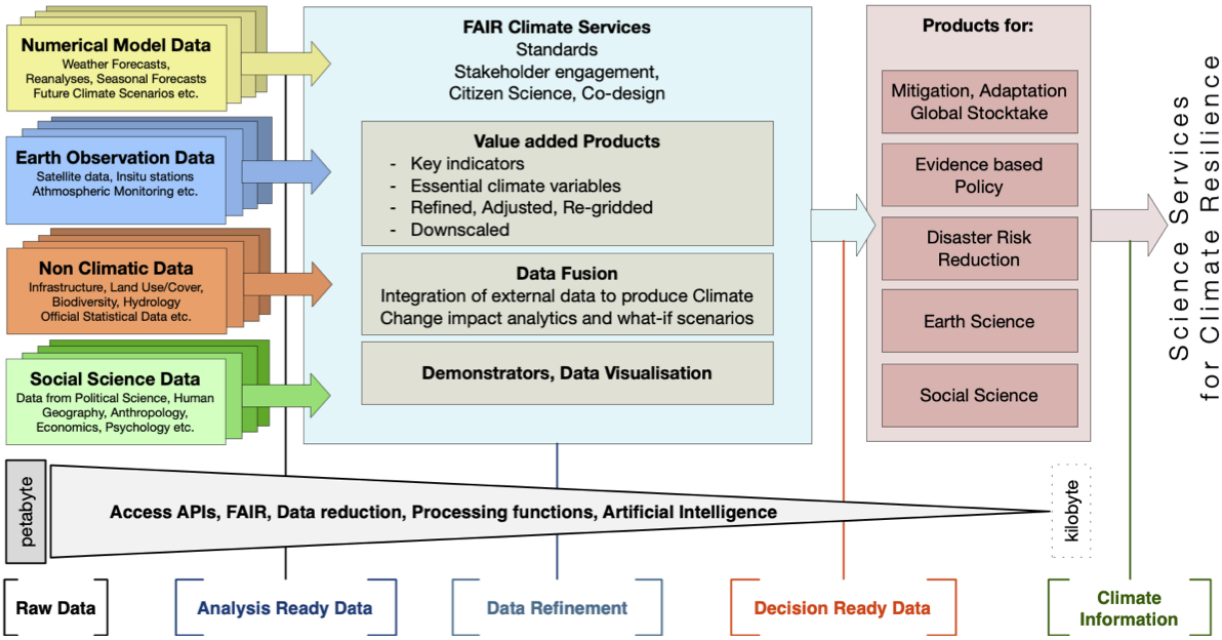
Cloud-based big earth data workflow architectures for operational decision making across communities need to follow FAIR (Findable, Accessible, Interoperable, Reusable) principles in order to be effective. This presentation highlights mature implementations of OGC standards-based building blocks for climate data processing and service provision that are deployed in leading climate services information server systems such as the COPERNICUS Climate Change Service C3S. OGC Web Processing Services (WPS) form the bases of component operations in these implementations, from simple polygon subsetting to climate indices calculation and complex hydrological modelling. Interoperable building blocks also handle security functions such as user registration, client-site utilities, and data quality compliance.

A particular focus will be the ROOCS (Remote Operations on Climate Simulations) project, a set of tools and services to provide "data-aware" processing of ESGF (Earth System Grid Federation) and other standards-compliant climate datasets from modelling initiatives such as CMIP6 and CORDEX. One example is the WPS service 'Rook', that enables remote operations, such as spatio-temporal subsetting, on climate model data. It exposes all the operations available in the 'daops' library based on Xarray. Finch is a WPS-based service for remote climate index calculations, also used for the analytics of ClimateData.ca, that dynamically wraps Xclim, a Python-based high-performance distributed climate index library. Finch automatically builds catalogues of available climate indicators, fetches data using "lazy"-loading, and manages asynchronous requests with Gunicorn and Dask. Raven-WPS provides parallel web access to a dynamically-configurable 'RAVEN' hydrological modelling framework with numerous pre-configured hydrological models (GR4J-CN, HBV-EC, HMETS, MOHYSE) and terrain-based analyses. Coupling GeoServer-housed terrain datasets with climate datasets, RAVEN can perform analyses such as hydrological forecasting without requirements of local access to data, installation of binaries, or local computation.

The EO Exploitation Platform Common Architecture (EOEPCA) describes an app-to-the-data paradigm where users select, deploy and run application workflows on remote platforms where

the data resides. Following OGC Best Practices for EO Application Packages, Weaver executes workflows that chain together various applications and WPS inputs/outputs. It can also deploy near-to-data applications using Common Workflow Language (CWL) application definitions. Weaver was developed especially with climate services use cases in mind.

The architectural patterns illustrated by these examples will be exercised and tested in the upcoming OGC Climate Services Pilot initiative, whose outputs will be also incorporated into disaster risk indicators developed in the upcoming OGC Disaster Pilot 2022.



Further reading:

https://docs.google.com/document/d/1IrwlEiR-yRLcoI9fGh2B1leH4KU0v0SUMWQqiaxc1BM/edit