



C3S – UERRA GA2

Manuel Fuentes
ECMWF

J-N Thépaut, Bernard Pinty*, D. Dee and B. Raoult

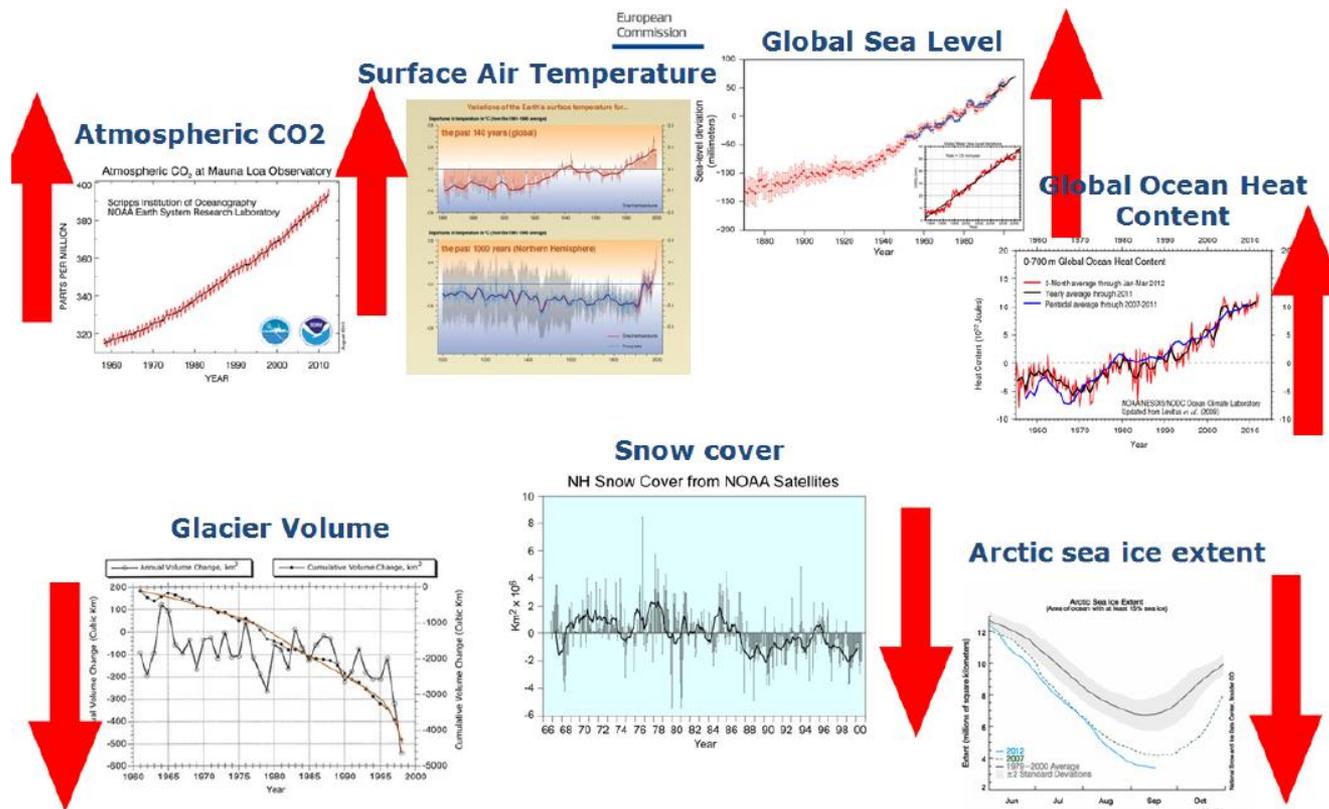


ECMWF has signed a delegation agreement with EC to become the Entrusted Entity that will operate:

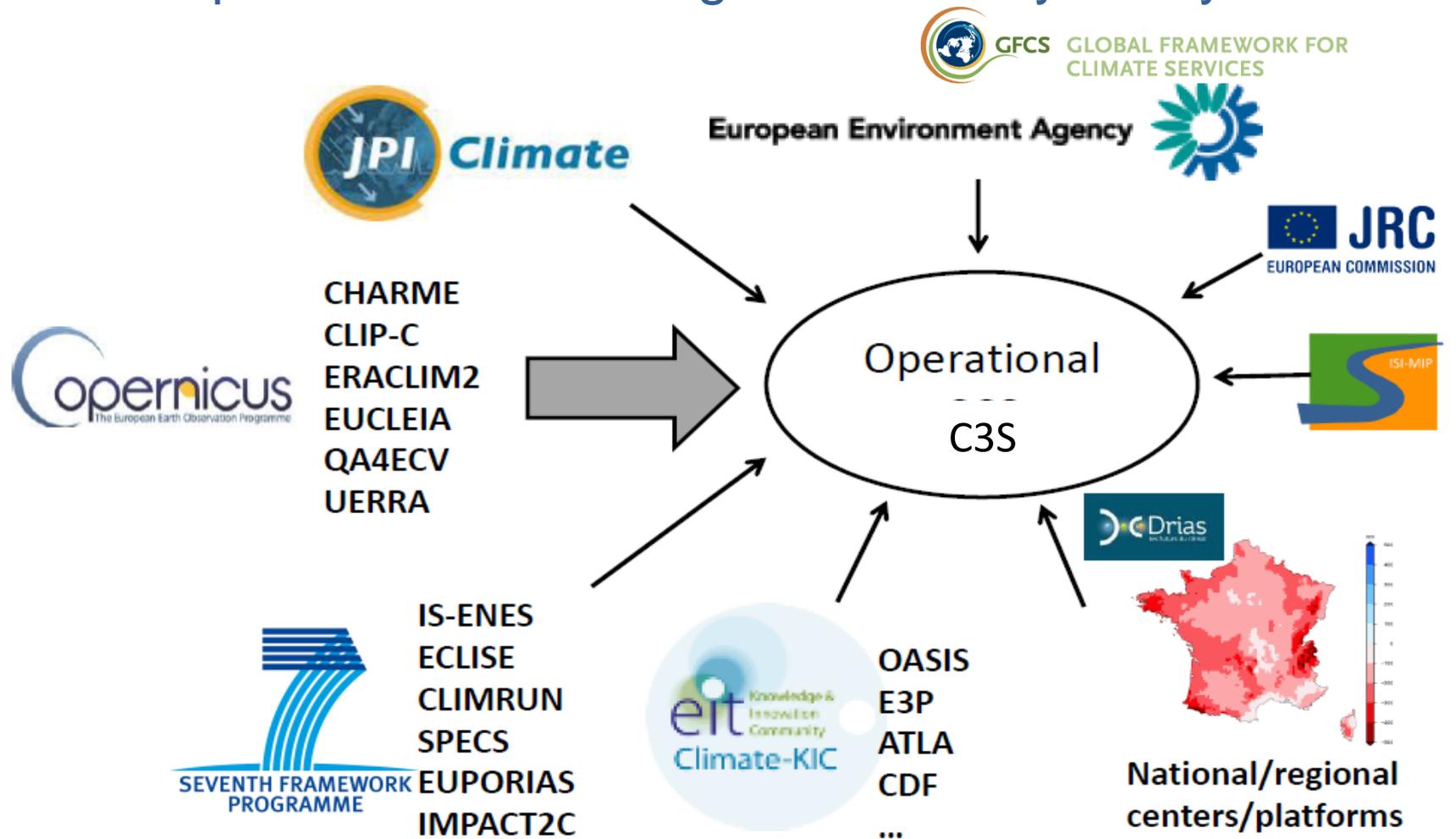
- CAMS: Copernicus Atmosphere Monitoring Service
- C3S: Copernicus Climate Change Service

From the Copernicus regulation (EU) 377/2014:

"the Climate Change service shall provide information to increase the knowledge base to support **adaptation and mitigation policies**. It shall in particular contribute to the **provision of Essential Climate Variables (ECVs)**, **climate analyses, projections** and **indicators** at temporal and spatial scales relevant to adaptation and mitigation strategies for various Union's sectoral and societal benefit areas."



No need to start from scratch: European Climate Change Community ecosystem



C3S vision

To be an authoritative source of climate information for Europe

To build upon national investments and complement national climate service providers

Is the climate changing?

- Earth observations
- Reanalyses

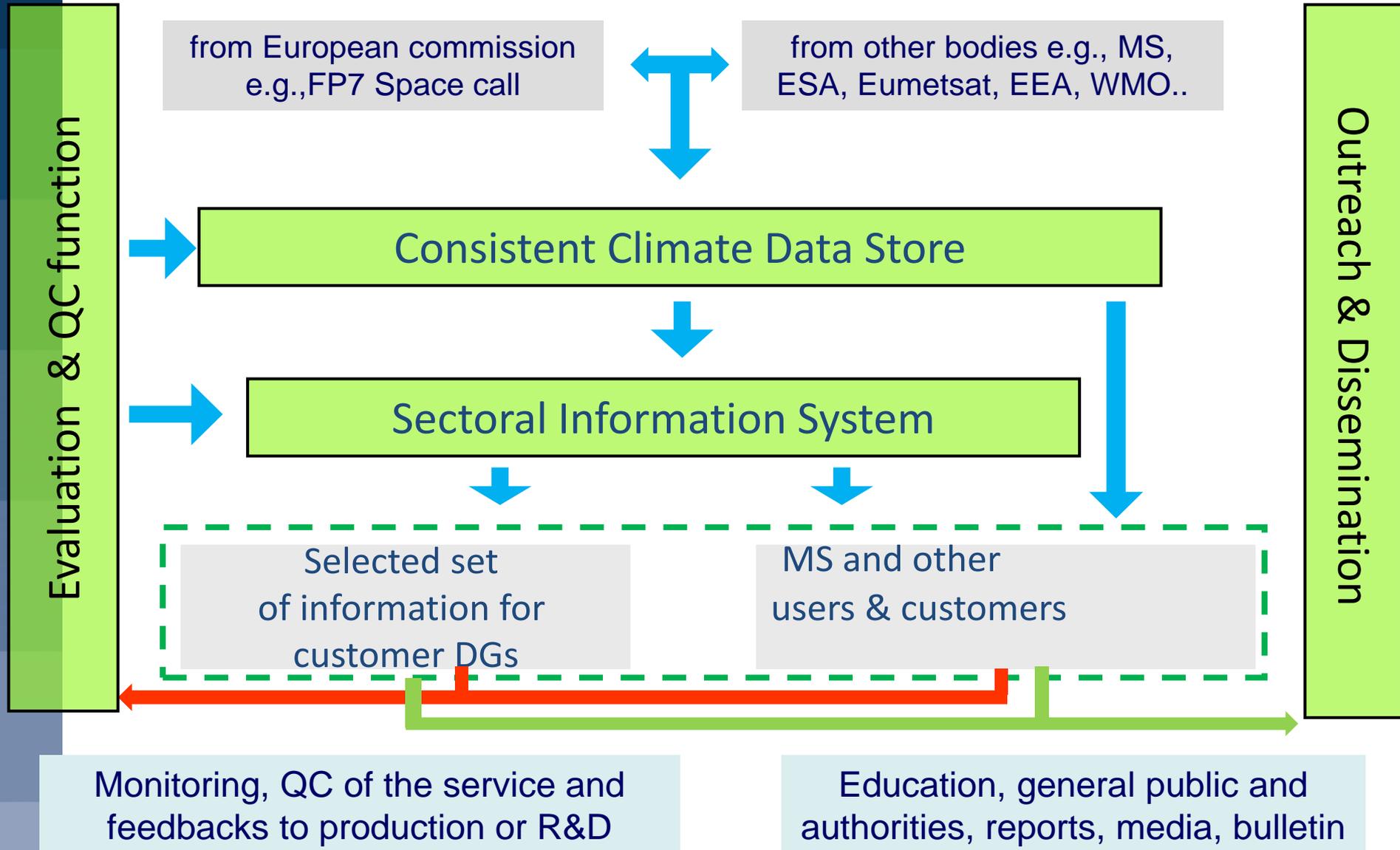
Will climate change continue, accelerate?

- Predictions
- Projections

What are the societal impacts?

- Climate indicators
- Sectoral information

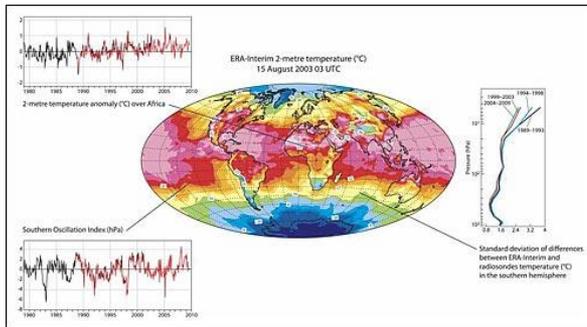
C3S architecture



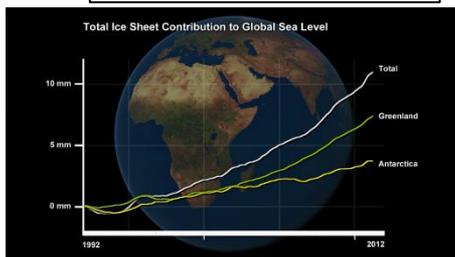
C3S Service elements: Climate Data Store

- Series of ECV datasets and climate indicators

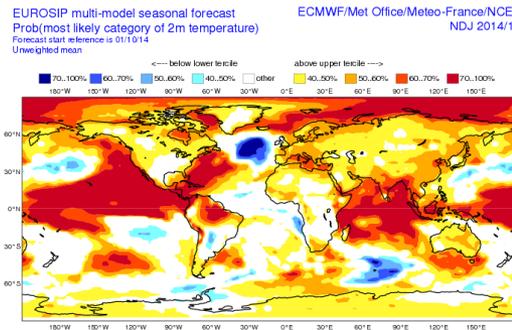
- Observed, reanalysed and simulated
- Relevant to support adaptation/mitigation policies at European level and wider



Reanalyses



Other ECV datasets



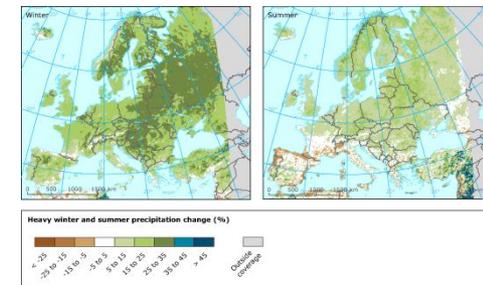
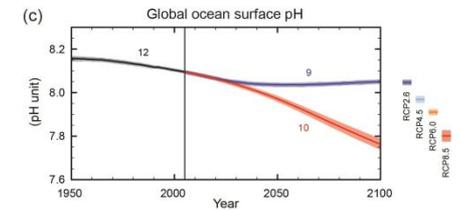
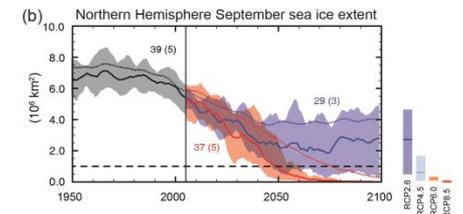
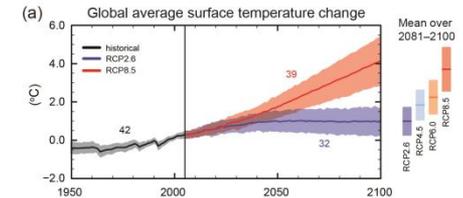
Multi model seasonal forecast products



Data reprocessing



Data collection and data rescue

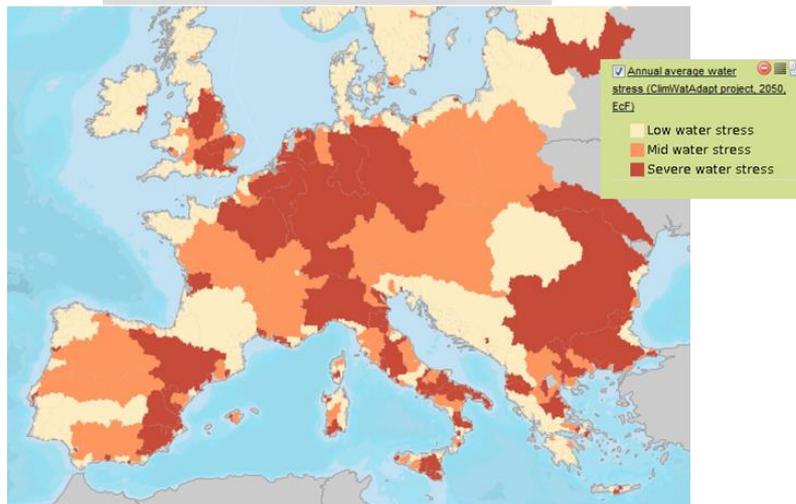


Climate projections

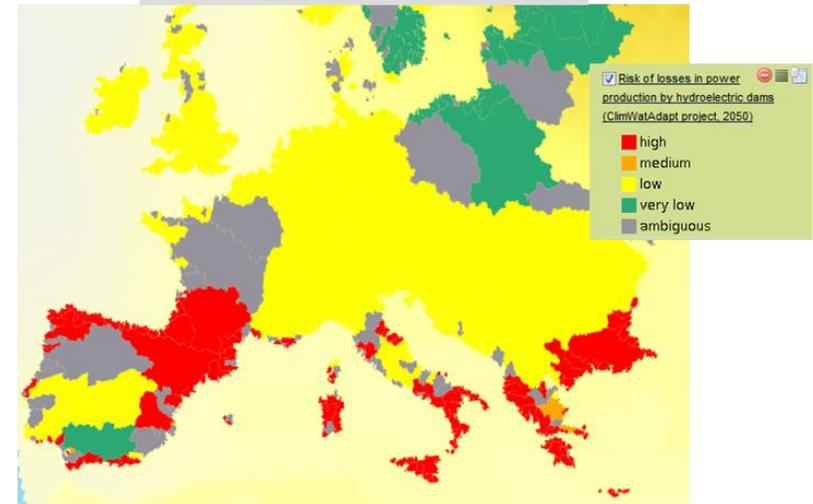
C3S Service elements: Sectoral Information System

- Tailored climate indicators for primary users:
 - CLIMATE-ADAPT, institutional users at European level,...
 - Science users, innovation and business development
- Data and tools to support sectoral applications and policy development

Water management



Energy



- ~ 30 ECV datasets and 10 Sectors to be addressed by 2020

Copernicus Climate Change (C3) service

Provisional timing

Stage 0 - Proof of Concept

Stage I - Pre-Operational

Stage II - Operational ~20 ECVs, ~5-6 Sectors

Stage III - Operational ~30 ECVs, ~10 Sectors

Pre-operational Phase



Consistent Climate Data Store - ~ 20 ECVs & indicators -
Observed, re-analyzed and model projected products

ATMOSPHERE

Surface Air Temperature
Surface Precipitation
Water Vapor
Surface Radiation Budget
Earth Radiation Budget
Carbon Dioxide & Methane
Ozone & Aerosols
Cloud properties
Wind Speed & Direction

OCEAN

Ocean Color
Sea Ice
Sea Level
Sea Surface Temperature
Global Ocean Heat Content

LAND

Snow Cover
Glaciers & Ice Caps
Albedo
FAPAR
Fire Disturbances
Ice Sheets

Sectoral Information System – 6-8 sectors

Agriculture and forestry

Health

Energy

Infrastructure

Insurance

Coastal areas

Water management

Tourism

Copernicus Climate Change (C3) service

Indicative road map Stage II & III

Consistent Climate Data Store - ~ 33 ECVs & indicators -
Observed, re-analyzed and model projected products

ATMOSPHERE

Surface Air Temperature
Surface Precipitation
Water Vapor
Surface Radiation Budget
Earth Radiation Budget
Carbon Dioxide & Methane
Ozone & Aerosols
Cloud properties
Wind Speed & Direction
Upper Air Temperature
Other Long-Lived GHGs

OCEAN

Ocean Color
Sea Ice
Sea Level
Sea Surface Temperature
Global Ocean Heat Content

CO₂ partial pressure
Ocean Activity
Sea Surface Salinity
Current Salinity

LAND

Snow Cover
Glaciers & Ice Caps
Albedo
FAPAR
Fire Disturbances
Ice Sheets
Lakes
Permafrost
Land Cover
Leaf Area Index
Soil Moisture

Sectoral Information System – ~ 8-10 sectors

Agriculture and forestry

Health

Energy

Infrastructure

Coastal areas

Water management

Tourism

Insurance

Marine and fisheries

Biodiversity

Disaster risk reduction

Transportation

C3S Data Store

... from de delegation
agreement...

C3S Data Store

- ... the service draws upon the outcome of the FP7 Copernicus precursor projects ... (e.g. CLIPC)
- ... integration of European contributions to state-of-the-art climate projections at global and regional level....
 - ... will have to be accessible in an operational way (e.g. ESGF).
 - ...technical development, maintenance and governance efforts will be required from the data providers to ensure fully compliance with the C3S requirements.

C3S Data Store

- The EQC will ... monitor ... using standard key performance indicators
 - ... technical quality of service as measured by timeliness, number of interruptions, response time for troubleshooting...
 - ...quality of products through statistical comparison with observed quantities;
 - ...quality of information made publicly available ...
 - ...uptake of services and products by users: ...unique visitors on the web portal, downloads, data volumes...

C3S Data Store

- ...access to the products for authenticated users according to access rules....
 - ... single logon across the Copernicus programme (mid-term)
- ...identification of backup solutions regarding the provision of information populating the CDS and the SIS.
- ... the provision of a technical user support and help desk facility...

C3S Data Store

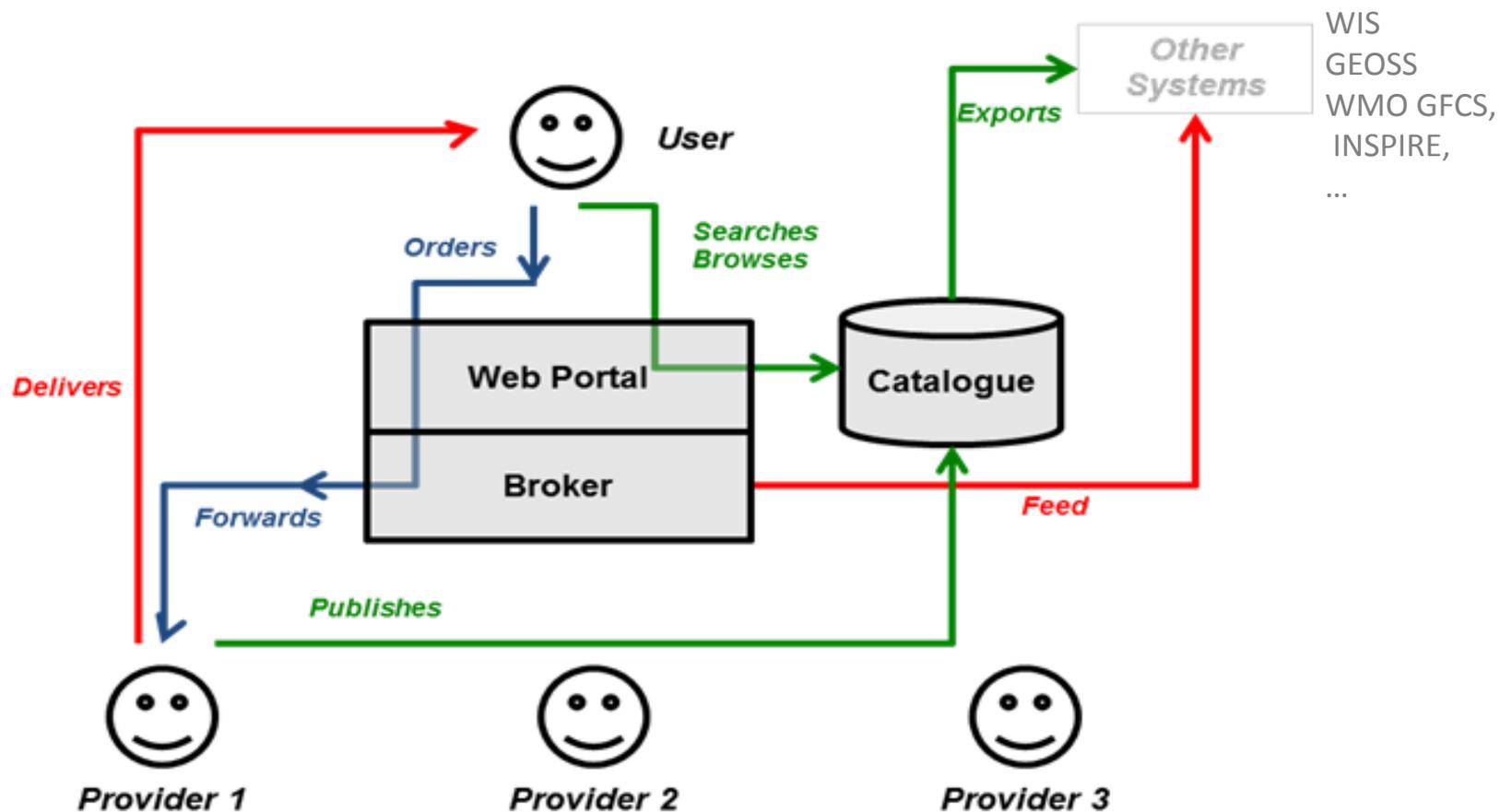
- Timely acquisition of state-of-the-art climate information from various data providers, and the development and maintenance of the C3S catalogue content
- The information delivered to the end-user is fully traceable, quality controlled and disseminated within the most appropriate time
- To ensure uptake of climate information by downstream users, climate toolboxes will be developed and maintained.

What does this mean?

Requirements for the Climate Data Store

- Be distributed
- Reuse existing systems when possible
- ... But should not be a mere collection of heterogeneous systems:
 - The user should have a consistent view of all data and services available through the CDS

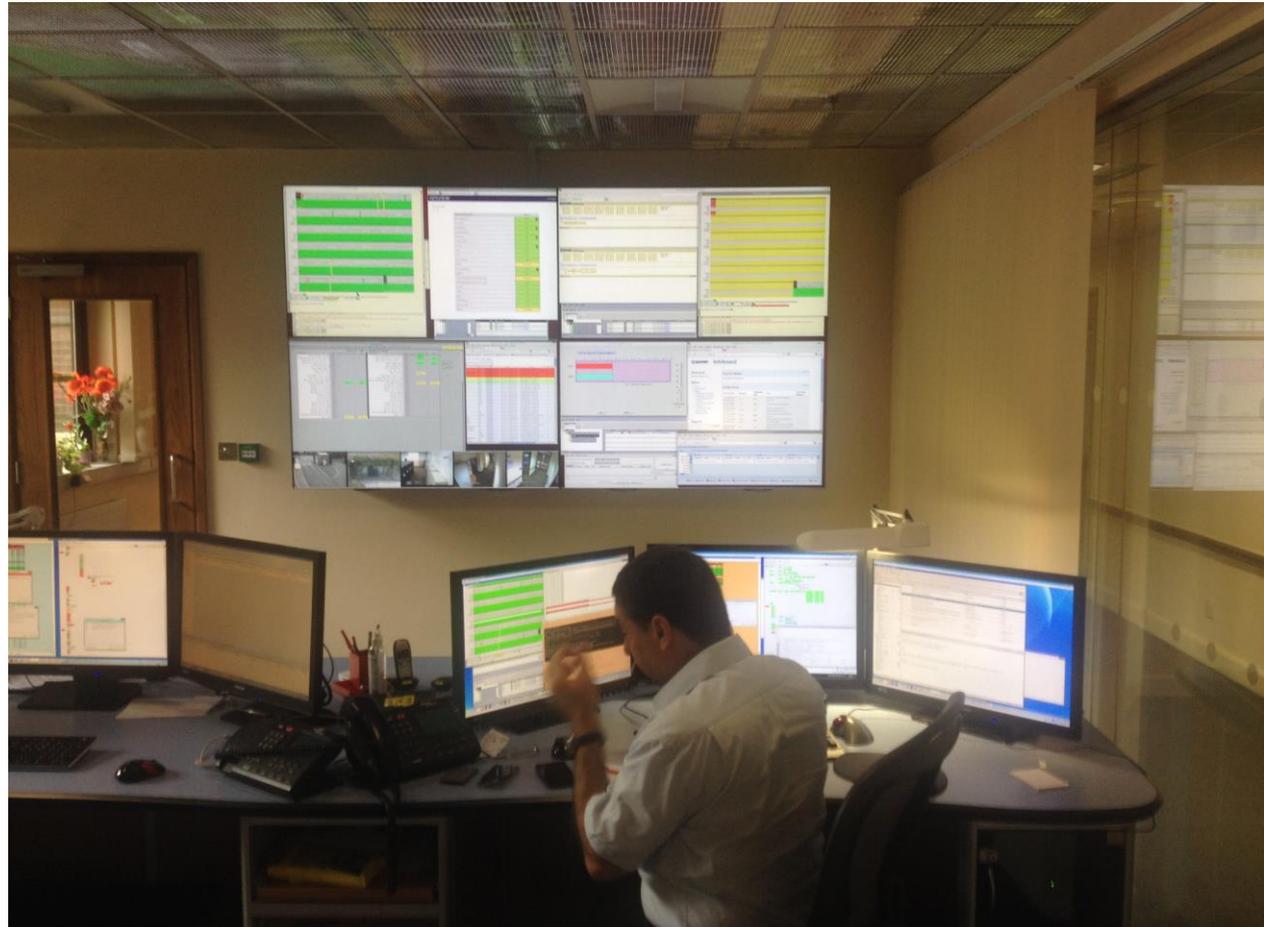
C3S infrastructure: Market place concept



- Distributed architecture
- Exploiting existing infrastructures

Operational?

- Monitoring
- Reporting
 - Capacity planning
 - Usage statistics
- Service level agreement
- On-call and support
- Help desk
- High-availability
- Backup
- QC



Standards are the key

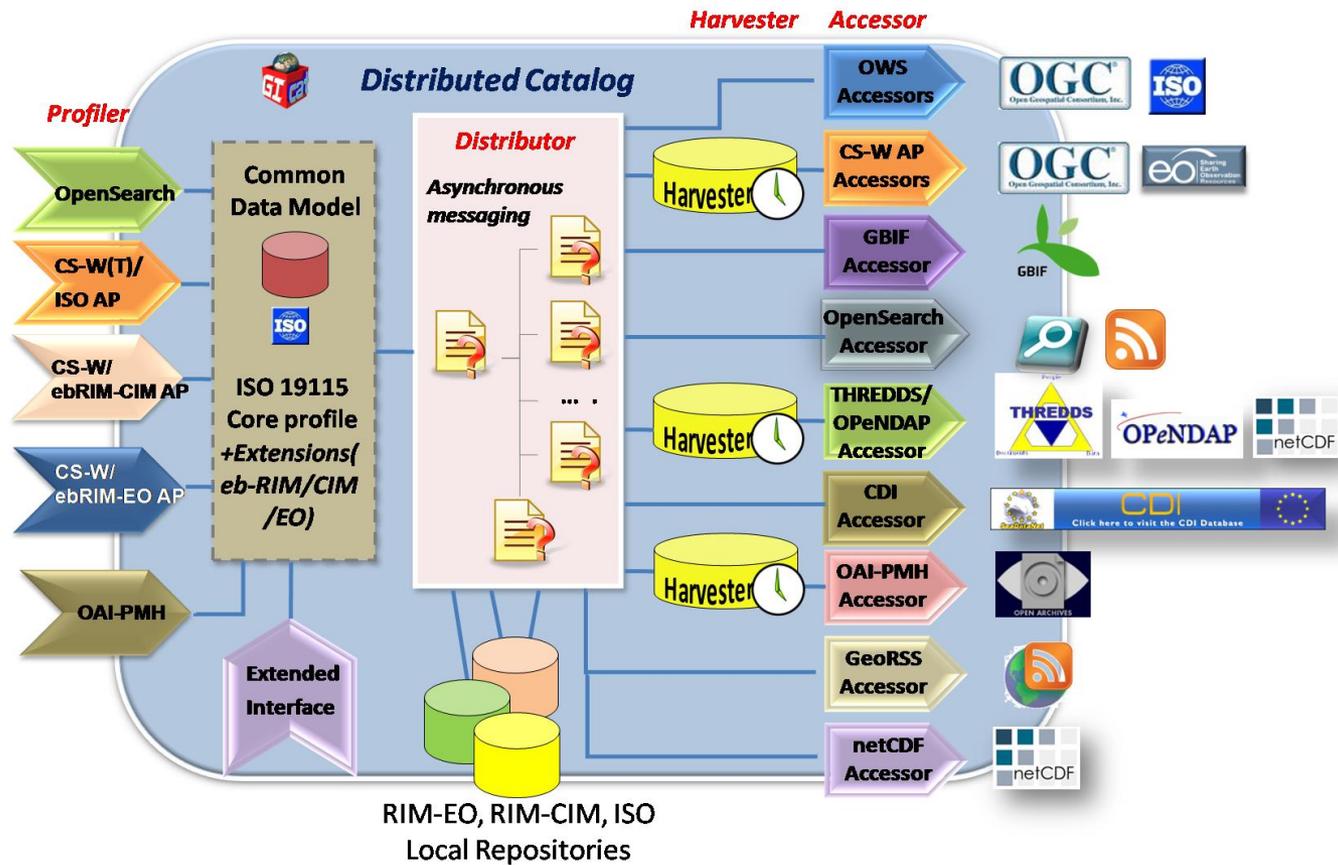
- INSPIRE, OGC
 - WMS, WMTS, WPS, CWS,...
 - ISO 19xxx series
- Data formats
 - NetCDF, GRIB
 - Time series? Images?
 - SIS (formats?)
- Single sign on
- Monitoring

Toolboxes

- Source code repository, bug tracking,
...
- Documentation, forums
- Support
- Open Source!

Example: GI-Cat (developed through many EU projects)

(<http://essi-lab.eu/do/view/Gicat>)



CDS next steps

- 
- Workshop at ECMWF 3-6 March 2015
 - With possible end-users
 - With existing service providers
 - With industry
 - Review the needs and expectations
 - See what is available
 - Perform a gap analysis
 - Issue tender mid-2015

Thank you!