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

*: Copernicus G2 Unit

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ECMWF has negotiated with the EC and became, as of 11 November 2014, the Entrusted Entity that operates:

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

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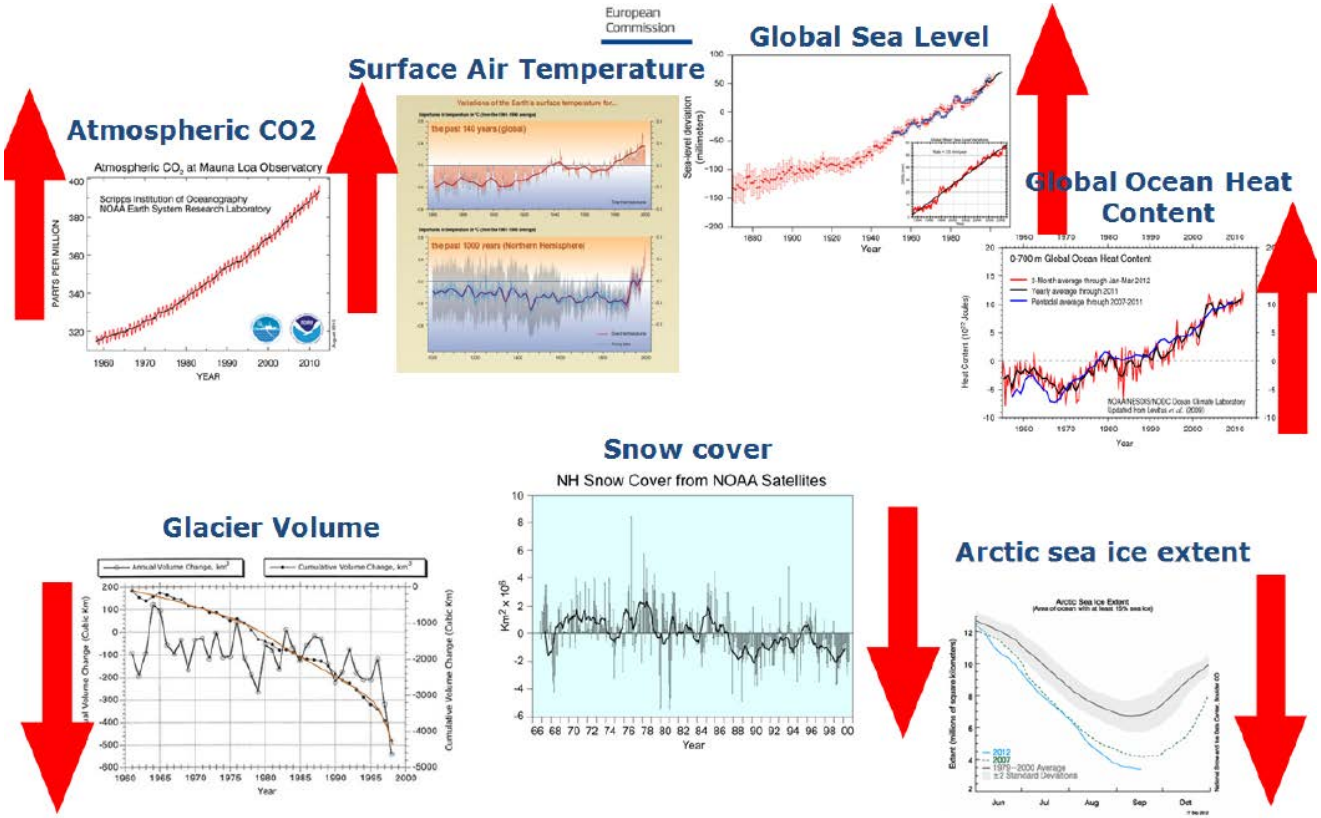
From the Copernicus regulation (EU) 377/2014:

"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."



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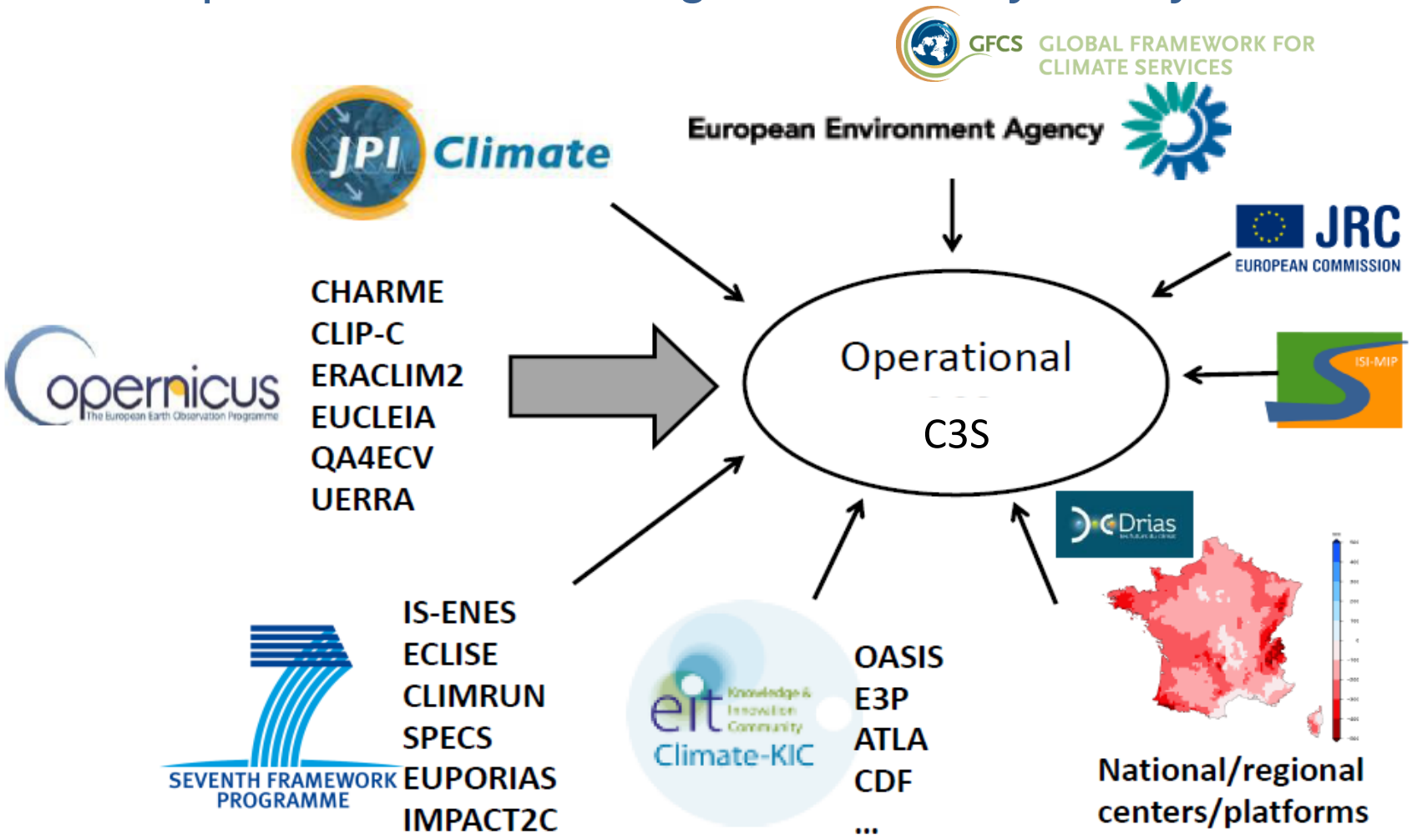
From the Copernicus regulation (EU) 377/2014:

"(36) The data and information produced in the framework of Copernicus should be made available on a full, open and free-of-charge basis subject to appropriate conditions and limitations, in order to promote their use and sharing, and to strengthen European Earth observation markets, in particular the downstream sector, thereby enabling growth and job creation.

(37) The Commission should work with data providers to agree licensing conditions for third-party data to facilitate their use within Copernicus, in compliance with this Regulation and applicable third-party rights."

Similar statements are made in chapter IV – Data and Security Policy – Article 23

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

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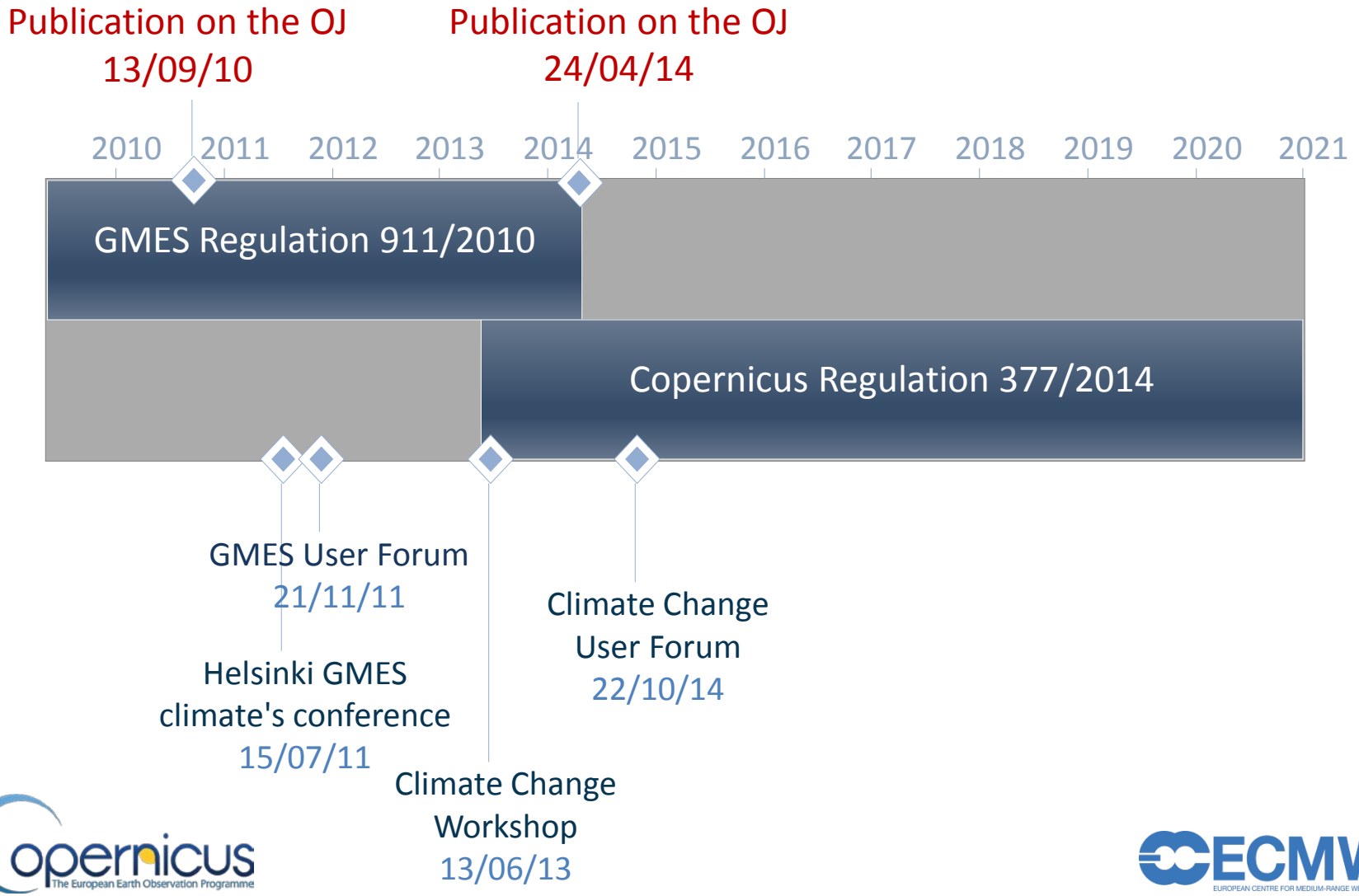
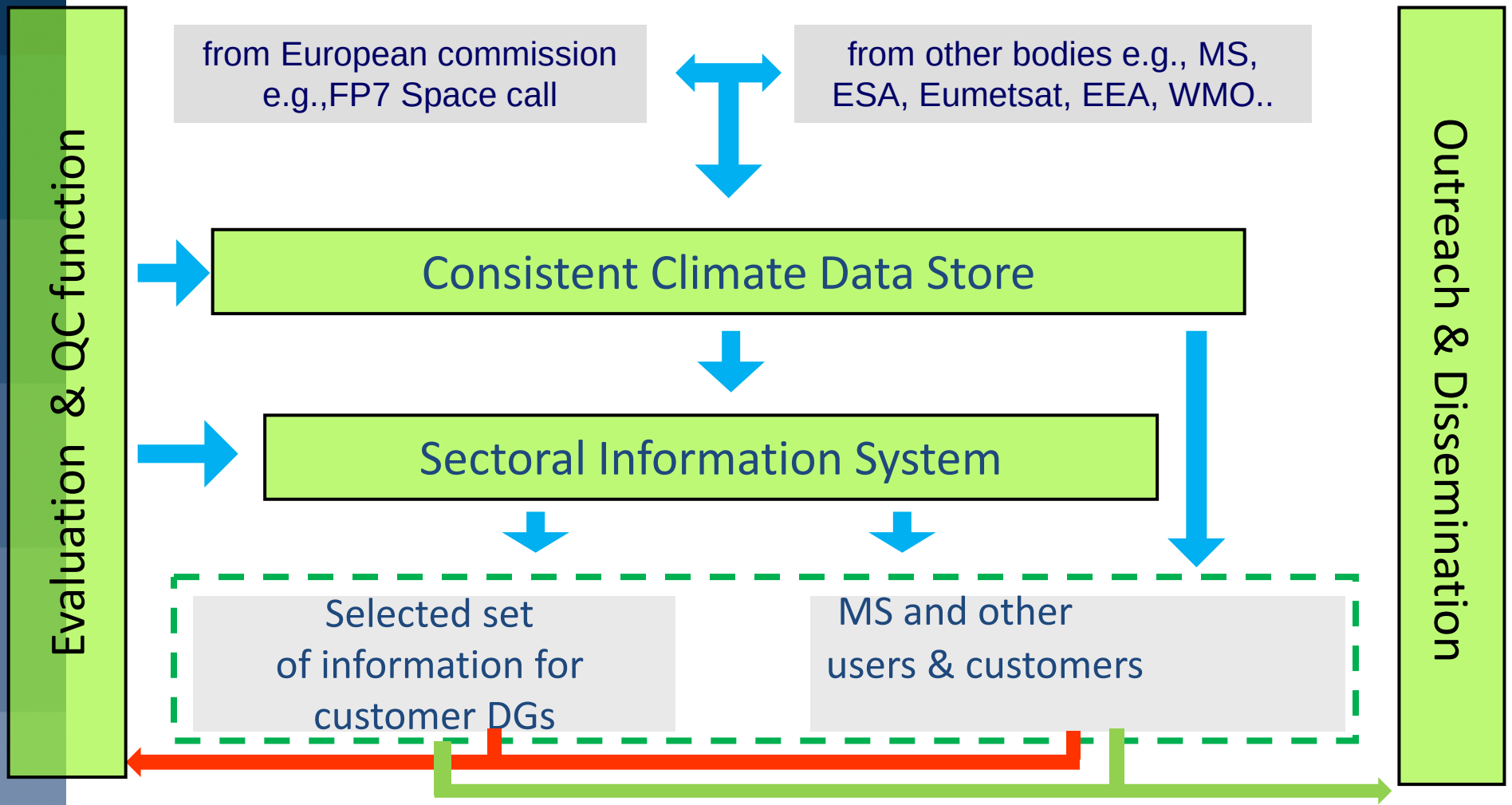
Copernicus Climate Change (C3) service

Legal frame & MS consultations



C3S architecture



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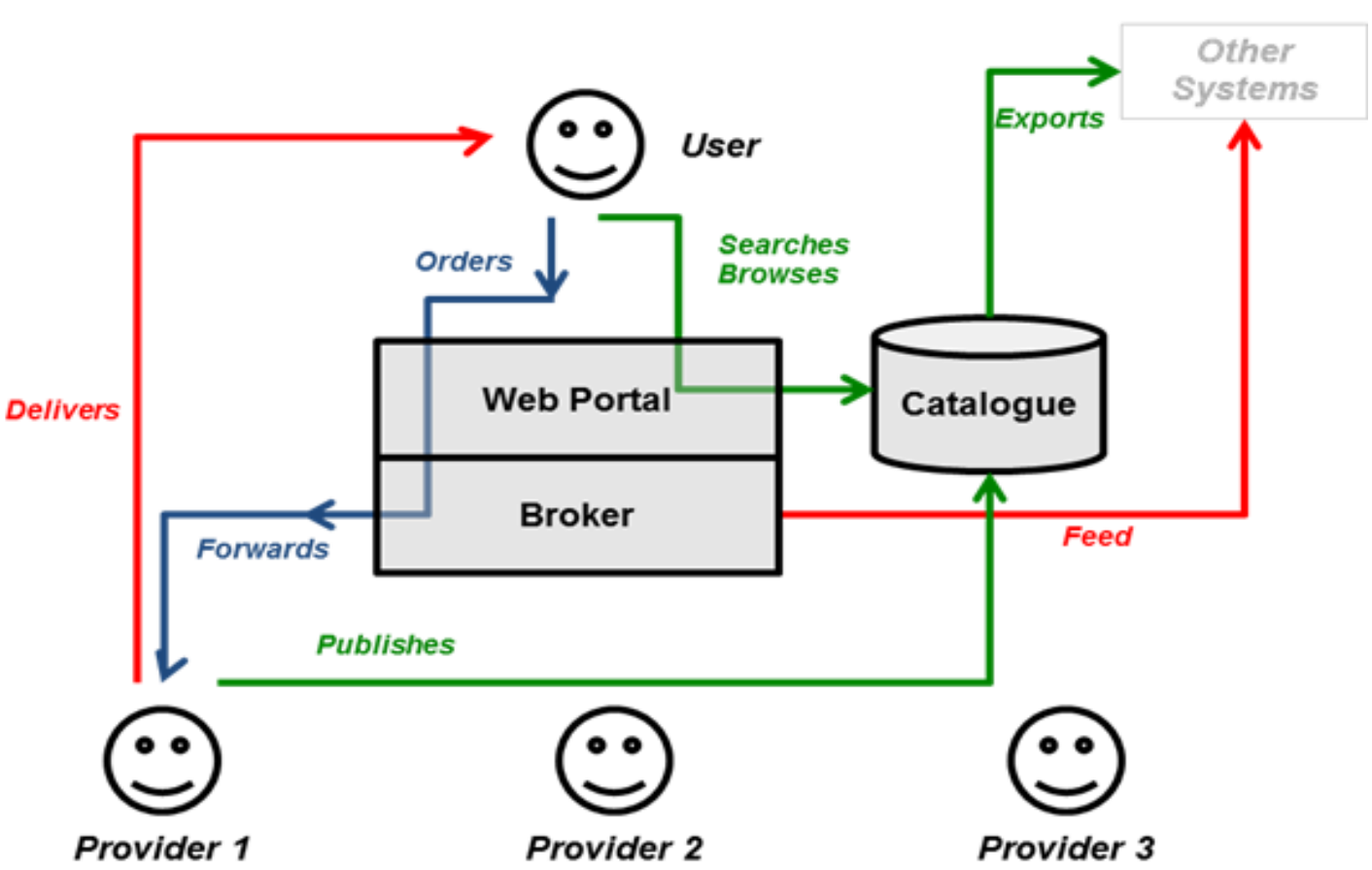
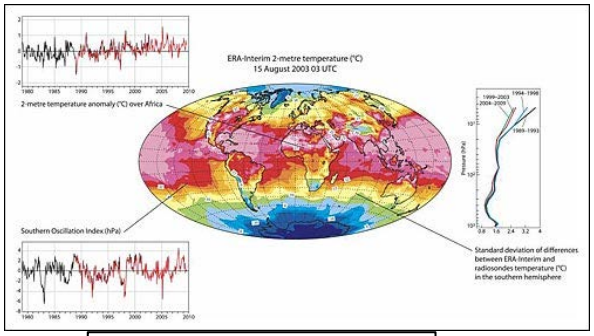
C3S infrastructure: Market place concept



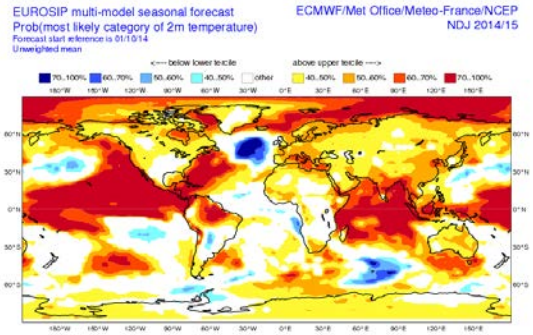
- Distributed architecture
- Exploiting existing infrastructures

C3S Service elements: Climate Data Store

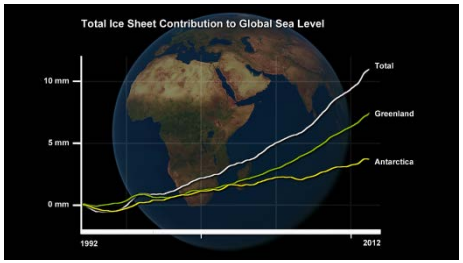
- Series of ECV datasets and climate indicators
  - Observed, reanalysed and simulated
  - Relevant to support adaptation/mitigation policies at European level and wider



Reanalyses

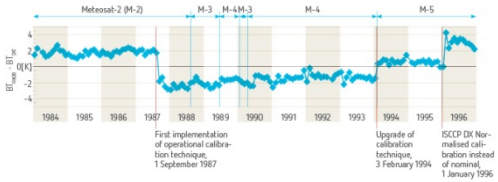


Multi model seasonal forecast products

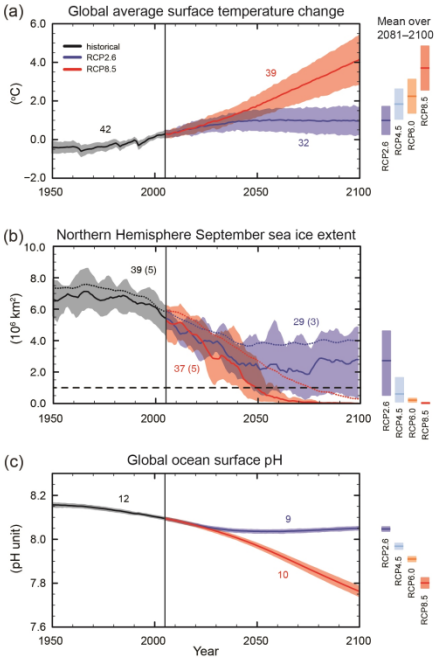


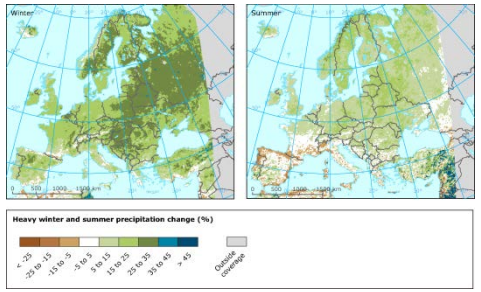
Other ECV datasets

Data collection and data rescue



Data reprocessing





Climate projections

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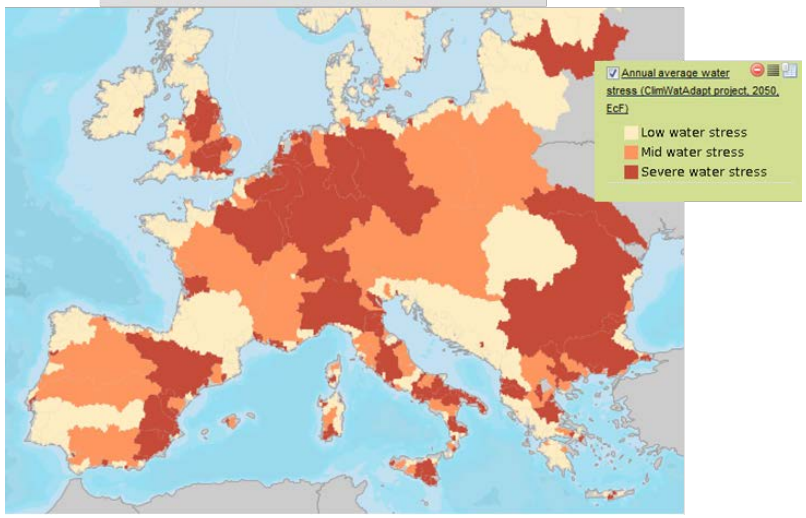
C3S Service elements: Sectoral Information System

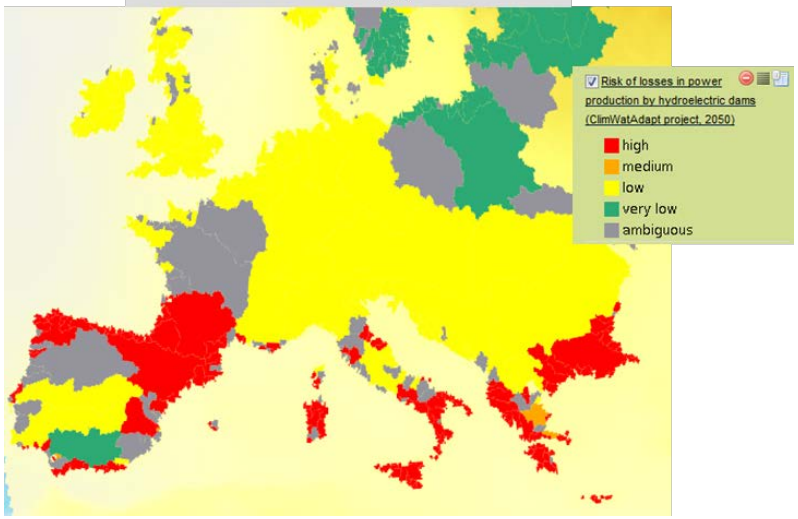
- Tailored climate indicators for primary users:
  - CLIMATE-ADAPT, institutional users at European level,…
  - Science users, innovation and business development

- Data and tools to support sectoral applications and policy development

Water management



Energy



- ~ 30 ECV datasets and ~ 8-10 Sectors to be addressed by 2020

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C3S Service elements: Evaluation and Quality Control

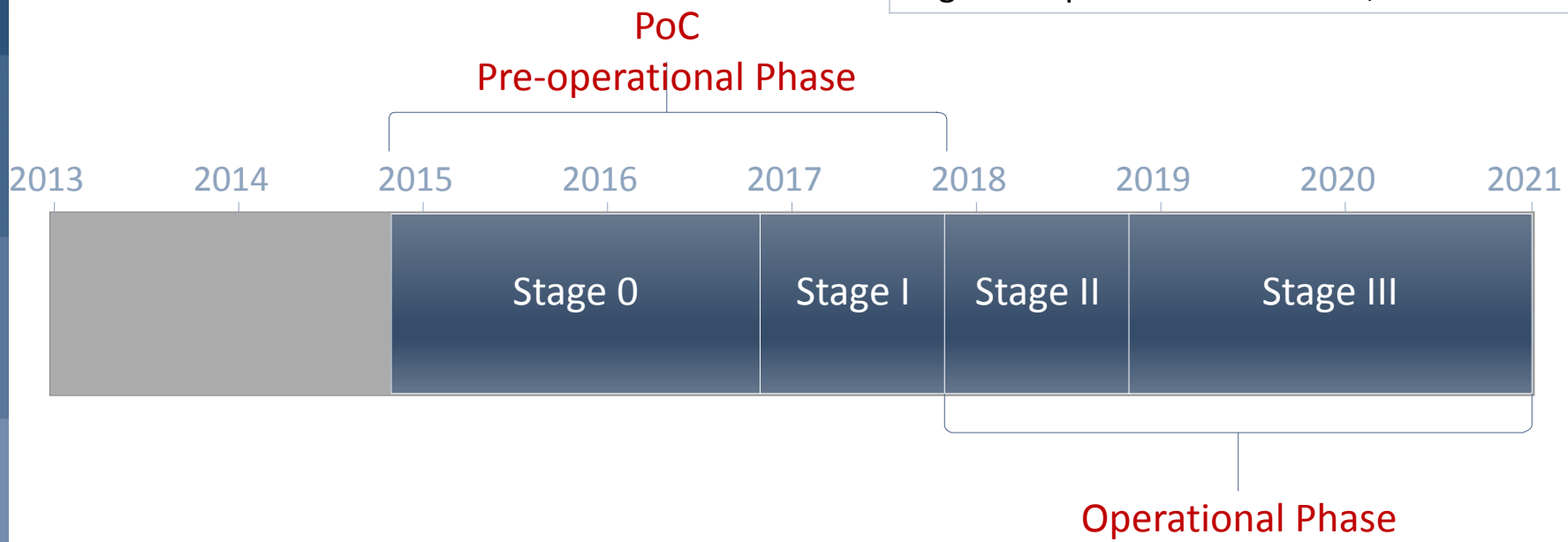
- User engagement:
  - Workshops, surveys, reports,…
  - User forum to ensure interaction and capacity building
- Continual evaluation of C3S products and services
  - Translation of user requirements into technical specifications
  - Identification of gaps in the Service (decadal prediction?)
  - Provision of guidance on dataset resolution requirements
  - Recommendations for new service components
  - Liaison with research programmes (H2020, others)
  - Strong interaction with CDS & SIS (multi-disciplinarity)
  - Scientific and technical assessments
- Support for expert groups and link with the EU F4P (Fitness for Purpose) function

C3S Service elements: Outreach and dissemination

- Web content provision and management
  - Coherence throughout the C3S, interfaces between pillars, etc.
- Public outreach:
  - All media, e.g. press, newsletters, climate impact visuals, twitter..
  - Annual State of Climate for Europe
- Coordination with national outreach efforts
  - On communicating events, findings, etc.
- Liaison with public authorities
  - Market/communicate C3S products
- Events (conferences, seminars, summer schools, ..)
- Training and educational material, smartphone apps, etc.

C3S implementation timeline

Stage 0 - Proof of Concept
Stage I - Pre-Operational
Stage II - Operational ~20 ECVs, ~5-6 Sectors
Stage III - Operational ~30 ECVs, ~8-10 Sectors



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C3S implementation timeline

Stage 0 (~2 to 3 years) is dedicated to infrastructure development and proof of concept:

- Building the CDS infrastructure
- Testing the mechanics of the C3S
  - Selecting two to three pilot sectors (energy, water, other)
  - Building and evaluating the value chain, from EO to tailored indicators
  - Coordinating and working with existing research projects
- Engaging with users (institutional and wider) to prioritize the ECV datasets and Sectors during preoperational phase

Stage 0 - Proof of Concept
Stage I - Pre-Operational
Stage II - Operational ~20 ECVs, ~5-6 Sectors
Stage III - Operational ~30 ECVs, ~8-10 Sectors

Implementation plans for later stages are sufficiently flexible to accommodate:

- Outcomes of FP7 precursor projects (ERA-CLIM2, CLIP-C, UERRA, EUCLEIA, QA4ECV)
- Products of CCI Phase 2
- New research, EQC recommendations, …

Copernicus Climate Change (C3) service

Indicative road map stage II

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

Coastal areas

Water management

Tourism

Insurance

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Copernicus Climate Change (C3) service

Indicative road map Stage II & III

Consistent Climate Data Store - ~ 30 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
- CO_2 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 – ~ 10 sectors

- *Agriculture and forestry*
- *Health*
- *Energy*
- *Infrastructure*
- *Coastal areas*
- *Water management*
- *Tourism*
- *Insurance*
- *Marine and fisheries*
- *Disaster risk reduction*
- *Biodiversity*
- *Transportation*

Conclusions

- C3S will be an operational service
- Most of the activities will be competitively procured
- A large user consultation process will be established throughout
  - Series of workshops in 2015
- Have a look at:

http://www.ecmwf.int/en/about/media-centre/news/2015/ecmwf-copernicus-services-open-business

- Note the information day in Brussels on 2 Feb 2015.

Thank You