Servizio Cambiamenti Climatici:
Copernicus Climate Change Service - C3S

Silvio Gualdi
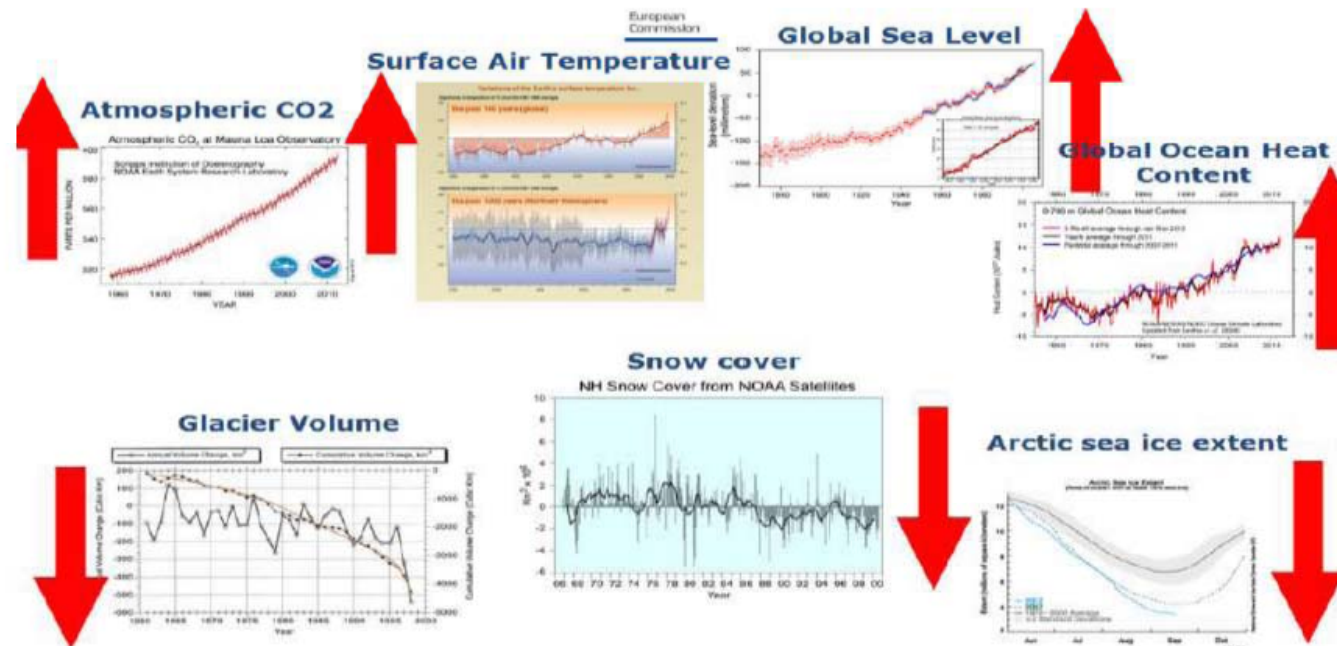Climate Simulations and Predictions
CMCC

Seminario Servizi e Collaborative Ground Segment del Programma Copernicus
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Presidenza del Consiglio dei Ministri - Sala Polifunzionale
Via Santa Maria in Via, 37b – Roma

cmcc
Centro Euro-Mediterraneo
sui Cambiamenti Climatici

C3S State of play

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."

C3S: vision

To be an authoritative source of climate information for Europe

To build upon national investments and complement national climate service providers

To support the market for climate services in Europe

Is the climate changing?

Will climate change continue, accelerate?

- Earth observations
- Reanalyses

- Predictions
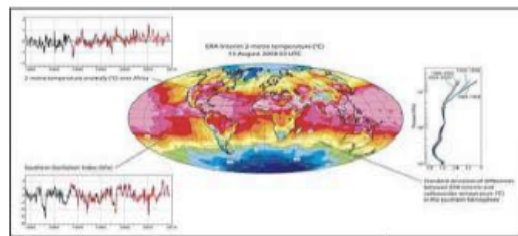- Projections

What are the societal impacts?

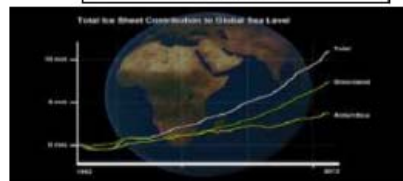- Climate indicators
- Sectoral information

C3S Services Elements: Climate Data Store

Series of ECV datasets and climate indicators

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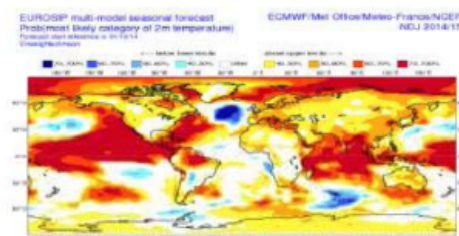- Relevant to support adaptation/mitigation policies at European level and wider
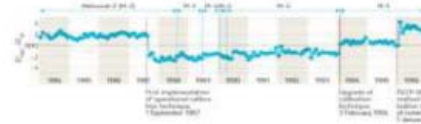

Reanalyses

Other ECV datasets

Multi model seasonal forecast products

Data collection and data rescue

Data reprocessing
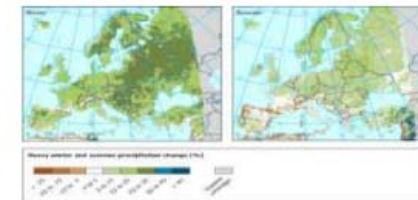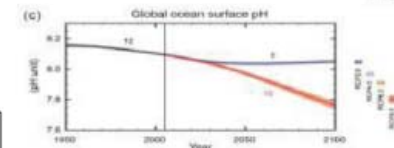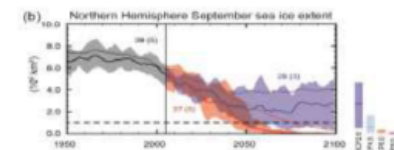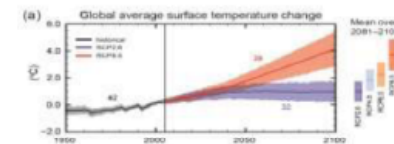
Climate projections

Copernicus

ECMWF

C3S Services Elements: Sectoral Information System

Tailored climate indicators for primary users:

- Institutional users at European level, EEA Climate-Adapt,…
- Science users, innovation and business development

Data and tools to support public and commercial applications and policy development

Water management

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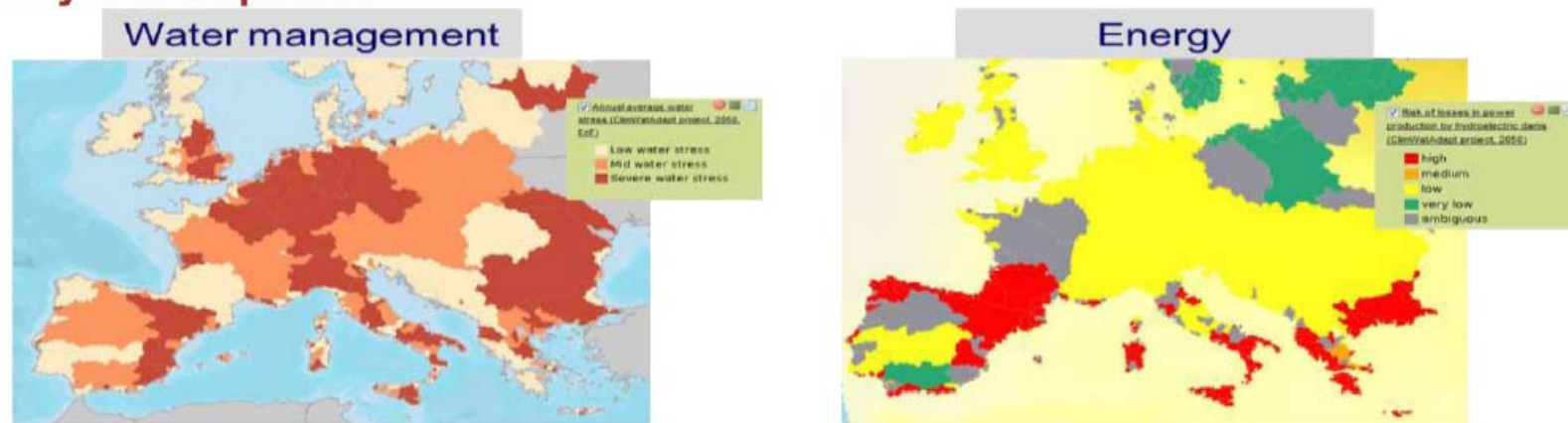
- ~ 30 ECV datasets and ~ 8-10 Sectors to be addressed by 2020

Adapted from Jean-Noël Thépaut, Brussels 2015

C3S Services Elements: Evaluation and Quality Control

User engagement

- Workshops, surveys, reports,…
- User forums 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-disciplinary)
- Scientific and technical assessments

C3S Services 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
- Downstream application and service providers

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 Provisional Timing

| 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 |

PoC + Pre-operational Phase

2013	2014	2015	2016	2017	2018	2019	2020	2021
		Stage 0			Stage I	Stage II	Stage III	
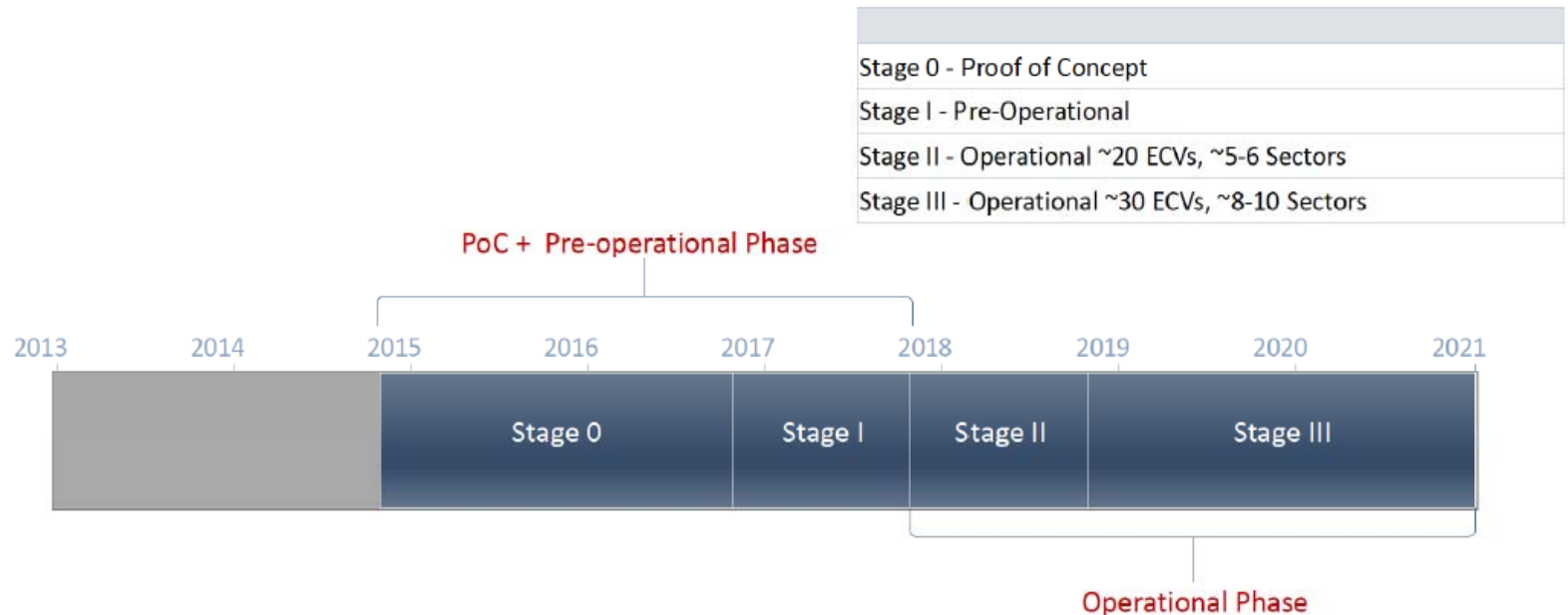
Operational Phase

Initial proof-of-concepts activities will be procured during 2015 and will expand as C3S develops throughout the pre-operational and operational stages

C3S initial procurements

➢ ECMWF has published eight Copernicus Invitations to Tender (ITT) and 19 Prior Information Notices in the Official Journal of the European Union (OJEU) for several Copernicus procurements.

➢ **Two of the eight ITT are for C3S:**

- **Seasonal Forecasts**

- **Sectoral Information System** (proof-of-concept)

Seasonal Forecasts:

• will support regular global re-forecasting activities at several European provider sites, at a resolution and frequency that would not be attainable without such support;

• will provide, once a month, a set of multi-model products using these re-forecasts and the providers' production global forecasts;

• will make available all the input data (production forecasts and reforecasts) as open data.

Sectoral Information System:

proof-of-concept aiming at demonstrating the value chain from earth observation and model outputs to actionable climate information in 3 different Sectors, with a focus over Europe:

- Energy
- Water management
- Other

This Sectoral Information System (SIS) will translate and combine climate information from the Climate Data Store of the C3S and other sources to support users acting in specific sectors. Customized information products in the form of climate change indicators and ancillary information will be disseminated via e.g. the Climate- ADAPT platform (EEA) and the C3S data portal as it develops.

This activity will start based on existing datasets.

C3S procurement plan

Call theme	Title	Call date	Start	End	Total value (k€)
C3S infrastructure					~3200
	System software development	Q2-2015	**Q4-2015**	Q4-2018	
	Application software developments	Q2-2015	**Q4-2015**	Q4-2018	
CDS content					~51000
	Observation collection and processing	Q3-2015	**Q4-2015**	Q4-2020	
	Observation gridded products (I)	Q3-2015	Q1-2016	Q4-2017	
	Observation gridded products (II)	Q3-2016	Q1-2017	Q4-2020	
	Regional Climate reanalyses	Q3-2016	Q2-2017	Q4-2020	
	Seasonal Forecasts	Q1-2015	**Q3-2015**	Q4-2017	
	Global Climate Projections	Q2-2015	**Q4-2015**	Q4-2018	
	Regional Climate Projections	Q3-2015	Q2-2016	Q4-2018	

C3S procurement plan

Call theme	Title	Call date	Start	End	Total value (k€)
Sectoral Information System					~40000
	Proof-of-concept (PoC) with three sectors	Q1-2015	**Q3-2015**	Q4-2018	
	Extension to other sectors	Q2-2016	Q4-2016	Q4-2020	
	Tool box and business developments	Q2-2016	Q4-2016	Q4-2020	
Evaluation and Quality Control					~15000
	Proof-of-concept: CDS infra structure and content, UR	Q2-2015	**Q4-2015**	Q4-2017	
	Proof-of-concept: SIS development for pilot sectors, UR	Q2-2015	**Q4-2015**	Q4-2017	
Outreach and Dissemination					~9500
	Web content provision & management	TBD			
	Public Outreach		ongoing		
	Events		ongoing		
	Training	Q3-2015	Q1-2016	Q4-2020	

ANNEX
to the Commission Implementing Decision
Concerning the adoption of a financing decision for 2016
in the framework of the Copernicus Programme

1. ACTION No 6: Climate Change Service

2016 will be the second year of the proof-of-concept and the plan therefore reflects continuity in the actions that will have been engaged during 2015 and that will be consolidated during this planning period. In addition, a number of new activities will be initiated, in particular in the area of climate projections and observations. The first deliverables and results from the sectoral applications will become available, as well as some elements related to the production of re-analyses and seasonal forecasts.

Climate Change Service – Stage 0

The second year of the proof of concept for Stage 0 will address the following areas*:*

- C3S infrastructure: Developing the C3S infrastructure and maintening a temporary infrastructure to support initial C3S activities during the pre-operational phase. This includes:

a. Provision of computing support for reanalysis and seasonal forecast productions

b. Developing further appropriate links with WMO Information System (WIS) and Global Framework for Climate Services (GFCS), etc.

c. Monitoring procured development activities

d. Co-developing and integrating technical solutions for the C3S portal and the CDS

e. Running data acquisition and cataloguing

f. Operationalising prototypes for key elements of the CDS, such as Climate Monitoring Facility and Observation Feedback Archive

An estimated budget of EUR 5.8 million is foreseen for these activities.

In Italy:

Need to synchronize the initiative of the country in Copernicus (EC and ECMWF) and WMO (CCl and GFCS)
and be a party of national climate services
(national co-ordination of subjects offered operating services):
National Climate Service Network of Italy (NCSNI)

The **National Climate Services Network of Italy (NCSNI)**

is a network of Italian public entities (weather services at national and regional level, research institutions and consortia, territorial and environmental protection agencies), expressing a portfolio of existing operational climate products and capabilities, with requirements driven and applications adopted by national, regional and local territorial management entities

**Sistema Nazionale delle Agenzie Ambientali
(ISPRA – ARPA)**

**Consiglio Nazionale delle Ricerche
Istituto di Scienze dell'Atmosfera e del Clima (CNR-ISAC)**

**Centro Euro-Mediterraneo sui
Cambiamenti Climatici (CMCC)**

**Aeronautica Militare
Servizio Meteorologico**

**Agenzia Nazionale per le Nuove tecnologie,
l'Energia e lo Sviluppo Sostenibile (ENEA)**

NCSNI Objectives

The purpose of NCSNI is to provide a coherent set of climate services for national objectives and for the participation in international programs on climate services, such as the Global Framework for Climate Service (GFCS),

the Copernicus Climate Change Service

and other European initiatives.

The NCSNI, together with the WMO Italian Permanent Representative, constitutes the Italian contribution to the system of climate services in relation to WMO climate programs.

NCSNI Products

1. Climate monitoring

Termoli meteorological station

Italy has one of the most valuable heritages in the world of historical data and in-situ climate observations.

The unique value of available historical data allowed for a long time the Italian scientific community to develop expertise in data rescue, quality checks, spatial interpolation and time series selection, reconstruction, homogenization and in the data geographical representation.

Lampedusa island

Three Special Sites for all ECV measurements and global climate atmospheric monitoring and investigations.


Monte Cimone

NCSNI Products

2. Climate variations and current trends

• Quality-checked, regularly updated time series of the main climate variables, responding to established requirements about their length, frequency and continuity

• Point and spatialized (maps) climate normals and annual anomalies

• Point and spatialized indicators of the trend of climate variables.

• Monthly, seasonally, yearly climate bulletins and reports
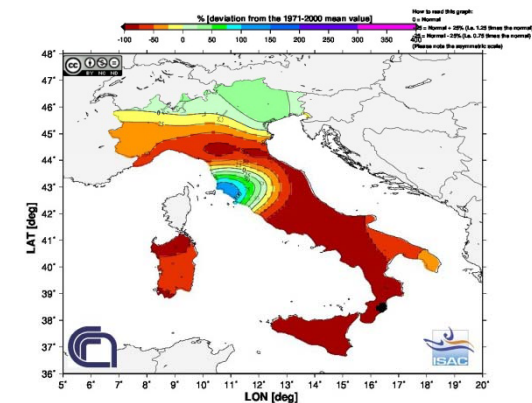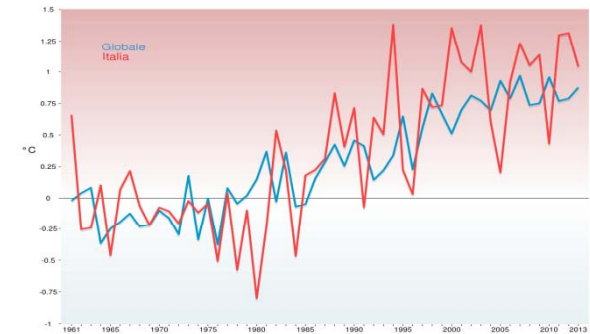
NCSNI Products

3. Seasonal forecast

Several modeling systems/approaches are used operationally to obtain seasonal forecasts. They contribute to the international program on Consensus Seasonal Forecasts and are routinely provided to the Task Team on Sub-Seasonal to Seasonal Predictions of the Italian National Civil Protection Department.

4. Climate projections and downscaling

Climate projections under future emissions scenarios are produced by global and regional coupled atmospheric-oceanic climate models. They participate to the Climate Model Intercomparison Project (CMIP) and Cordinated Regional Climate Downscaling Experiment (CORDEX) of the World Climate Research Programme (WRCP) and provide updated climate scenarios needed for climate change mitigation and adaptation planning at global and regional scales, with focus on the Mediterranean area.
Several Empirical-Statistical model chains are applied to reduce systematic errors, generate probabilistic information at small scale and extend the set of predictions to other climate-derived quantities.

Examples of NCSNI <u>Sectoral Applications</u>

1. ## Agriculture and water management

   Spatialized high-resolution climate data are used to develop the 2014–2020 Rural Development Plan for Sicily Region;

   Seasonal forecasts are transferred to several local bodies responsible of water management: probabilistic assessment of potential irrigation demand of crops for the Emilia-Romagna Region

2. ## Flood risk management

   Planning of flood risk management policies aimed at securing the areas closed to rivers: climate/hydrological/water balance modeling chain reproduce the present discharges of Po River and its tributaries and simulate future discharges under different climate change scenarios. For small mountain catchments, climate impact assessment systems are devoted to estimating the risk of flooding and anomalous aquifer response, based on suitably downscaled climate projections/predictions

Examples of NCSNI <u>Sectoral Applications</u>

3. ## Landslide risk management

   Estimates of changes in intense precipitation and of the associated modifications in landslide risk is one of the central issues for the Italian territory. A system for the seasonal-to decadal estimate of changes in rainfall-triggered landslide risk is under construction

4. ## Energy

   High-resolution climate information for the past decades and for the future are used to evaluate the effects on hydropower plant potential productivity in small Alpine and Apennine catchments. Moreover, seasonal prediction of electricity demand and renewable energies production are routinely provided to the national grid operator

5. ## Forest fires

   An early multiscale service for forest fire potential condition, based on high-resolution regional multimodel ensemble and ECMWF Integrated Forecasting System, is provided to the regional authorities in the western Alps to operational planning of fire fighting resources.

6. ## Food security

   A Seasonal Forecast System is used as a prototype service for the provision of drought early warnings in Ethiopia (EU-FP7 Euporias)