# IS-ENES impacts
# on the path towards the infrastructure sustainability

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https://is.enes.org

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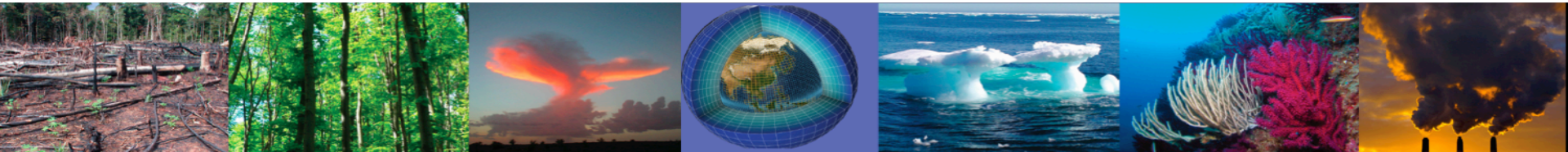
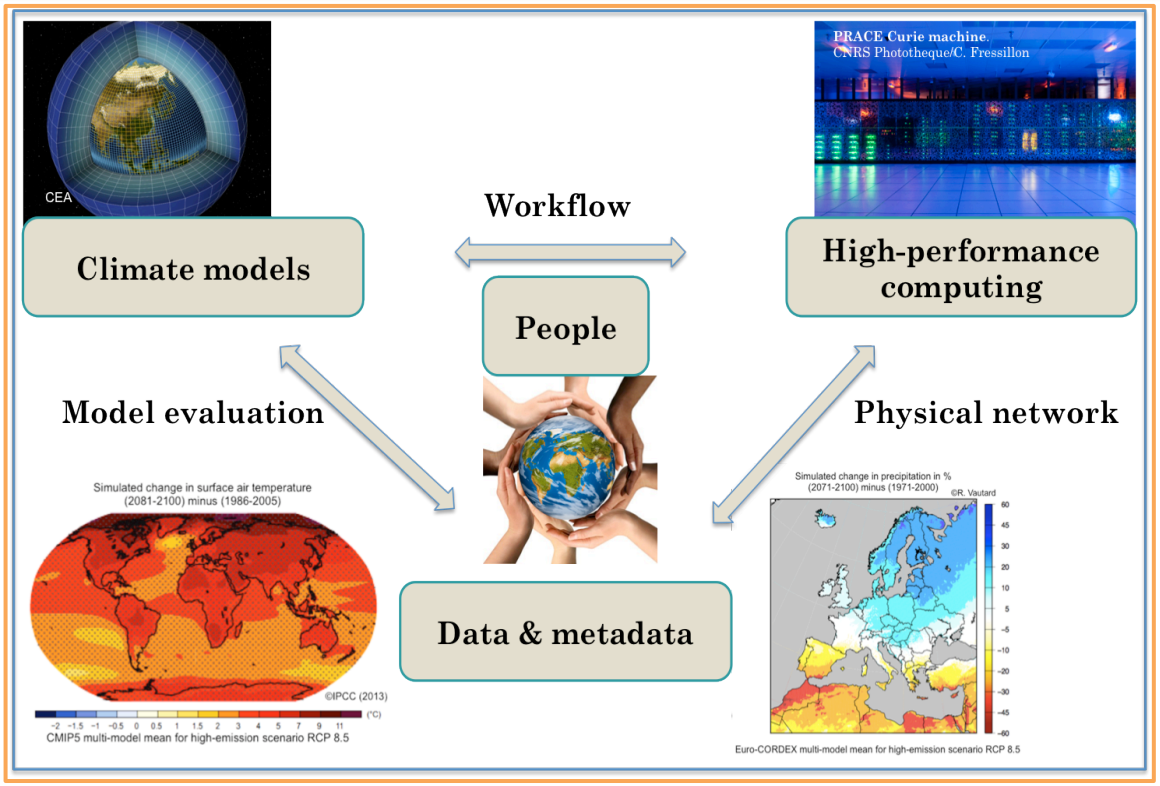
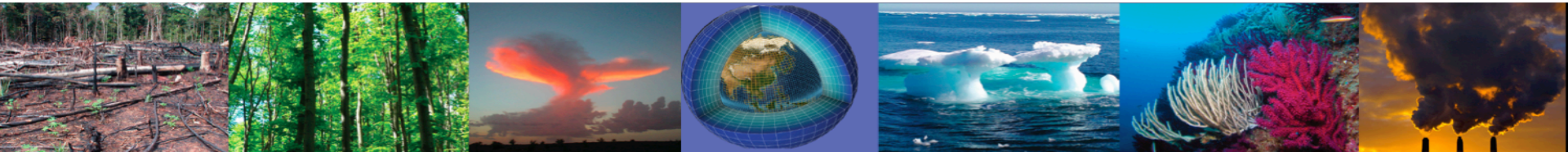


# The infrastructure of




ENES Infrastructure strategy 2012-2022
(updated in 2017)

https://enes.org



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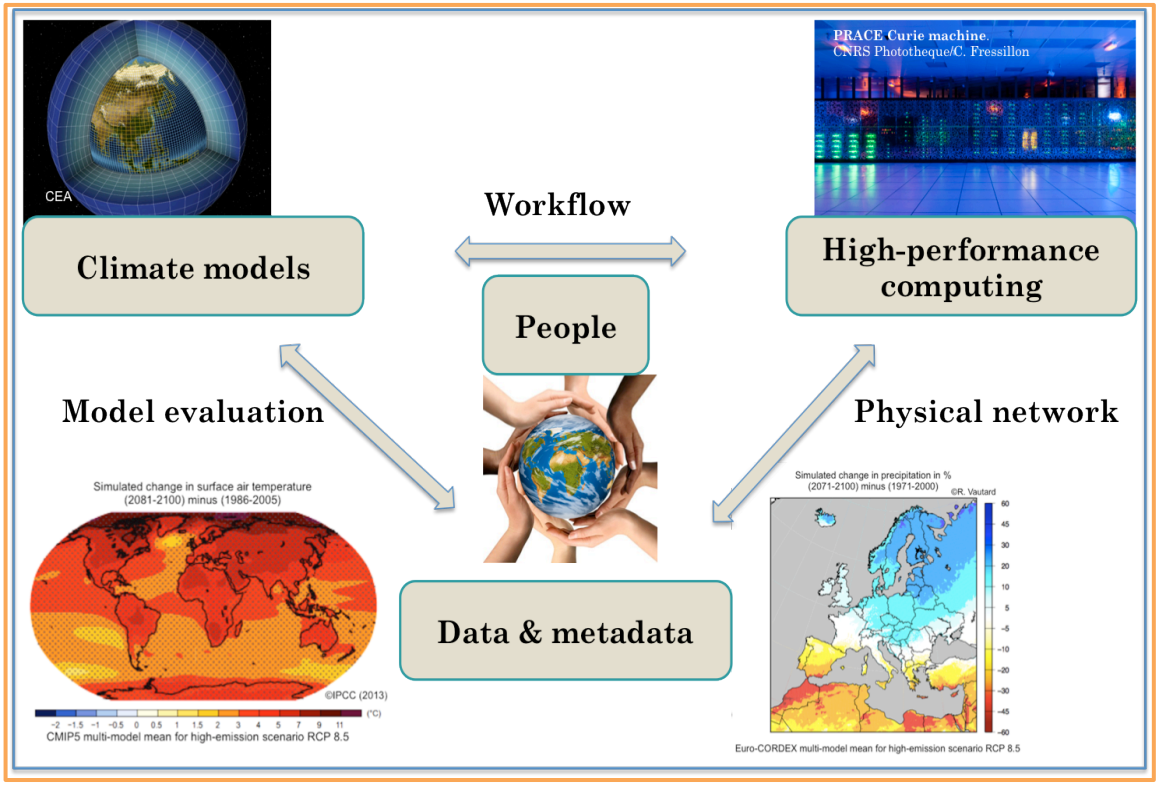


ENES Infrastructure strategy 2012-2022
(updated in 2017)

https://enes.org

## IS-ENES infrastructure projects

- IS-ENES (2009-2013)
- IS-ENES2 (2013-2017)
- **IS-ENES3 (2019-2022)**

Support WCRP internationally coordinated climate model experiments (CMIP & CORDEX)

Support sharing of expertise on climate models, tools, & HPC

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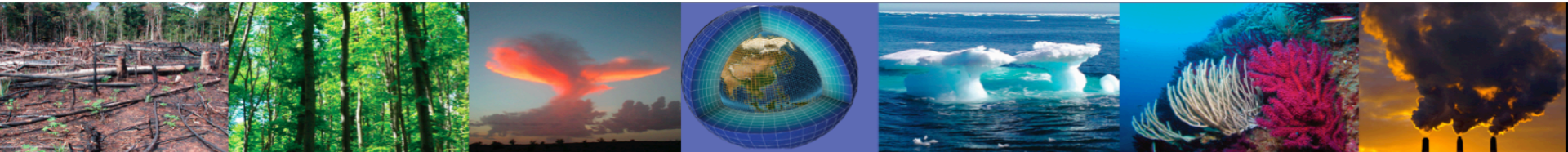


# IS-ENES3

## Main objectives

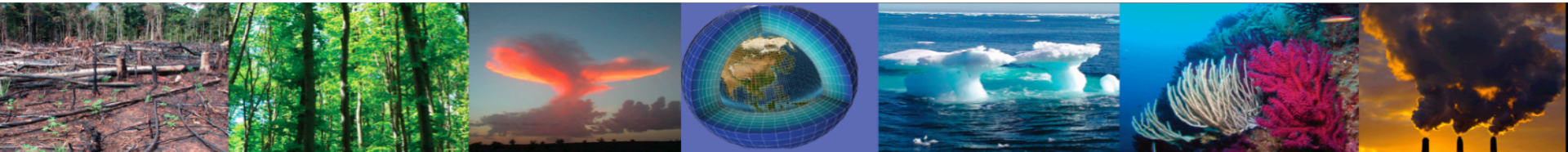
- Pursue integration of the climate modelling community & **prepare sustainability of the research infrastructure**
- Foster common development of models and tools and efficient use of HPC
- Support **exploitation of model data by Earth system science, climate change impact science, and climate services**

**January 2019 – December 2022**

**22 partners** from 11 countries

CNRS-IPSL,CEA, SU (FR); UREAD-NCAS (UK); DKRZ (DE); CERFACS (FR); Met Office (UK); BSC (ES); KNMI (NL); CMCC (IT); UKRI (UK); SMHI (SE); DLR (DE); NLeSC (NL); UC (ES); Met.no (NO); MF-CNRM (FR); UNIMAN (UK); NCSR-D (GR); WENR (NL); CUNI (CZ); FPUB (SR); NORCE (NO); LiU (SE)

EC funding: 9.8 M€/4 years & national support



is-enes
INFRASTRUCTURE FOR THE EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING

# A distributed e-infrastructure

EGU General Assembly 2019

**Climate models**
Environment software tools
*ESM ca 1000 man years*

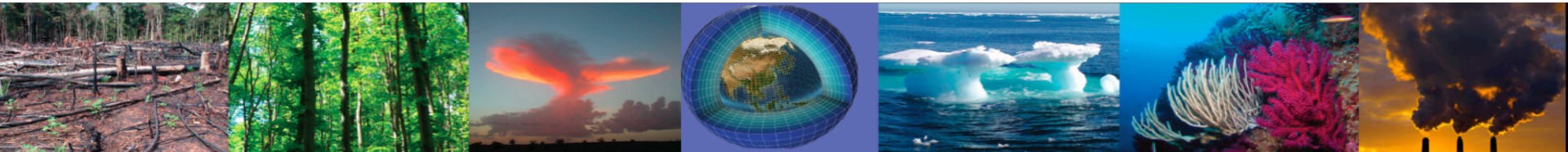
**High-performance computers**
& storage facilities

**Data & metadata**
Standards
Distributed database ESGF
*> 20 000 registered users worldwide*
*Open access*

WCRP World Climate Research Programme

**Climate & Impact research**
**Climate services**

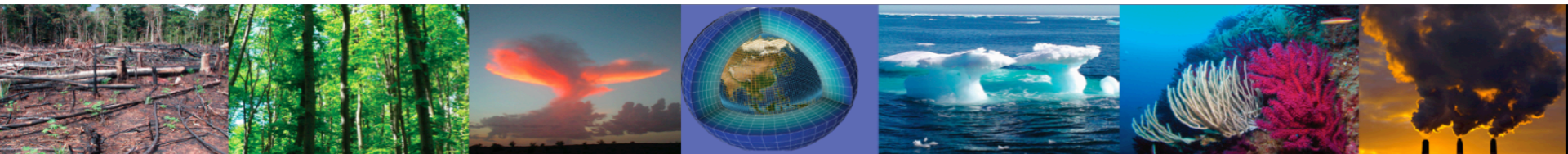
enes
EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING



# A distributed e-infrastructure

## targeting a blend of user communities

- Earth climate system modelers (developing and using models, providing data)
- climate researchers (analyzing CMIP simulations)
- wider community working on impacts of climate change (using CMIP/CORDEX projections)
- Climate services
- Other RIs

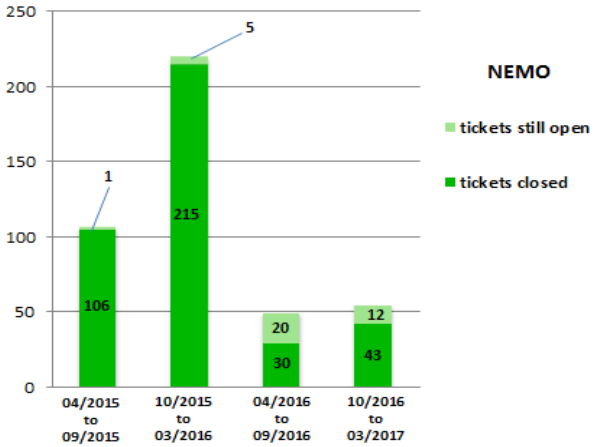


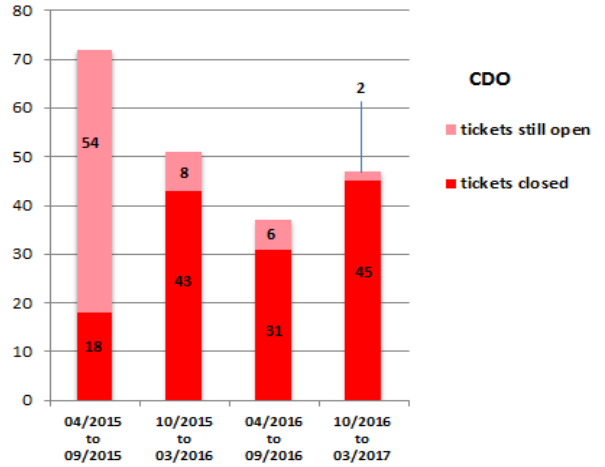
# Impact metrics for access: software

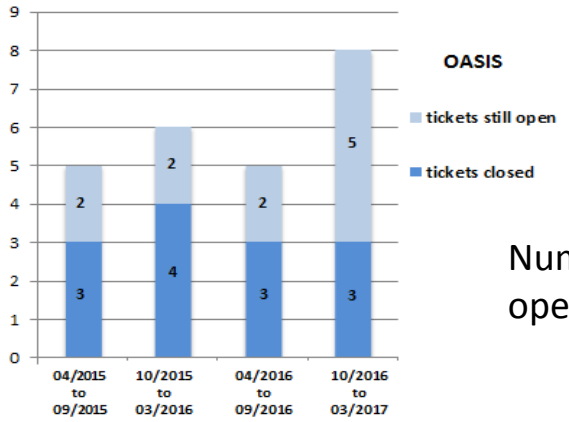
**sharing software (models & tools) and expertise**

- NEMO ocean model
- ESMs
- OASIS coupler
- CDO post-processing,

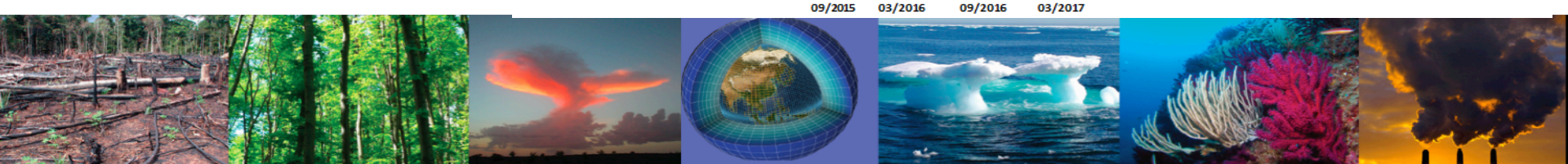
- **NEW!** XIOS IO server,
- Cylc metascheduler,
- Common sea-ice model



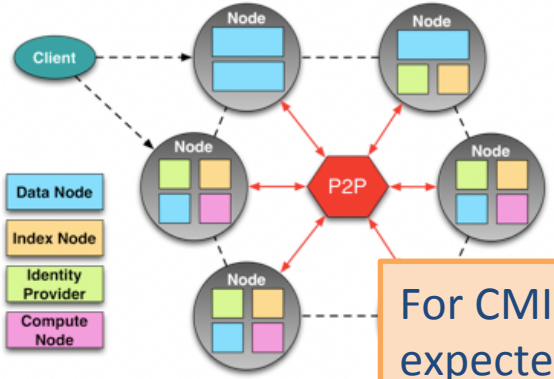




Number of tickets opened/closed



# Impact metrics for access: data 1/2

**Earth System Grid Federation (ESGF)**
Now 20 000 registered users worldwide




For CMIP6 expected 20 PB!

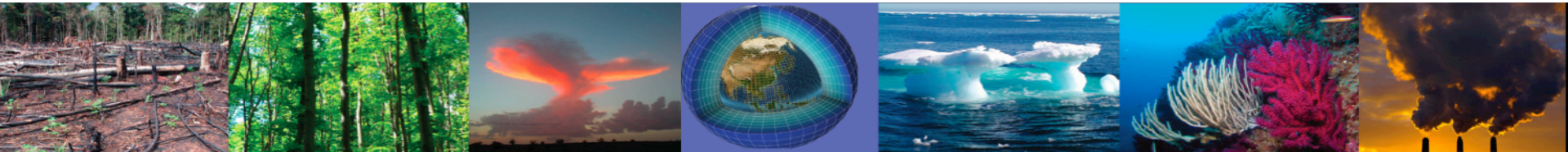
All projects

| | | |
|---|---|---|
| 1,315,244 total datasets 7,459.38 TB | 1,098,055 distinct datasets 3,975.53 TB | 217,189 replica datasets 3,483.85 TB |

Top projects

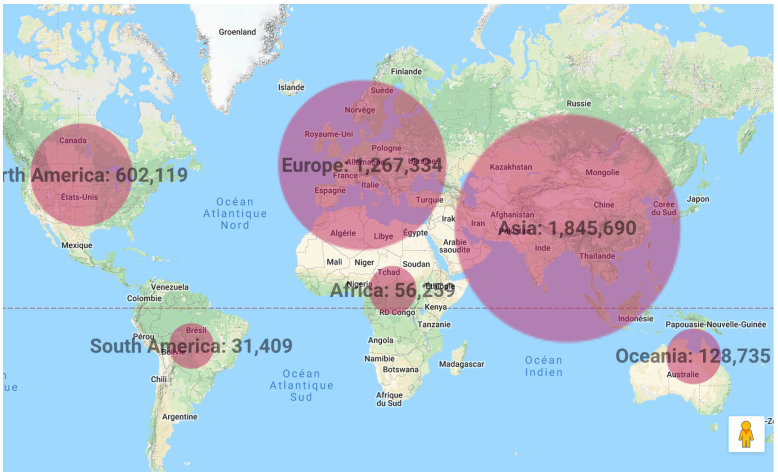
| | | |
|---|---|---|
| CMIP5 171,463 total datasets 4,820.46 TB | CMIP5 55,501 distinct datasets 1,729.05 TB | CMIP5 115,962 replica datasets 3,091.42 TB |
| CMIP6 356,790 total datasets 1,587.27 TB | CMIP6 61,186 distinct datasets 1,200.86 TB | CMIP6 95,604 replica datasets 386.42 TB |

Usage of ESGF

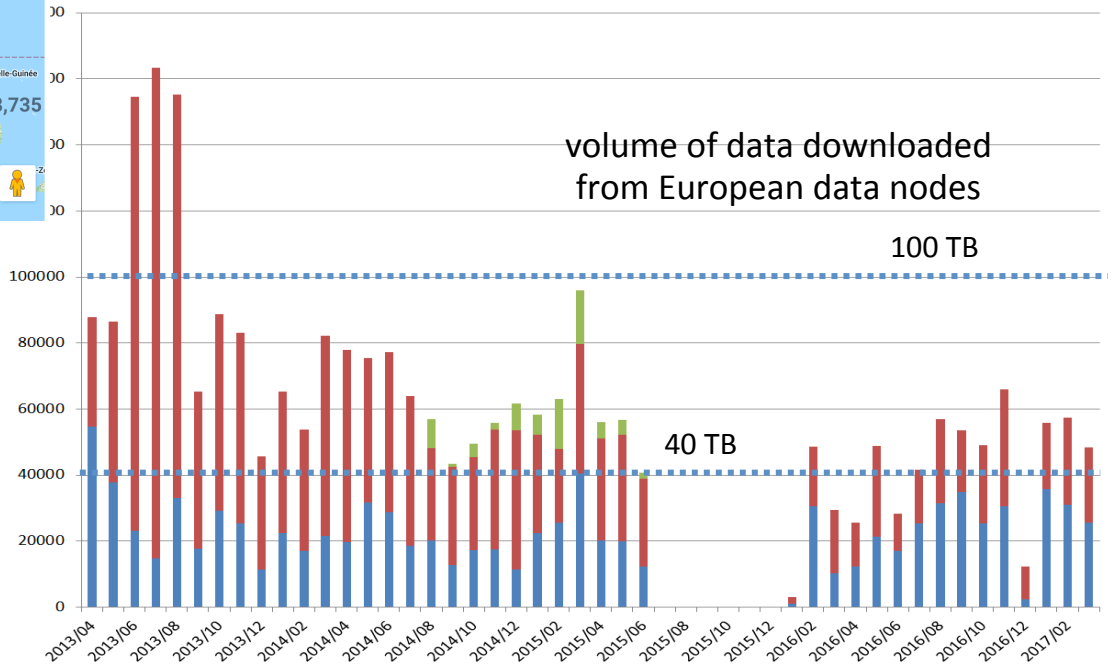


# Impact metrics for access: data 2/2

## Usage of European ESGF

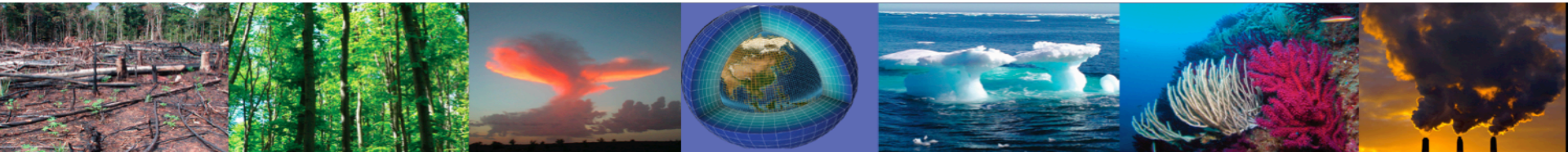



- volume of data downloaded
- number of active users on nodes
- help desk queries




With CMIP6 likely to increase!

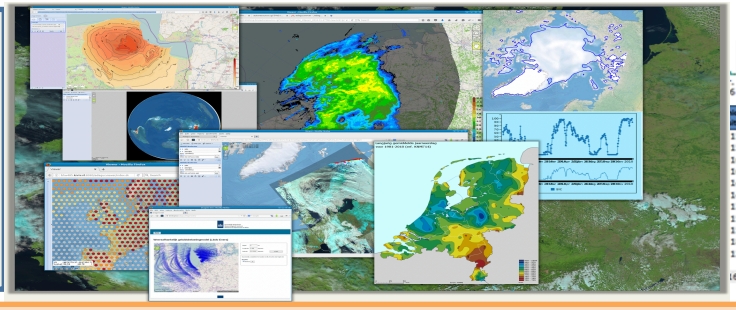
- New computing services

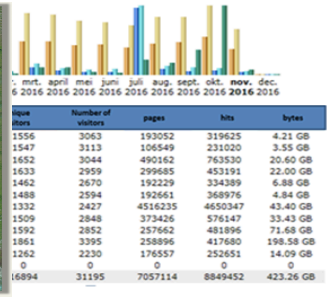


# Widening the user base

**Climate4impact portal**

- Facilitating ESGF data access for climate impact science and climate services





New ESGF processing tools:

- facilitating access for climate researchers

Training sessions

- Targeting VIA, impacts science and climate services
- Located also in Eastern Europe

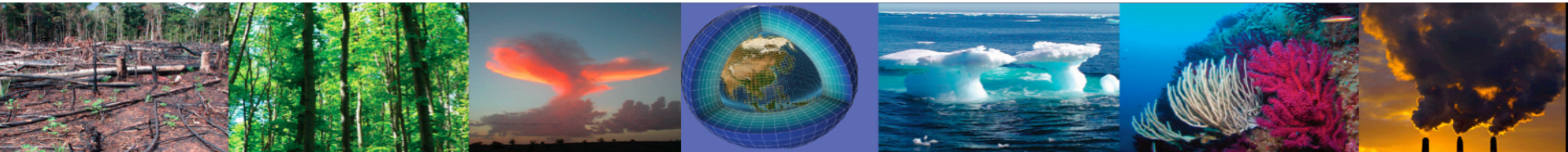
New schools

- Targeting young scientist and ICT community

Mapping attendance

- career stage
- geographic provenance
- community

Cooperation with other projects (e.g. Copernicus) to reach climate services providers

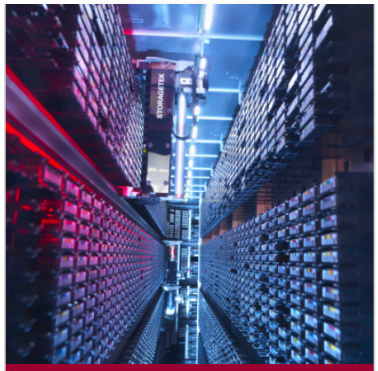


# Socio-economic impact 1/2
# downstream exploitation

Access to CMIP5: broker from ESGF with support from IS-ENES teams

Implemented by ECMWF as part of The Copernicus Programme

**Climate Change Service**



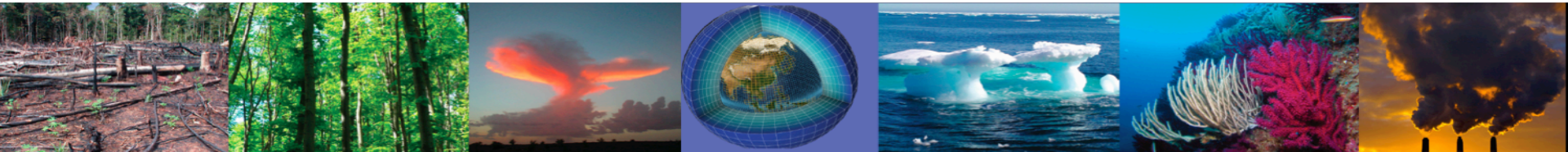
Climate Data Store

https://cds.climate.copernicus.eu

**CMIP5 simulations**

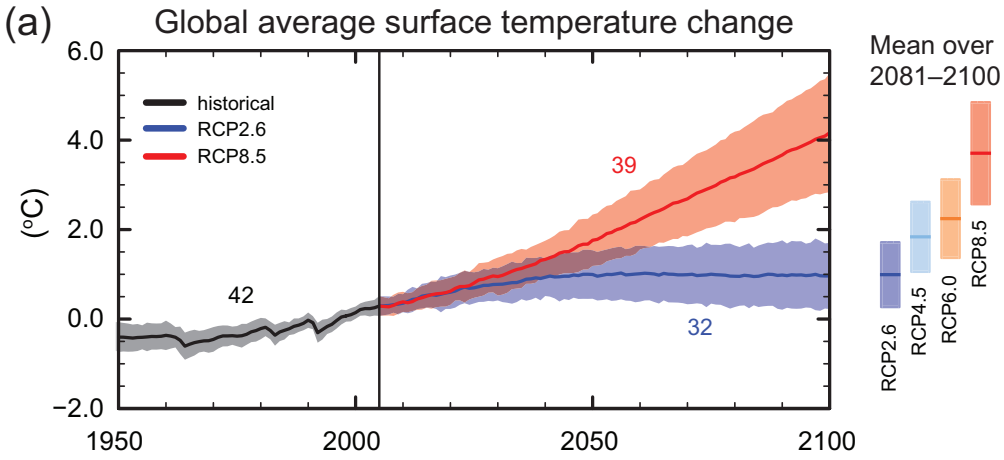
- CMIP5 daily data on pressure levels
  **CMIP5** daily data on pressure levels
- CMIP5 daily data on single levels
  **CMIP5** daily data on single levels
- CMIP5 monthly data on pressure levels
  **CMIP5** monthly data on pressure levels
- CMIP5 monthly data on single levels
  **CMIP5** monthly data on single levels
- Essential climate variables for water sector applications derived from CMIP5 projections
  Essential climate variables for water sector applications derived from **CMIP5** projections

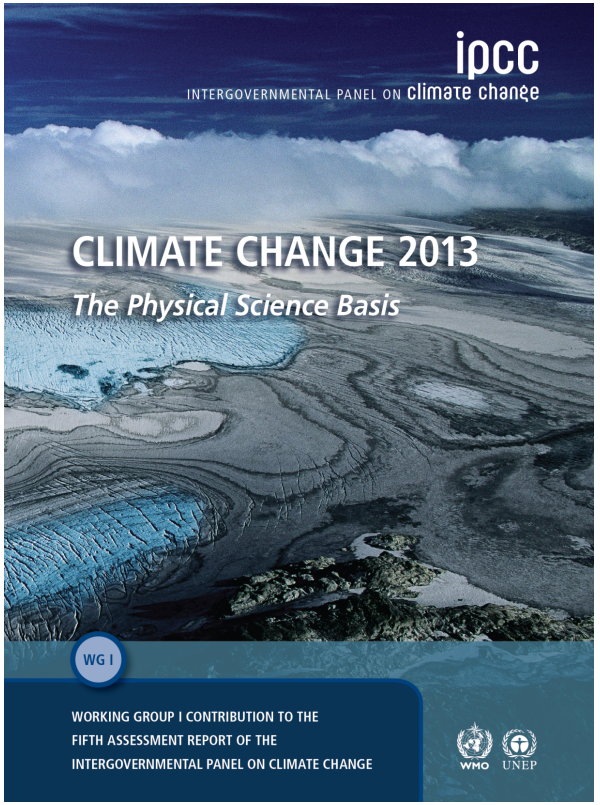
5 C3S
spin-off projects!



# Socio-economic impact 2/2
## impact on policy making

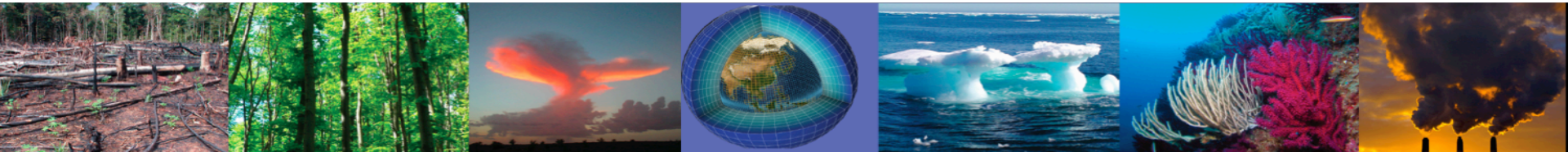
**CMIP5 simulations:** Basis for IPCC AR5




To be continued with CMIP6!

IPCC Data Distribution Centre
www.ipcc-data.org
maintained by CEDA & DKRZ for 20 ys



# Other expected impacts

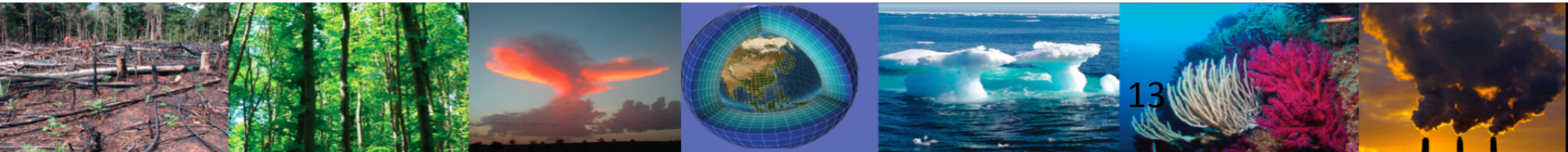


New synergies/interoperability with other infrastructures

- analysis of the demand (besides technical feasibility)

Advanced innovation in the field of climate modelling

- a dedicated, virtual WP in IS-ENES3



# Conclusions

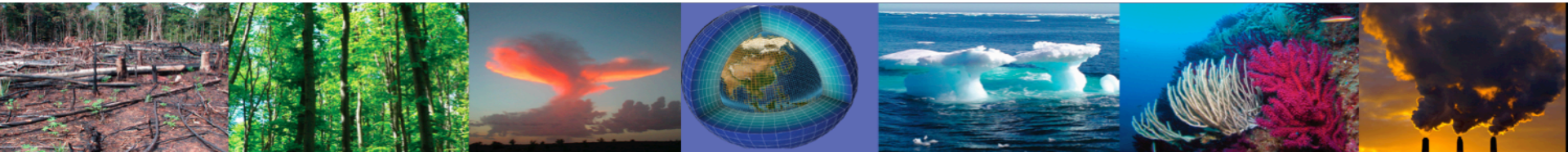
A wealth of impacts

- on research
- socio-economic impacts (IPCC & climate services, innovation)

Some impacts indicators

Analysis of impacts and constant monitoring of indicators

- prevent/tackle external hurdles
- prepare sustainability

Sustainability

- strategy and vision
- adjustments based on analysis of impacts
- implementation plan
- management of the complex national/international dimension