Climate services in support of the energy transformation

EGU

11 April 2018, Vienna, Austria

Alberto Troccoli, Sylvie Parey, and the C3S ECEM team

Climate Change

Copernicus Europe's eyes on Earth

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Outline

- Background of the C3S European Climatic Energy Mixes (ECEM)
- Climate Variables
- Energy Variables
- The ECEM demonstrator

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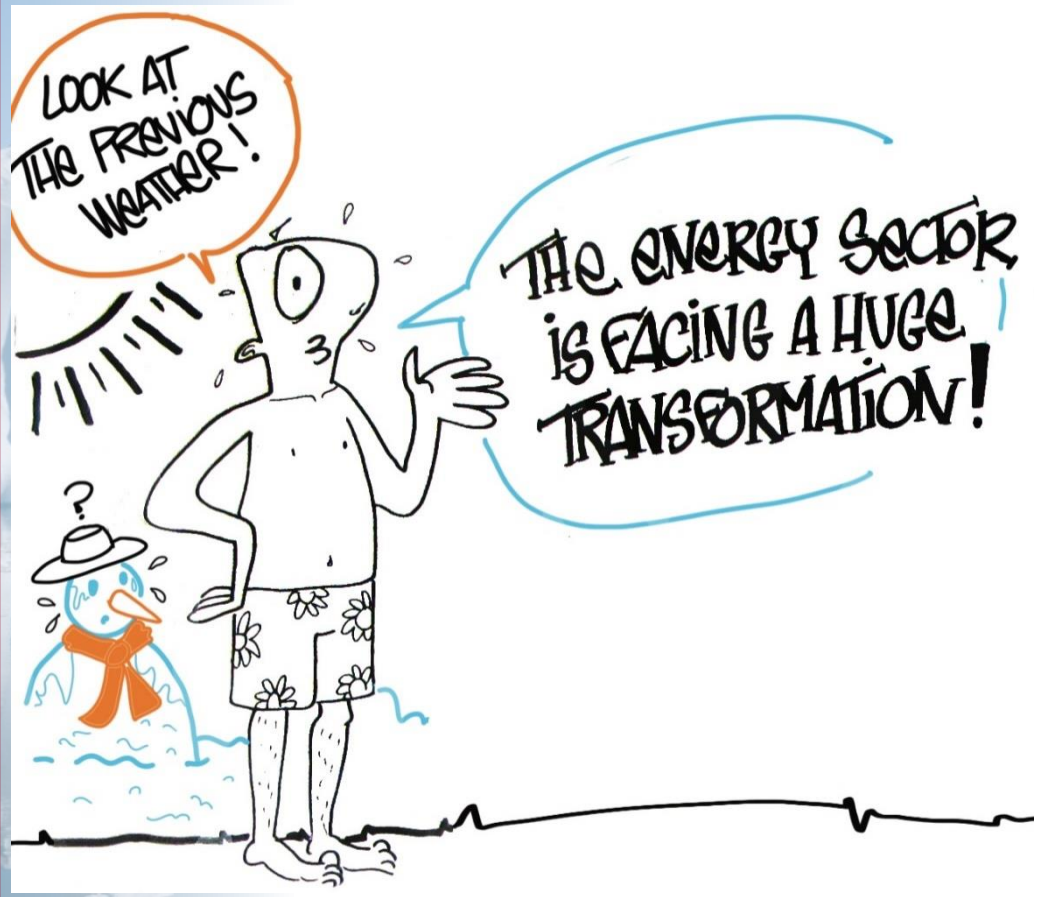
Motivation



The C3S European Climatic Energy Mixes (ECEM) has developed a demonstrator to assess how well **different energy supply mixes** in Europe will meet demand, over different time horizons, focusing on the role climate has on the mixes

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The ECEM Approach

Calibrated Climate Variables

- Temperature
- Rainfall
- River Discharge
- Wind Speed
- Cloud Cover
- Solar Radiation
- Others ?

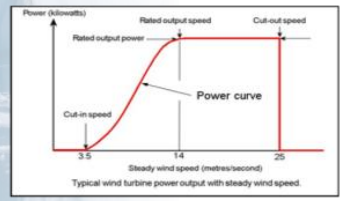
+Ancillary

- Skill & Reliability
- Assessment of Seasonal Forecasts of Energy Variables

+ Extreme Events Case Studies

Define models & transfer functions

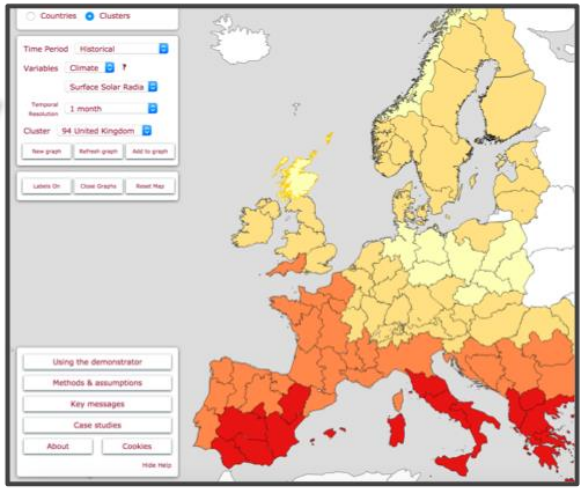
Select / Gather relevant datasets



Energy Variables

- Demand
- Hydro Power
- Wind Power
- Solar Power
- Thermal Power

- Sub-Country Scale
- Historical Period
- Seas. Fcst
- Clim. Proj.



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Variable distributions for bias-adjustment

- Normal Distribution for Air Temperature
- Gamma Distribution for Precipitation (fits much better when a low threshold for daily precipitation is selected, 0.5-1.0mm)
- Gamma Distribution for Dewpoint Depression (needed to produce RH)
- Weibull Distribution for Wind Speed
- Solar Irradiance (directly adjusted using satellite data, as very few direct observational sites)

- Air Temperature and Precipitation from E-OBS
- Wind Speed and Dewpoint Depression values from HadISD
- Solar Irradiance from Helioclim-v3 satellite data

For additional details of datasets and distributions see Jones et al (2017)

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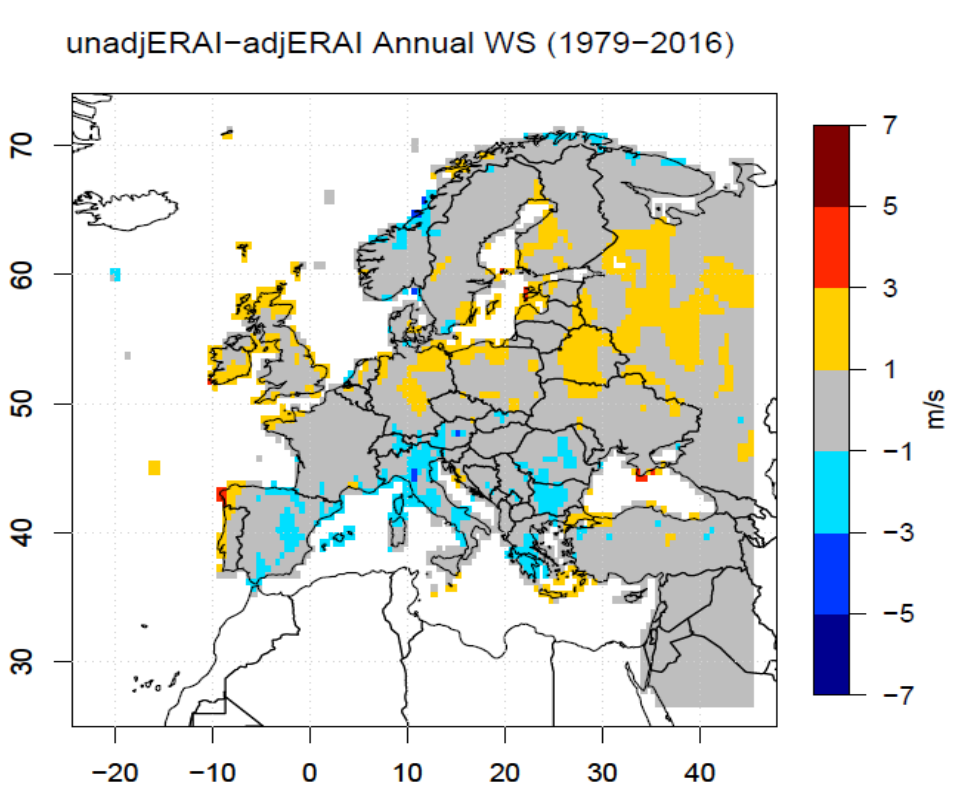
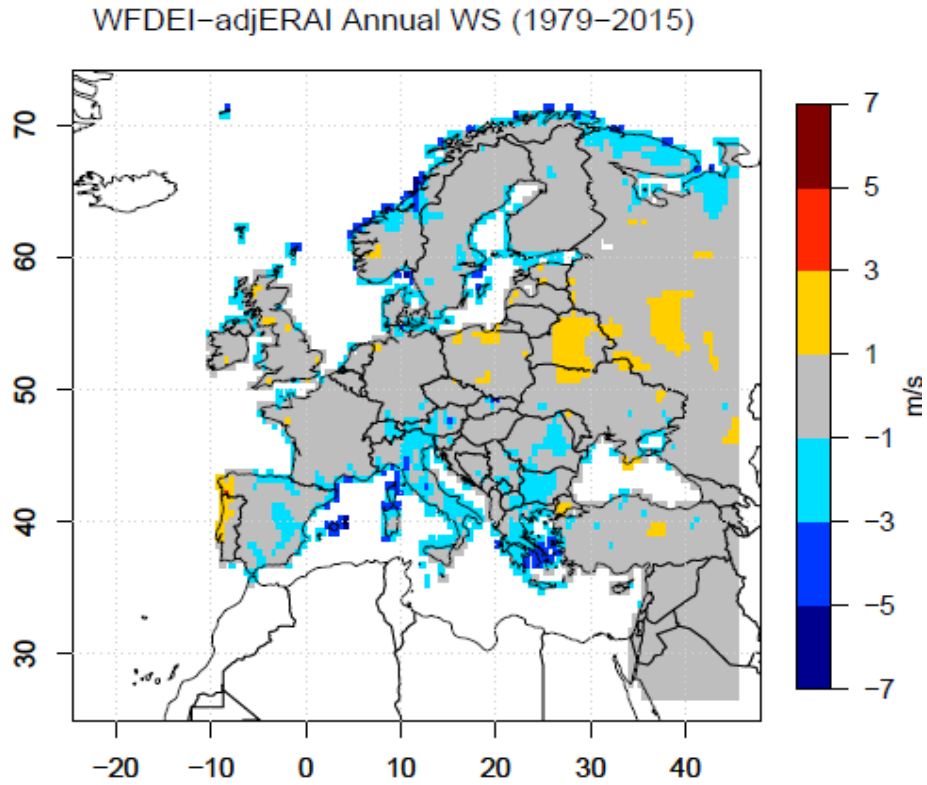
Unadjusted minus adjusted (Wind Speeds)





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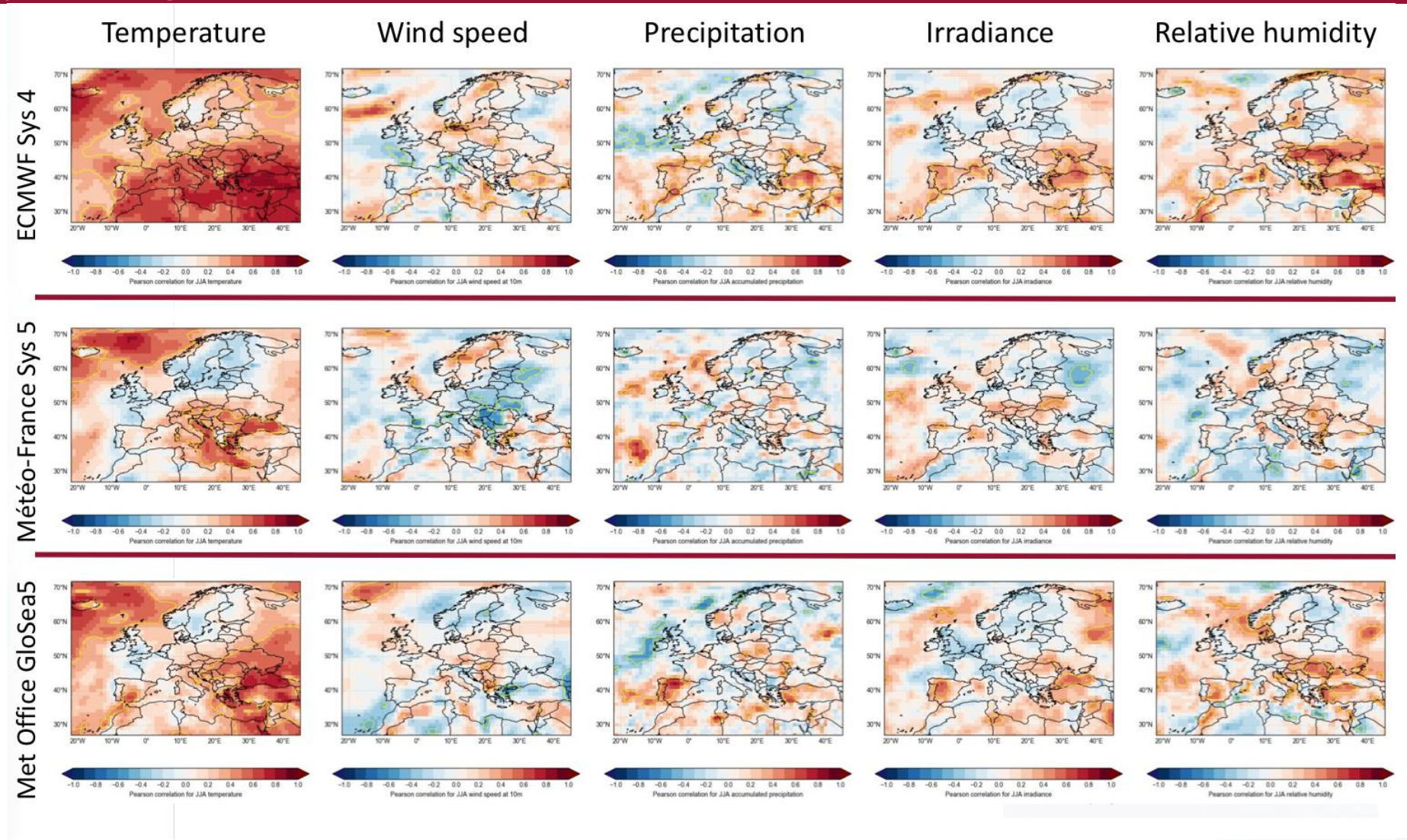
Seasonal forecasting skill: correlations for summer



Bett et al. (2018a)

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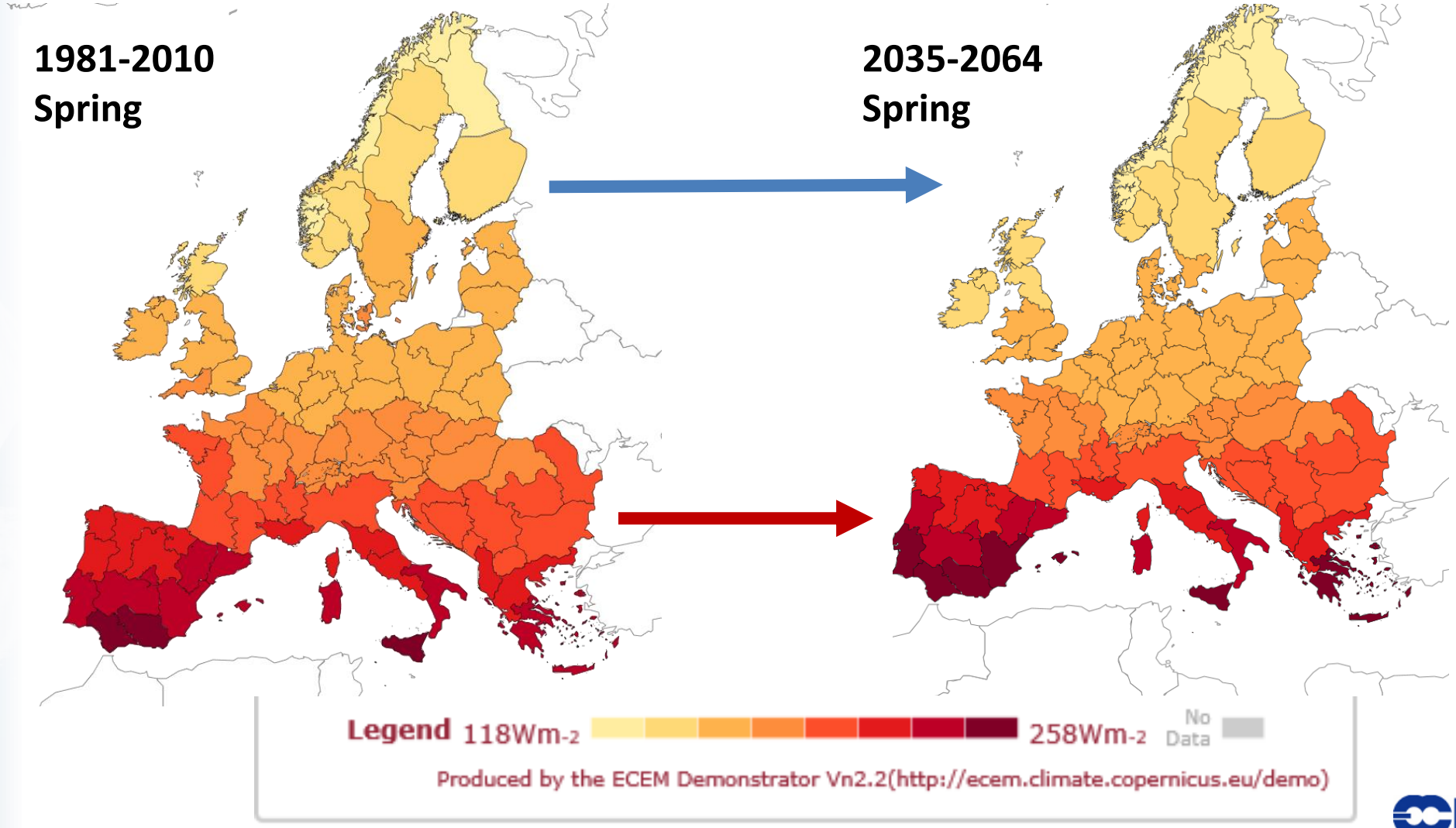
Climate Projection (RCP 8.5) Radiation



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Climate Projection timeseries

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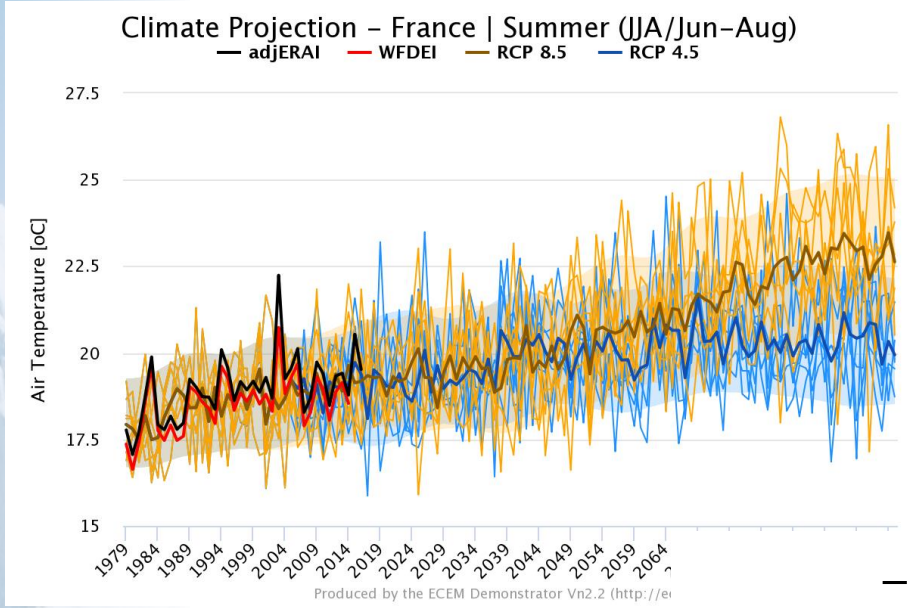

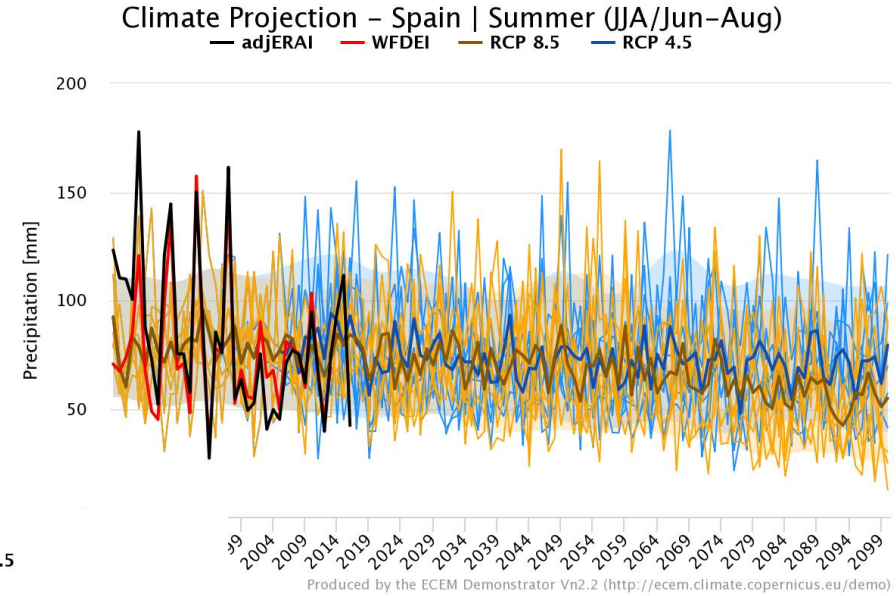

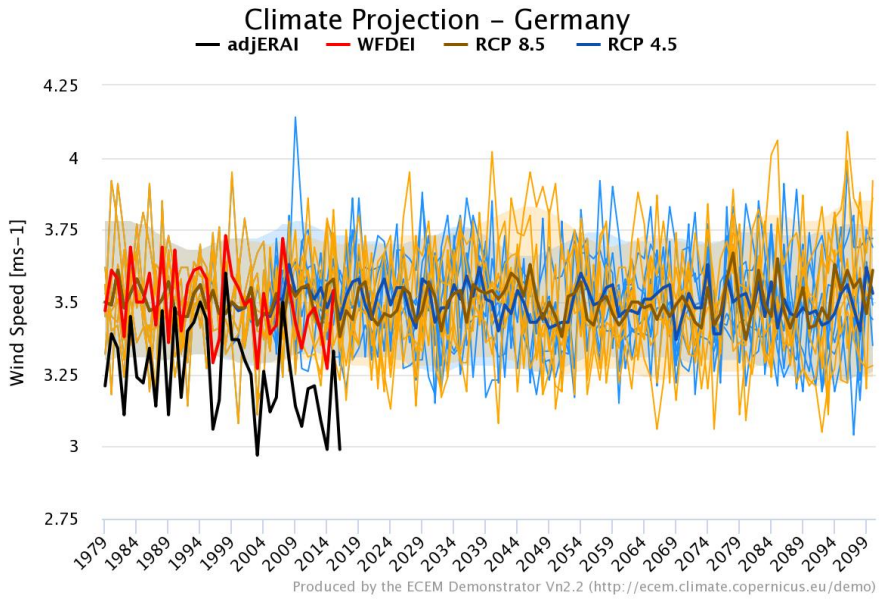

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Ensuring we use the most accurate Energy data

The Energy data challenge:

- **There is no single reference database for energy**
- **Many data sources, inconsistencies between them, incompleteness, access rights (minimal open/free access data) …**

➔ Need strong support to collect & organise the huge amount of energy data required for a useful service

➔ **ECEM is demonstrating that good data allows a good service!**

entsoe
Reliable Sustainable Connected

eurostat
Statistics Explained

Enerdata
intelligence + consulting

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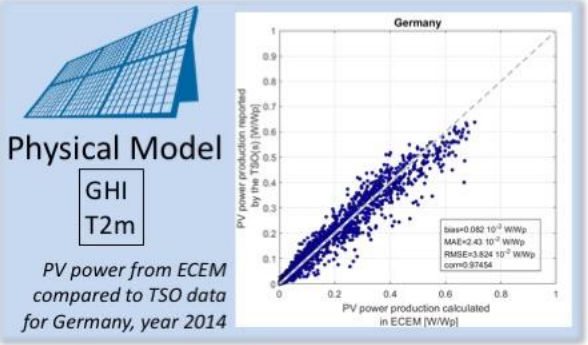
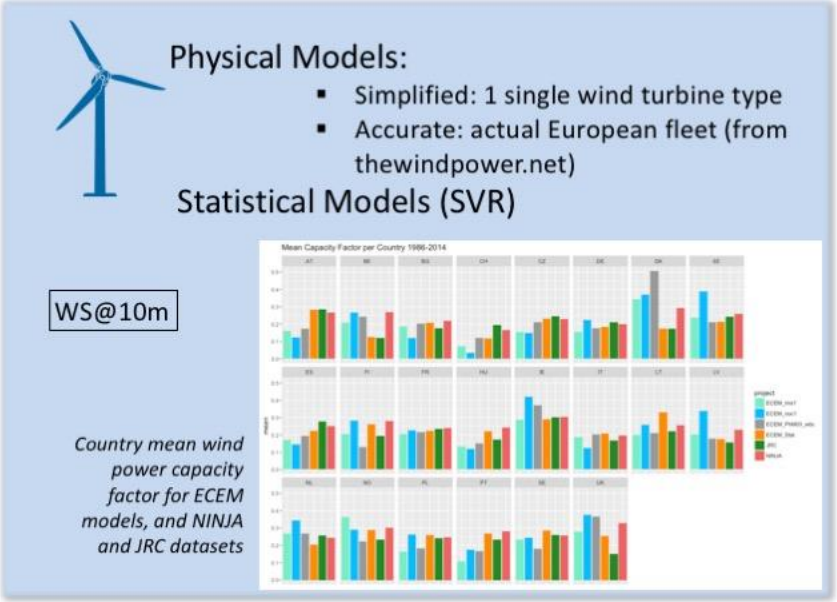
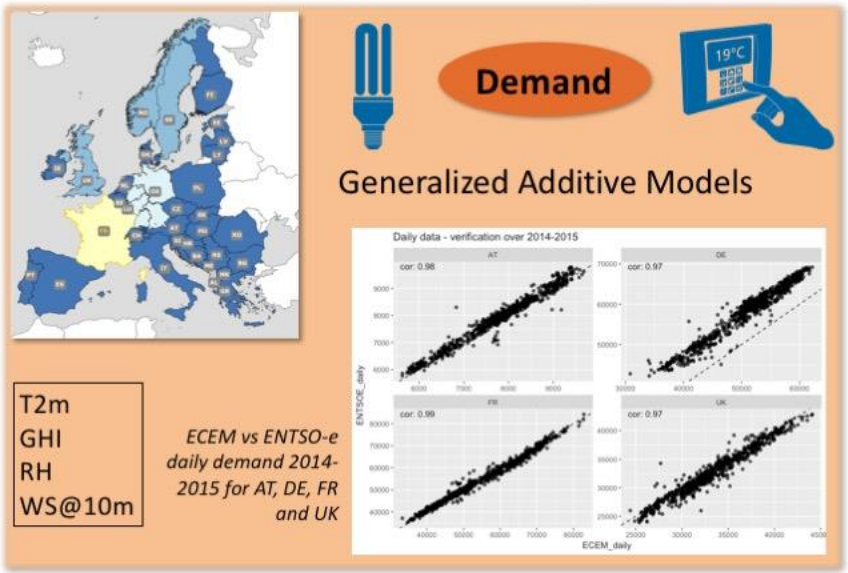
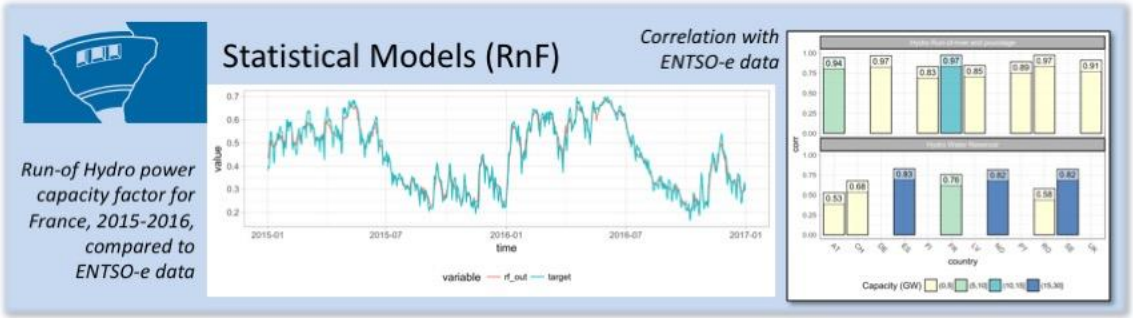
Energy Conversion – A summary

A mix of **physical** & **statistical** models, based on energy data availability









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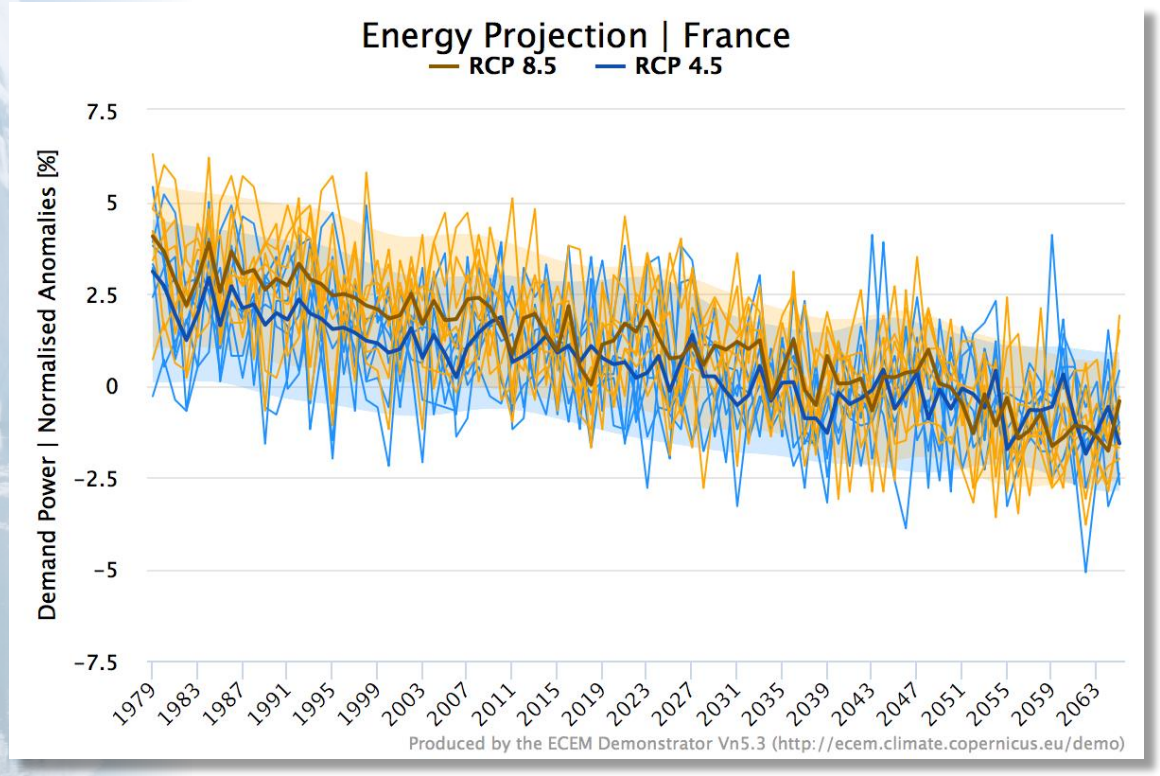
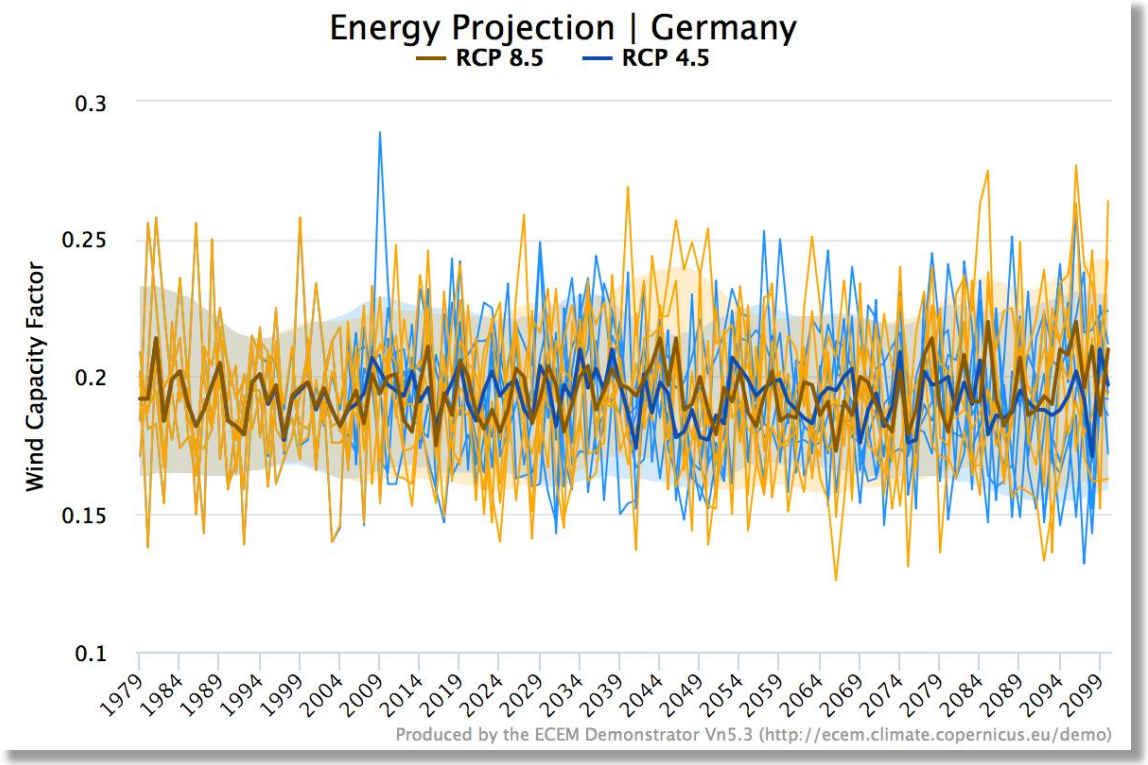
Energy Projections

Demand





Wind Capacity Factor

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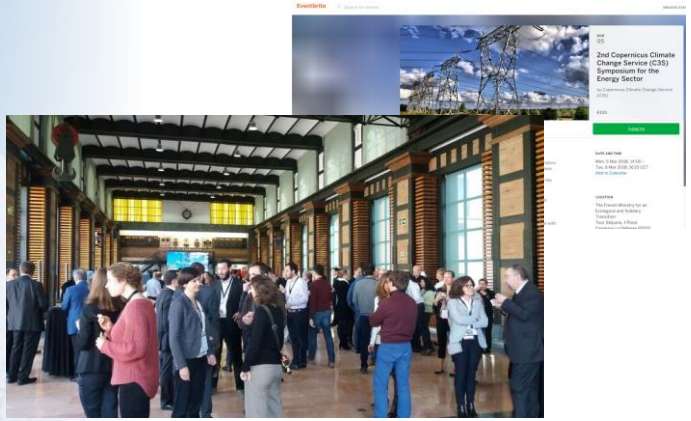
Multi-faceted Stakeholder Engagement & Communications

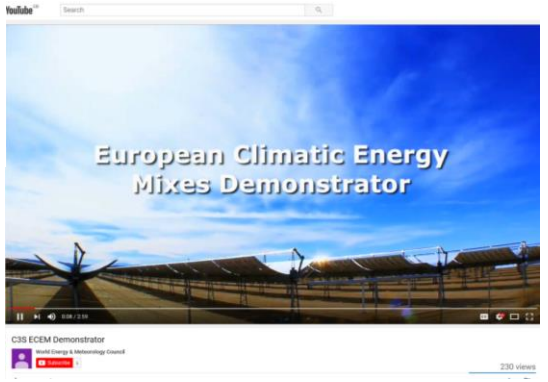
Stakeholder Workshops



Websites

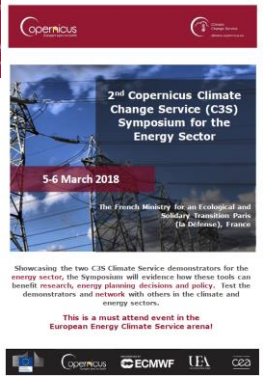
Press releases

Promotional video



Social media

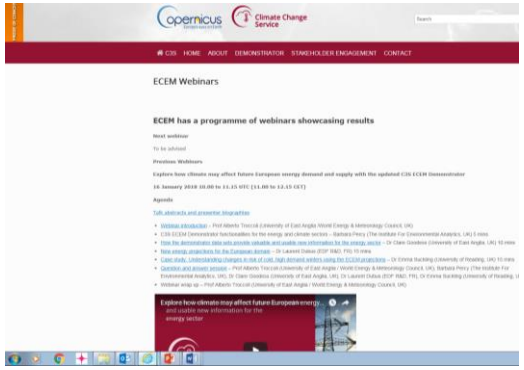
Promotional material



One to one presentations

Direct email

Webinars/training



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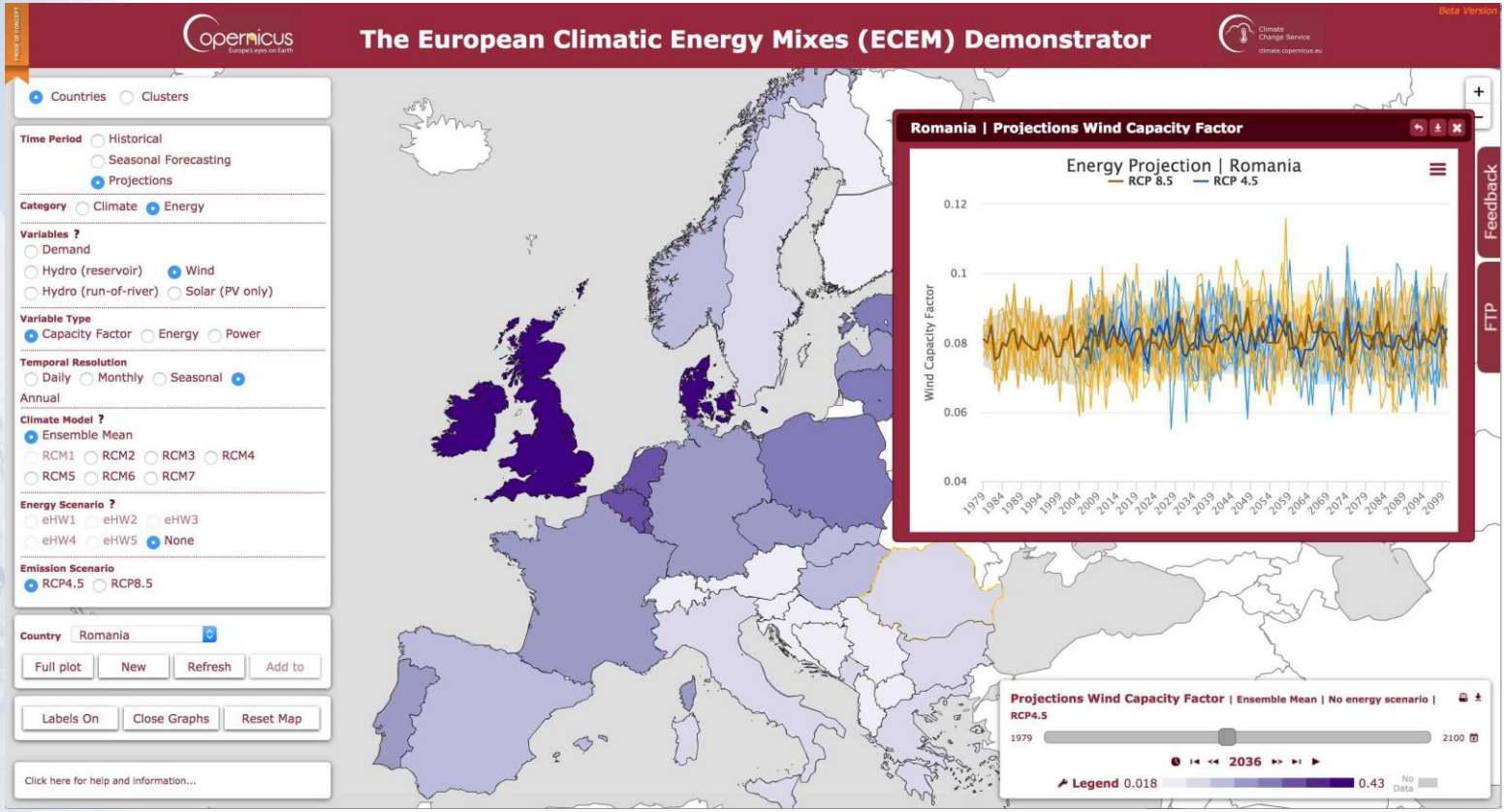
An online interactive tool to test energy mixes



http://ecem.climate.copernicus.eu/demo

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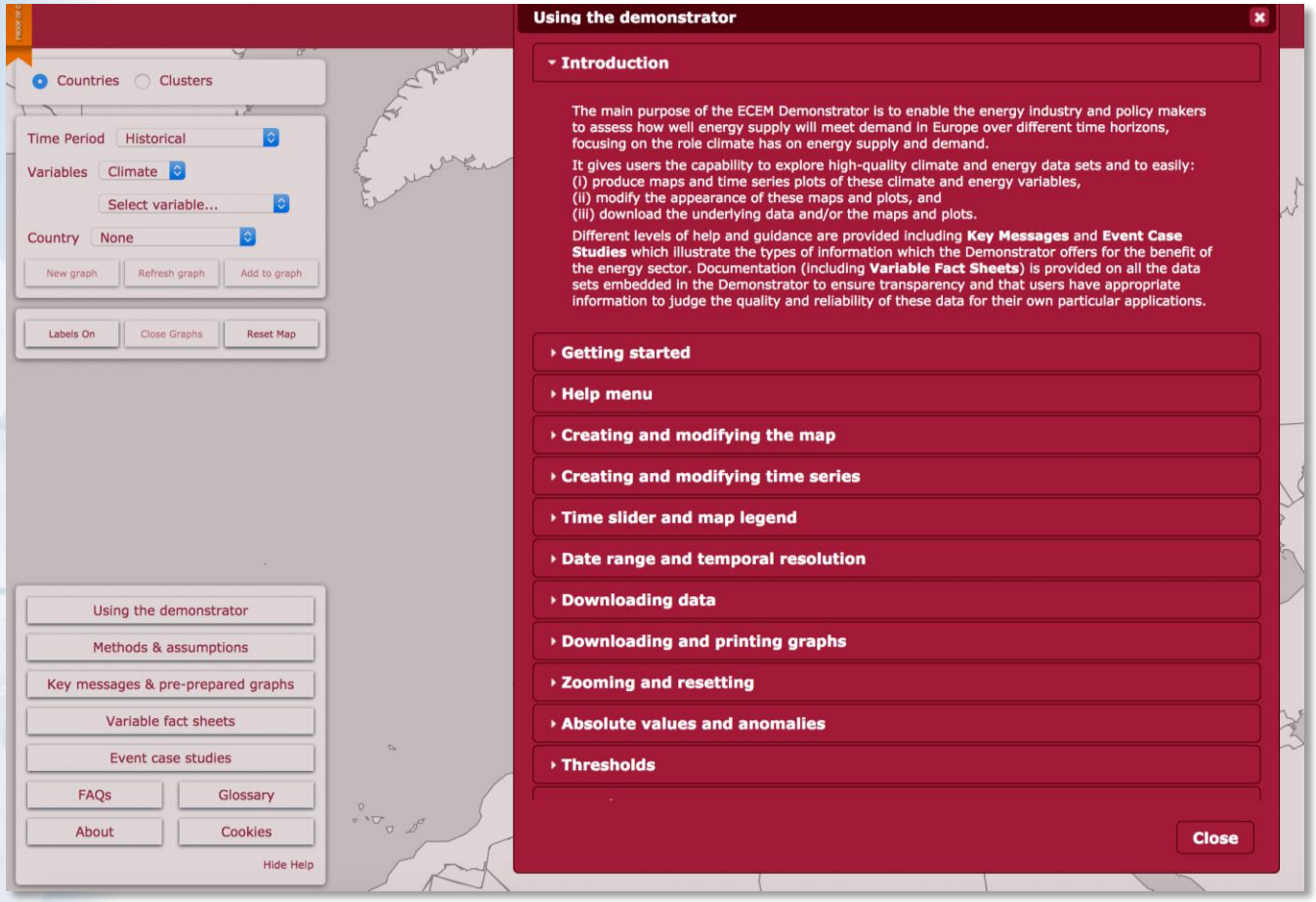
General Documentation and Key Messages

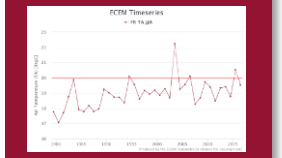


EUROPEAN CLIMATIC ENERGY MIXES (ECEM)

KEY MESSAGES

ECEM KM 01

A warming Europe



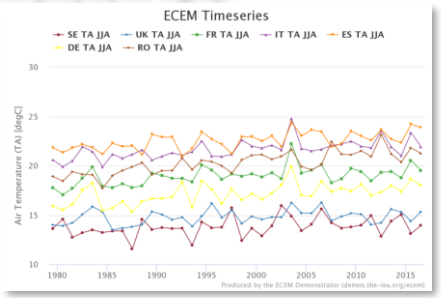
A series of Key Messages for the European energy sector based on the analysis of data in the ECEM Demonstrator.

Key messages: A warming Europe

- Temperatures have risen consistently across Europe over the last ~40 years
- In countries such as Germany the warming has been strongest in winter whereas in Spain, for example, it is strongest in summer
- At the same time, variability from year-to-year and day-to-day persists, and cold events have continued to occur in recent years
- Temperature is a major driver of the ECEM models for energy demand and of solar and hydro supply thus these trends and patterns of variability will impact estimates of these energy variables

How do we know Europe is warming?

Warming trends are evident in time-series plots of historic air temperature data (°C) for 1979-2016 including those for the seven countries shown here (Sweden, UK, France, Italy, Spain, Germany and Romania). The plot below shows the trends for summer (June, July and August).



For more information visit
www.ecem.climate.copernicus.eu
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Date of publication: 25 June 2017

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Variables and Event Case Studies Fact Sheets

EUROPEAN CLIMATIC ENERGY MIXES (ECEM)

VARIABLE FACT SHEET
ECEM VFS E01

Energy demand

A series of fact sheets which provide metadata for the climate and energy variables produced by ECEM

1 General

1.1 Description
1.2 Units
1.3 Links
1.4 Data format
1.5 Keywords
1.6 Contact

2 Dataset coverage

2.1 Geographic area
2.2 Temporal resolution
2.3 Time period
2.4 Spatial resolution

3 Usage

3.1 License conditions
3.2 Citation(s)

4 Lineage statement

4.1 Original data source
4.2 Tools used in production of indicators

5 Data quality

For more information visit
http://ecem.climate.copernicus.eu
Date of publication: 12 June 2017

EUROPEAN CLIMATIC ENERGY MIXES (ECEM)

EVENT CASE STUDY
ECEM CS 001

High demand in winter 2009/10

A series of case studies based on extreme events which illustrate how the ECEM demonstrator can be used by the energy sector to enhance understanding and support decision making.

Boosting Decision Making

1 Winter 2009/10 saw high power demand due to extremely cold temperatures across much of northern Europe, as seen in the ECEM demonstrator

2 The impact of another winter similar to 2009/10 is likely to be greater today because of the increase of weather-sensitive renewables such as wind in the energy mix. For the UK, the ECEM historical dataset shows a significant drop in wind power if 2009/10 conditions occurred today

Scientific/ Technical Advances

1 ECEM has brought together credible data from the climate and energy communities, processed in a consistent way over a range of time scales

2 The demonstrator tool provides valuable insight into the winter 2009/10 event and can be used to study the impact of other extreme weather events on European power systems

3 Analysis of the ECEM datasets has revealed dependencies and risks across European countries and between energy and climate variables

Key Lessons

1 The ECEM historical dataset allows:
- Investigation of an event in the context of recent history
- 'What if' questions to be assessed based on today's energy mix and the climate drivers

2 The demonstrator can help anticipate future risks through:
- Seasonal forecasts
- Climate projections

For more information visit
www.ecem.climate.copernicus.eu
or contact the ECEM team at
support@ecem.climate.copernicus.eu

Version 4, Date of publication: 4 December 2017

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A couple of upcoming Events

WMO-WEMC-GFCS-BCC TRAINING COURSE ON CLIMATE AND ENERGY – SHANGHAI, CHINA

MAY 18 - MAY 20

Applications of weather & climate information for the energy sector

WMO WEMC World Energy & Meteorology Council GFCS BCC Beijing Climate Center

http://www.wemcouncil.org/wp/event/training-course-on-climate-and-energy-2018/

http://www.wemcouncil.org/

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