The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 1: Heat Wave in Italy

Extreme heat wave in southern Europe July 2015

Increase in power prices associated with spike in summer

Priority climatic variables:
- Tmp2m

Mandatory Time Resolution:
- Monthly

Desirable Time Resolution:
- Weekly

Grant Agreement n. 776868
The SECLI-FIRM project has received funding from European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 776868.

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 2: Drought in Italy

Mild and dry winter 2015/2016 in the Alps and Apennines => Gas price movements in the context of low demand and hydroelectric production

Priority climatic variables:
- \( \text{tmp}2\text{m} \),
- Total precipitation,
- Snow fall,
- Snow depth,
- Snow density,
- water balance

Mandatory Time Resolution:
- Monthly

State of the Art

Enel:
- Analyzed data from ERA – Interim;
  - Found snow density anomalous data between 2003-2014.
- Downloaded ERA – 5 data
  - hourly data from Copernicus website;
  - monthly data from ECMWF website;
- Transformed the data in a regular grib format;

EGU 2019!
The SECLI-FIRM project has received funding from European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 776868.

Grant Agreement n. 776868

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 3: Wind variability in Southern Italy

Variable wind speeds in Southern Italy in the first two weeks of March 2016

Priority climatic variables:
- Wind speed at 10 meters

Mandatory Time Resolution:
- Weekly

...State of Art:
- To be solved problems with C3S DS
- Needed weekly resolution to analyze the event
The SECLI-FIRM project has received funding from European Union’s Horizon 2020 Research and Innovation Program under Grant Agreement 776868.

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 4: High/low winds in Spain and energy generation

January 2014 – March 2014. For the high production of wind and hydro energy.


Demonstrating the impact of using wind speed seasonal forecast information for a big utility with multiple generation assets of different technologies.

Priority climatic variables:
- Wind speed at 10 meters

Mandatory Time Resolution:
- Weekly

* Source: RED electrica de España.
The SECLI-FIRM project has received funding from European Union’s Horizon 2020 Research and Innovation Program under Grant Agreement 776868.

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 5: Strong El Niños and energy mix planning

The El Niño-Southern Oscillation (ENSO) cycle.

Severe drought between 2015-2016 in Colombia as a result of a strong El Niño event.

Designing adequate decision-support products to predict the expected amount of flow for hydro resources.

Priority climatic variables:
- tmp2m,
- Total precipitation,

Mandatory Time Resolution:
- Monthly

Study of optimization of optimal energy mix of renewable energy sources hydro, wind and solar.

* Source: ERA5 data (2010-2017)
Case study 5: State of the art

EMGES- Enel:

- Analyzing data from ERA-5
- Implemented link functions by Enel -> to be applied to Colombian CS
The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 6: North Sea wind and waves impact on maintenance planning and logistics

Access by vessel depends on wave height, wind speed, etcetera. Different thresholds for different means of access.

Examples; Climatic variables
- Significant wave height
- Windspeed

Desirable variables:
- Precipitation

Mandatory Time Resolution:
- To be decided (Weekly)

Under investigation:
- Application: maintenance & supply
- Area
- Skill
The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Voor onderhoud:
- Stromingsrichting (Getij)
- Stromingssnelheid
- Windrichting
- Windsnelheid
- wolkenhoogte
- Golfperiode
- Significante golfhoogte
- Neerslag, regen, sneeuw, IJssel
- Temperatuur
- Luchtvochtigheid
- Luchtdruk

Voor transport en systeem:
- Koude periode (hogedrukgebied boven midden Europa)
- Warme/hete periode (hogedrukgebied boven midden Europa)
- Windvoorspelling (richting + snelheid) op zee/langs de kust.
The SECLI-FIRM project has received funding from European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 776868.

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 7: North Sea weather windows in seasonal shoulder months

Priority sub-seasonal variables:
- Significant Wave Height
- Mean Wave Period
- 10m Wind Speed

Mandatory Time Resolution:
- Daily

Desirable Time Resolution:
- Daily

Present practice:
Limited use of fortnightly, monthly and sub-seasonal outputs, with judgement of the MetOcean Engineer relied upon when long-range decision essential.
Case study 8: Energy demand balancing
Winter 2018 and 2010

Present practice – winter outlook:

Priority climatic variables:
- \( \text{tmp2m} \)
- \( \text{w10m} \)
- irradiance
- Weather typing

Time Resolution:
- Hourly

Normalised demand: forecast for each week of the year based on a 30 year average of each relevant weather variable that is related to demand.

The real time demonstrator will determine winter peak demand using National Grid’s existing demand model, driven by seasonal climate forecasts (instead of climatology).
Case study 9: Identifying periods of stress to the supply – demand balance

Acute demand situations e.g. Winter 2018 and summer 2017, Low supply situations e.g. 2012

Priority climatic variables:
1. Maximum temperature
2. Minimum temperature
3. Rainfall
4. Sunshine
5. Regimes

Time Resolution:
- Daily

Present practice:
- 10 day ahead demand forecast
- Demand prediction – based on climatology
- Supply prediction – based on climatology

Co-designers: Thames Water