Use of climate information in the wind stakeholder chain

The high penetration of wind power in the electricity system provides many challenges mainly due to the unpredictability and variability of wind power generation. Therefore, having accurate forecasts of wind power is becoming increasingly important for many stakeholders in the wind energy sector.
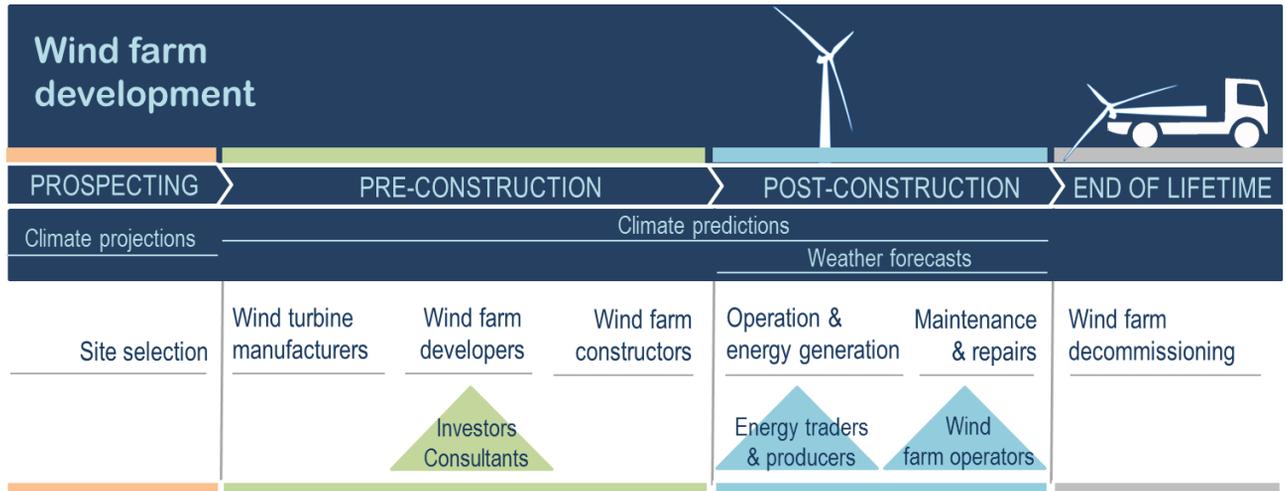

Figure 1: Stages of wind farm development, stakeholders involved and temporal horizons of climate information used

Prospecting

- **Climate projections** can be used for site selection according to the predicted wind conditions in a particular location in future decades.

Pre-construction

- **Climate predictions from years to decades** can be relevant to understand and quantify the wind resource. For example, they can inform wind energy investors about the volatility of the resource in the future and how this risk can have an impact on the return on investment.

Post-construction

- **Weather forecasts below 6h** are useful to predict sudden events like ramps that can be managed by turbine and farm control.
- **Weather forecasts from 6h to 2-3 days** are used by transmission system operators for power system management (scheduling reserves, planning, congestion management). Wind farm operators use day-ahead & intraday forecasts for trading in the energy market.
- **Weather forecasts from 2-3 days up to a week** are used for operation & maintenance planning of wind farms, conventional power plants & transmission lines.
- **Climate predictions from sub-seasons to seasons** are particularly interesting to support offshore wind farm servicing logistics and onshore operation and energy generation.
- **Climate predictions from seasons to decades** are relevant to understand and quantify the wind resource, i.e. inform wind energy investors about the volatility of the resource in the future and how this risk can have an impact on the return on investment.

SPECS
Seasonal-to-decadal climate Prediction for the
improvement of European Climate Services

Technical content: low
SPECS Fact sheet #8

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October 2016

Applications of seasonal and sub-seasonal predictions

Current energy production and distribution systems are designed to respond to weather variability, such as daily changes in temperature that affect the total energy load, or rapid changes in renewable resource availability that can affect the energy supply. However, the tools used to predict, evaluate and optimize response strategies in the near-term are less robust for longer-term planning, for which a retrospective approach has been adopted (based on climatology). In this context, probabilistic sub-seasonal and seasonal predictions represent an alternative to a retrospective approach for the renewable energy sector, presenting many potential applications (Figure 2).
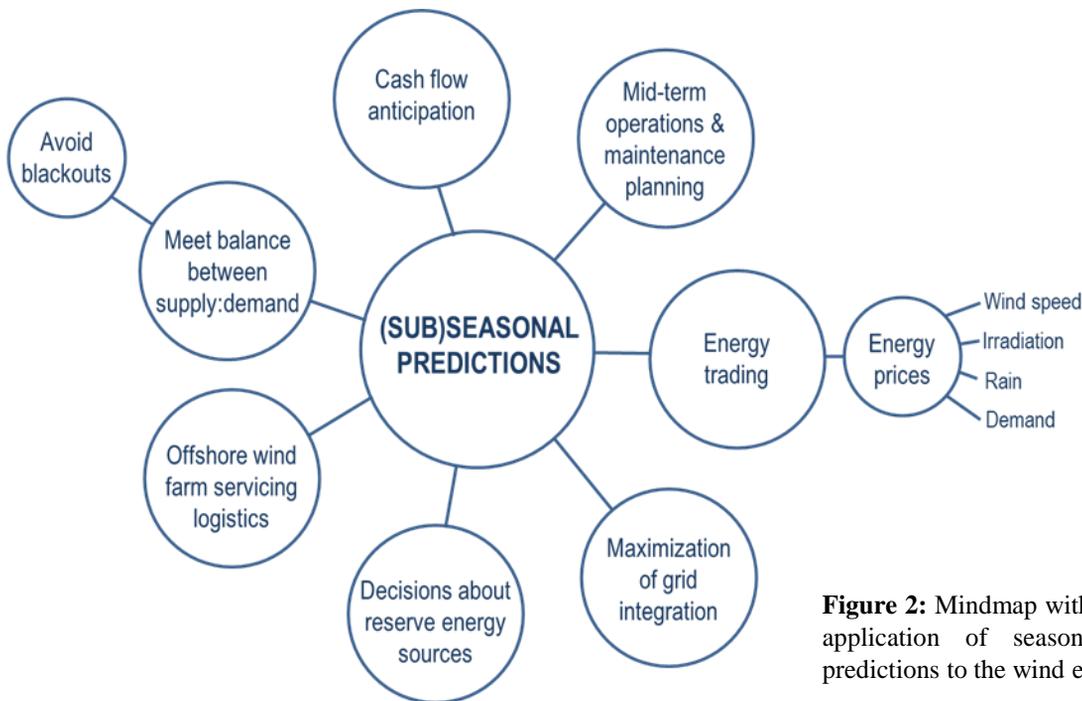

Figure 2: Mindmap with the potential fields of application of seasonal and sub-seasonal predictions to the wind energy sector.

Source: Unsplash