



Update on Wind Conditions and Climatic Effects (SP3) Research Roadmap

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► Wind Resource Assessment R&D Roadmap – Workshop I

Held 24th January 2019

Jointly with EERA JP SP3 and IEA-Wind Task 31

Many thanks to Javier Sanz Rodrigo for co-development

Follows up on the outcomes of New European Wind Atlas (NEWA) project.

Thanks to Uppsala University in hosting and coordinating.

Short term
challenge
solution
impacts

Medium term
challenge
solution
impacts

Long term
challenge
solution
impacts

Outcome document:

<https://www.eerajpwind.eu/subprogrammes/>

▶ Wind Resource Assessment R&D Roadmap – Challenges

- Efficient data sharing across academia and industry
- Uncertainty quantification of Annual Energy Production and siting parameters
- Surface characterization
- Feedback of wind farm installations on resource and conditions
- Greater meteorological understanding of high impact phenomena
- Basic science on boundary-layer physics
- Climate change impacts

► Wind Resource Assessment R&D Roadmap - Solutions

- Data management and standardization
- Combinations of high fidelity modelling outputs and engineering models
- New trust enabling technology for data confidentiality
- Multidisciplinary collaboration (solar, climate, data science, etc)
- Data-driven modelling
- Novel measurement technology and campaign design
- Advancement on model chain from mesoscale to microscale models
- Atmosphere-ocean coupling, and two way coupling across scales



c. On Impacts:

Lowering the cost of energy through mitigating uncertainties in the assessment of wind conditions a climate remains the most apparent impact in the short-to-medium term. At the same time, there is growing awareness on the need to increase system value by, for instance, addressing wind and solar resources in the transition to smart grids that effectively integrate abundant renewable energies for the growing energy demands of the society.

Through better knowledge on wind conditions across all relevant scales, from turbulence to climate, a site conditions it will be possible to improve the deployment of wind clusters across national boundaries and design larger wind turbines that can capture wind more reliably over a longer lifetime. Improving our ability to predict the wind resource of the future over a multi-decadal period will facilitate taking investment

▶ **Research Roadmap for Wind Conditions and Climatic Effects- Workshop II**

At the International Conference of Energy and Meteorology (ICEM2019) in 25th June 2019

The workshop objectives were to:

- further develop the SP3 research roadmap

- disseminate EERA JP Wind to the ICEM2019 participant

Participant were a mixture of professionals from energy sector and meteorology

The workshop will be supported by content developed by EERA JP Wind in the first part of 2019, in collaboration with IEA

► **Research Roadmap for Wind Conditions and Climatic Effects- Workshop II**

Invited presentations from industry and research institutes:

John Zack, MESO, Inc., USA

Cristina Archer, University of Delaware, USA

Daniel Drew, University of Reading, UK

Claudia R. Calidonna, CNR, Italy

Helmut Frank, German Weather Service, Germany

Alasdair Skea, UK Met Office, UK

Eric Tromeur, Meteodyn, France

Outcome document:

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► Research Roadmap for Wind Conditions and Climatic Effects- Workshop II

Emphasis on understanding variability over a large span of time scales:

- from sub 6-hours to decadal, as well as understanding climate change trends
- validation of longer time scale variability is a challenge
- requires long and high quality time series datasets

Modelling needs to be able to include the impact of variability

- do better than resource based on historical data alone
- use of climate projections, and from CMIP5 in particular, for wind conditions assessment
- stronger move towards probabilistic assessment of wind conditions

Specific meteorological and flow phenomena were highlighted:

- gap flows, stability effects, wind profiles and shear, wake effects, thunder storms, sea breezes
- frontal and cyclonic systems

Importance of relatively small scale because of high concentration of installed capacity:

- for example in offshore wind farm clusters

► **Research Roadmap for Wind Conditions and Climatic Effects- Workshop II**

Modelling and measurement challenges

- measurement and modelling of soil moisture
- air-sea interaction including wind-wave coupling.
- guidelines about how to reliably quantify stability, both in measurements and in modeling results

High performance computing and earth system modelling challenge:

- global modelling at sub 1-km scales
- challenges in handling local effects as well as global circulation
- different approaches to modelling convection and surface roughness, amongst others
- data volumes are immense and a challenge to handle

Use of climate projections, and from CMIP5 in particular, for wind conditions assessment
Stronger move towards probabilistic assessment of wind conditions

► Questionnaire – concept

Jointly with the New European Wind Atlas project a questionnaire was set-up

On “Challenges” it asked

from slide 5

- Importance
- Urgency

On Solutions is asked

from slide 6

- Impact
- Effort

37 have replied

Interpretation and follow-up still in process....

Order on slide 5 and 6 based on Importance * Urgency and Impact/Effort

Results to come on:

<https://www.eerajpwind.eu/subprogrammes/>

► **Summing up – take home messages**

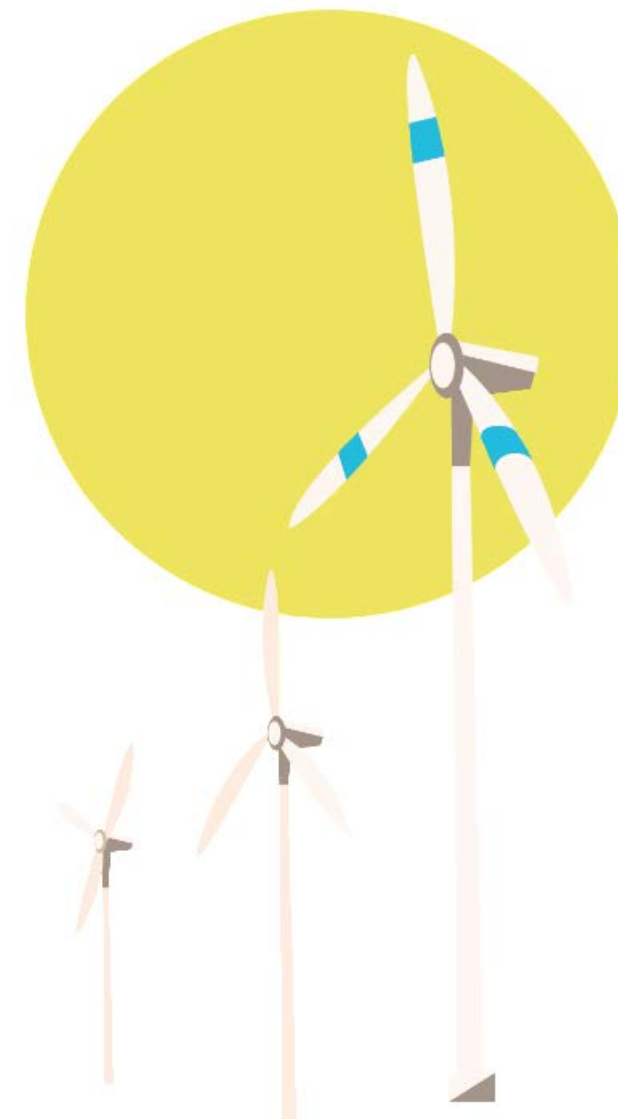
- Two workshops have discussed research in Wind Conditions and Climatic Effects (SP3)
 - outcome documents on: <https://www.eerajpwind.eu/subprogrammes/>
- Broad consensus on challenges and solutions topics
 - Meteorology and climate community emphasized long term variability and trends
- Outcome is not yet a roadmap as such
 - more like a menu of important research themes
- One questionnaire completed and interpretation underway
- Please utilize the material as background to joint project idea development within EERA JP Wind

Thank you

Contact:

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