

Intro to TCE's Wind, Metocean & Climate Change Data Creation Project

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About TCE

- TCE is an independent organisation accountable to UK Government. We invest to improve our own decision-making, as well as for the benefit of our sectors.
- We create evidence to inform future marine spatial planning through our 'Whole of Seabed' programme.
- We select sites for future lease areas, based on a balance of financial, social, environmental value and spatial constraint.
- We have a strategic aim to be a world-leading provider of data and insight.

Weather data



Project appraisal and front-end engineering design

About the project

- **Immediate need:** TCE's current UK-wide **wind, wave and current** data holding is obsolete. We need better data to inform spatial optimisation (e.g. cost modelling)
- **Wider opportunity:** We also want to deliver freely available, UK-wide, state-of-the-art data to developers and researchers to help **optimise, de-risk and accelerate** future projects **across all marine sectors**.
- Phase 1 (Oct-23 to May-24) will deliver a technical specification based on stakeholder engagement and a set of recommendations.
- Phase 2 (May-24 onwards) will deliver the data.

Process: questions we addressed

Data uses, needs

Who uses wind and metocean data?
What do they use these data for?
What data products are used currently?
What data may be required in the future?
To what extent are data users considering climate change sensitivities?

Existing resources

What is TCE's current wind and metocean data holding?
What data are available to users?
Are available data of sufficient coverage and resolution across the UK EEZ?
Are data uncertainties sufficiently quantified?
Are available data easy to access, straightforward to use and/or cost effective?

State-of-the-art approaches

How is climate change anticipated to impact wind and metocean parameters in the UK EEZ?
What state-of-the-art approaches could be used to improve data?
Are there any ongoing or planned projects, programmes or efforts to these data for the UK EEZ?

Justification for and scope of new dataset

What is the potential scope of a new dataset?
How could this dataset be validated?
How could the dataset be developed, stored, maintained, updated, and accessed?
Would the value of the dataset exceed the likely cost of developing and managing it?
What structures or efforts could improve access to and use of these data?

Output: draft specification for dataset

2. General Requirements

2.1. Model Domains

The dataset shall include time-series of atmospheric, sea state and ocean parameters, coupled, time-synchronised fashion. It shall capture:

- Atmospheric parameters, e.g. wind vectors, air temperature
- Ocean parameters, e.g. current vectors, tide height, wave state

2.2. Spatial Coverage and Resolution

The dataset shall cover the entire offshore UK EEZ. The boundaries shall be:

- Minimum latitude: 47° 26' 7.5" N (47.4354°)
- Minimum longitude: 14° 53' 50.4" W (-14.8973°)
- Maximum latitude: 63° 53' 13.5" N (63.8871°)
- Maximum longitude: 3° 24' 0" E (3.4°)

The horizontal spatial resolution of the data shall be 1km. **Note:** It is not yet clear whether it is reasonable or cost-effective to run a 1km resolution. This is being explored via the stakeholder engagement.

For 3D atmospheric parameters, data shall be produced at (as a chart datum: 10m, 15m, 30m, 50m, 75m, 100m, 150m, 200m, 250m, 300m, 500m, 750m, 1000m. **To be confirmed.** 10m is for con 500m are as per the CERRA reanalysis; 1000m to 10000m are for 500m.

For 3D marine parameters, data shall be produced at a minimum of 10m to the seabed. **To be confirmed.**

2.3. Temporal Coverage and Resolution

It is expected that an initial dataset shall be delivered, then this shall be updated regularly such that data are as close to real time as possible. **The rationale is that an initial long dataset but measure-correlate-predict requires the dataset to extend up question.**

The initial time-series dataset shall cover a minimum of 30 years of initial delivery. It would be preferable for the period from 1979 onwards.

The dataset shall then be updated regularly such that data are as close to real time as possible. **This should be incorporated in a bid agreement with the supplier, covering update frequency, availability, identified by TCE or users etc.**

The temporal resolution is **to be determined.**

3. Time-Series Parameters

3.1. Atmospheric Parameters

As a minimum, the following atmospheric parameters are required to be included in the dataset:

Parameter	Origin	2D or 3D	Units	Comments
Wind, u-component	Modelled	3D	m/s	
Wind, v-component	Modelled	3D	m/s	
Wind speed	Derived	3D	m/s	
Wind direction	Derived	3D	° CW from true north	Where wind is coming from
Turbulent kinetic energy	Modelled	3D	m ² /s ²	
Turbulence intensity	Derived	3D	%	
Air temperature	Modelled	3D	K	
Potential temperature	Derived	3D	K	
Relative humidity	Modelled	3D	%	
Virtual potential temperature	Derived	3D	K	
Air density	Derived	3D	kg/m ³	
Shear stress at sea surface, u-component	Modelled	2D	N/m ²	
Shear stress at sea surface, v-component	Modelled	2D	N/m ²	
Friction velocity at sea surface	Derived	2D	m/s	
Atmospheric boundary layer height	Derived	2D	m	[1]
Sea surface sensible heat flux into the air	Modelled	2D	W/m ²	
Sea surface evaporation rate	Modelled	2D	kg/m ² s	
Obukhov length	Derived	2D	m	
Incident solar radiation		2D		[0]
Sea surface albedo		2D		[0]
Cloud cover		2D		[0]
Cloud base		2D		[0]
Precipitation		2D		[0]
Liquid water content		3D		[0]
Others TBC				

[0] To be defined

[1] There are various criteria which could be used to characterise the ABL height. It is desirable to include the Ri<0.25 criterion (as per ERA5) and TKE<10⁻⁴ criterion (as per WRF), plus any others which the supplier deems meaningful

1. Background and purpose
2. General requirements
 - Model domains
 - Spatial coverage and resolution
 - Temporal coverage and resolution
 - Data formats and metadata standards
 - Other modelling details
3. Time-series parameters
4. Statistical parameters
5. Verification and validation
6. Interface requirements

Next Steps:

- technical specification published online for public feedback (May)
- procurement of data modelling (May-Jul)