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SUSRENEW - WP 3

Approach to modelling climate risks related to a full renewable energy system

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Preparations for setting up the model

Model creation

1. **Integration of weather data**
   How can we translate weather data to modelling – Climate Matrix

2. **Model coupling**
   How to enhance the model allignement and coupling (TIMES and ENERGYPLAN)

3. **Preliminary results**
   Test run with few inputs

Integration of weather data

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Climate Data

ERA5 dataset – Copernicus Climate Change Service (CS3)

1. Hourly data with high temporal resolution, covering the period from **1950 to the present**, enabling long-term analyses and historical trends for energy systems modelling .
2. Global coverage – spatial resolution of 31 km (0.25 ° x 0.25 °)

1

- **Wind speed (10m, 100m)** – Wind energy assessmen.
- **Solar radiation (GHI, DNI, DHI)** –Solar energy output.
- **Temperature (2m)** – Demand forecasting and HVAC systems.
- **Precipitation** – Impacts hydropower prod.
- **Humidity (various layers)** – Affects PP efficiency and evaporation.
- **Cloud cover** – Influences solar power systems.
- **Soil moisture** – Geothermal and hydrology.
- **Sea surface temperature (SST)** – Influence on marine energy.
- **Wave height and energy** – For wave energy systems.

Integration of weather data

Climate Scenario Matrix

1

EXTREME WEATHER EVENTS

- Extreme temperatures
- Prolonged droughts
- Wildfires
- Ice storms/blizards
- Windstorms
- Flooding
- Heatwaves
- Storm surges
- Cold waves
- Hailstorms
- …

Scenarios generation

COMPOUND EVENTS

- Cold winter + drought + doldrum
- Clustering of major storm events
- Extreme precipitation events
- Dunkelflaute (low wind + persistent cloud cover)
- Storm surge + heavy rainfall
- Compound drought + heatwave
- Lack of rainfall + atmospheric blocking
- Long term vegetation stress + hurricane influence
- …

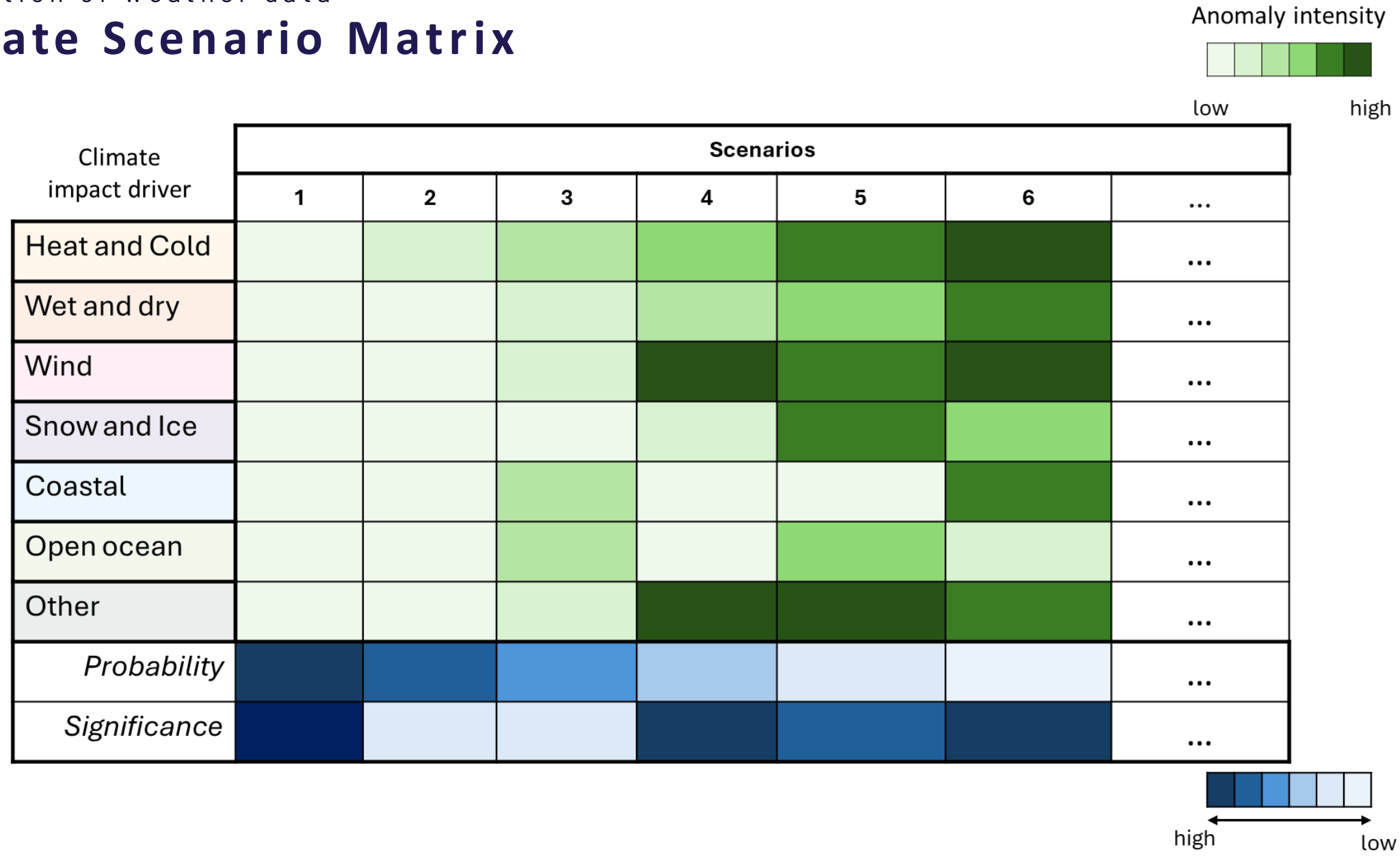
Filtering and validation

Final test matrix

Integration of weather data

Climate Scenario Matrix

1



Modelling framework

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Model coupling

Modelling framework

2

- Transition pathways from IFE-TIMES-Norway as inputs to EnergyPLAN (simulation)
- Stress test system feasibility during hourly operations
- Develop links and feedback loop from hourly simulations of the system back into TIMES
- Selection of significant atypical meteorological years (1972, 2010) with a combination of different climate data-series
- Mapping and inclusion of a wide spectrum of climate hazards.