

Potential to incorporate external shocks into assessment tools

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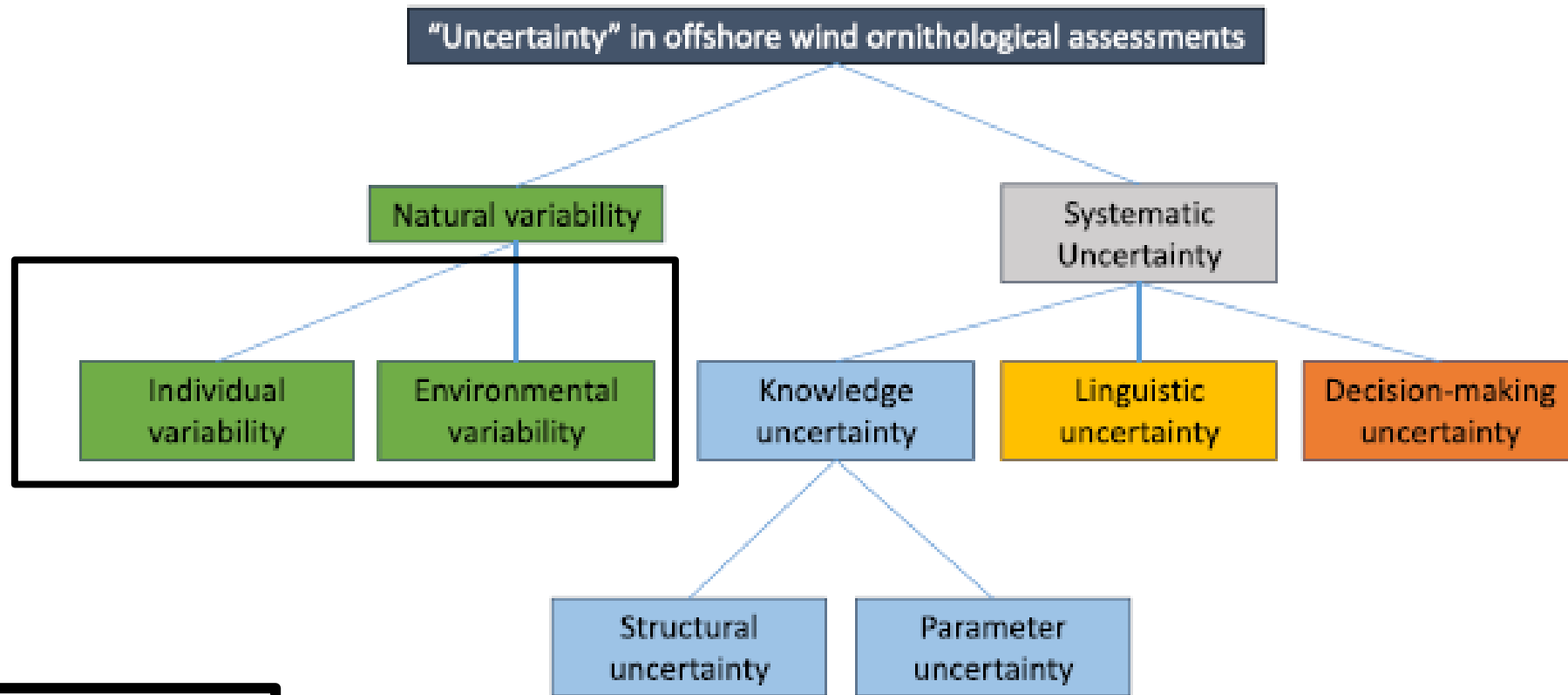
PrePARED AKEM, February 2024



Context

- Within PrePARED **empirical findings** will be used to enhance the **data** and tools used in **assessments**
- The tools aim to capture **variability** and **uncertainty**
- Ability to do this is variable, with gaps, and key **priorities** for **improving** quantification of uncertainty & variability have been highlighted
- **PrePARED** and other projects are addressing a number of these priorities
- This is providing mechanisms by which **external shocks**, such as avian flu and the marine heatwave, can be incorporated quantitatively into assessments

Forms of uncertainty and variability



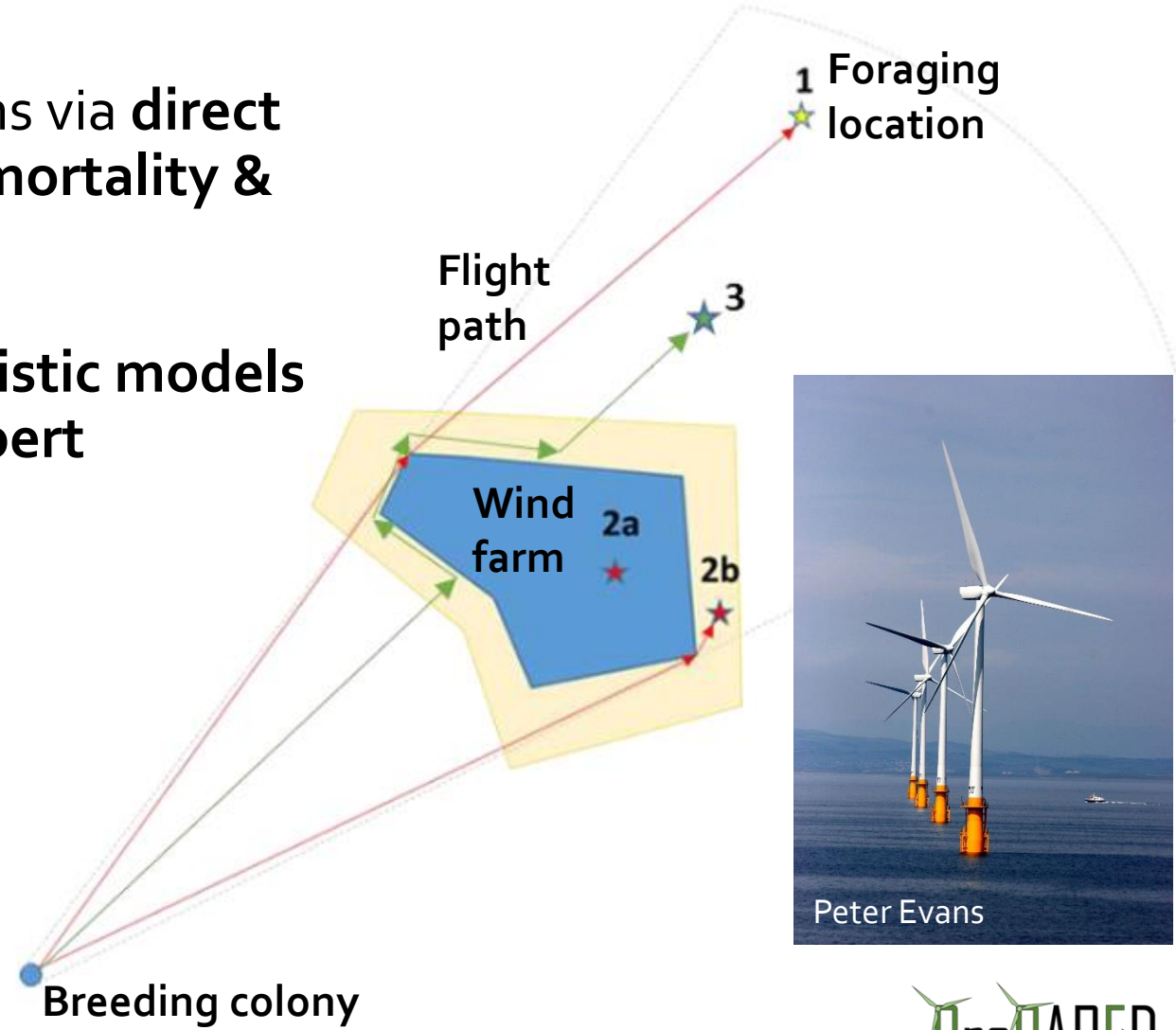
Searle et al. 2023

Quantifying OW effects

- Offshore windfarms may impact populations via **direct mortality** (collision) or **indirect effects on mortality & productivity** (displacement, disturbance)
- Impacts can be quantified through **mechanistic models** or simpler approaches that encapsulate **expert judgement**

External shocks may –

- Alter **baseline characteristics** (spatial distributions, population sizes, flight heights)
- Alter **spatial OW interactions**

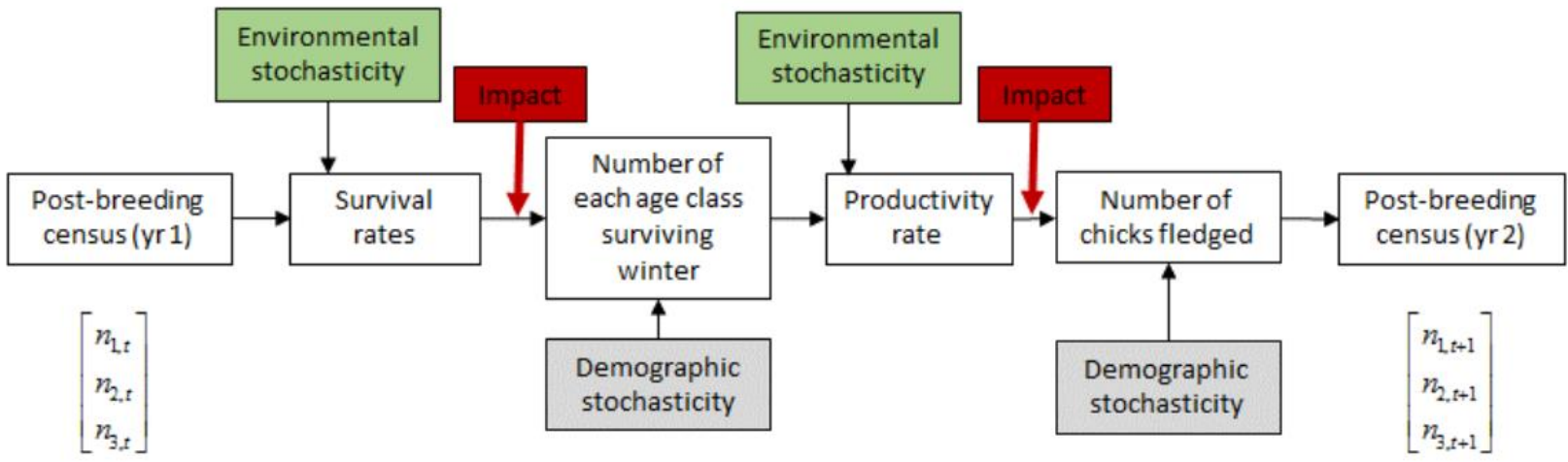


Population Viability Analysis

- Evaluates long-term consequences of annual effects for a population by generating **baseline** and **impacted simulations** using a **Leslie Matrix model**, and comparing these using **PVA metrics (Jitlal et al., 2017)**
- Will typically incorporate **demographic** and **environmental stochasticity**

External shocks may –

1. Modify **OW effects**
2. Increase levels of **stochasticity**
3. Create a “**shifting baseline**” of demography



Shifting baseline of demography

Current PVA approaches used in assessments assume that **environmental stochasticity** is independent from year to year & the distribution the same each year

This may provide a plausible assumption in the context of **transient** external shocks, but not in the context of longer-term changes

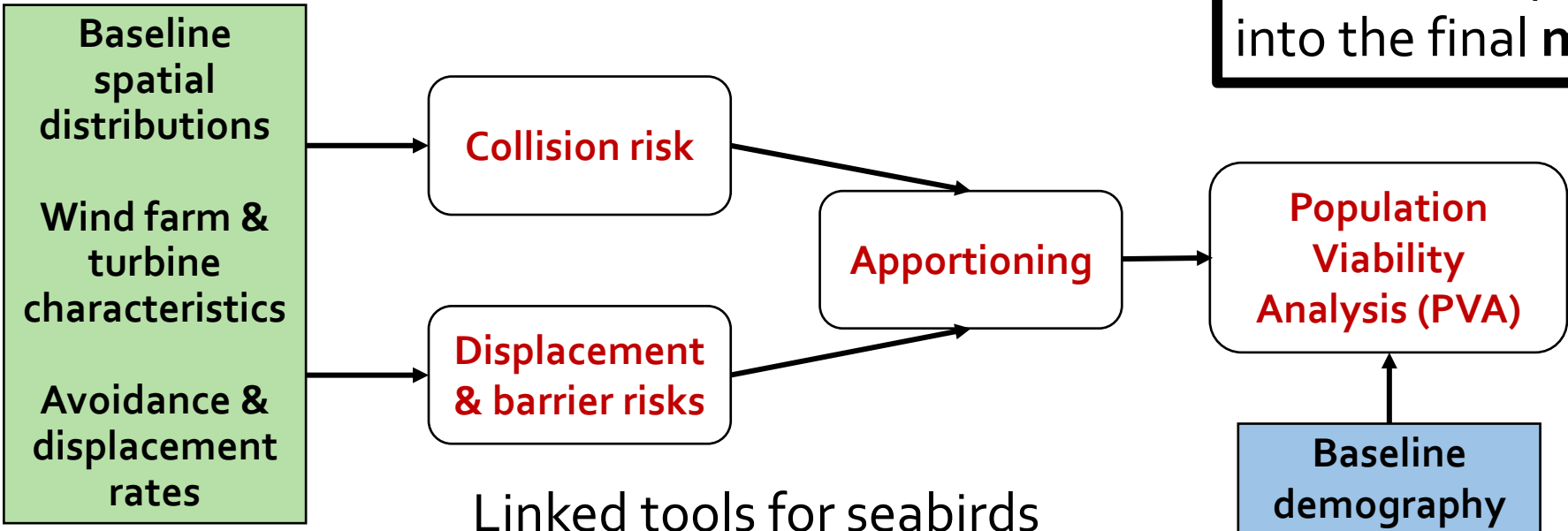
Work across a range of research projects to revise models & tools to capture -

1. **systematic changes in baseline demography over time – “shifting baselines”** (e.g. impacts of climate change on frequency of extremes)
2. **stochastic shocks that persist across multiple years** (e.g. avian flu)

End-to-end quantification of uncertainty

Tools and data can be **linked** together, and **uncertainty** can be **propagated** between them via **simulation**

This approach allows improvements to individual components – e.g. in relation to external shocks – to automatically **propagate** through into the final **metrics** of impact



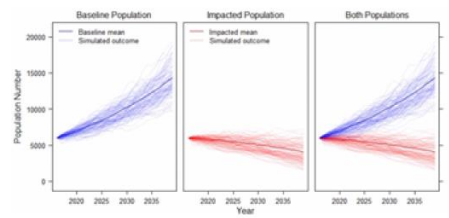
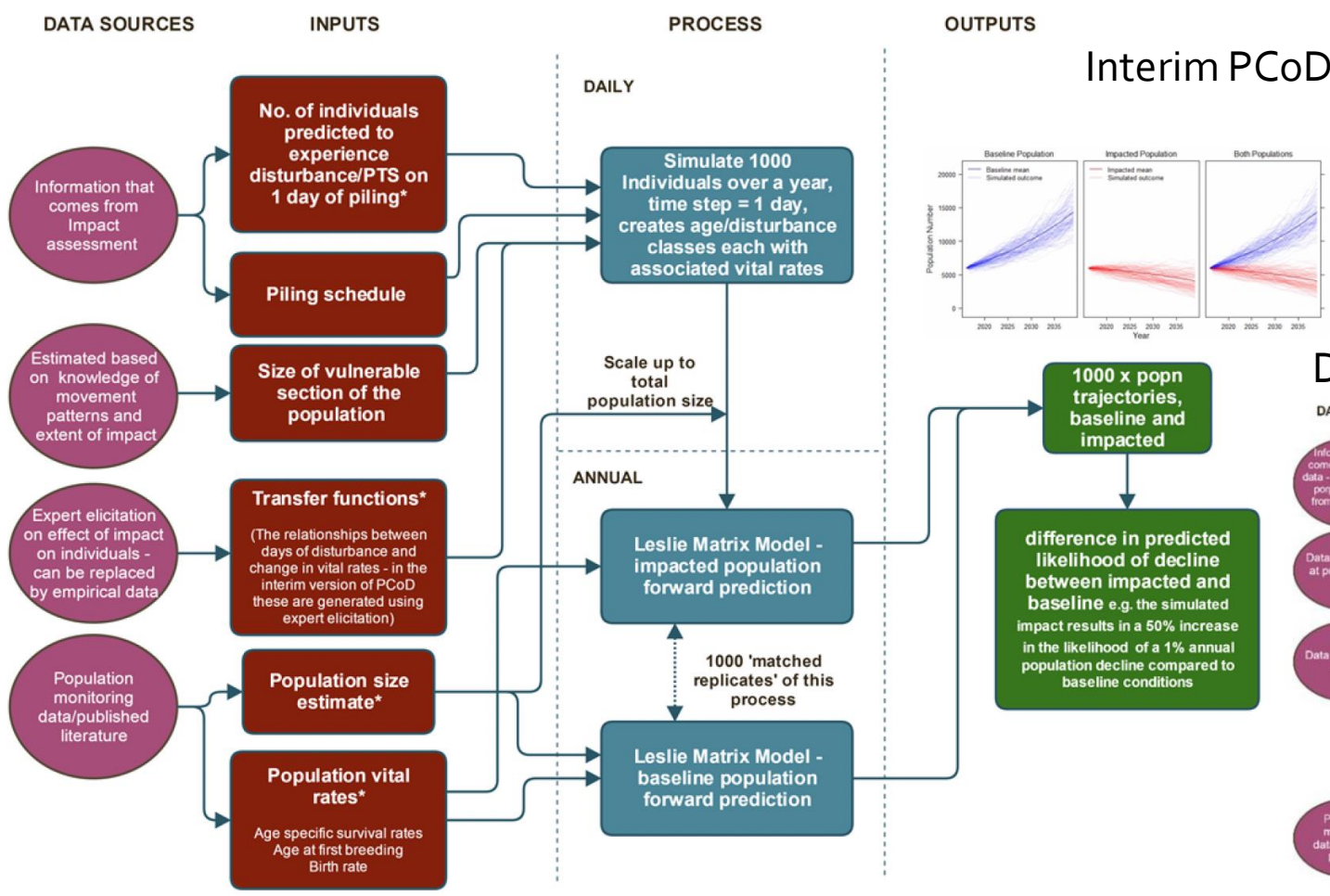


JNCC Report No: 607

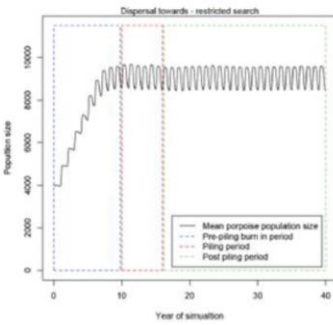
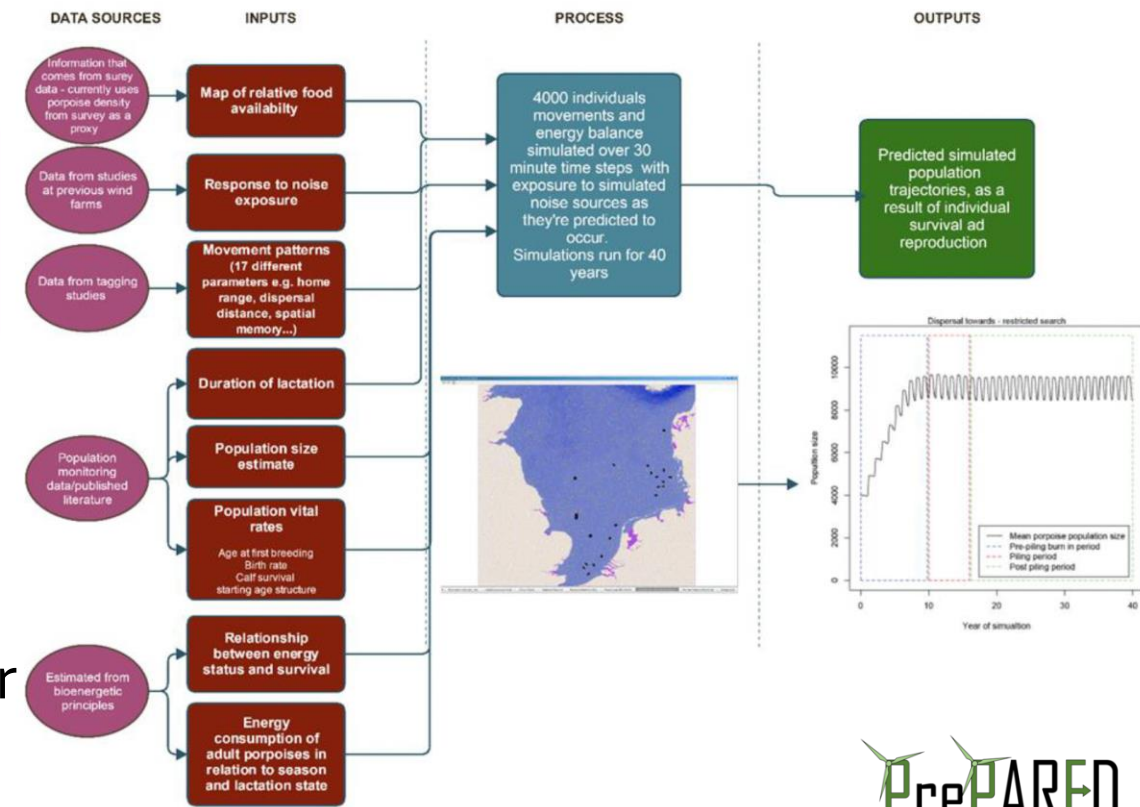
Guide to Population Models used in Marine Mammal Impact Assessment

Sparling, C.E., Thompson, D. & Booth, C.G.

The report was reviewed by John Harwood and Jacob Nabe-Nielsen and colleagues in the Marine Industries Group - Marine Mammals which comprises staff from JNCC, SNH, NRW, NE and DAERA.



DEPONS



The same process is undertaken with CIA tools developed for informing management decisions for marine mammals (e.g. iPCoD, DEPONS)



Conclusions

- **Uncertainty** and **variability** are explicitly considered within assessment tools
- There are important gaps & limitations in the way this is currently done, but projects such as PrePARED are **helping to overcome these limitations**
- This provides mechanisms by which **external shocks** can be incorporated into the quantification of impacts, and associated uncertainty
- Research needed to better understand shocks & how they **project forward** into the future - but as we learn about this the information can be **incorporated into assessment tools**

