

Hello world: sustainable solutions through modelling

Andy Moore explores how defence can achieve Net Zero by extracting sustainable value from data.

When intelligently applied, computational modelling has the potential to deliver insights in complex or uncertain situations, but is the sustainability transformation for defence one of them? (Spoiler: yes, it almost certainly is). Andy Moore explores how to start extracting sustainable value from data.

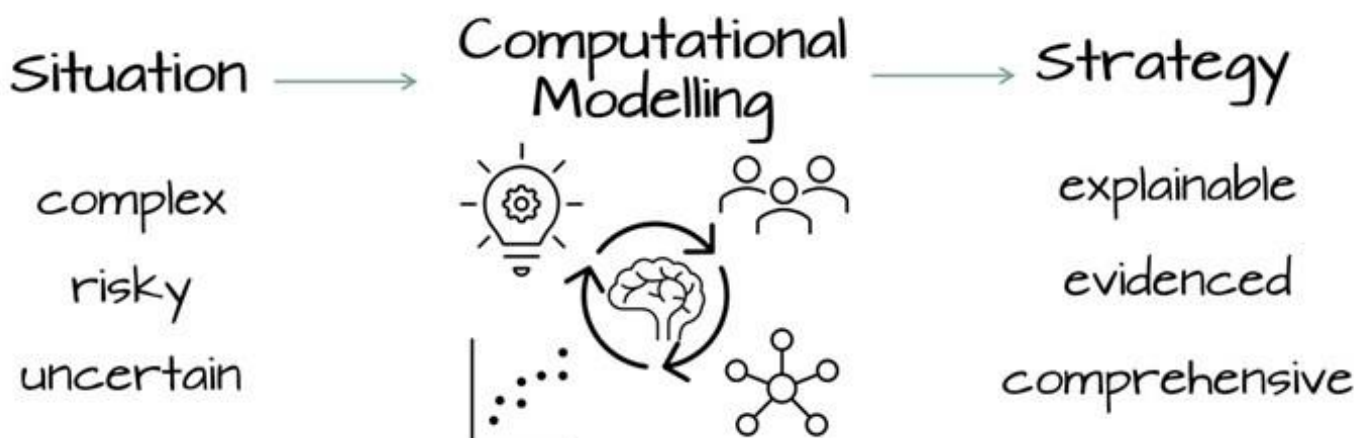
This is a blog post about applying computational modelling to the challenge of meeting sustainability goals. So it might seem strange to start it off by exploring whether you should bother at all. But to be effective you need to apply these techniques to the right kind of challenge – otherwise, you may end up effectively swatting mosquitoes with a laser cannon.

Building a computational model to inform or speed up your decision making will take effort (although not having one at all can be more costly). Start by convincing yourself that your problem will benefit from something over and above using your experience and best judgement. Good reasons include:

“People, ideas, machines – in that order.”

Colonel Boyd, US Air Force pilot and military strategist

- The complexity of the problem means that the risks and consequences of your choices cannot be anticipated by common sense or experience. There may be detailed interactions to track, and timescales are long or varied
- It is unethical, expensive, too hard, or too slow to carry out physical experiments on the target system
- You need to integrate reliable knowledge from different sources into a more complex whole to understand the system interactions



- You need to engage with a range of stakeholders in order to ensure decisions are well founded, and the decision needs to be communicated effectively to win trust
- You need to prepare in advance for different outcomes in a complex or uncertain future.

The strategic approach to sustainability in defence is one of those challenges – characterised by large timescales, uncertainty in future situations and risks of capability shortfalls. If executed well, computational modelling can deliver explainable, evidenced and comprehensive strategic insights.

How to develop robust decision making

There are vast amounts of powerful and innovative ways you can improve the quality and speed of your decision making using computational modelling and other data science techniques. An obvious place to start exploiting these capabilities is to understand the baseline position of your organisation. Once you have started to measure where you are today, you can:

1. **Predict.** Combine your baseline data with an understanding of how your system will behave to make predictions of capabilities, costs, risks and outcomes.
 - a. **Don't** try to predict a single best guess at what will happen in the future. It will be wrong and not much use to anyone.
 - b. **Do** make predictions probabilistically across a range of possible future scenarios, for an appropriate list of strategic options.
2. **Decide.** Once you have a credible set of predictions you can make a decision on which strategy works best.
 - a. **Don't** just rely on your judgements to make important decisions mired in complexity. Use data science and modelling to provide the evidence for your business case.
 - b. **Do** choose a robust strategy that will work well across a range of possible future scenarios.

3. **Manage.** Risks need to be mitigated and tactical decisions made to achieve the best outcomes.
 - a. **Don't** blindly trust your predictions about how the future will play out. Validate your predictions and update your understanding if necessary.
 - b. **Do** ensure that the data you collect can be put to good use with a data governance strategy. Use automation to drive further value from data.

Putting it into practice

What does this look like in reality? Recently at Frazer-Nash we helped a client who wanted to decarbonise its fleet of support vehicles.

There were many options and different opinions from judgement alone about how choices would affect its operations. We applied our fleet simulation tool to the organisation to understand the impacts of choices on its overall fleet effectiveness metrics for different vehicle options. The visualisations from the model helped to communicate their final decision, and the model can now be used to manage the decisions that face them during their transition phase.

When to start exploiting data

We've learnt from experience that you shouldn't be put off starting predictions because you haven't yet fully documented your baseline position. Data will always improve over time but will never be perfect. As long as your predictions account for uncertainty this is not a problem, so there is no need to delay getting the benefits. Define your problem and get started!

