

Delivering Forecasting Models to Decision Makers

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Our Company

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Apex Resource Management Solutions

Ecological Forecasting Redefined

Delivering state-of-the-art ecological models to decision makers

 SyncroSim Software

Focus Areas



Landscape Change

We model changes in vegetation, land use and land cover, including changes due to wildfire.

[Details →](#)



Populations Dynamics

We predict the dynamics of animal populations and disease, including COVID-19.

[Details →](#)



Ecosystem Services

We forecast the fate of ecosystem services, including carbon, animal habitat, habitat connectivity and recreation.

[Details →](#)

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Ecological Forecasting Redefined







What is an “actionable” forecast?

→ For a forecast to be “actionable” it should inform a decision of some kind

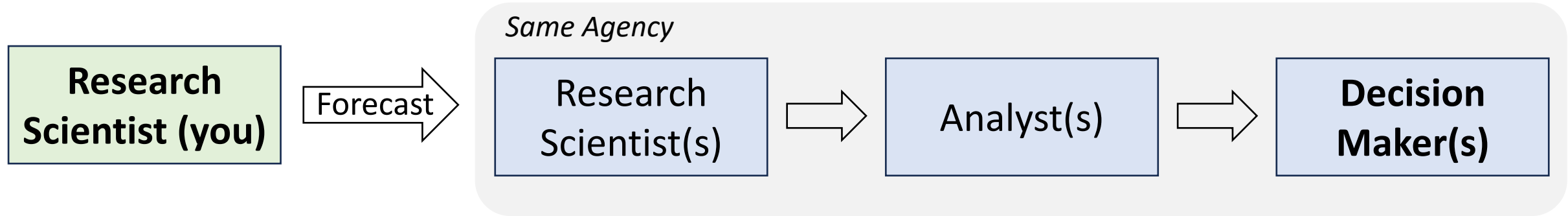
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Examples of
ecological decisions
requiring forecasts:

Government	<i>Federal:</i> species recovery, fisheries management, vaccine procurement
	<i>Provincial:</i> forest management, big-game harvest, hospital capacity management
	<i>Municipal:</i> watershed management
NGOs	Land management alternatives; ecosystem restoration
Industry	Compliance with regulations (e.g. forestry, mining)
Stakeholders	Indigenous land claims consultation

Decision making process



Our Experience: Forecasts most often delivered through intermediary research scientists and/or analysts

→ For forecasts to be actionable, they need to move all the way from left to right

Decision making process

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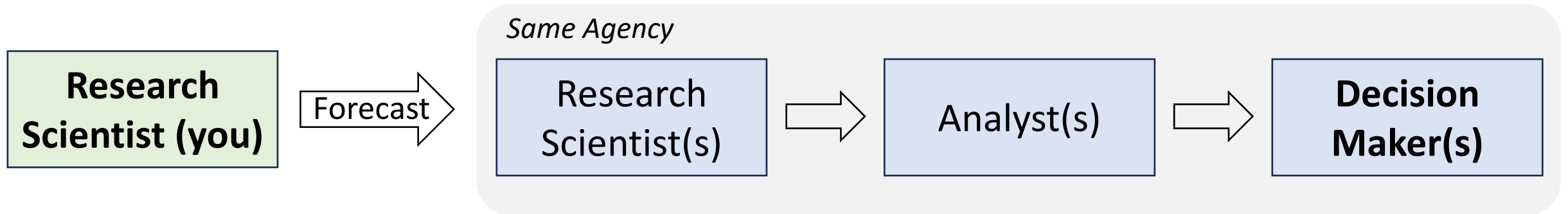
$$\text{Trust} = \frac{(\text{Credibility}) + (\text{Reliability}) + (\text{Intimacy})}{(\text{Self-orientation})}$$

- Credibility
 - technical expertise
- Reliability
 - dependability, consistency
- Intimacy
 - mutually increasing risk & closeness
- Self-orientation
 - advisors who appear to be more interested in themselves than client

How to make your forecasts actionable

First step: **Identify the audience** for your forecasts

- Decision maker directly? Or through other intermediaries?
- Level of scientific expertise? Coding skills?



→ *How will you gain the trust of the decision maker's "Trusted Advisors"?*

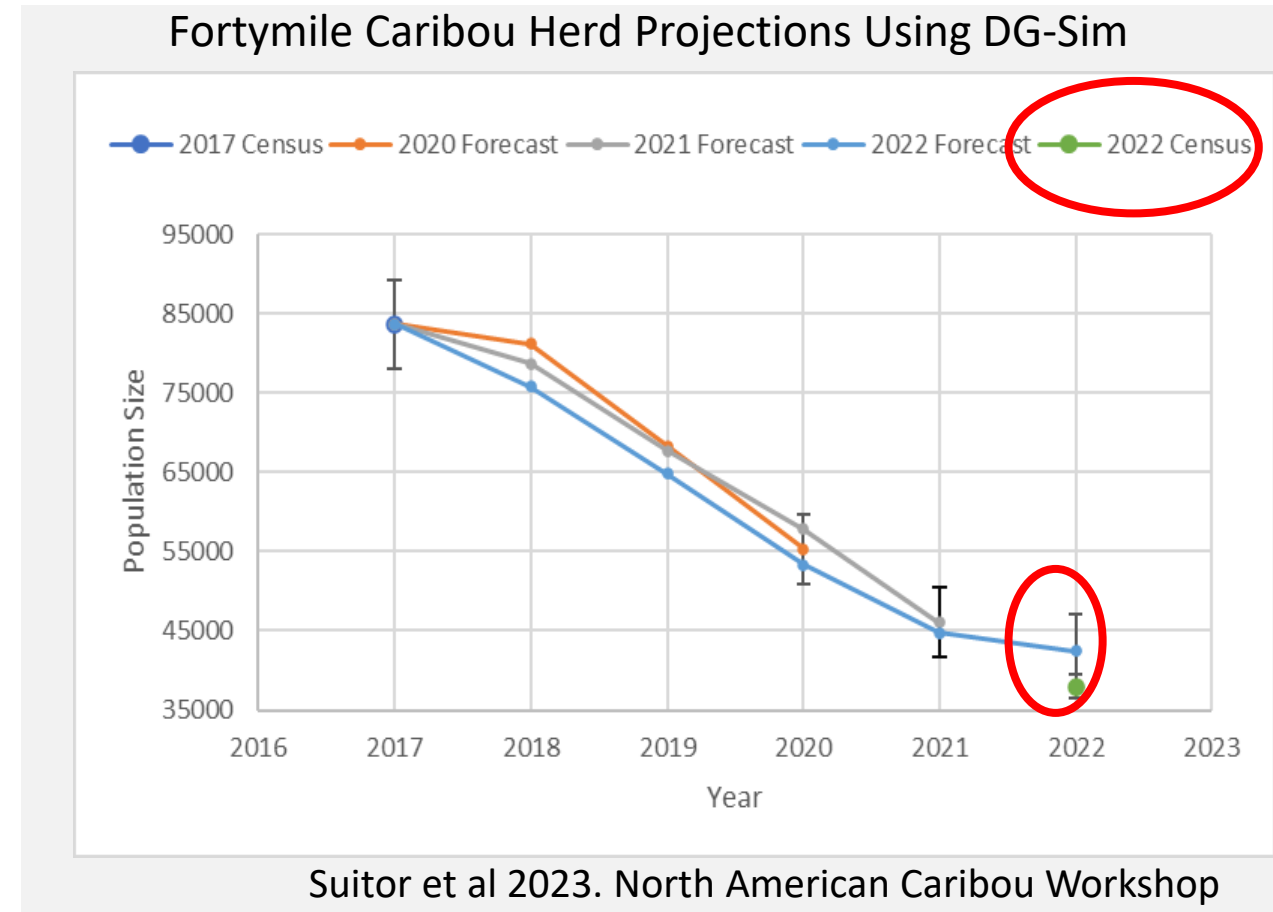
Key elements of an actionable forecast

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Carbon forecasts under alternative climate scenarios

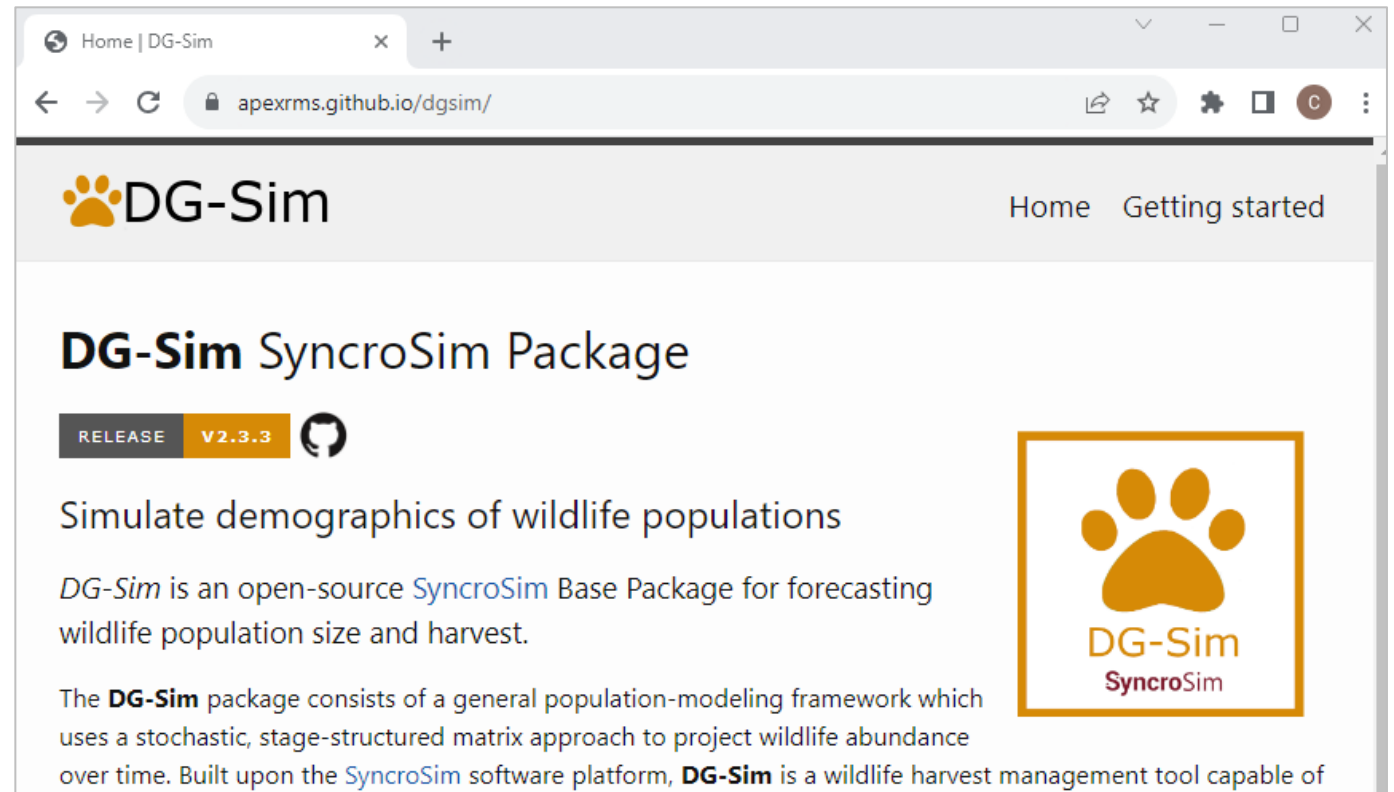
RCP	GCM	Δ NPP	Δ NECB
RCP 4.5	CanESM2	4.2	9.6
	CNRM-CM5	15	12.3
	HadGEM2-ES	-6.8	6.8
	MIROC5	-11.9	5.3
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Sleeter et al 2018. Glob Chg Biol

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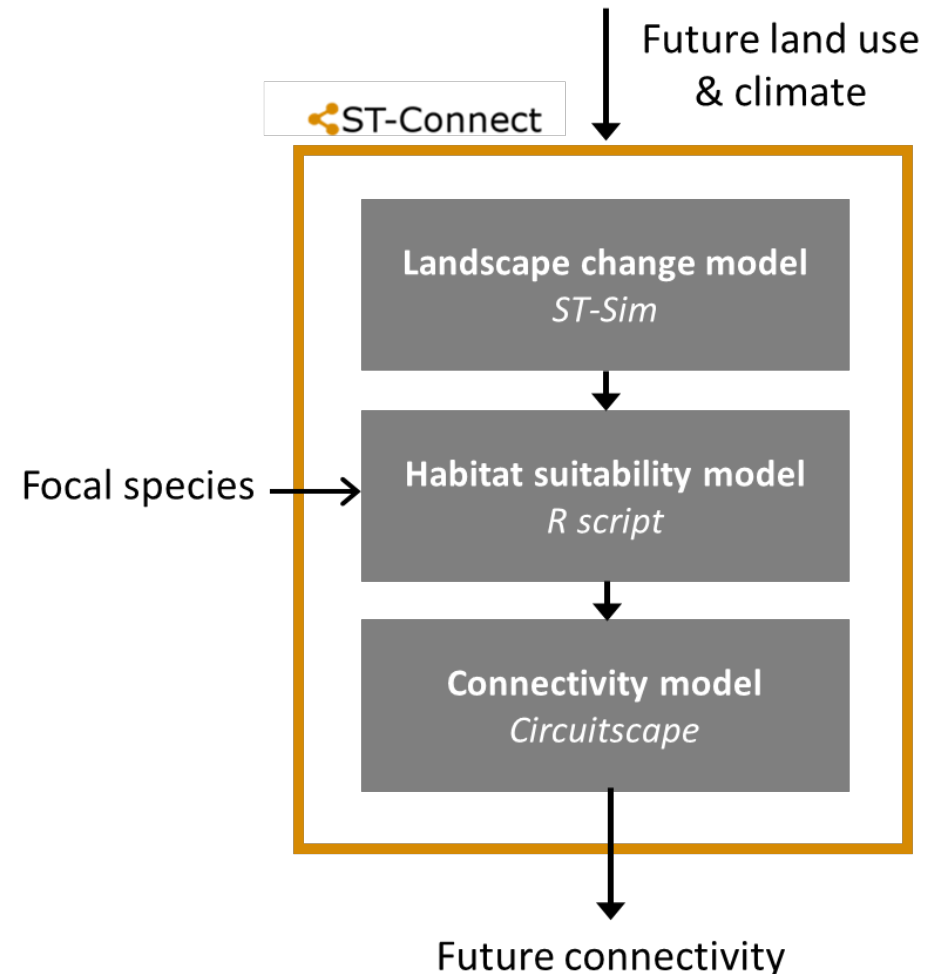
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- **“Available” for review**
 - make models “open science”
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 - make models “open science”
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- **Best available science**
 - don’t “dumb down” your models
 - often includes linked legacy models



Key elements of an actionable forecast

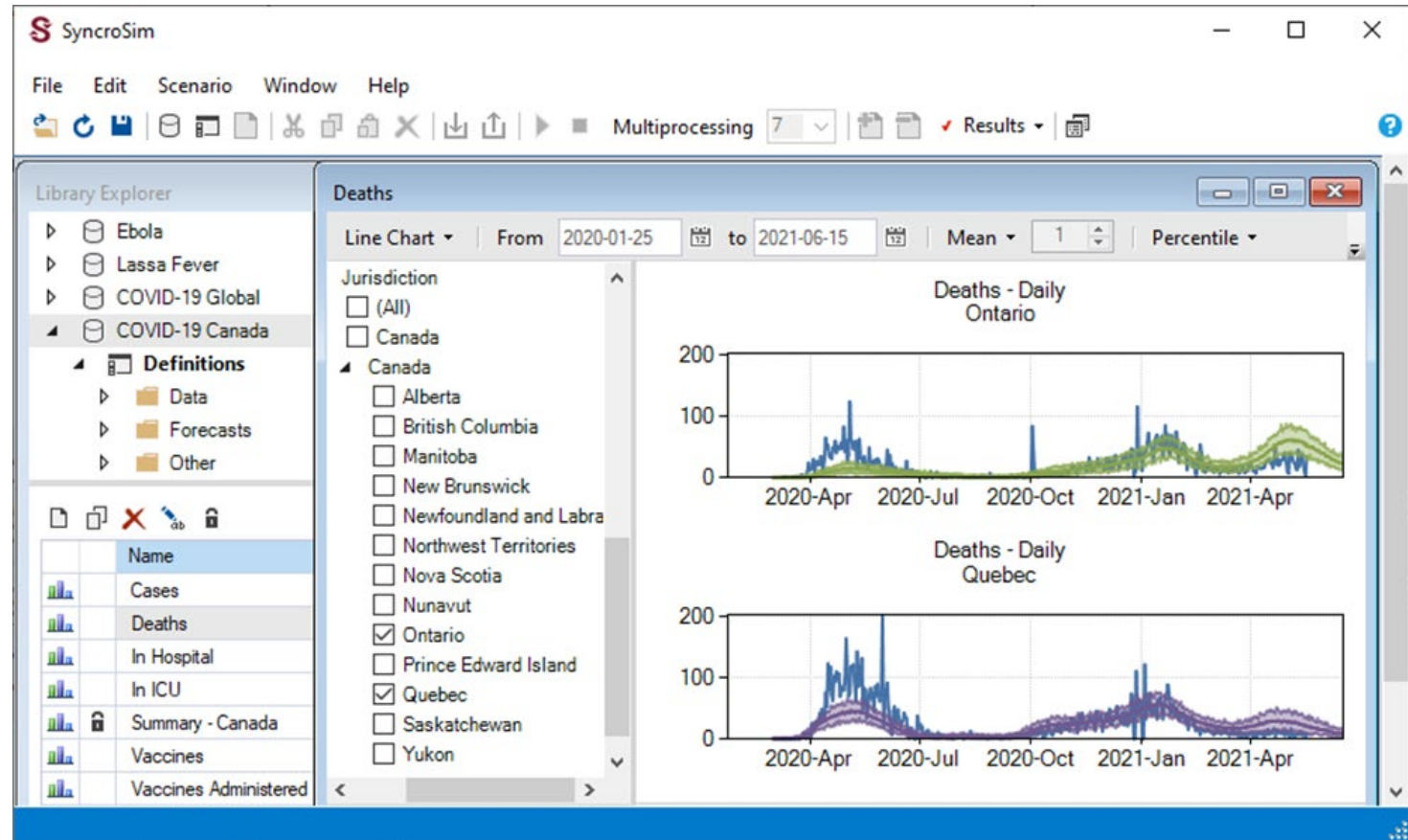
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- **Up-to-date**

- **automated data updates** (and thus revised parameter estimates)
 - *COVID-19: daily*
 - *animal populations: annual*
 - *forest vegetation: decadal*
- **regular updates to model structure**
 - *COVID-19: monthly?*



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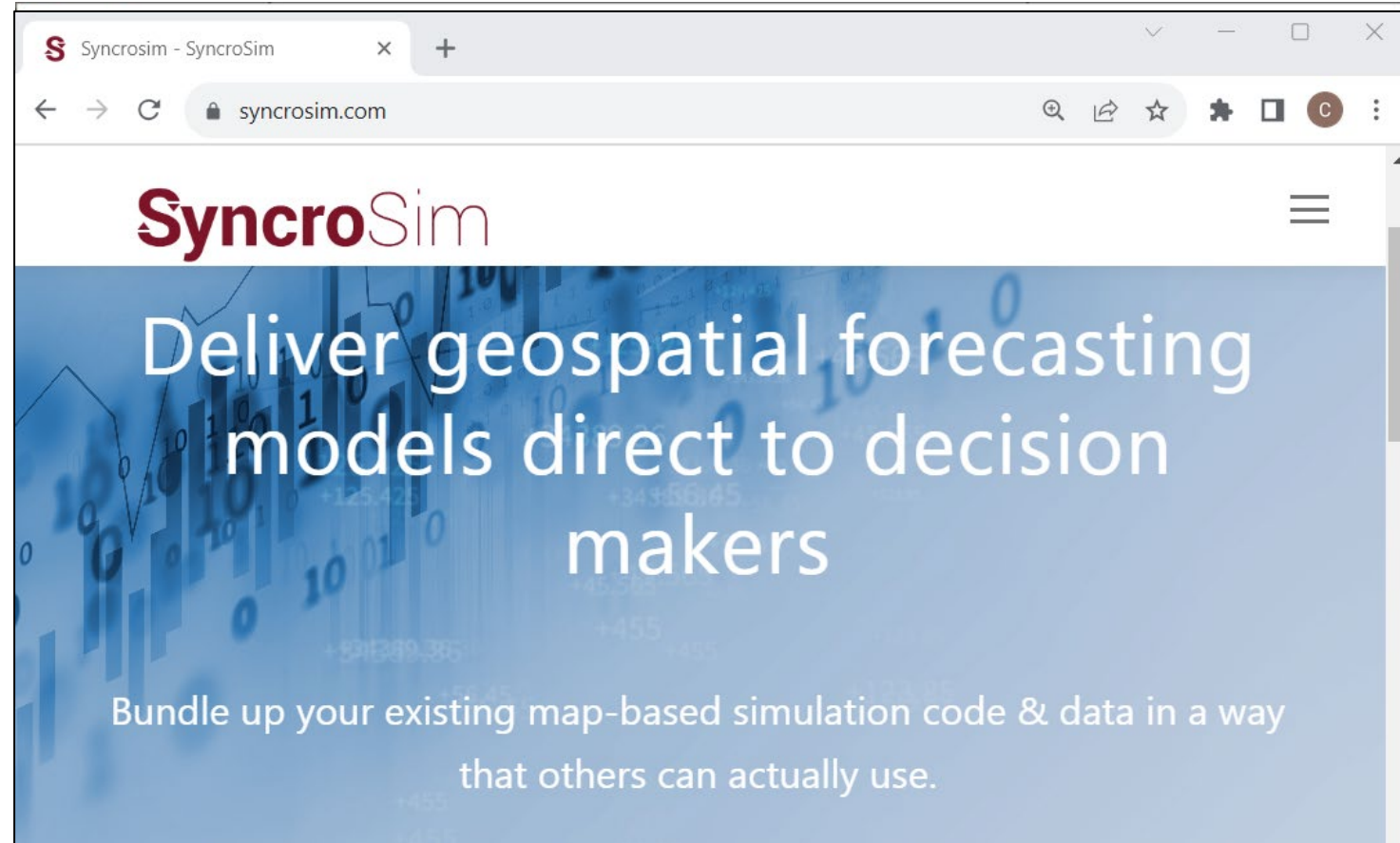
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- **Available in the future**

- setup enduring infrastructure
- trust can take years to develop...



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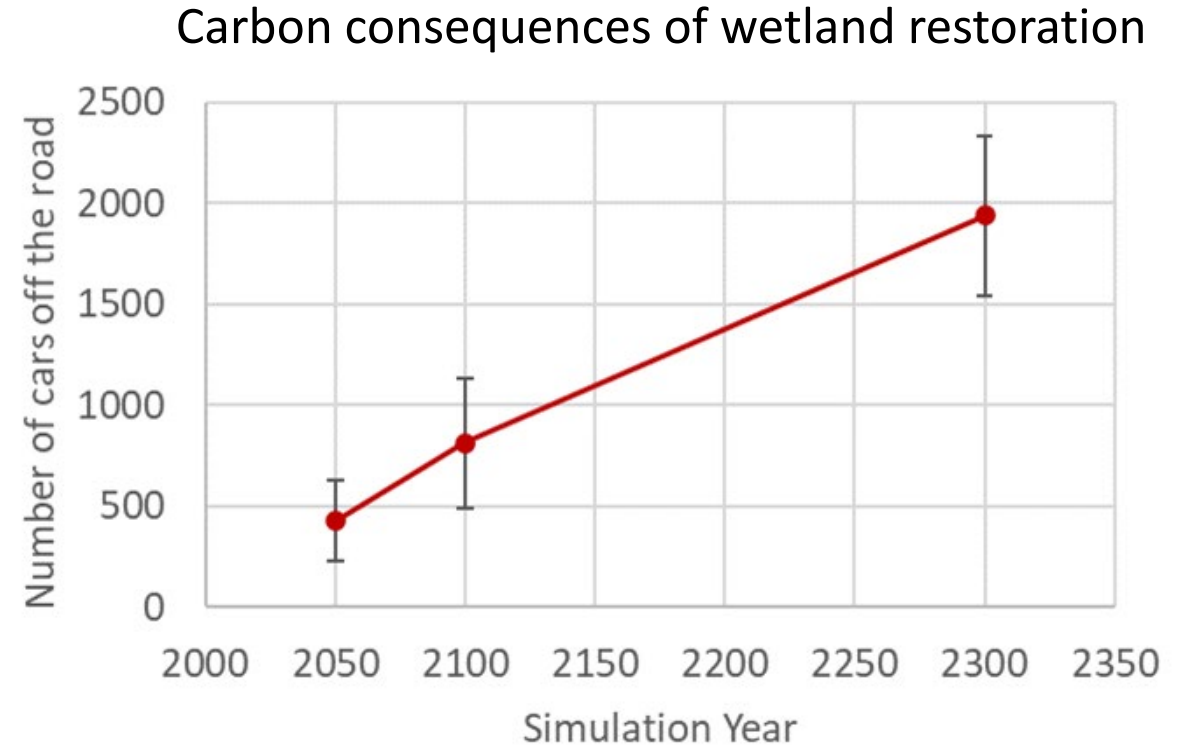
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- **Choose the right (i.e. decision-oriented) indicators**
 - Weather: chance of precipitation (never 50%!)
 - Ecosystem carbon: number of cars off the road
 - COVID-19: number of hospitalizations

→ ***Ask the decision maker!***



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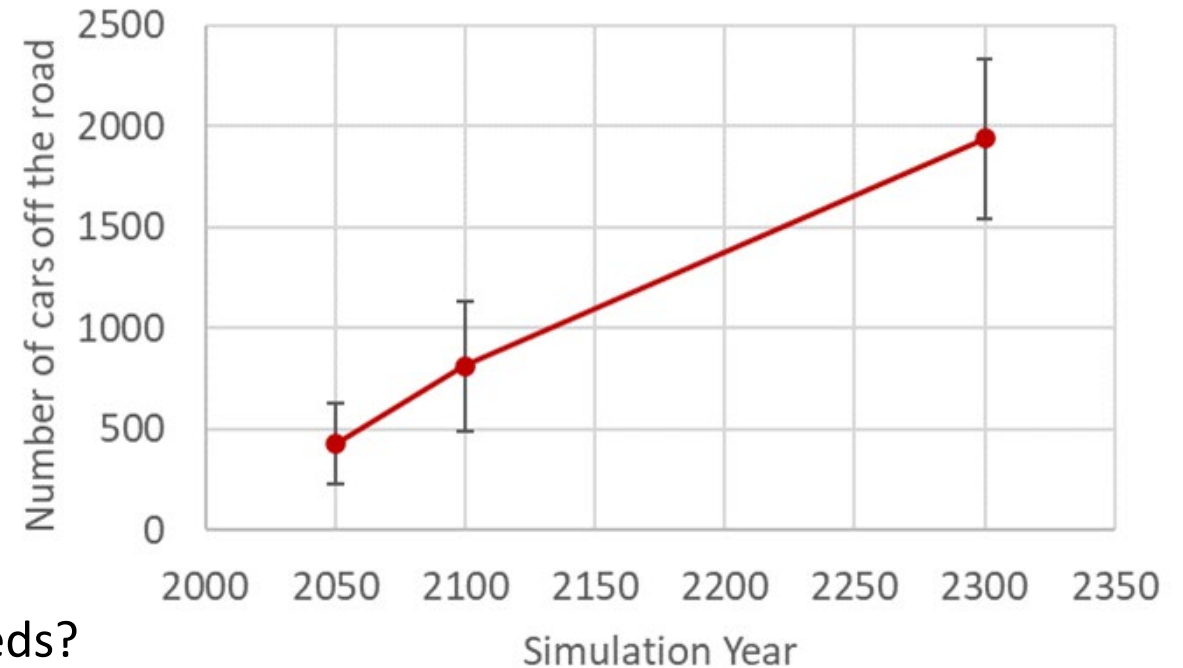
- **Don't limit scenarios**

- Are you sure you understand decision maker's needs?

→ *a priori scenarios can erode trust*

→ Better to deliver full running models than pre-determined scenarios

Carbon consequences of wetland restoration



Key elements of an actionable forecast

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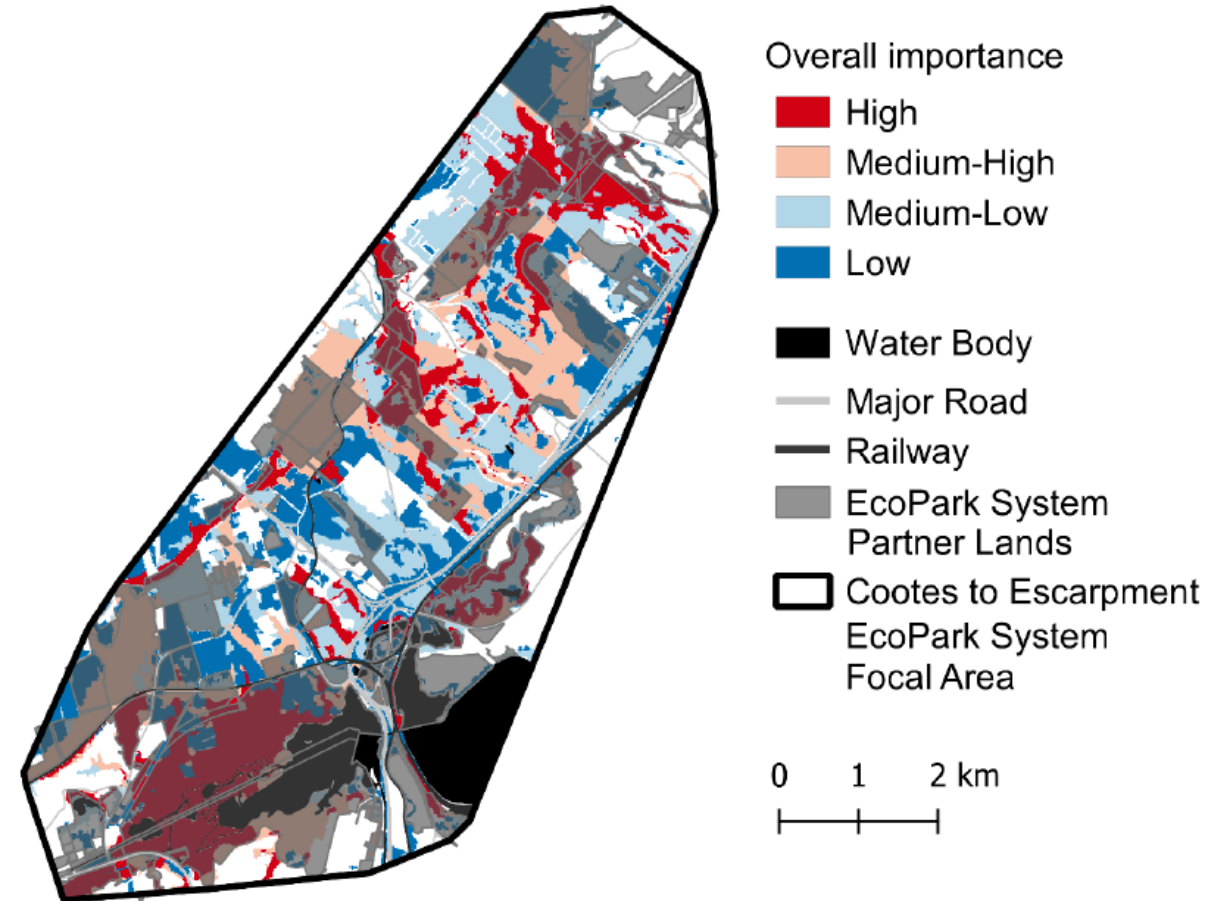
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- **Delivery depends on audience**
 - **Static reports:** *can work with decision maker engagement & slow-moving systems*

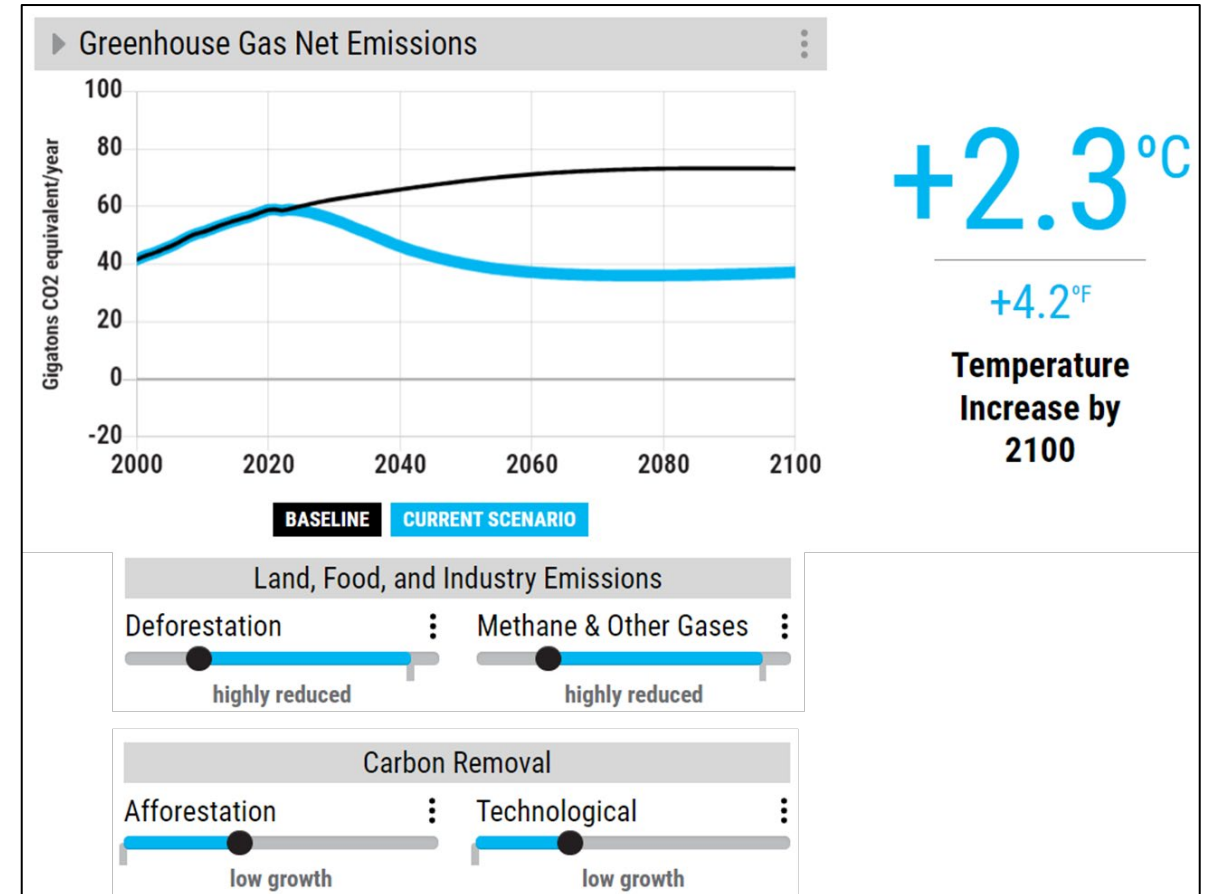
Priority areas for multispecies connectivity conservation



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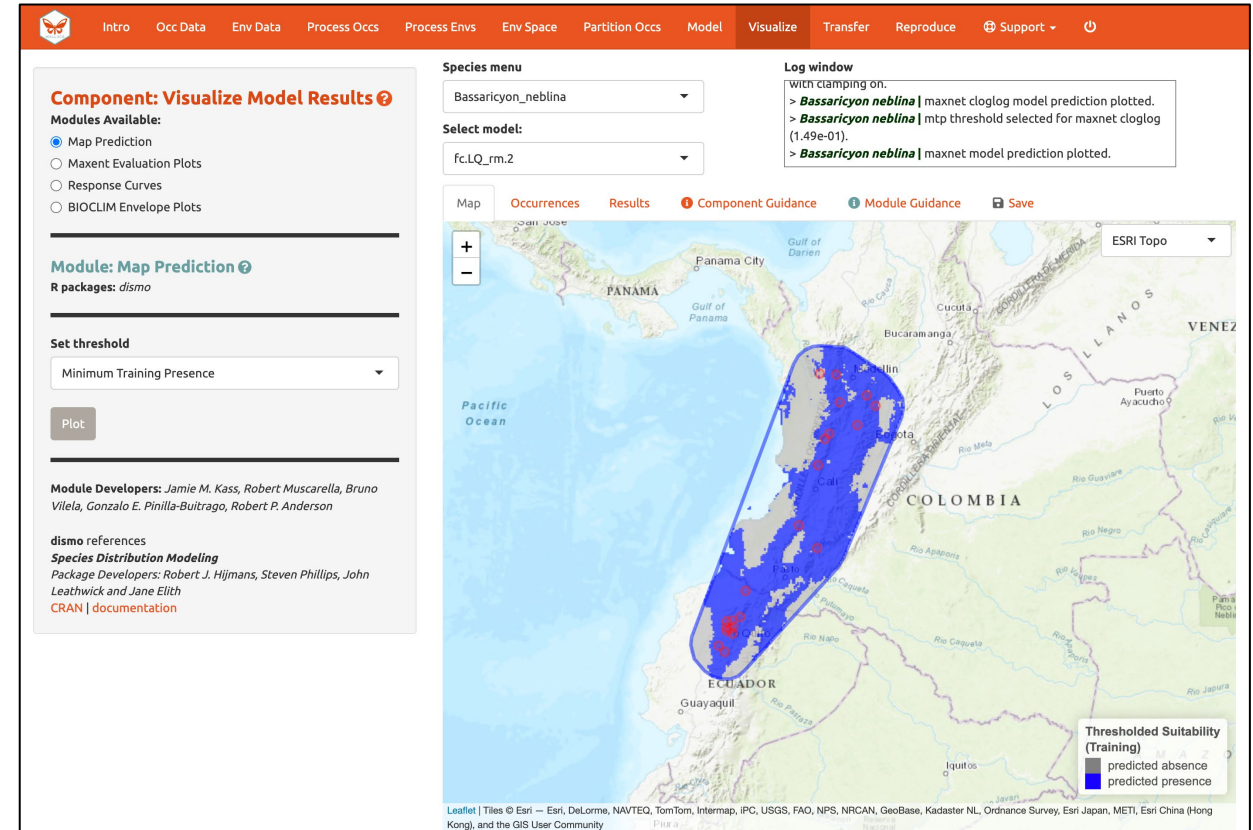


<https://en-roads.climateinteractive.org/>

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 - **Interactive apps** (e.g. R Shiny)
 - *allow model to be run → increase trust*
 - *often limited to “toy” runs (e.g. single scenarios; no sensitivity; limited processing)*

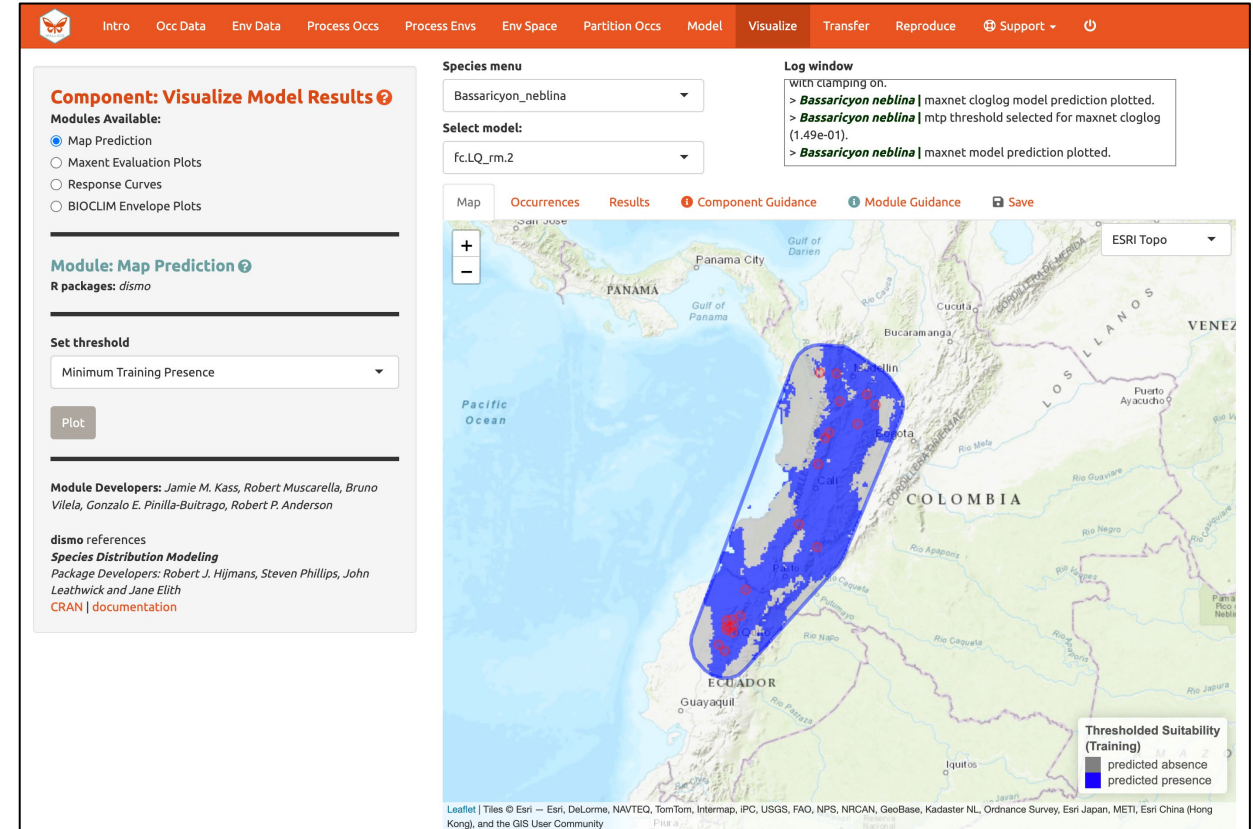


<https://wallaceecomod.github.io/>

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→ Ideally forecasts are delivered with multiple interfaces (for multiple audiences)

To summarize

- Decision makers generally rely on a circle of “trusted advisors”
- Gaining trust of these advisors is key to making your forecasts actionable
- Trusted (and thus actionable) forecasts should be:
 1. Credible
 2. Reliable
 3. Relevant
 4. Accessible

} ↓ Self-orientation

→ *Getting all this right is very difficult... Leverage existing resources wherever you can!*