



Complexity Science in Action

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September 2013

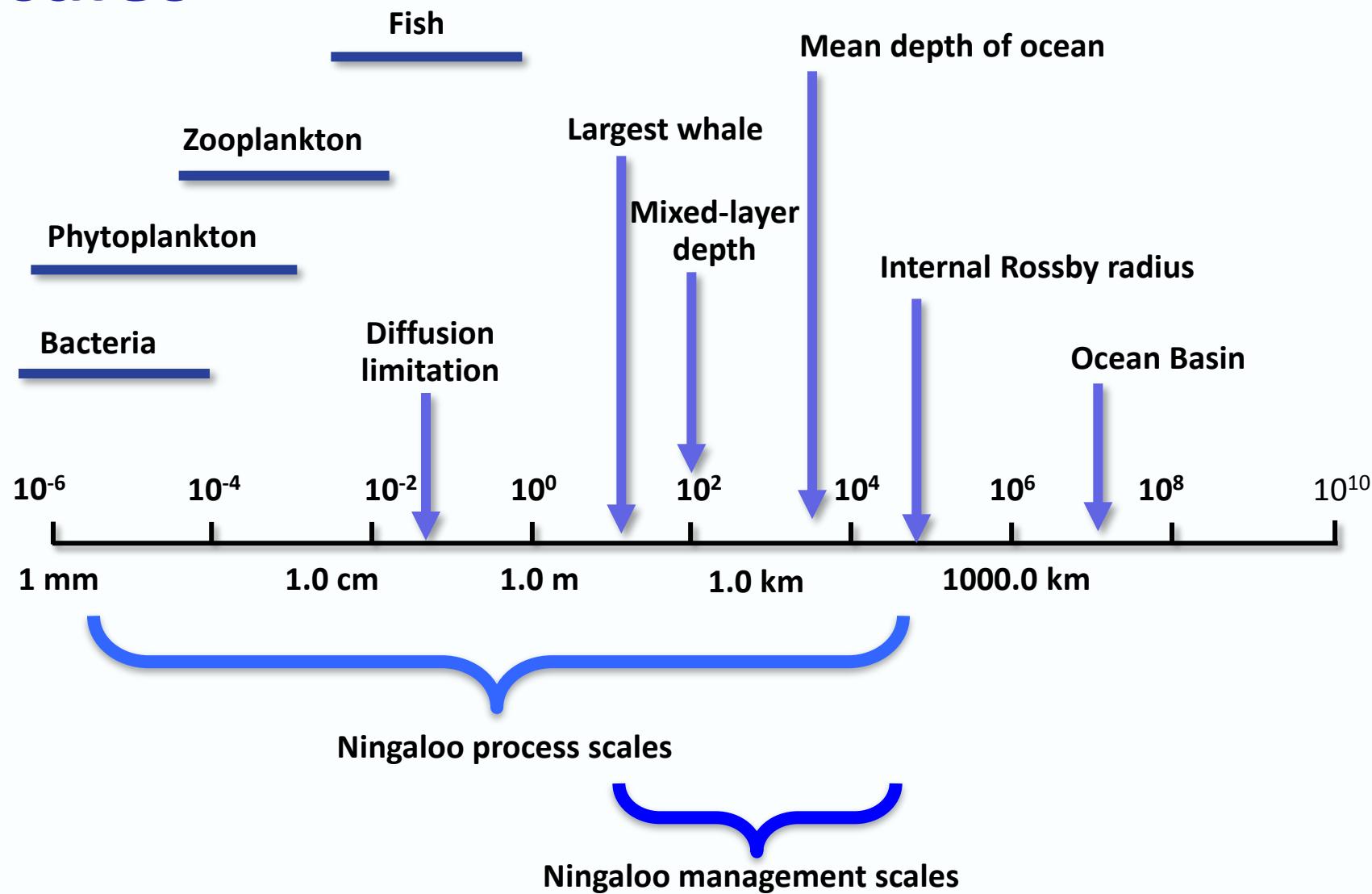
CSIRO WEALTH FROM OCEANS FLAGSHIP
www.csiro.au



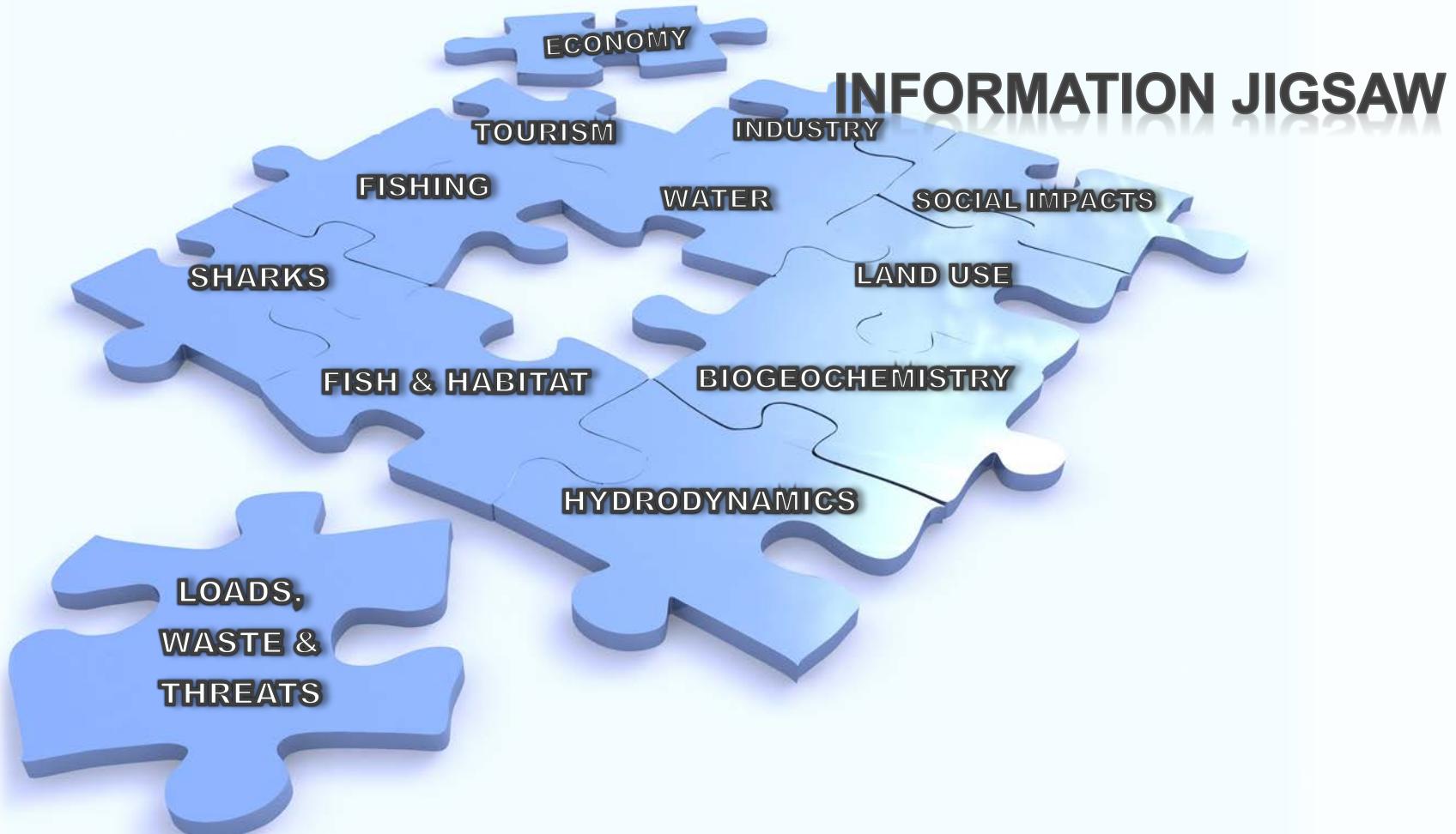
Nested Scales



Scales



Regulatory Jigsaw



Regulatory Focus



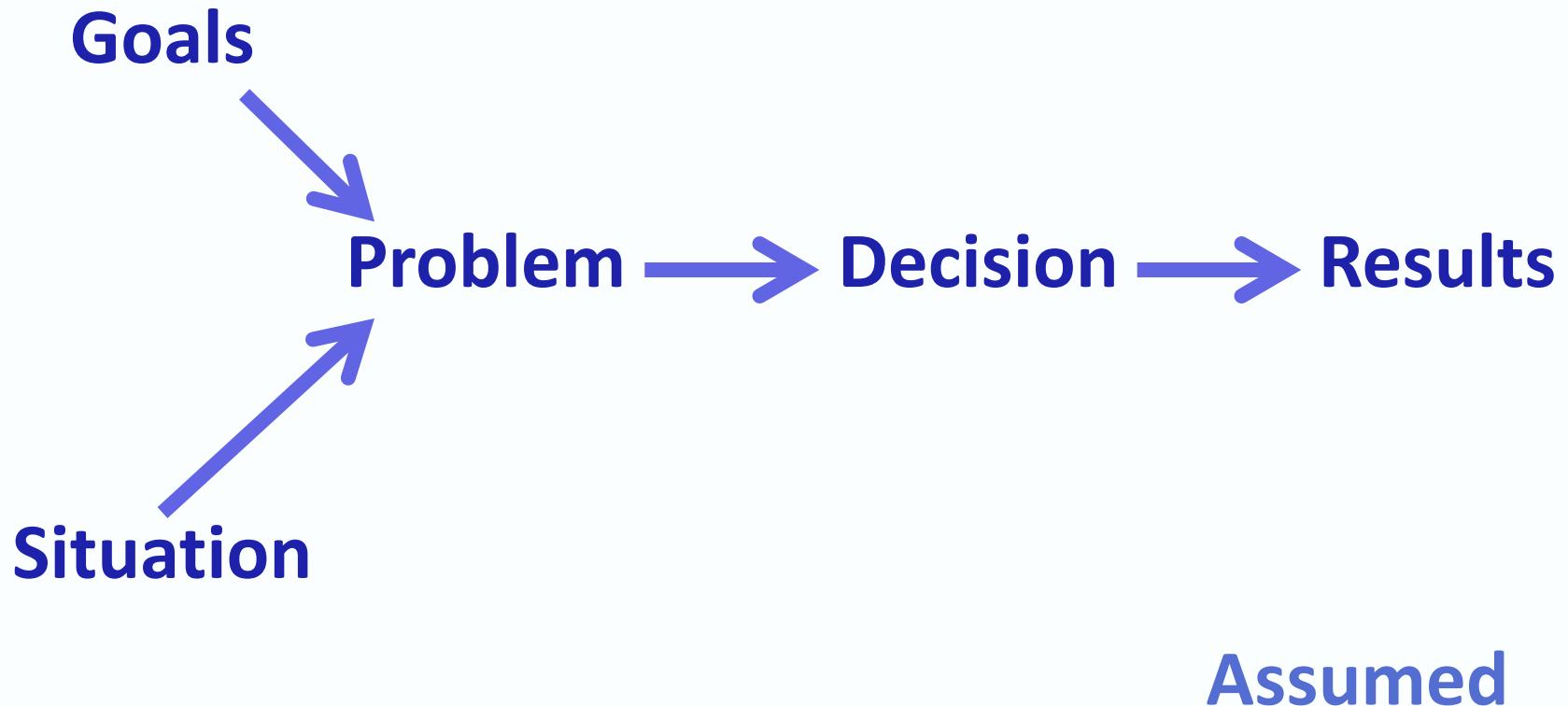
Northwest – Multiple Use



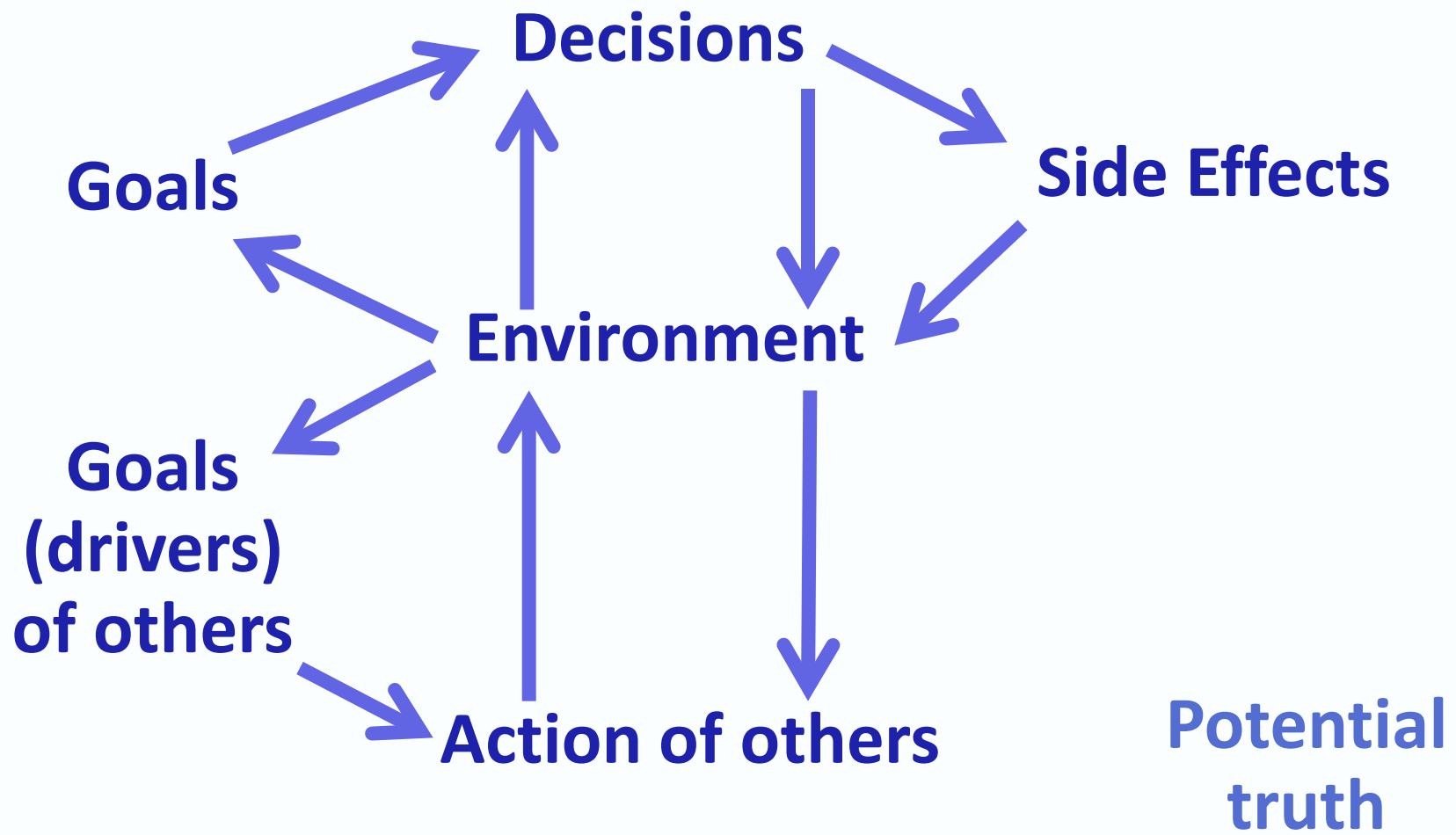
Marine multiple use management



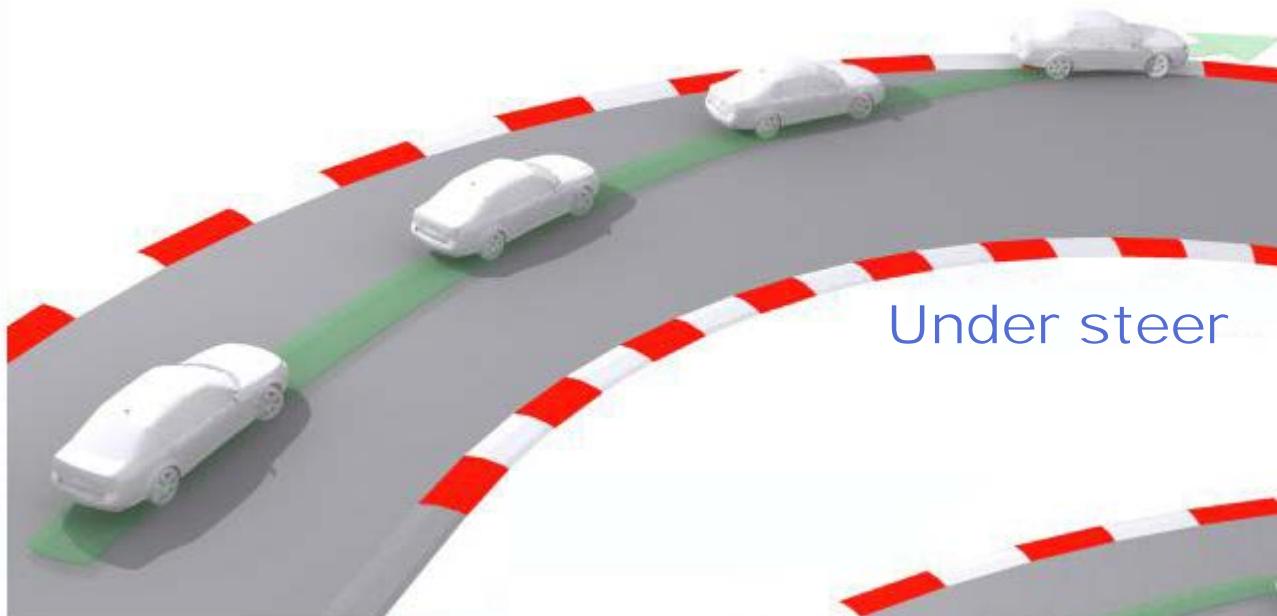
Decision Processes



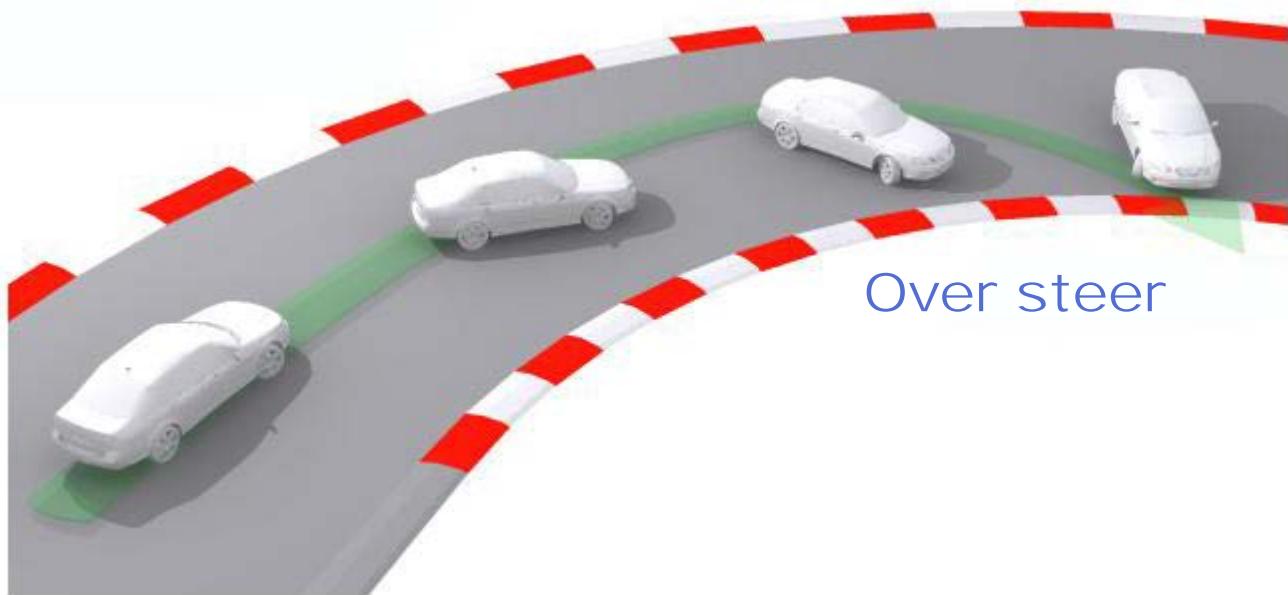
Decision Processes



Mis-judging feedback



Under steer

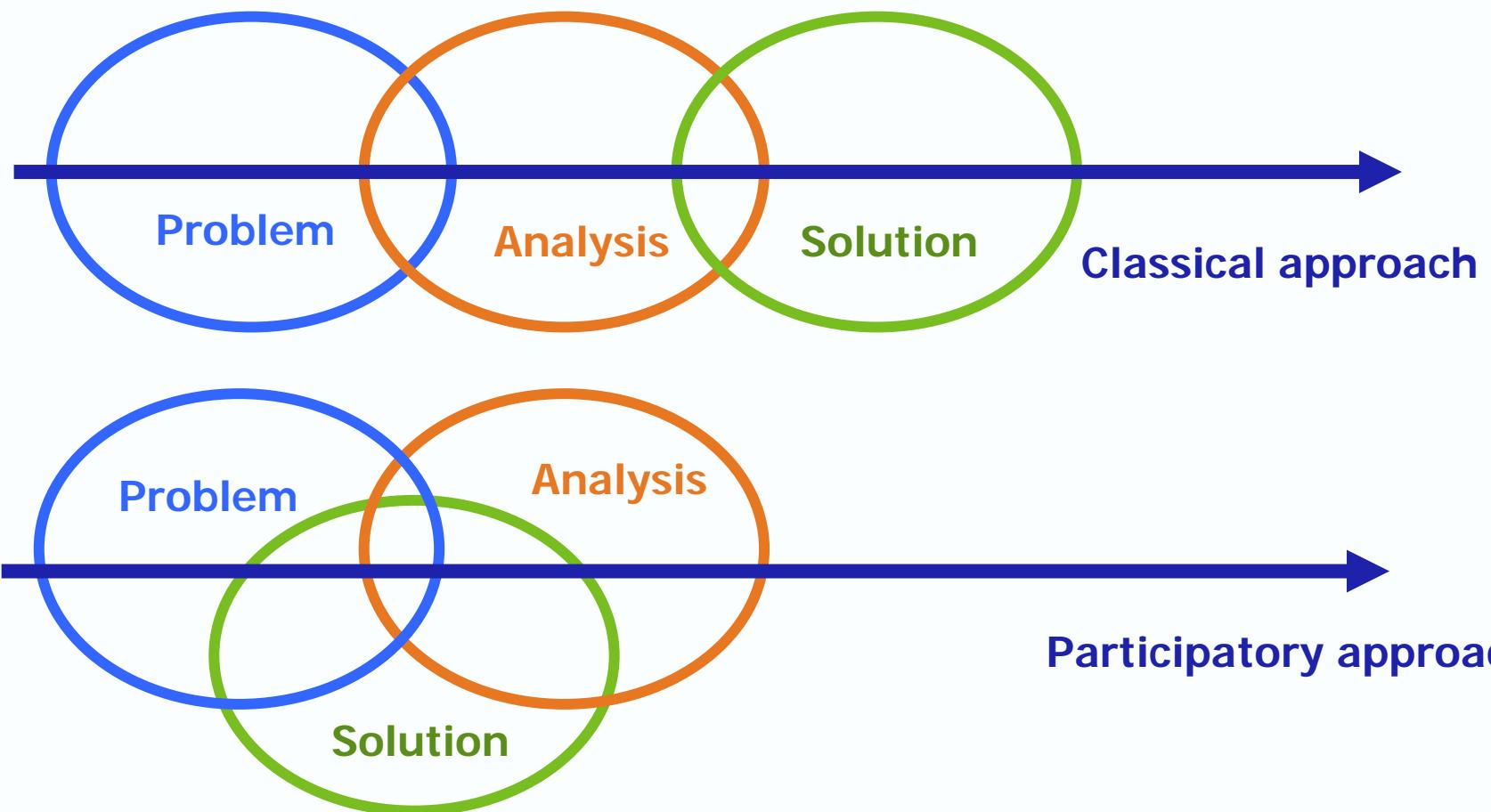


Over steer

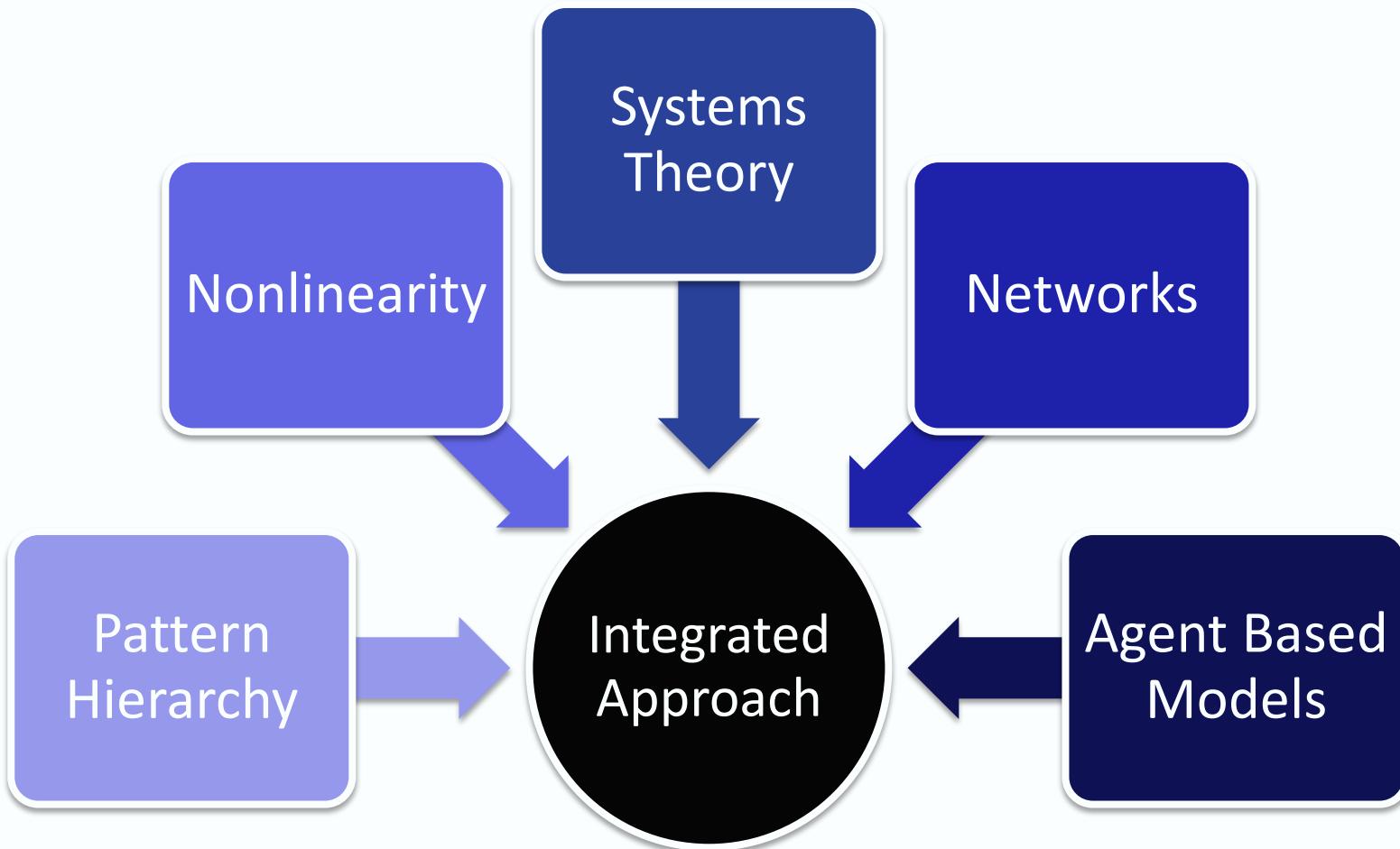
Training (brain)



1. Participatory Modelling

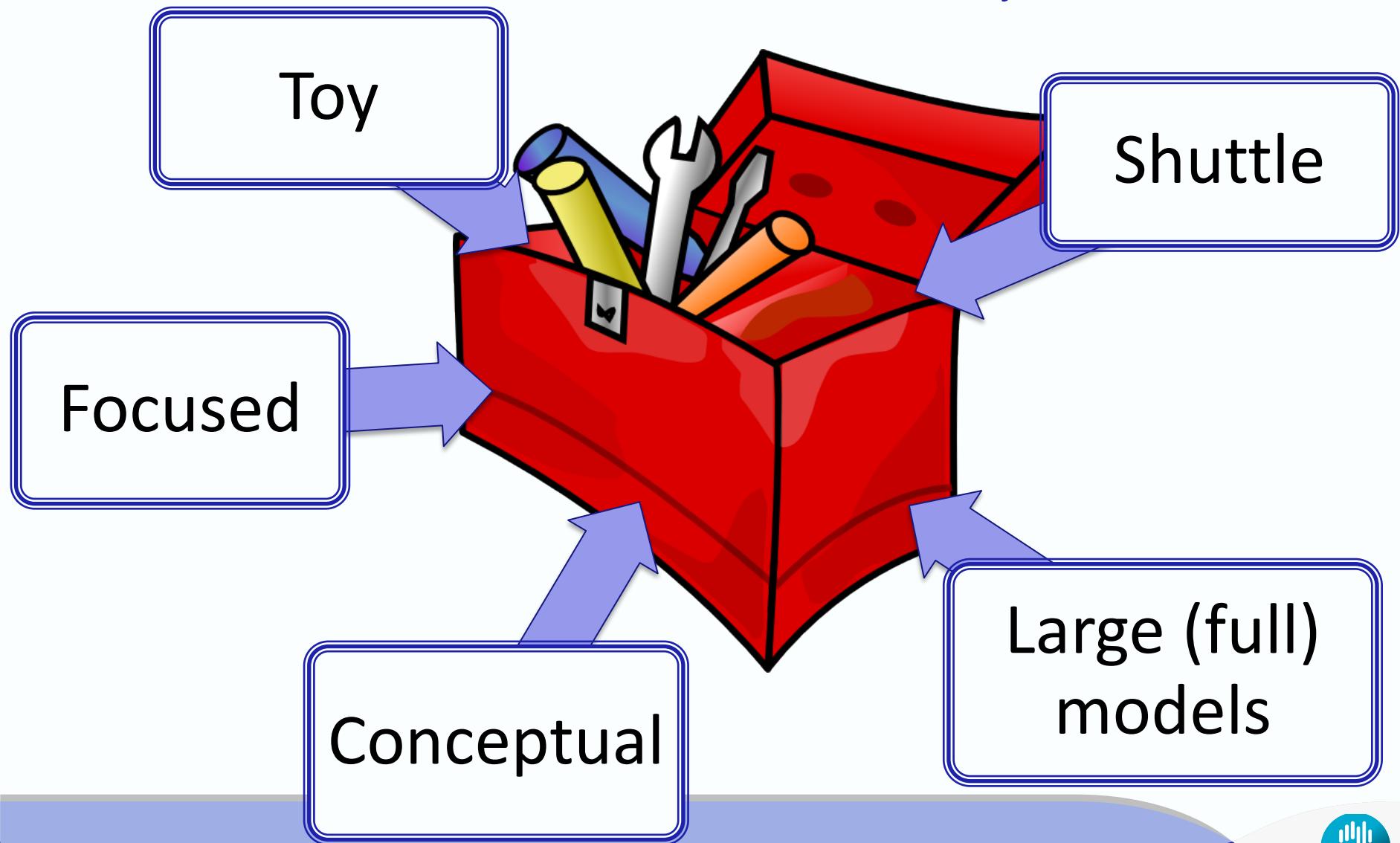


2. Complexity science

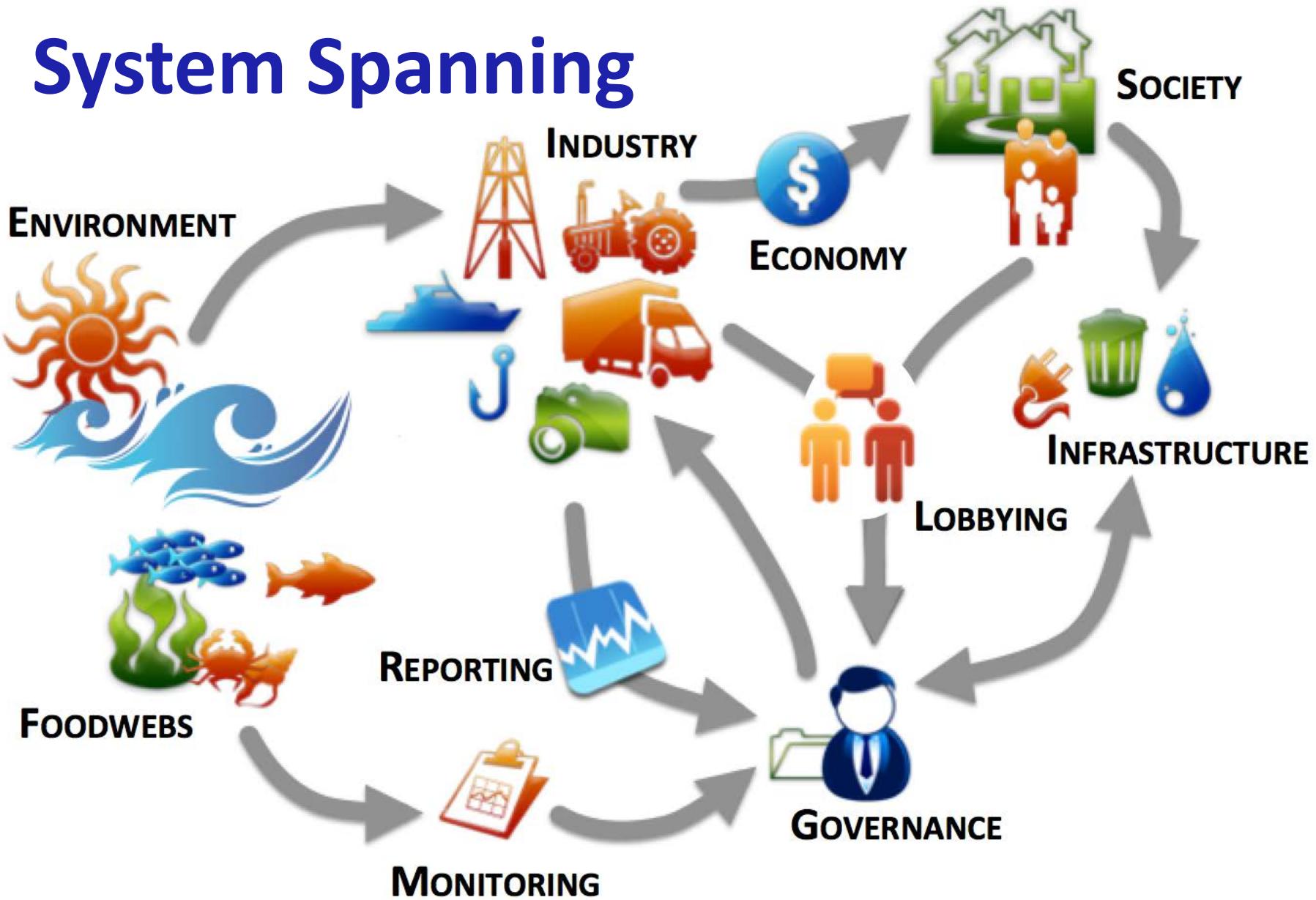


Multiple models

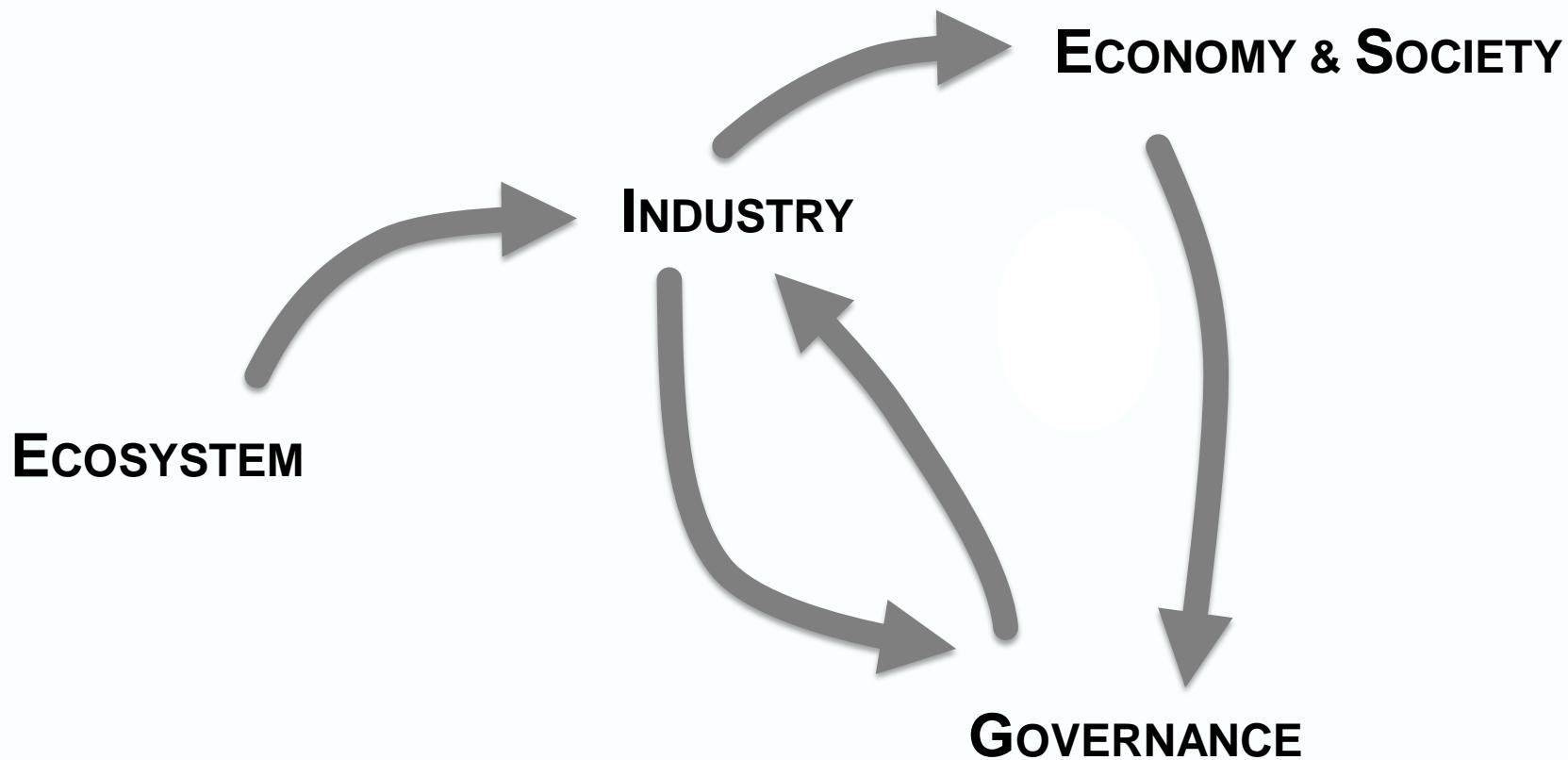
- All individually useful
- Don't always need the set



System Spanning



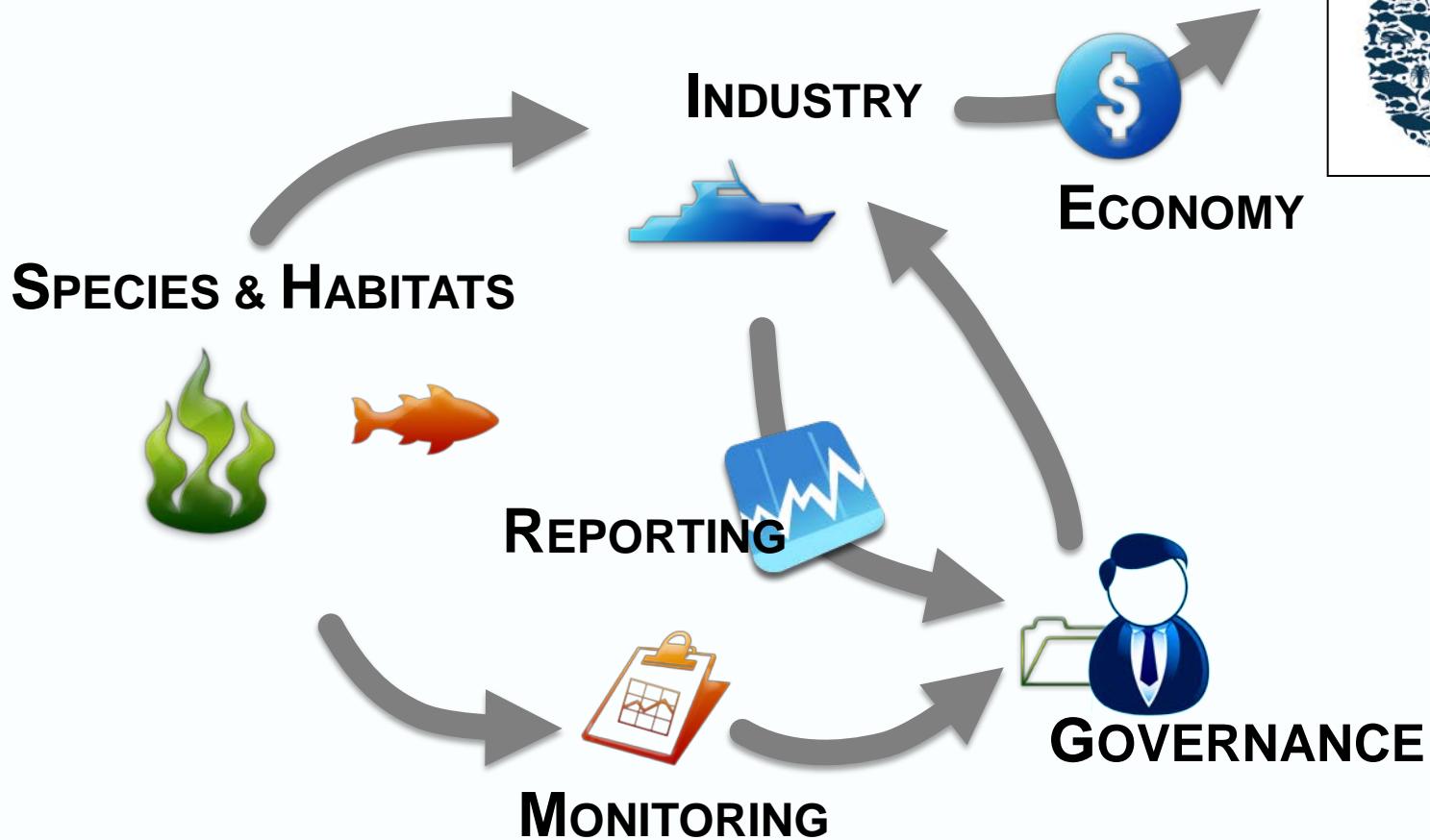
Qualitative



Conceptual



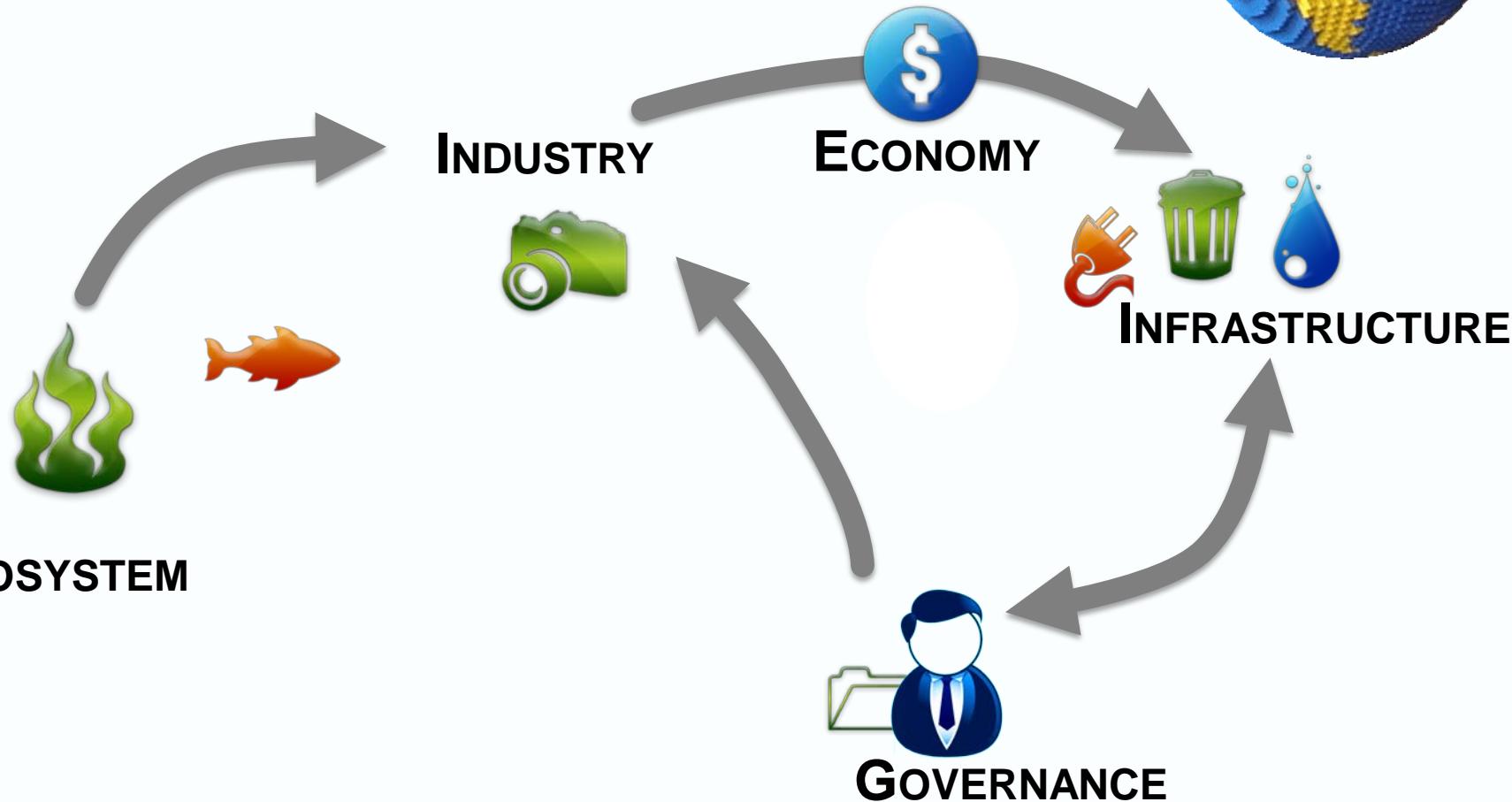
Empirical & Focused



Focused

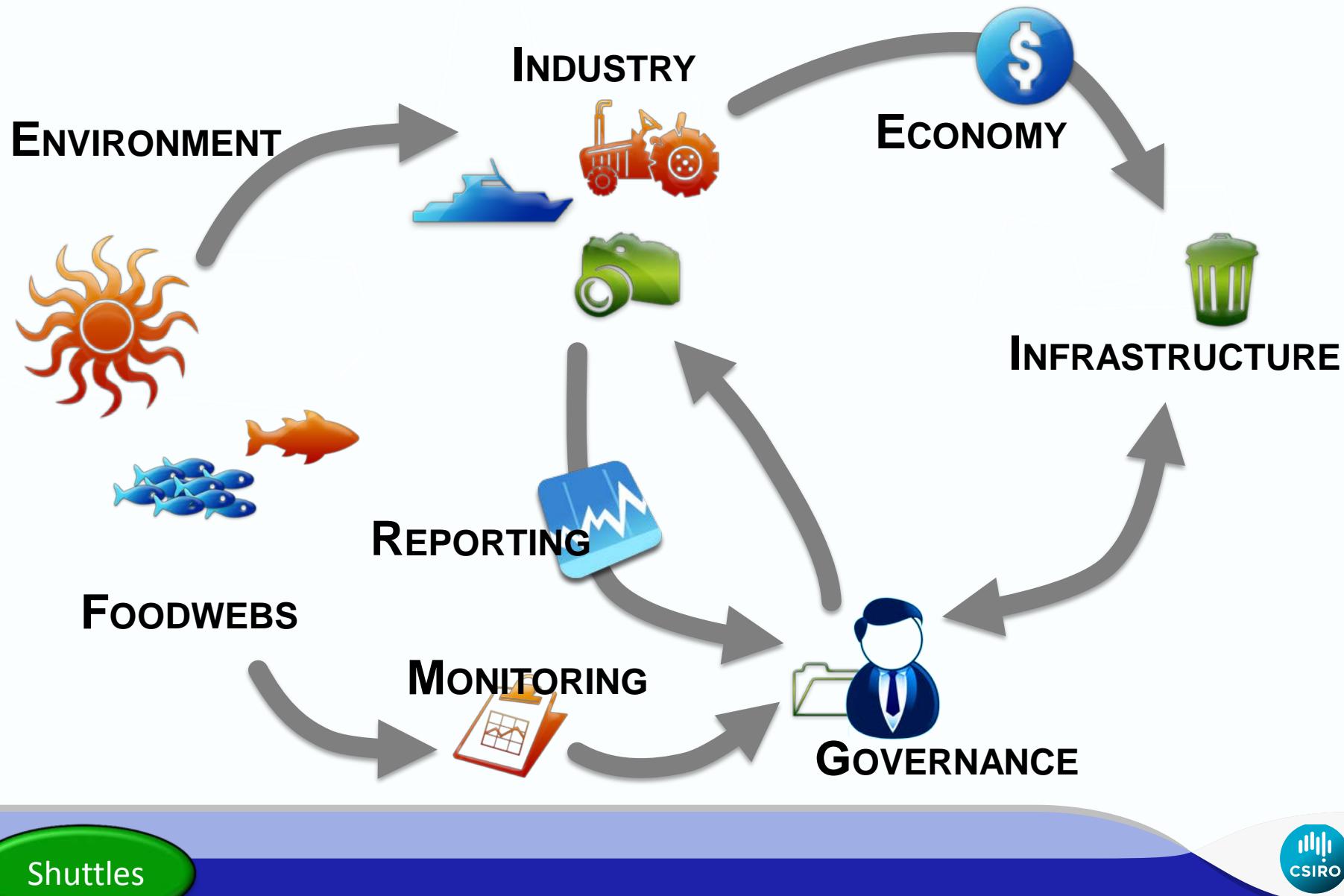


Toy models

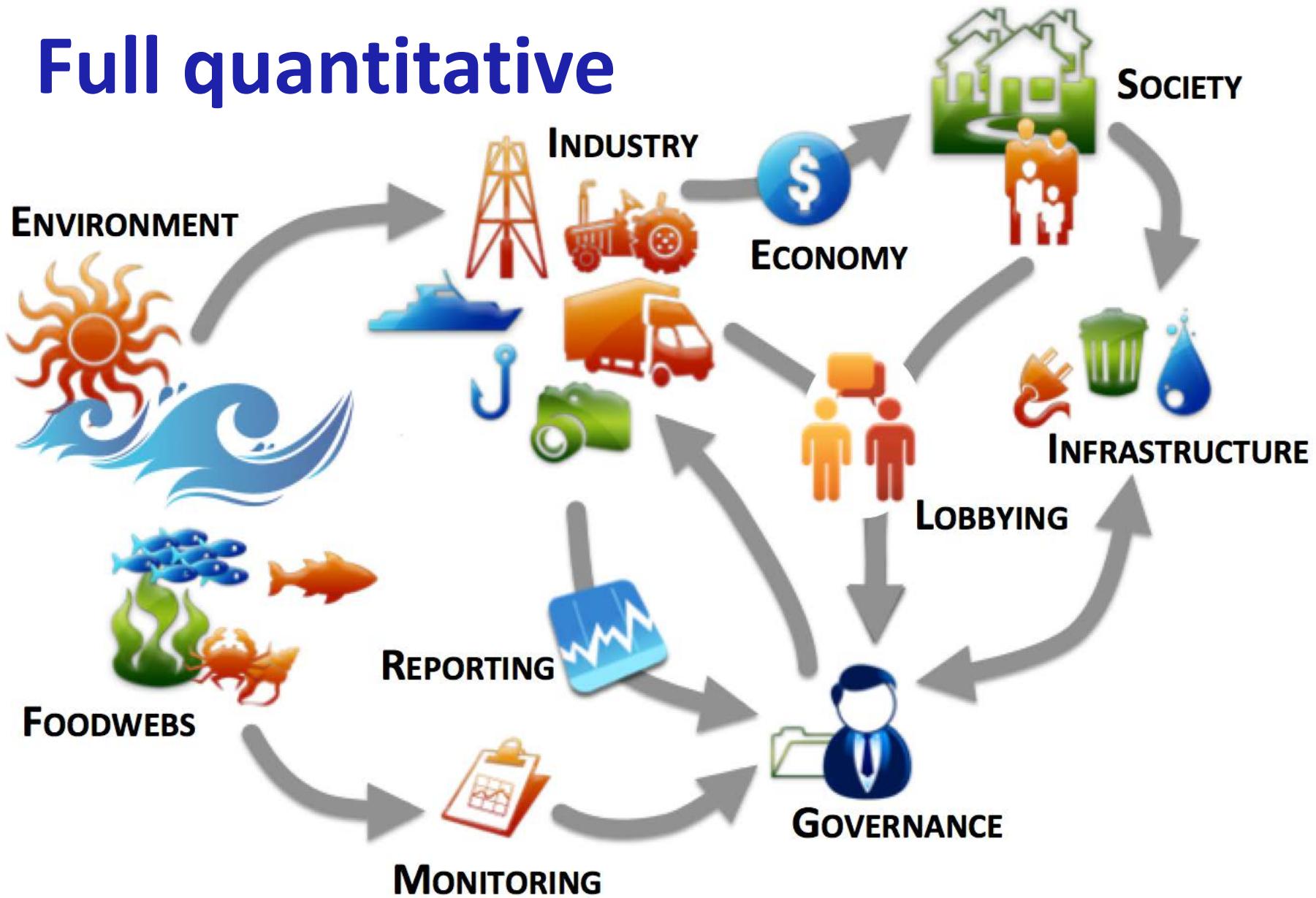


Toy models

Minimum realistic (shuttle ideas)



Full quantitative



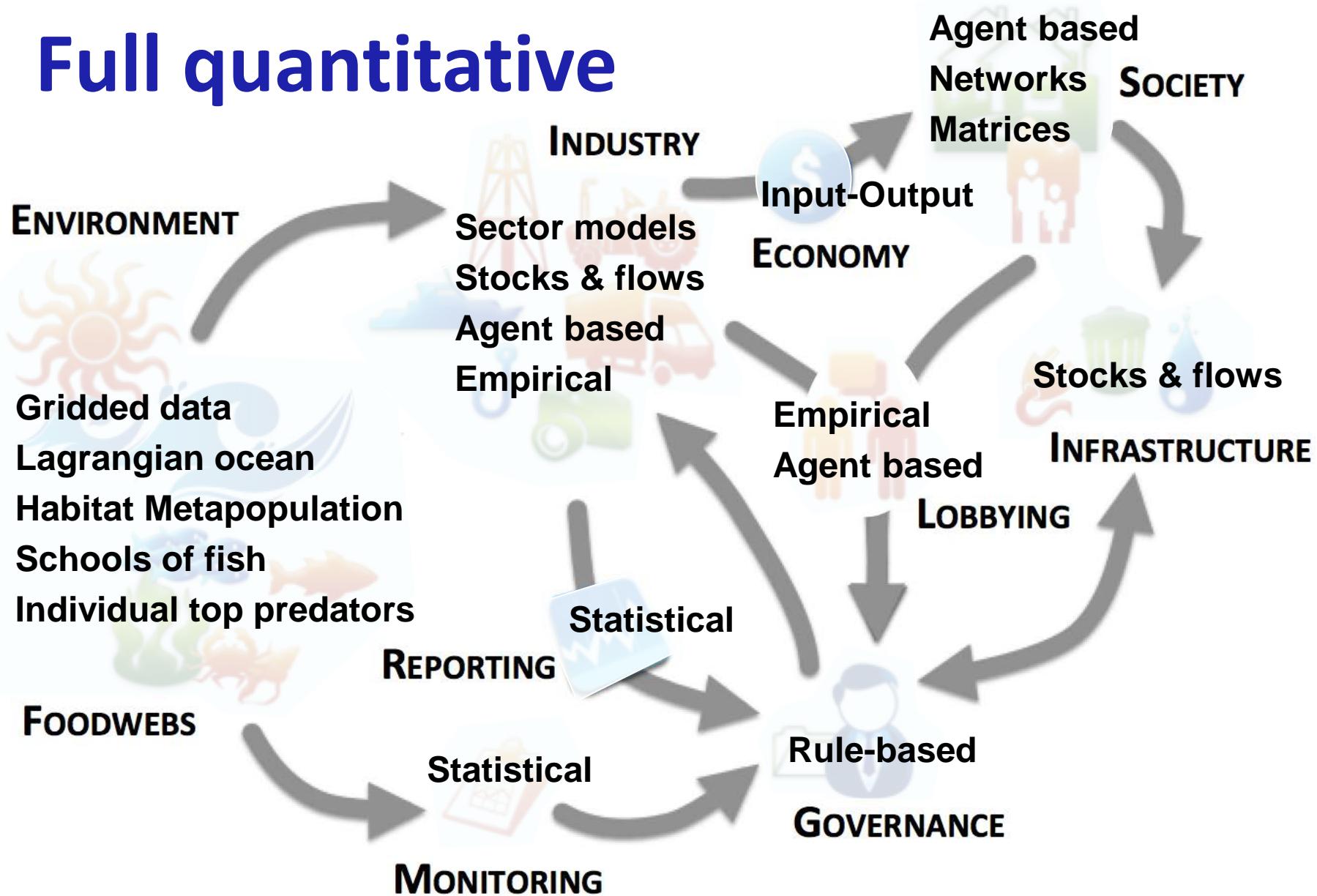
Large model

Full quantitative



Large model

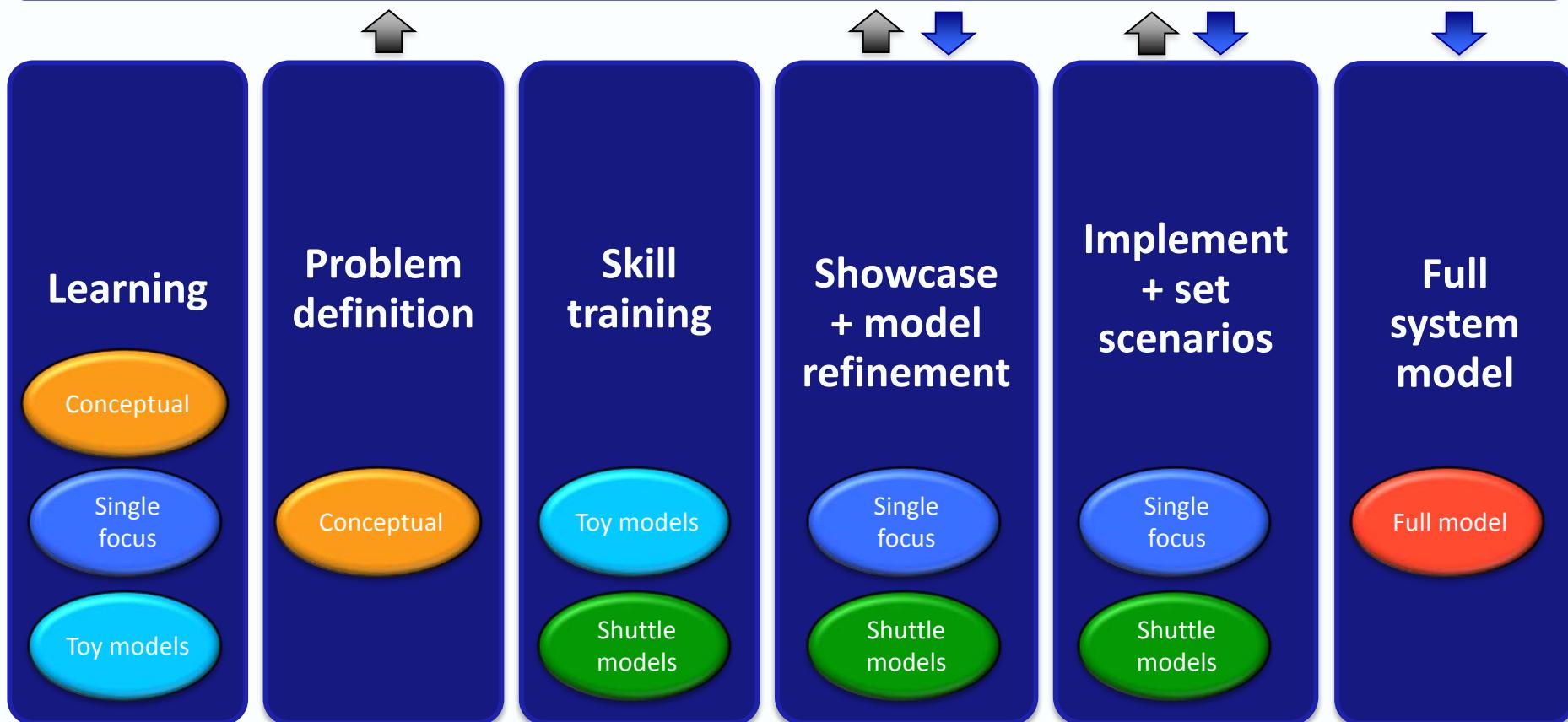
Full quantitative



Large model

Multiple models

Full study (and model development)



Australian Example: SE Fishery

- Multi-everything fishery
- Highly diverse and variable
- Solutions needed



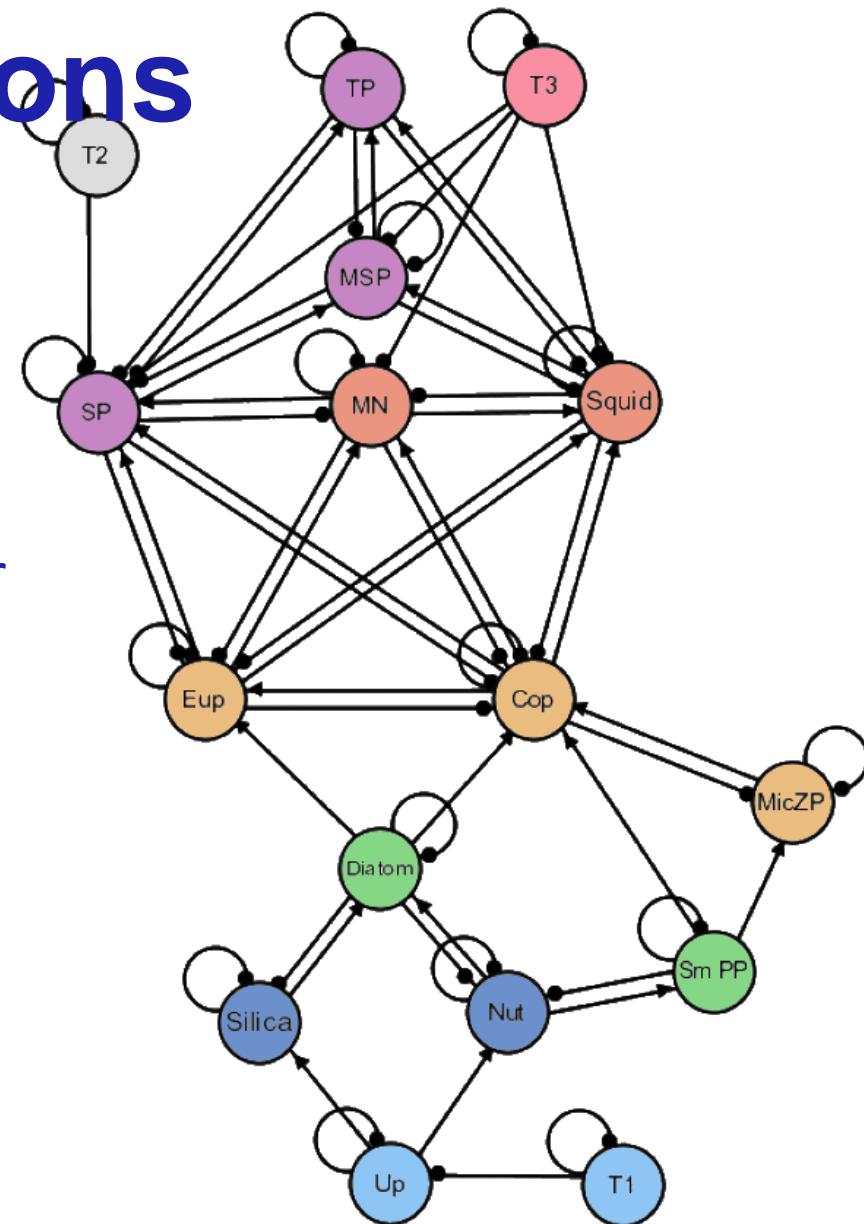
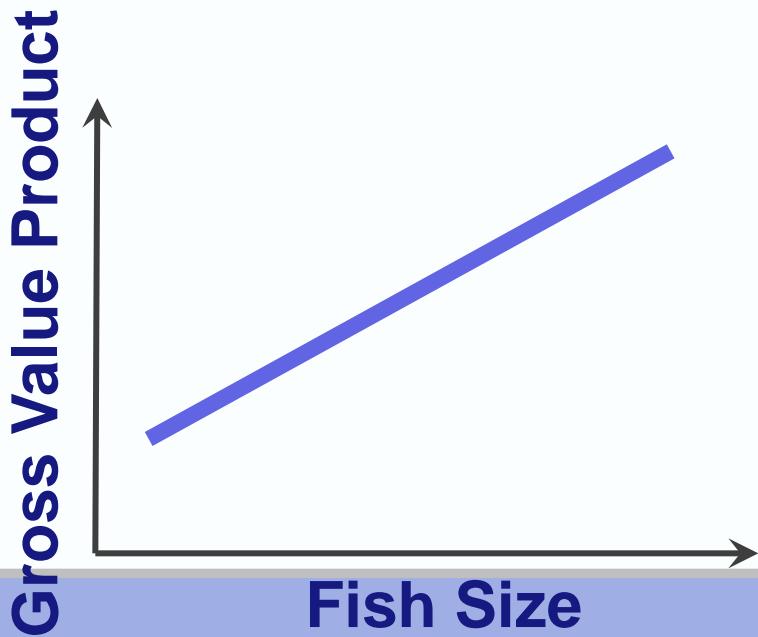
Desired Outcome

*Find small interventions
with large returns*

*Avoid large interventions
with small returns*

Expert Assumptions

- Each concentrate on focus topic
 - Stock assessments, economics
 - Assumed linear relations
 - Miss interactions
 - Miss dynamic human behaviour



Scenarios

Status quo (quota management & not that effective)

Quotas on everything of value

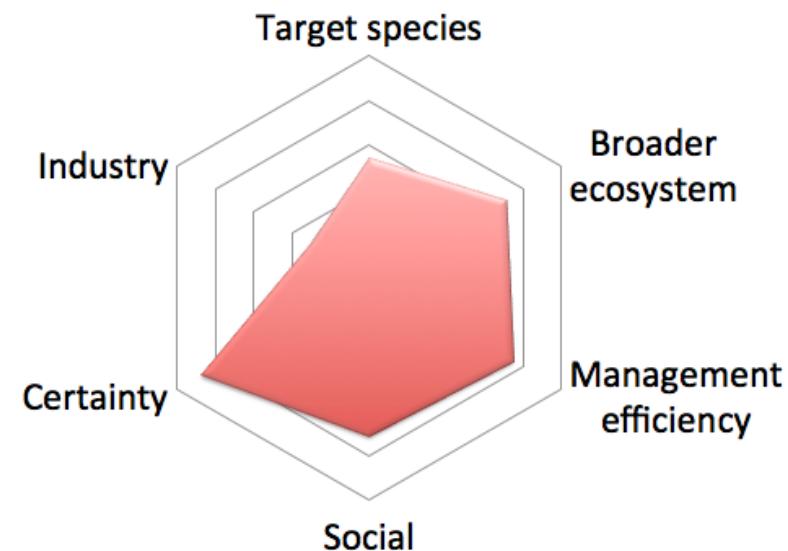
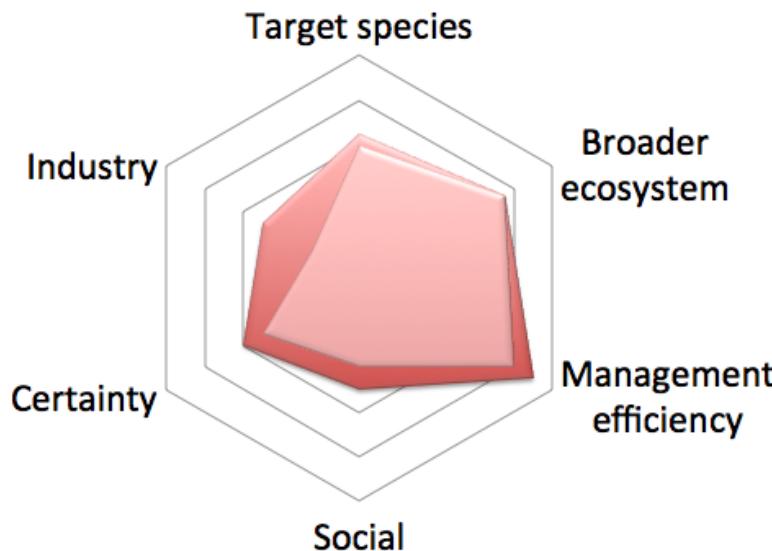
Integrated management (zoning; gear restrictions; quotas)

Conservation driven (open paddocks, closed world)

Assumed vs Reactive Responses

Status quo (2006)

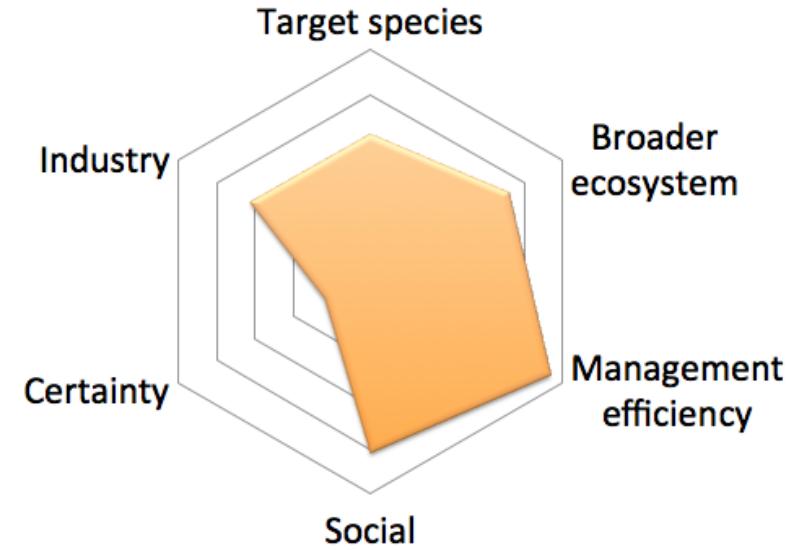
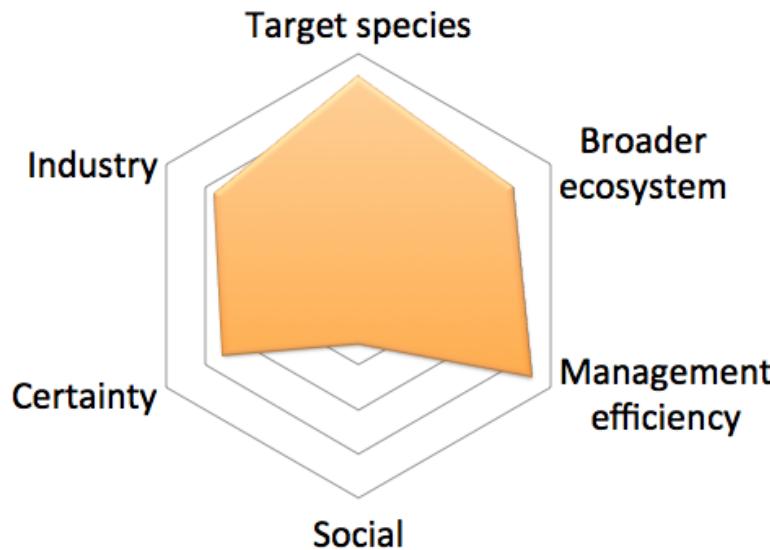
- Qualitative analysis
 - pessimistic
 - optimistic
- Quantitative analysis



Assumed vs Reactive Responses

Lots of quotas

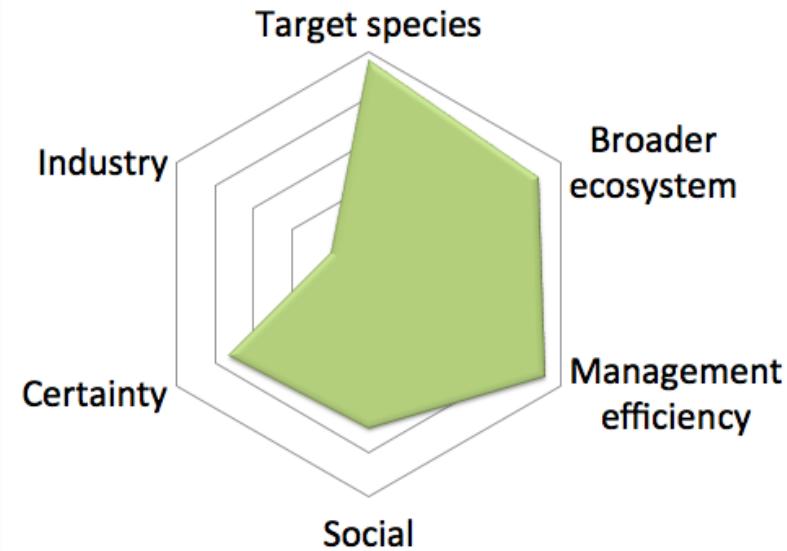
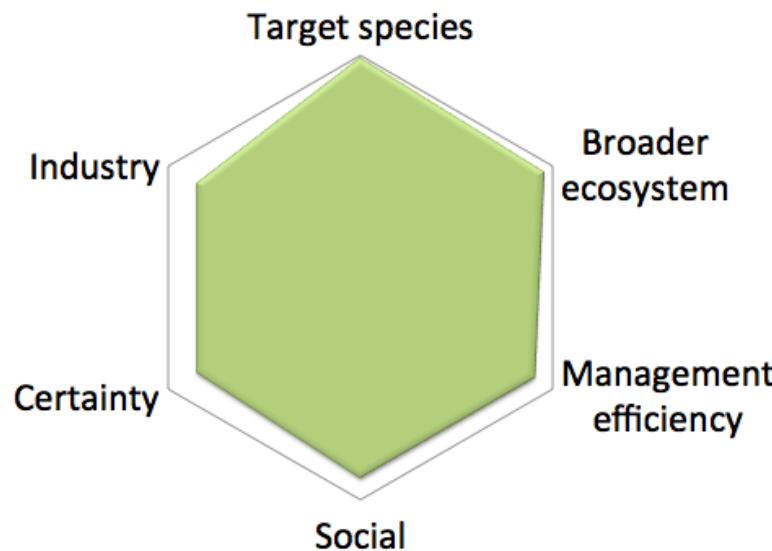
- Qualitative analysis
- Quantitative analysis



Assumed vs Reactive Responses

Conservation

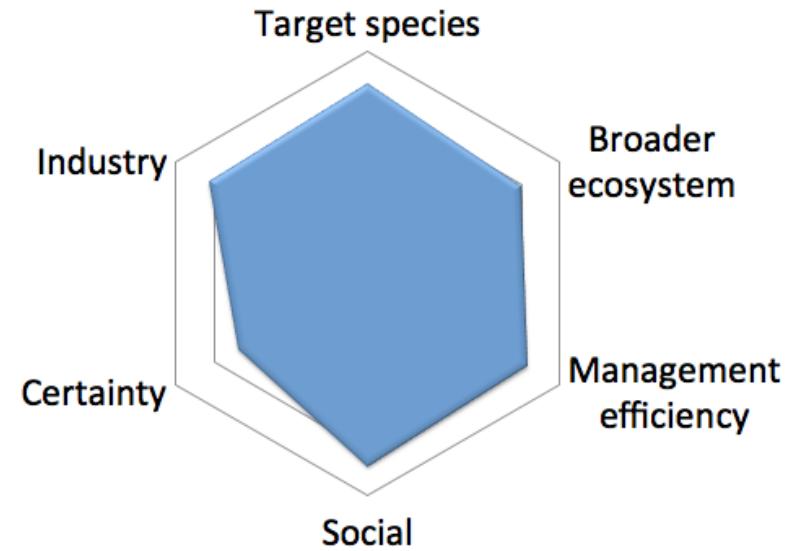
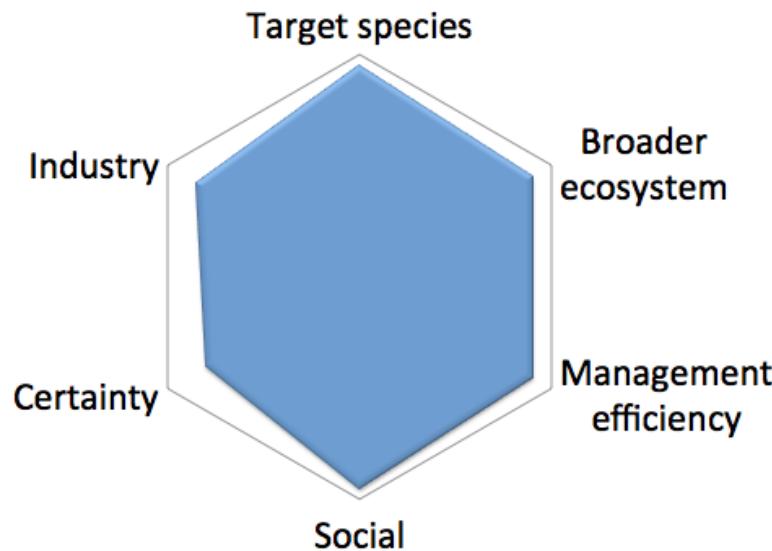
- Qualitative analysis
- Quantitative analysis



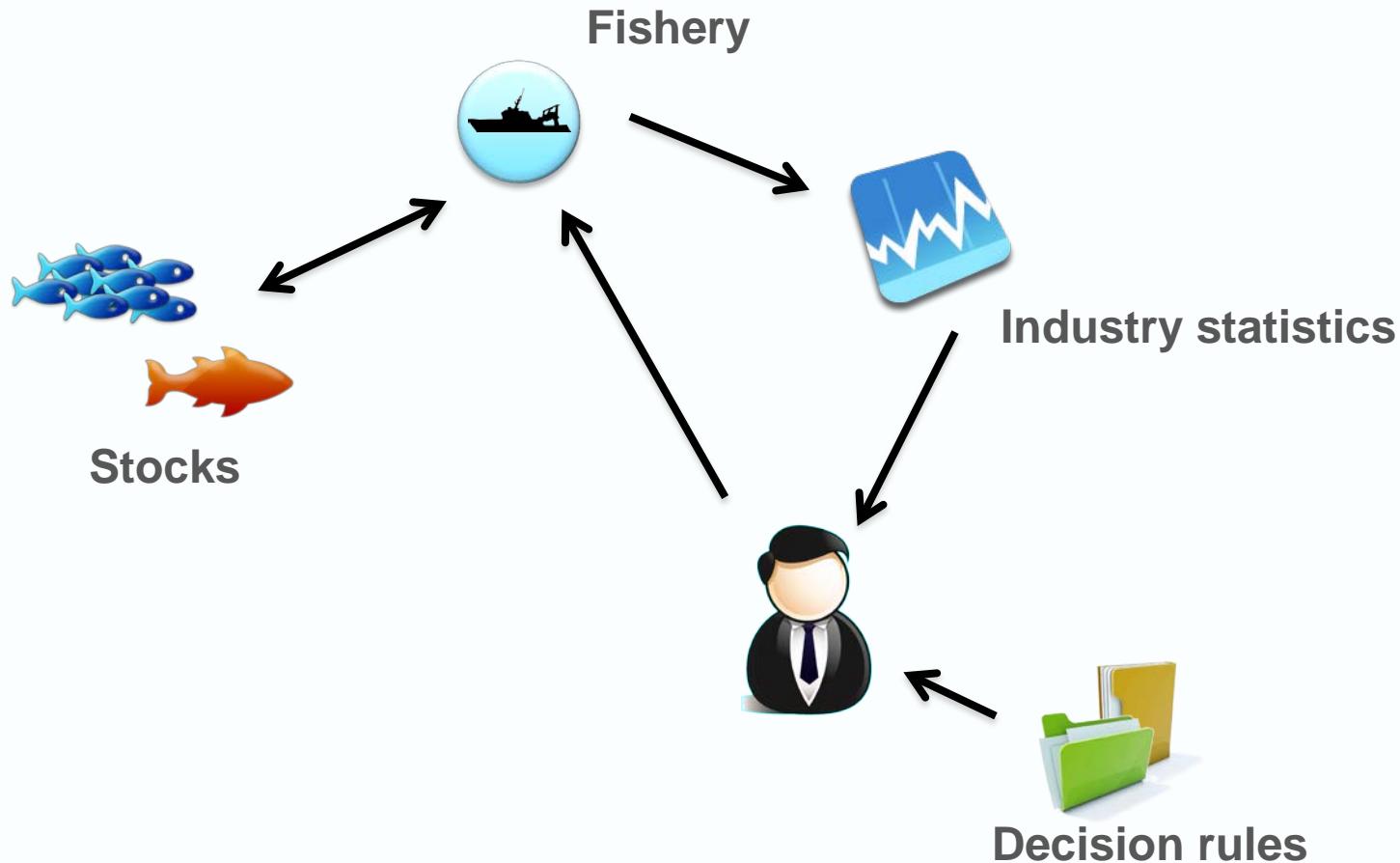
Assumed vs Reactive Responses

Integrated

- Qualitative analysis
- Quantitative analysis

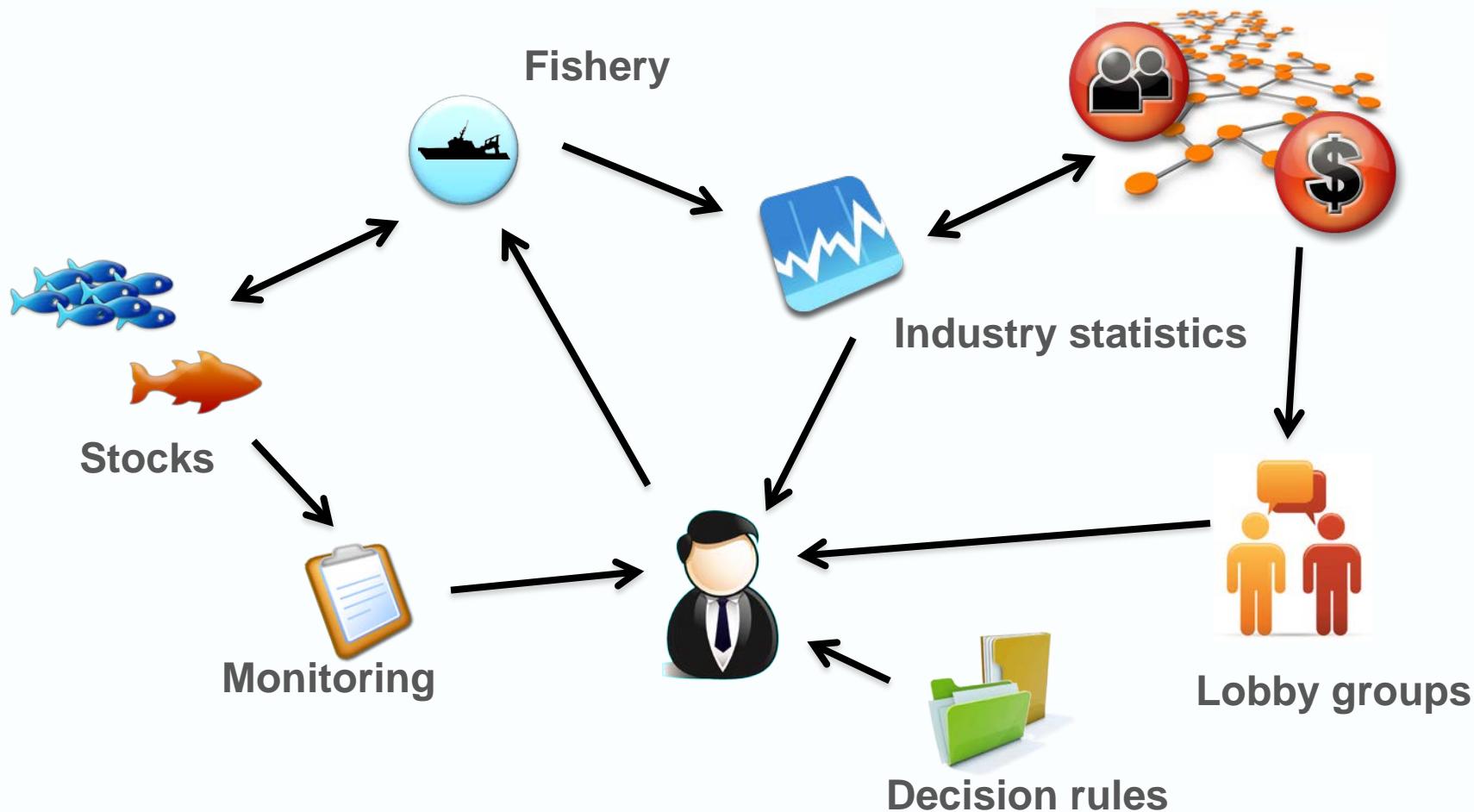


Disciplinary Focus



- Best management = quotas (mostly)

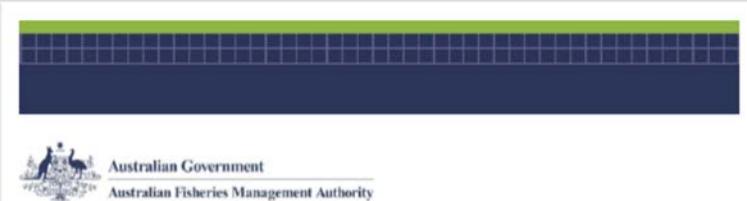
Cross-disciplinary Links



- Best management = quotas + spatial + gear restrictions
- Similarly for coastal zone management

General Finding & Outcomes

- Trade-offs
 - Sectors (small and large)
 - Timescales
(short-term costs vs long-term risk)
 - Conservation vs economic objectives



Australian Government
Australian Fisheries Management Authority



Future Operating Environment
for Commonwealth Fisheries

- Fishery restructured



\$220m to secure Australia's fishing future

Fisheries Minister Ian Macdonald announces the \$220m adjustment package earlier today.

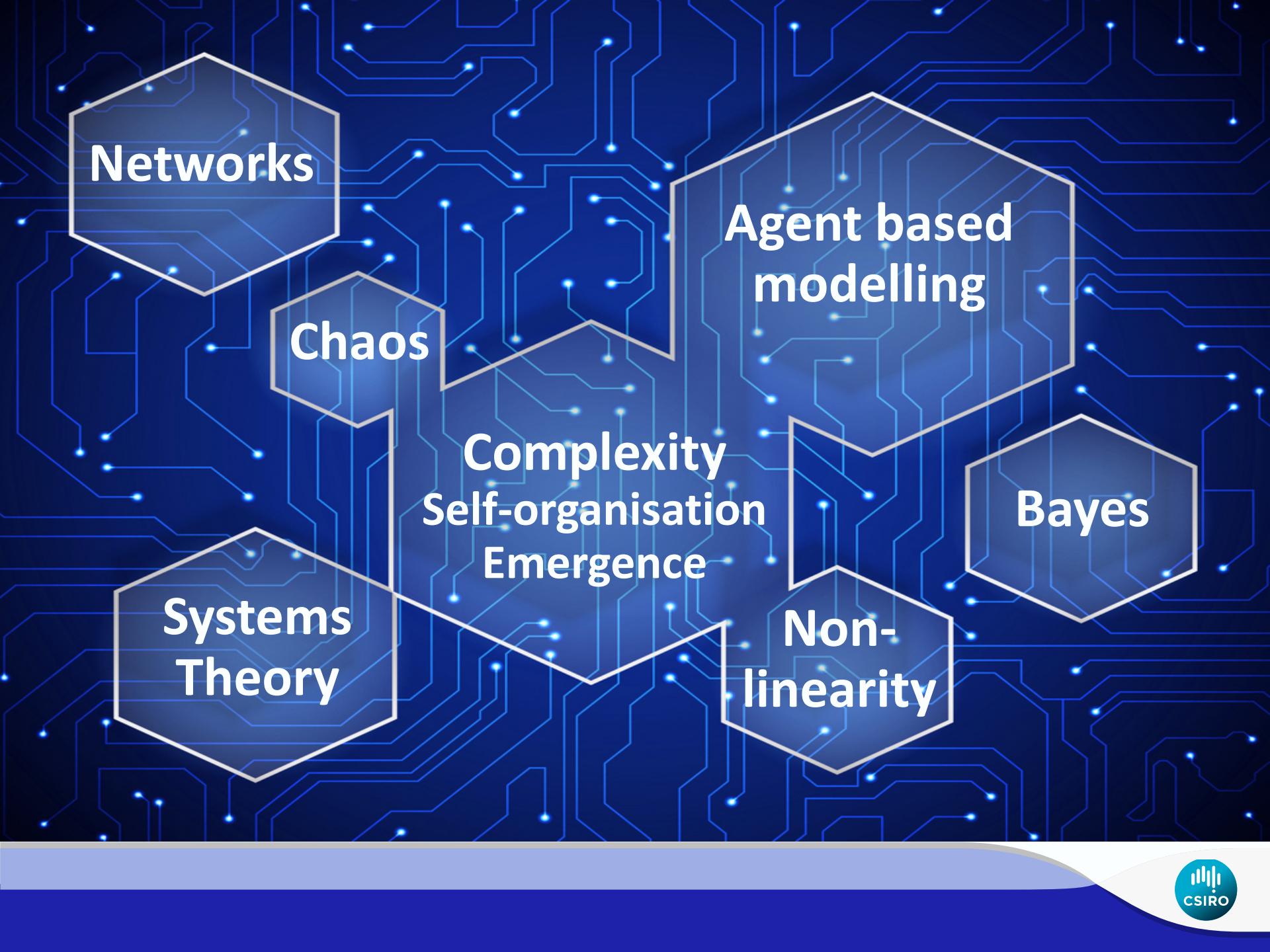
The Minister for Fisheries, Senator Ian Macdonald today announced a \$220 million adjustment package to help secure Commonwealth fish stocks and a profitable future for the fishing industry. The *Securing our Fishing Future* package follows concerns about the state of Australia's fish stocks, and the sustainability and profitability of the industry.

The Government will provide a major package of one-off structural adjustment and improved management measures for those fisheries managed by the Australian Government. As part of the measures, AFMA has today released new catch limits for the SESS and effort limits in the ETBF (further information follows).

Conclusions

- Integrated adaptive management
= most effective management option
- Coasts & oceans (& society of users) = complex systems
- Complexity science-based toolbox
 - explore alternative futures (feedbacks & uncertainty)
 - can be transformative
 - industry & biophysical usage becoming more common
 - inclusion of social aspects rarer (often critical though)
 - transdisciplinarity is key (especially being participatory)





Networks

Agent based
modelling

Chaos

Complexity
Self-organisation
Emergence

Bayes

Systems
Theory

Non-
linearity



Taking a systems approach to systems

The First Global Conference on Research Integration and Implementation www.I2Sconference.org

Thank you

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