



Ecosystem approaches to managing marine systems – the human dimension

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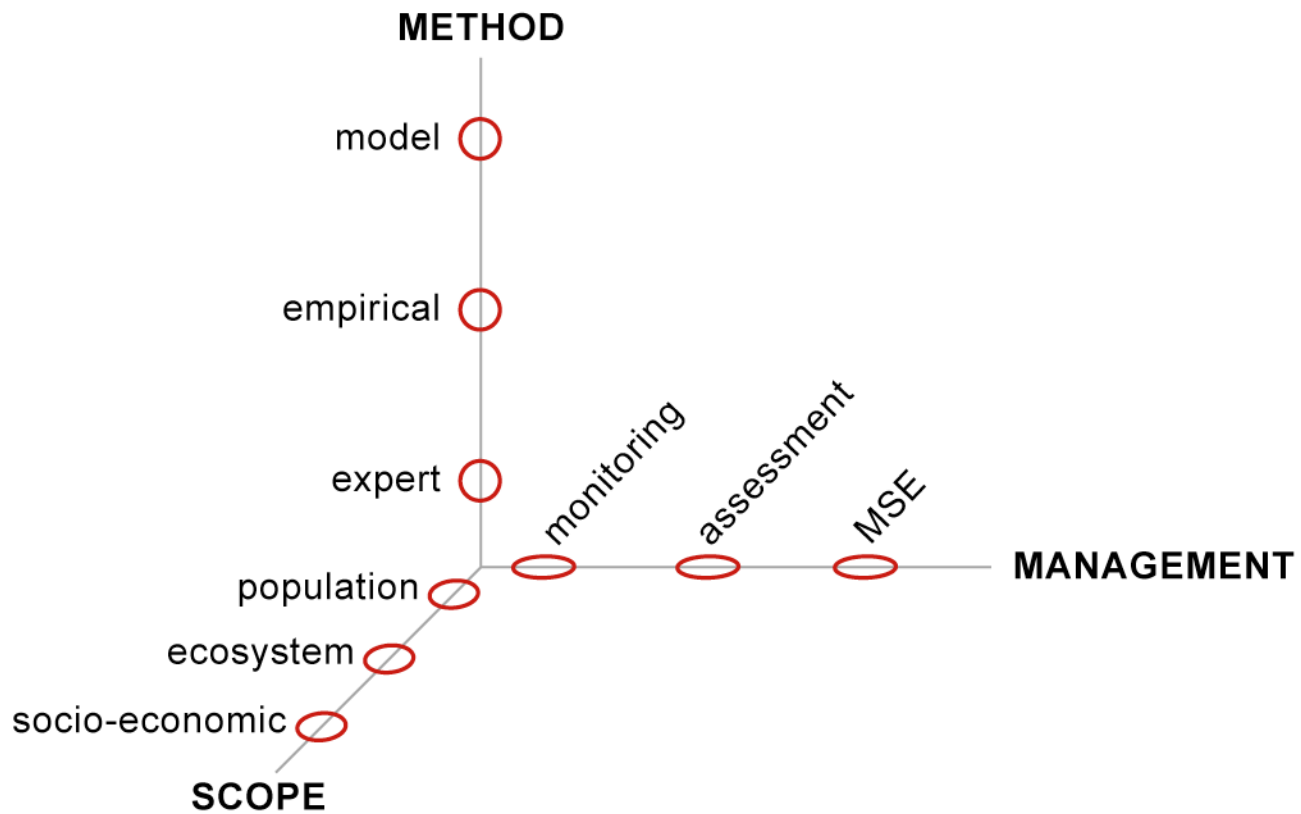
Outline

- Scientific tools to support EBFM – Atlantis
- An application of Atlantis – EBFM for SE Australia
- Incorporating human behaviour in Atlantis
- Why the human dimension matters
- Improving the study of human behaviour in marine management

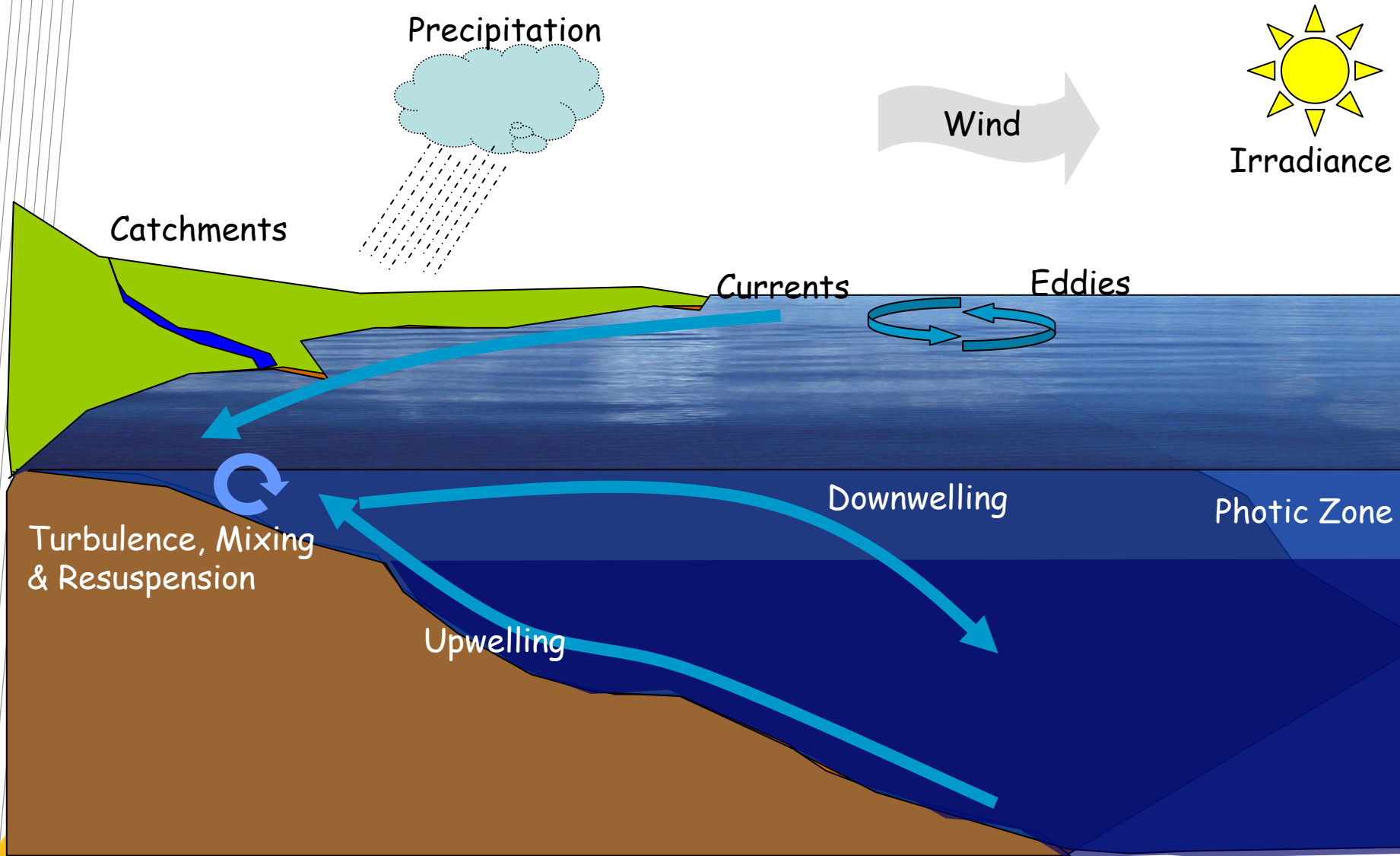
Scientific tools to support EBFM

- Strong drivers for EBFM / EAF / IMM emerged late 1990s
- Rapid implementation in Australia
 - Environmental legislation
 - Oceans policy
 - Formal adoption of EBFM
- Policy ahead of the science – rapid catch up needed

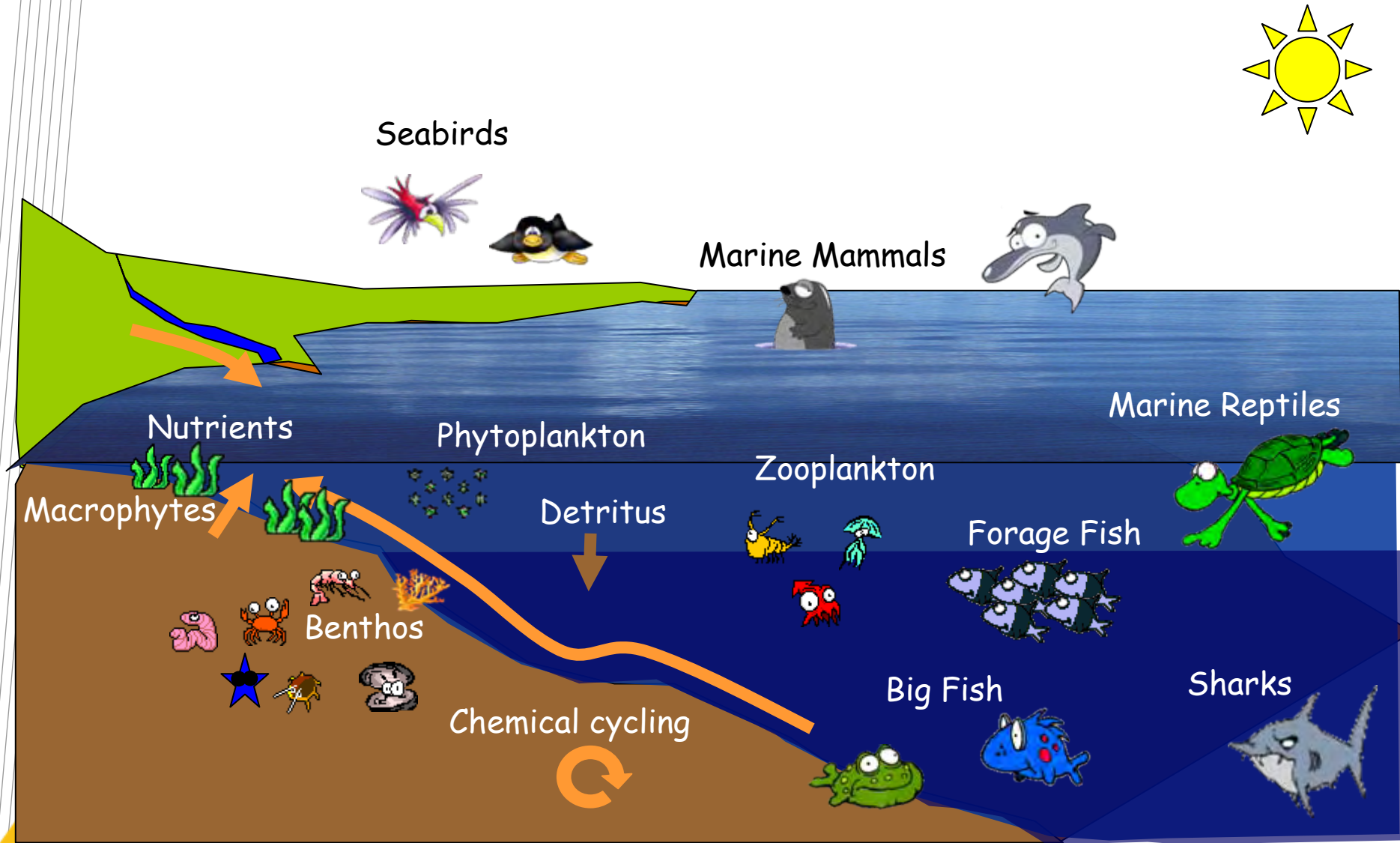
Tools for EBFM



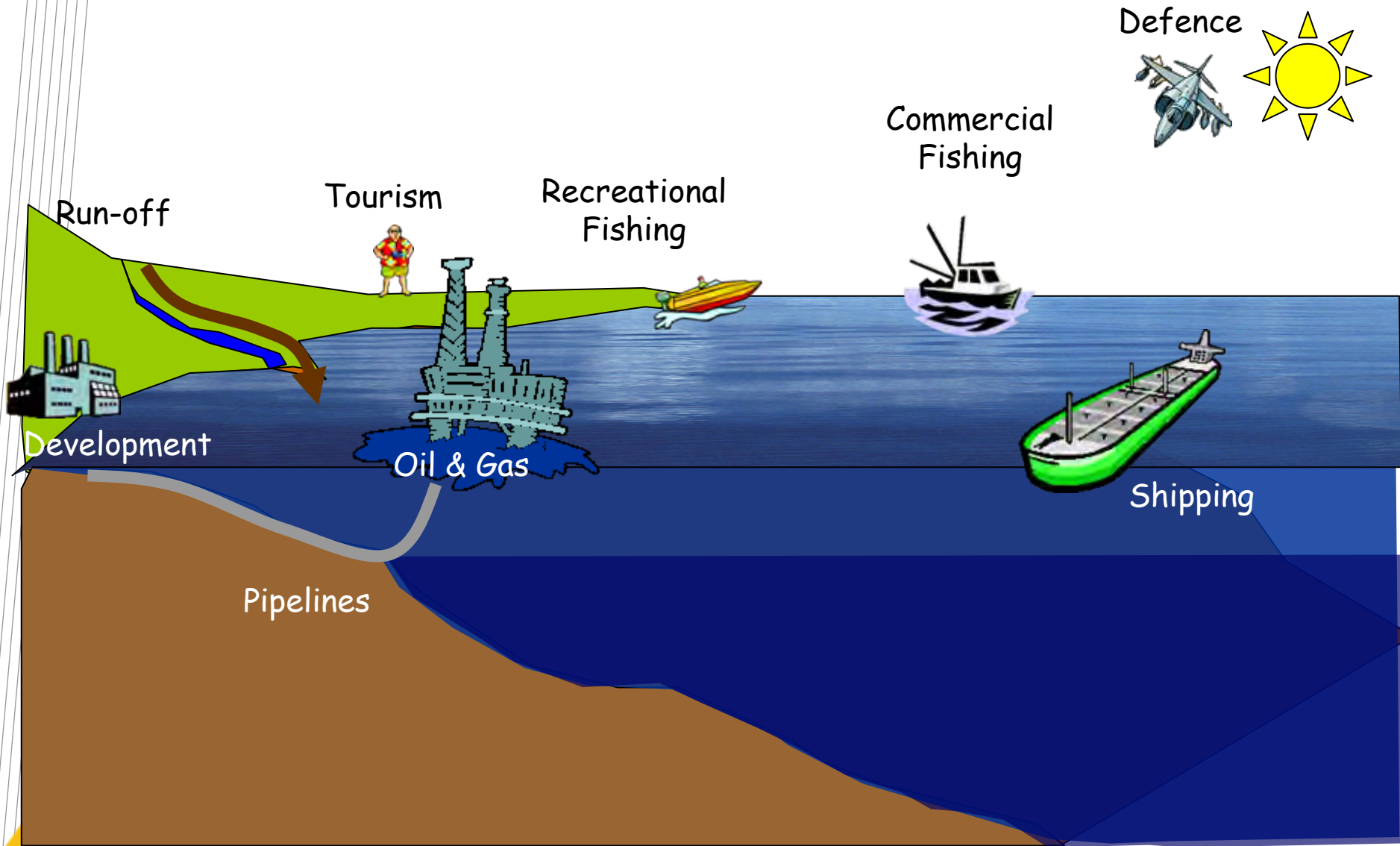
Atlantis - Lets Get Physical



Now Ecological



Finally Socio-Economic

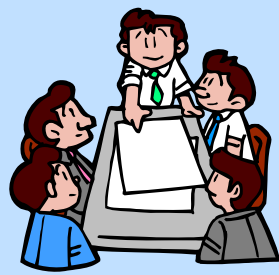
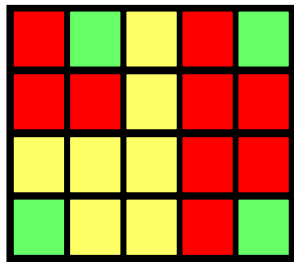


Management Strategy Evaluation

Design & Analysis

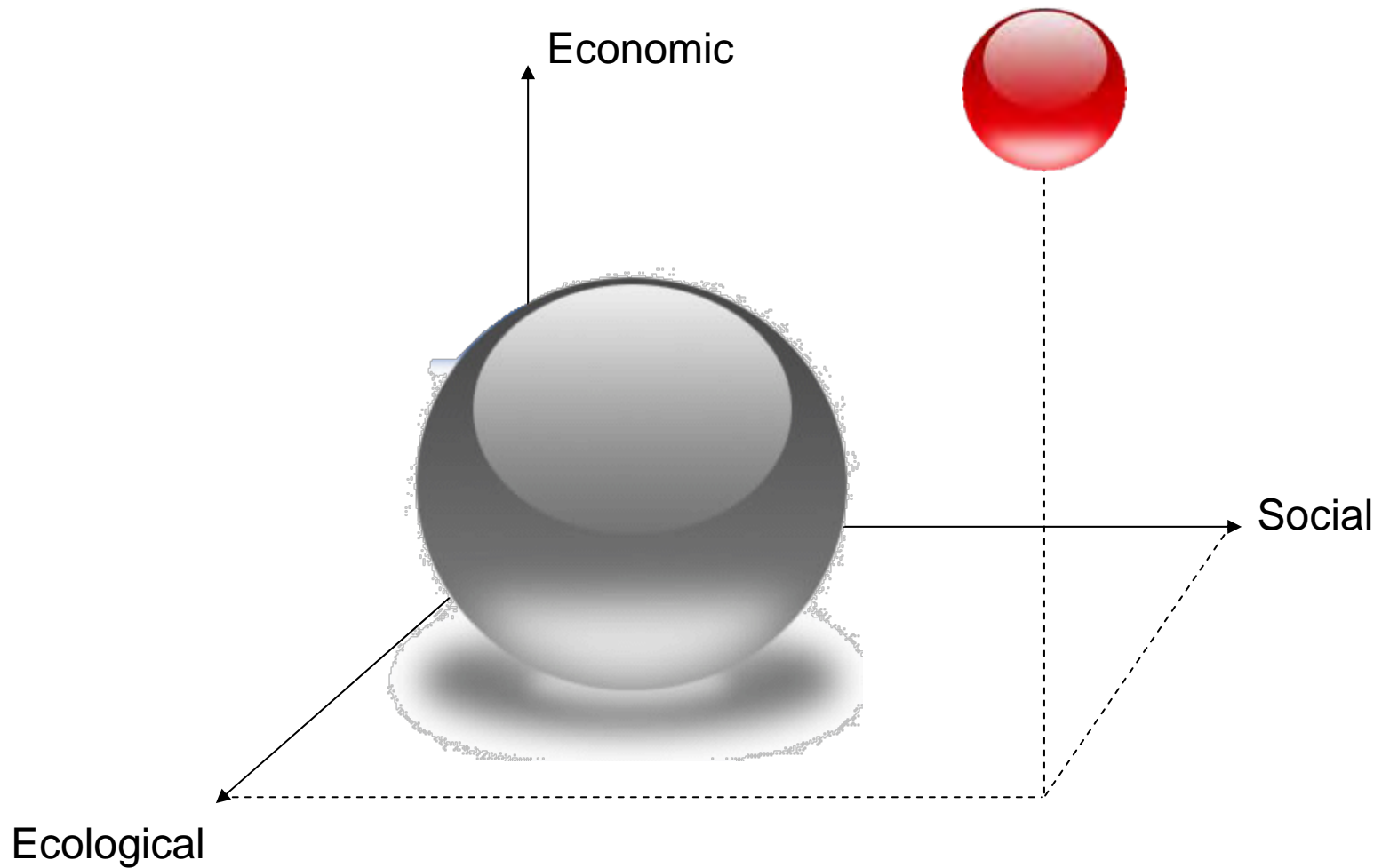
Define Objectives

Performance Measures

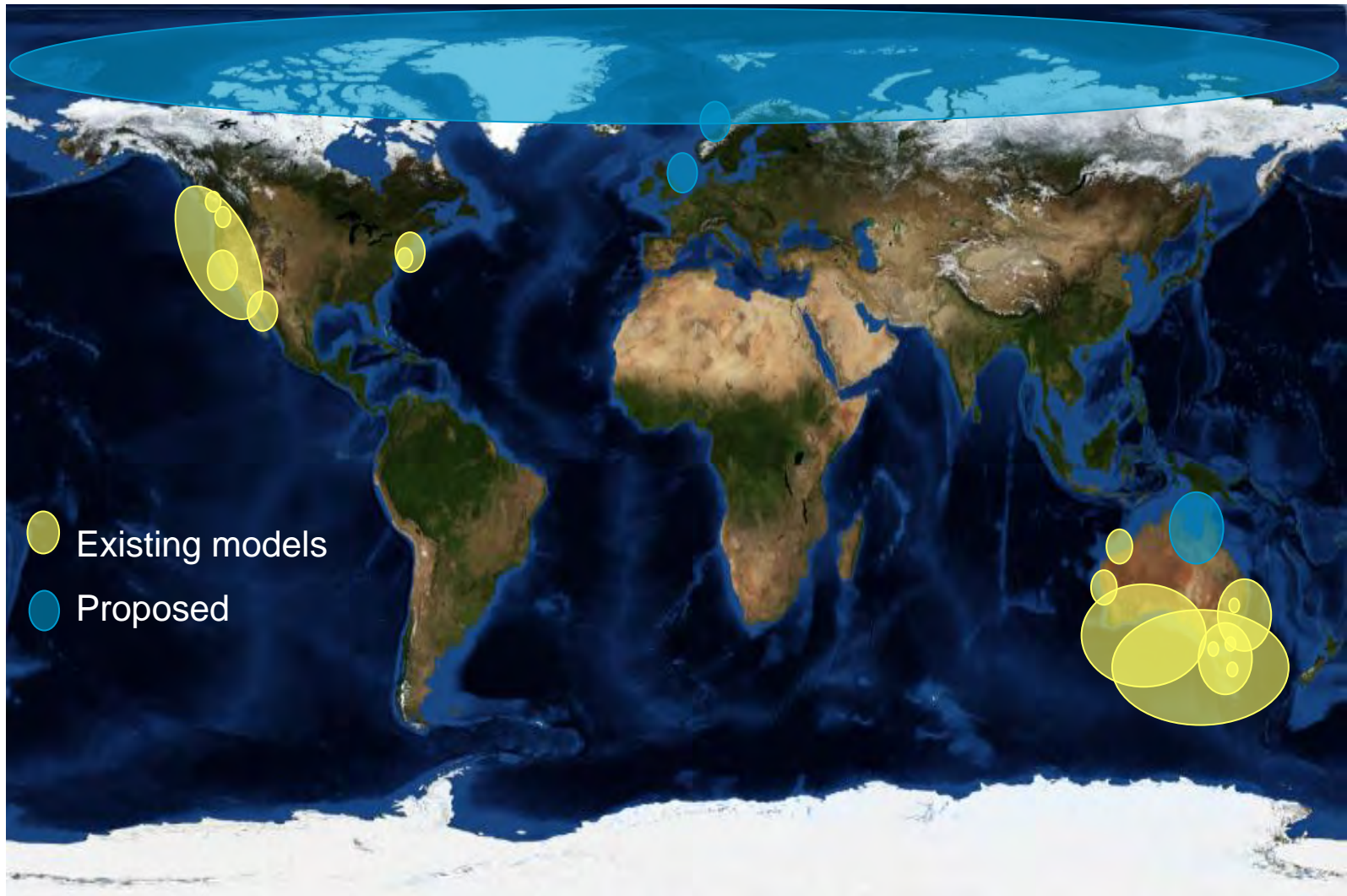


Simulation Cycle

Reachable Space



Implementations of Atlantis

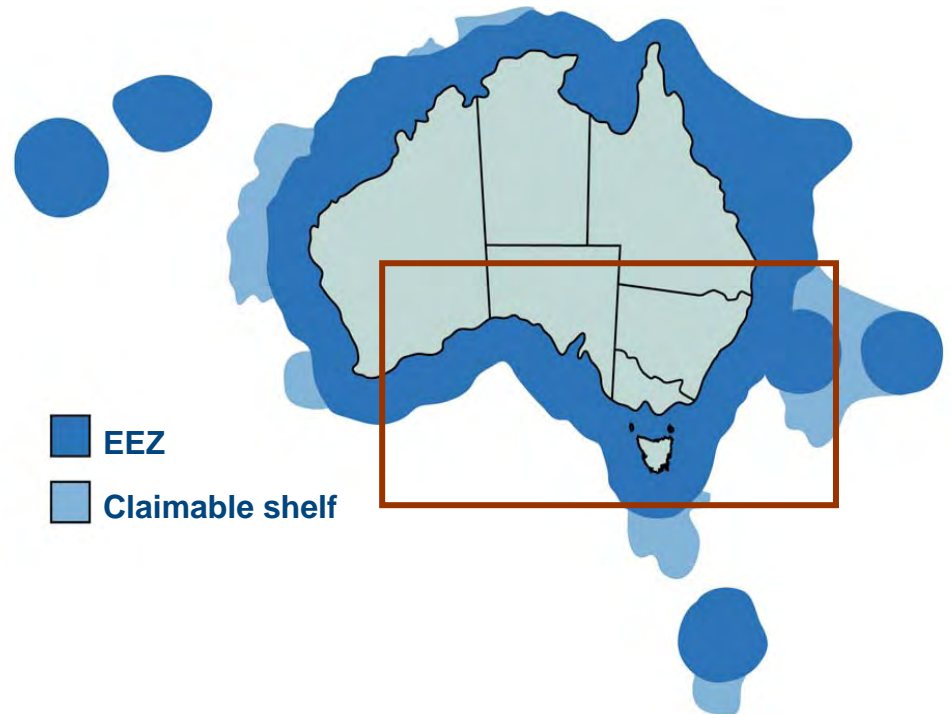


Existing models

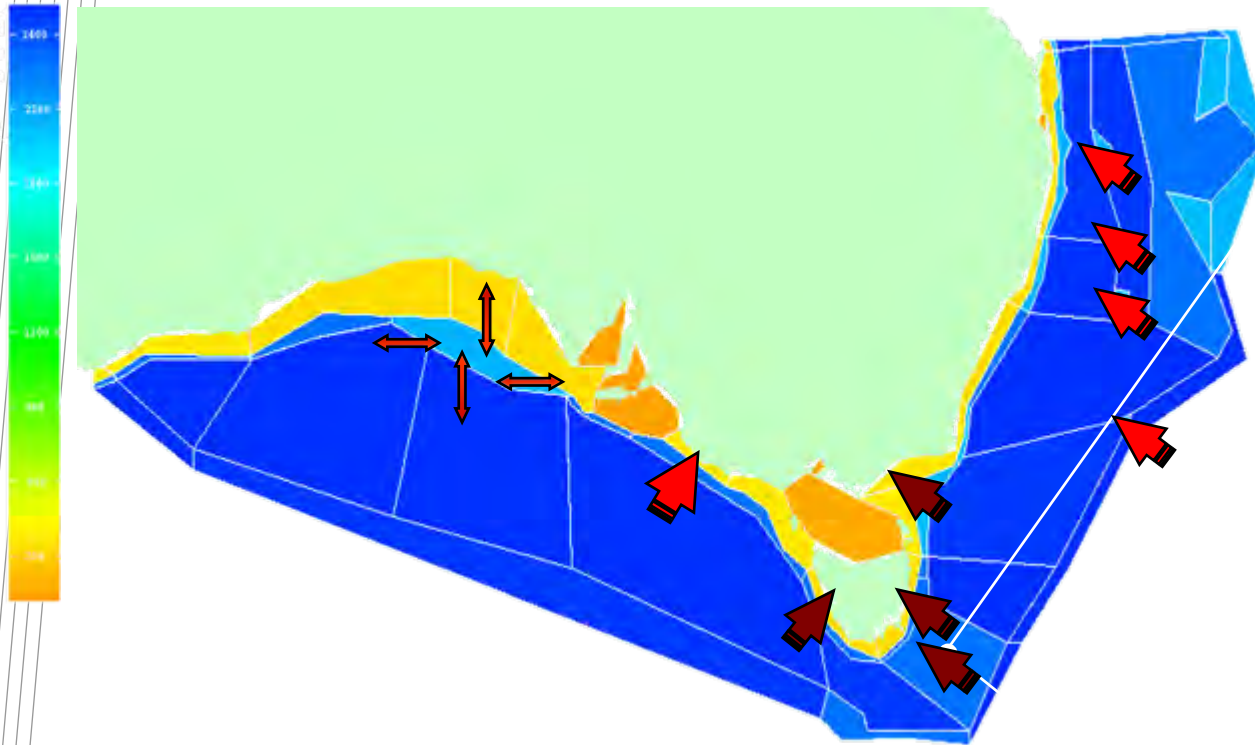
Proposed

EBFM for SE Australia

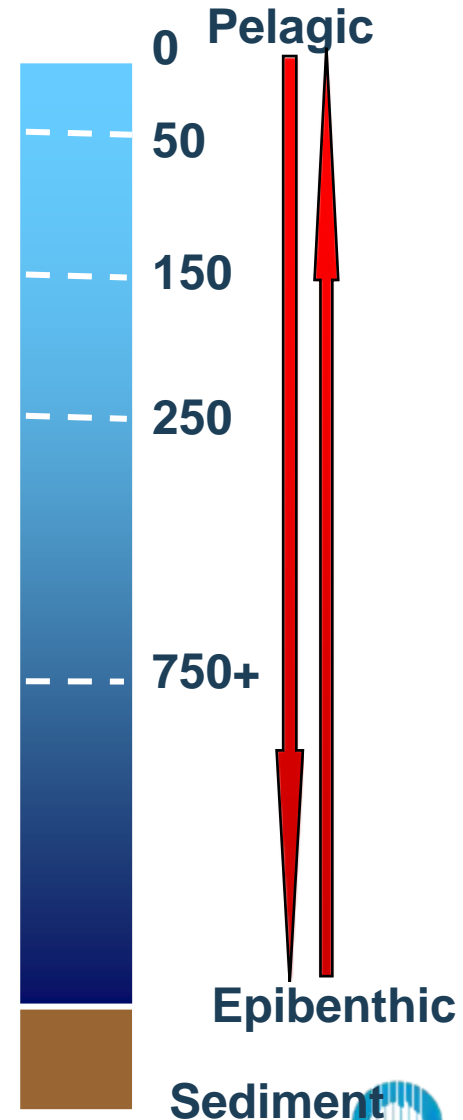
- 3.7 million km² (tropical – subantarctic, inshore – oceanic)
- Strongly seasonal
- Highly diverse
- Everything fishery
 - gear
 - species
 - jurisdictions



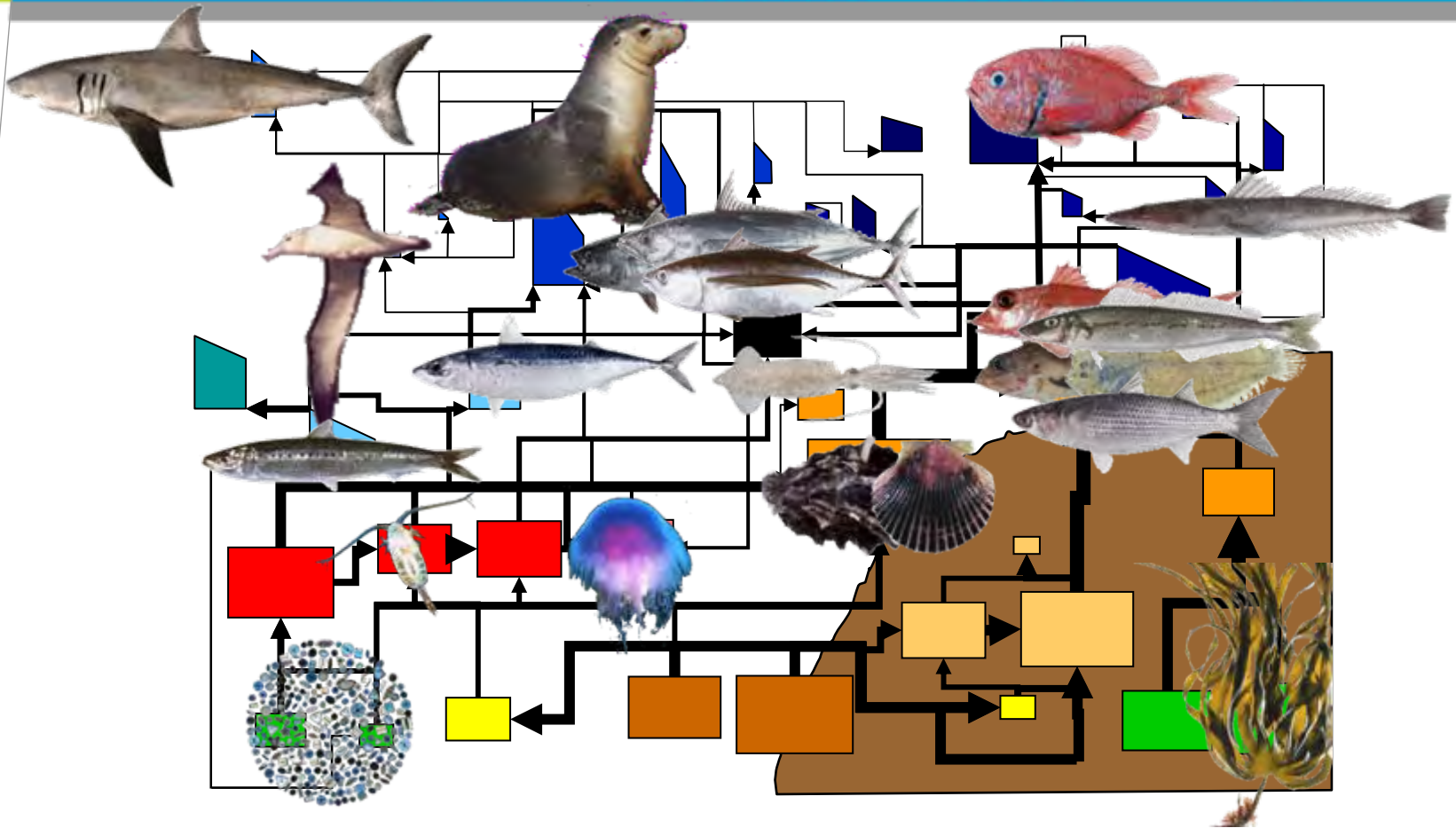
Atlantis SE - Physical



- ↔ flows
- ➔ upwelling (to surface or at depth)



Atlantis SE - Ecological



- 21 invertebrate groups
- 32 vertebrate groups

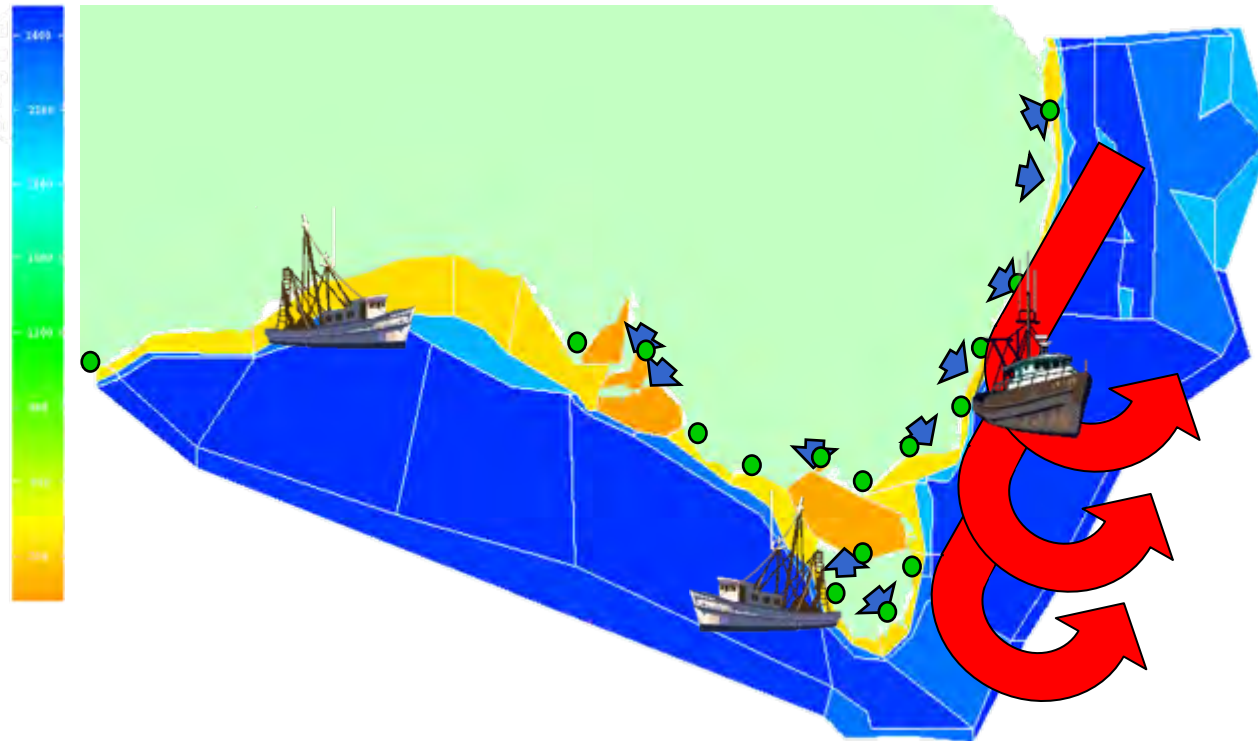
Atlantis SE - Sectors



➤ river or major inputs

● ports

➔ currents

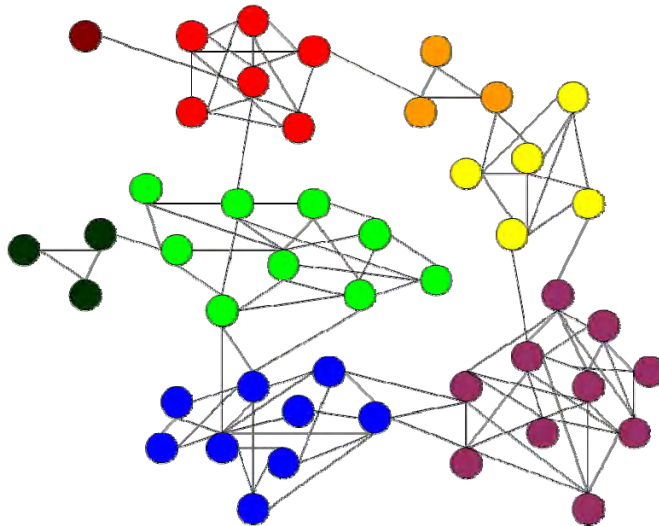


- 27 fleets
- Other anthropogenic impacts

Atlantis SE - Socioeconomics

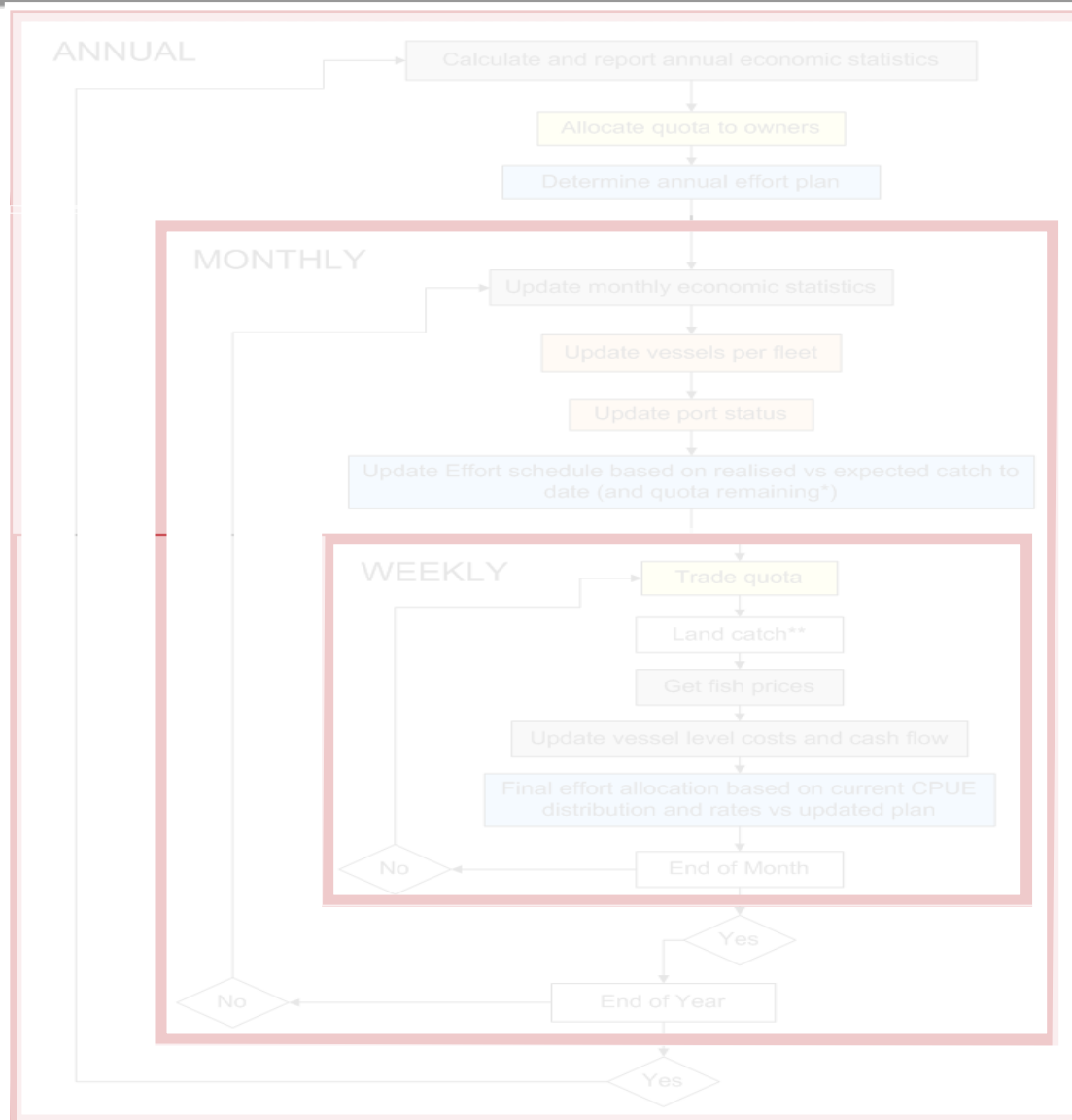


- Effort allocation (by subfleet)
 - Economic drivers
 - Social drivers



- **Behavioural uncertainty** (usually ignored)

Atlantis SE - Fishing Decisions



Atlantis SE - Fishing Decisions



- Tiered planning and effort allocation
- Quota trading
- Markets
- Multiple cost sources (fixed, variable, crew, gear, fuel)
- Investment and disinvestment

- Social and economic indicators
- Costs of management (across compliance, research, infrastructure, monitoring)

Atlantis SE – Management Levers



- Gear (size, selectivity, access to habitat types)
- Spatial zoning (per sector through to closures, rolling)
- Seasonal closures
- Discarding rules (BRD, size, per species, per area, limits)
- Quotas (overall, stock-based, regional, basket, companion)
- Trip limits
- Effort limits (days-at-sea)

- Compliance

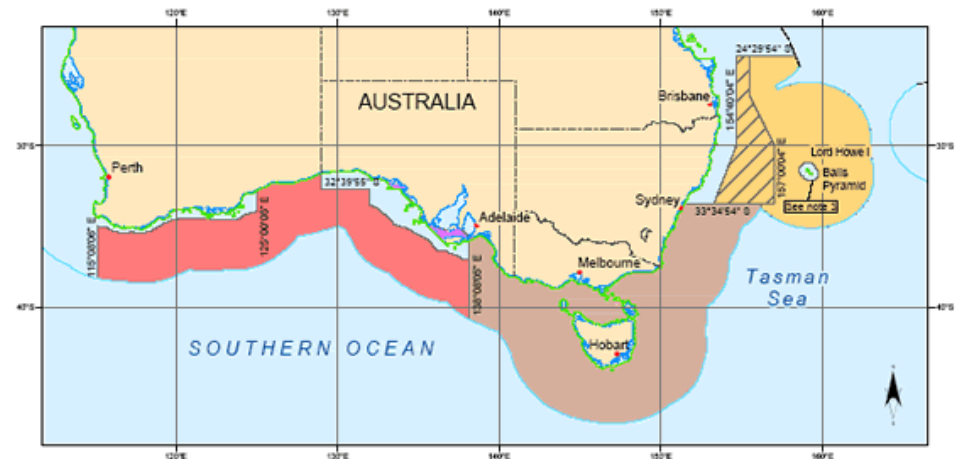


Atlantis SE – Decision Rules



- Formal harvest strategies
- Informal decision rules (response to trends)
- Political process and lobbying

Southern and Eastern Scalefish and Shark Fishery
Commonwealth Trawl Sectors and South Australian Coastal Waters Sector



LEGEND

- East Coast Deepwater Trawl Sector
- Trawl Exclusion Zone (closed by permit conditions)
- Commonwealth GAB Trawl Sector
- Commonwealth Trawl Sector
- South Australia Coastal Waters Sector
- Limit of Coastal Waters (3nm)
- Limit of Australian Fishing Zone (200nm)

Projection: Geographic
Datum: GDA84

NOTES

1. The sectors of the fishery are sourced from Schedule 1 of the BSS Management Plan, September 2003.
2. The maritime zone boundaries shown on this map are sourced from AMSS 2003 (p.13/October 2003).
3. The area of the East Coast Deepwater Trawl Sector excludes waters within 25 nautical miles of the coastline of Lord Howe Island and Balls Pyramid at low water.



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for the Australian Fisheries Management Authority, April 2005.
MP 030457.34.25



Management Scenarios

Status quo (quota management & not that effective)

Quotas on everything of value

Integrated management (zoning; gear restrictions; quotas)

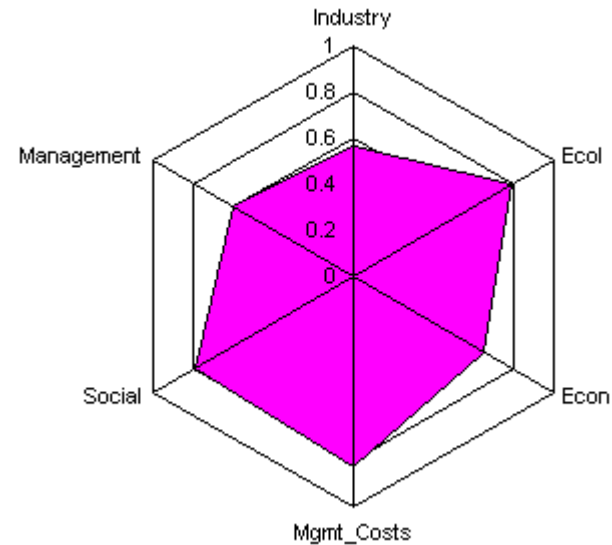
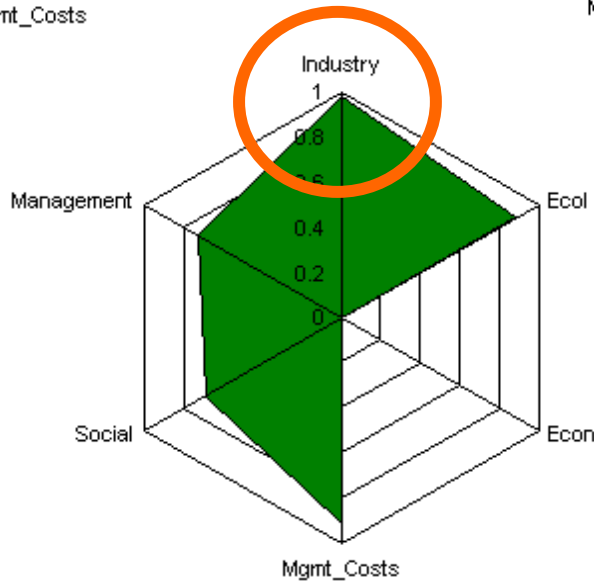
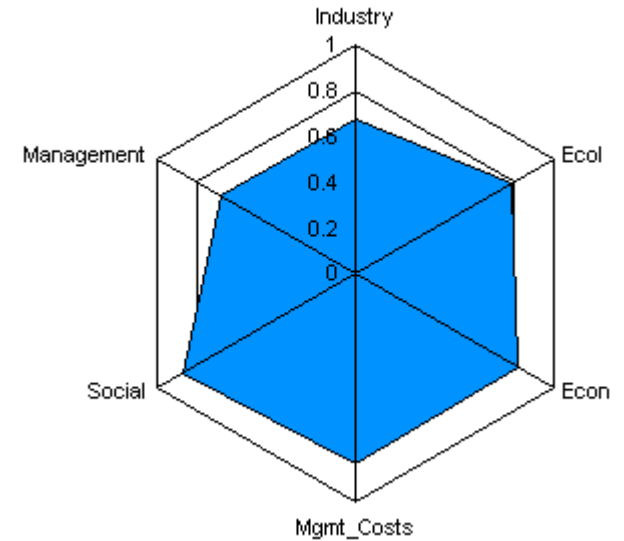
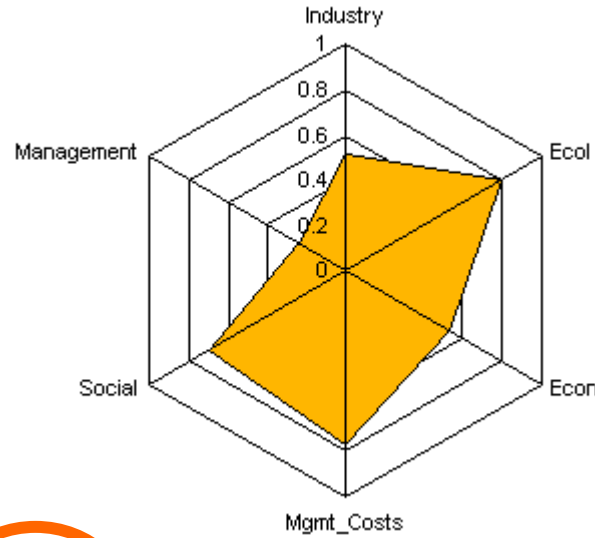
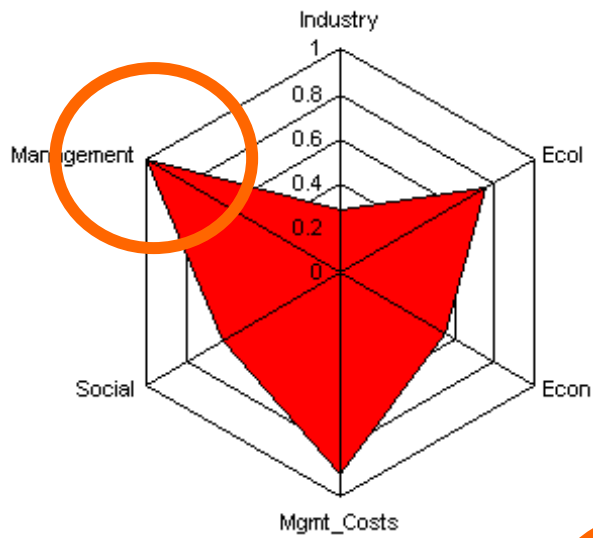
Conservation driven (open paddocks, closed world)

Pragmatic reality

Assessing performance

- **Management** = stability, access, trading
- **Management costs** = overall, research, compliance, monitoring and assessment costs
- **Industry (non-economic facets)**, reflects work load and fishing pressure) = discards, habitat-impacts, total effort, CPUE, total landed catch, average size of the catch and catch composition
- **Economic** = Gross Value of landed catch, revenue per tonne, revenue per effort, costs, profits
- **Social** = Public image, gear conflict, port activity
- **Ecological** = Habitat cover, pelagic:demersal biomass, piscivore:planktivore biomass, change in BSS-slope, biomass of target, bycatch, TEP, microfauna and chondrichthyan biomass

Competing Objectives



Key findings

- EBFM and management strategy implications
 - no single best solution (integrated better)
 - spatial management = effective if chunky
 - behavioural uncertainty is **VERY** important

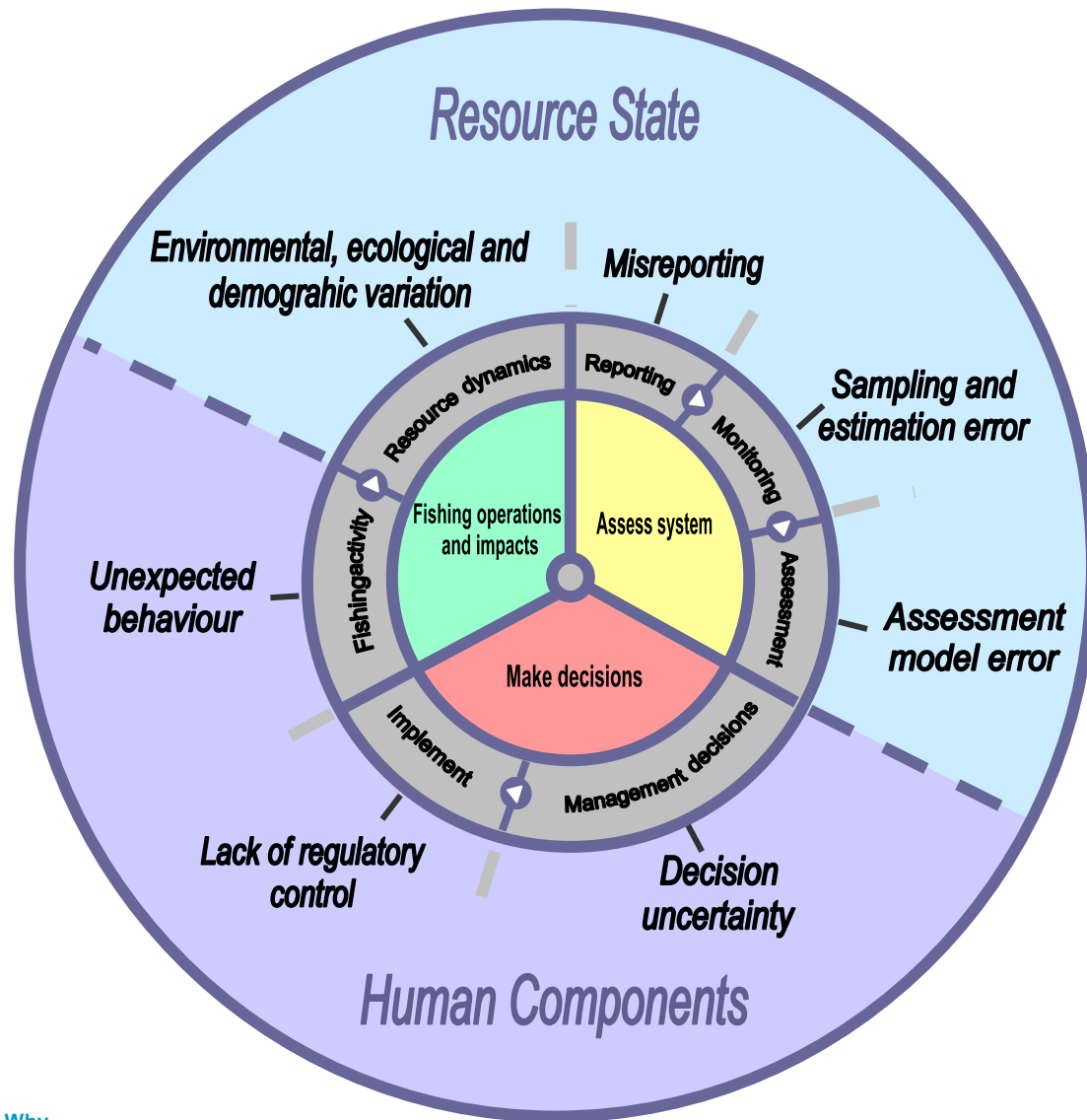
The human dimension in Atlantis

- Multiple fleets and effort dynamics
- Markets, quota trading and investment
- Fisher responses to changes in regulation and compliance
- Management processes – from formal decision rules to informal reactive management
- Economic and social consequences of alternative management plans

Our conclusion

- Human behaviour is harder to model than ecosystems!

Behavioural Uncertainty



Why the human dimension matters

- Social impacts matter (to politicians and fishers)
 - Policies and strategies that focus only on ecological outcomes are doomed to failure
- Understanding the root causes of management failures is important
 - not usually because of poor science
 - often failure to predict fisher response
 - bionomic equilibrium as a “strong attractor”
- Social sciences can contribute at 3 levels
 - Behaviour of individuals
 - Behaviour of communities and groups
 - Institutional dynamics and governance

Improving the study of human behaviour in marine management

- Fishery science is currently unbalanced
 - **ecological**, economic, social
- There are few truly integrated approaches and interdisciplinary studies
- There are some real obstacles to integration
 - Different epistemological approaches
 - Different journals and literature
 - Science politics and competition for funding

A way forward?

- Provide forums for exchange of ideas
 - ICES, PICES,
- Provide funding for integrated approaches
 - EU Framework approach?
 - National strategies (e.g. under Oceans policy)
- Demonstrate tools that work
 - Atlantis and others
 - Current evolution of GCC models to IAM
 - Promising approaches out of complex systems science

Concluding remark

- Sustainable development is a three legged stool
 - ecological, economic and social
 - it's hard to sit on a one-legged stool!

Questions?