



# Supporting Adaptation

Scoping & Response Framework

Beth Fulton | 2021

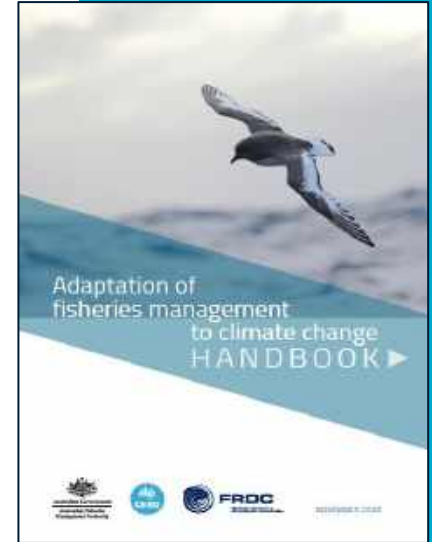
Australia's Pre-eminent National Science Organization

A photograph of a bird, possibly a booby, in flight over a body of water. The bird is captured in mid-flight, with its wings spread wide. The background is a soft, out-of-focus view of the ocean and sky. A teal-colored diagonal shape is overlaid on the bottom right of the image, containing white text.

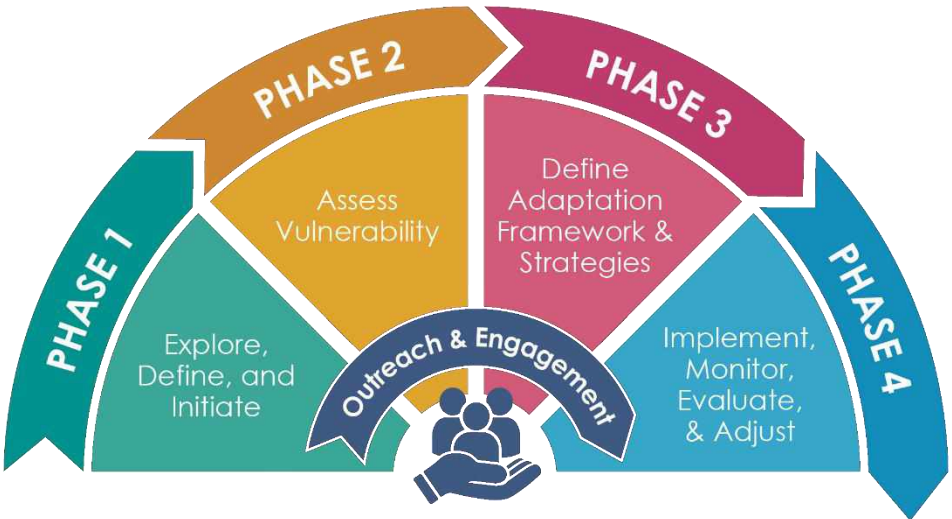
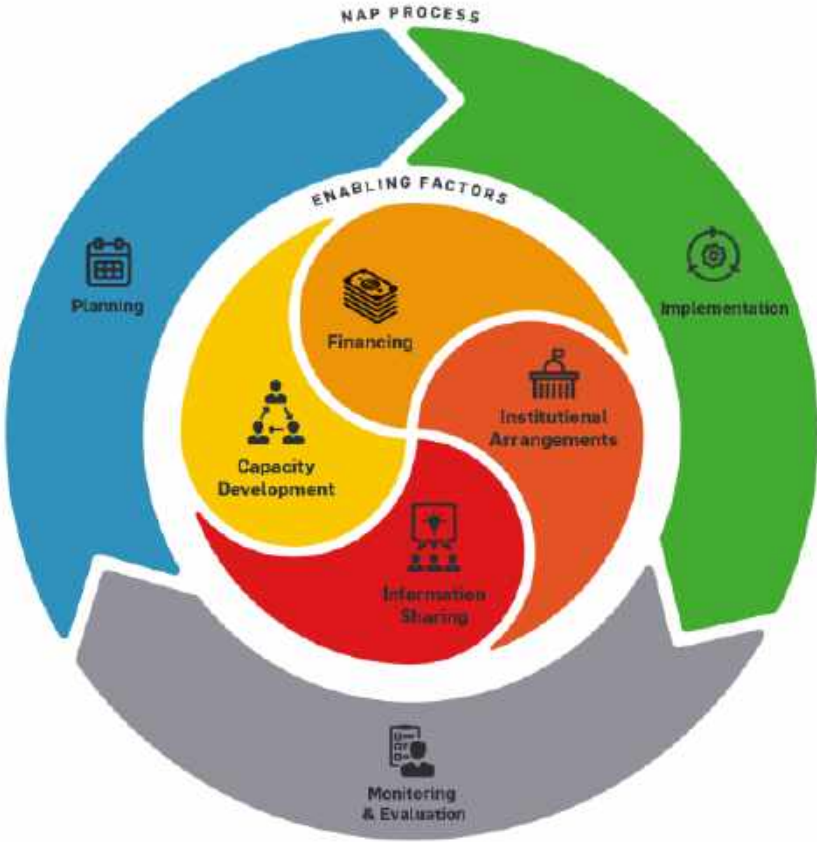
Adaptation of  
Commonwealth  
fisheries management  
to climate change

# Adaptation – Handbook & Response

1. To assess how well the existing Commonwealth fisheries management framework will cope with climate change impacts
2. To develop a methodology and approach for AFMA and other fisheries to adapt their regulatory environment to climate change impacts on Commonwealth fisheries
3. To develop strategies and priorities to account for effects of climate change in the management of Commonwealth fisheries



# Handbook Scope



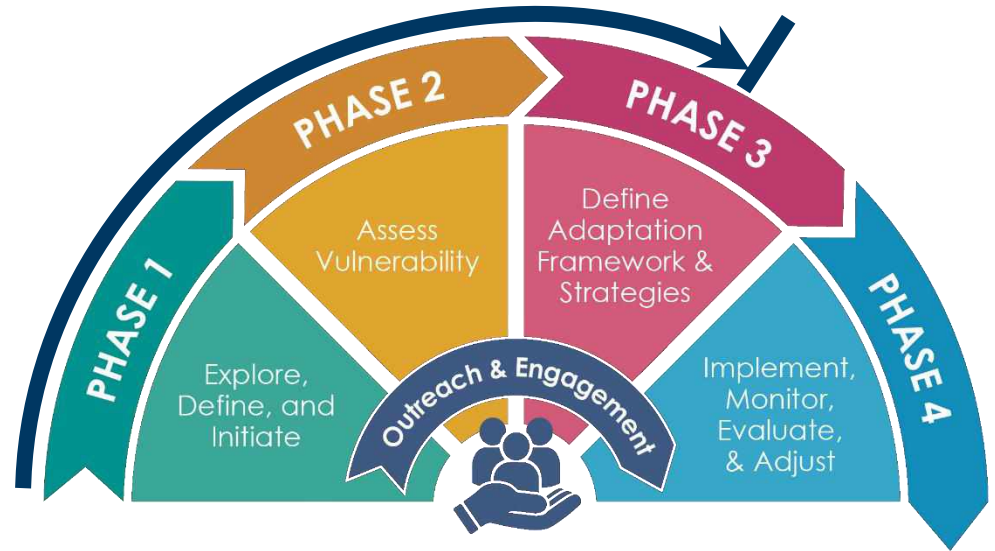
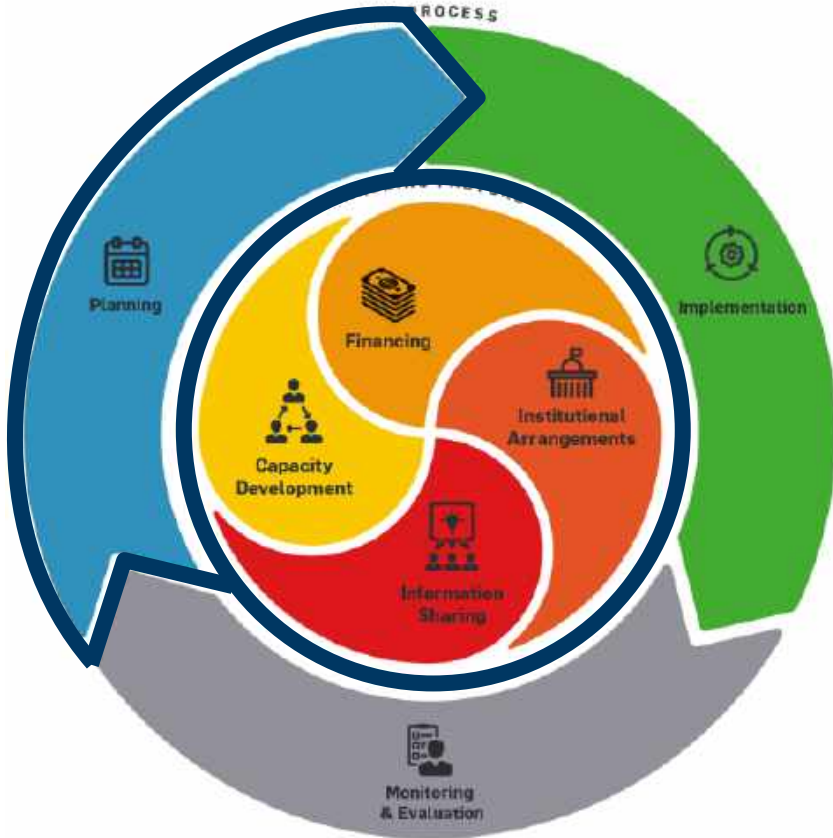
SCAG 2020

CSIRO

IISD 2016

# Handbook Scope

SCAG 2020



IISD 2016

CSIRO

# Reaching Recommendations

- Recognise hazards (risk factors)
- Identify intervention points (and whether might helps)
- Prioritise options (based on risk/reward/cost)

LIKELIHOOD  
What's the chance the of the risk occurring?

CONSEQUENCE  
How severe could the outcomes be if the risk event occurred?

		INSIGNIFICANT 1	MINOR 2	SIGNIFICANT 3	MAJOR 4	SEVERE 5
ALMOST CERTAIN 5	MEDIUM 5	HIGH 10	VERY HIGH 15	EXTREME 20	EXTREME 25	
LIKELY 4	MEDIUM 4	MEDIUM 6	HIGH 12	VERY HIGH 16	EXTREME 20	
MODERATE 3	LOW 3	MEDIUM 6	MEDIUM 9	HIGH 12	VERY HIGH 15	
UNLIKELY 2	VERY LOW 2	LOW 4	MEDIUM 6	MEDIUM 8	HIGH 10	
RARE 1	VERY LOW 1	VERY LOW 2	LOW 3	MEDIUM 4	MEDIUM 5	



# Handbook Process

- Co-created with intent guide is:

**Inclusive** – designed to involve committees of industry, management and other stakeholders to come to a more shared understanding of climate risks and develop more robust adaptive management options

**Scalable** – designed to be applied with differing degrees of detail so that it can be adjusted for the available information and the resources available

**Flexible** – not limited to the climate-driven risks to ecological components of Commonwealth fisheries, could be applied to other sectors and/or other types of risks (& even within fisheries “tweak” as need)



# Assessment Considerations

- Taking systems-based approach
  - Commercial, recreational and traditional fisheries
  - Local/regional environmental (or other) changes occurring
  - Species in that area that interact with the fishery (target species, byproduct, bycatch, discards, threatened-endangered-protected species) and habitats those species use
  - Who is involved with the fishery (management agencies, fishers, other key fisheries stakeholders or rightsholders)
- Global drivers (climate & market) & consumer behaviour incidentally considered



## STEP 1

Climate driven  
change to ocean variables  
& Species /  
ecosystem  
response

e.g. temperature change



e.g. species distribution

**Ecological risk**

## STEP 2

Autonomous and  
desired behavioural  
change



e.g. steaming longer

**Fishery risk**

## STEP 3

Initial  
management  
response & Further  
management  
response

Adaptive  
management

e.g. increase  
stock monitoring



e.g. move zones

e.g. time of fishing, targeting



**Fisheries management risk**



## STEP 1

Identify physical ocean change



Identify ecological effects



**Ecological risk score**

## STEP 2

Determine potential fishery  
(adaptive) responses



Identify impact of social and  
economic (adaptive) responses



**Fishery risk score**

## STEP 3

Determine potential management  
responses

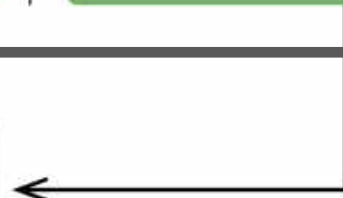
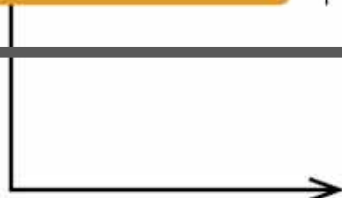


Identify costs and speed of  
management responses

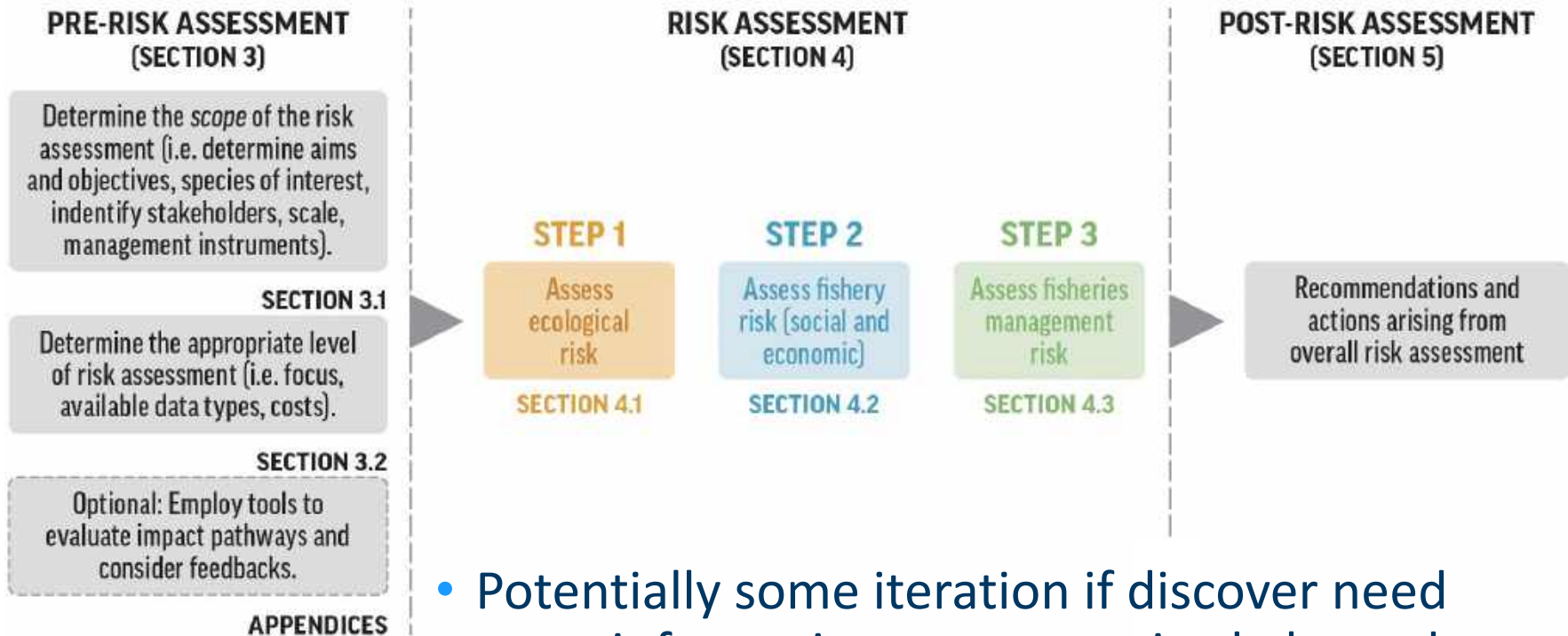


**Management risk score**

**Overall risk assessment score**



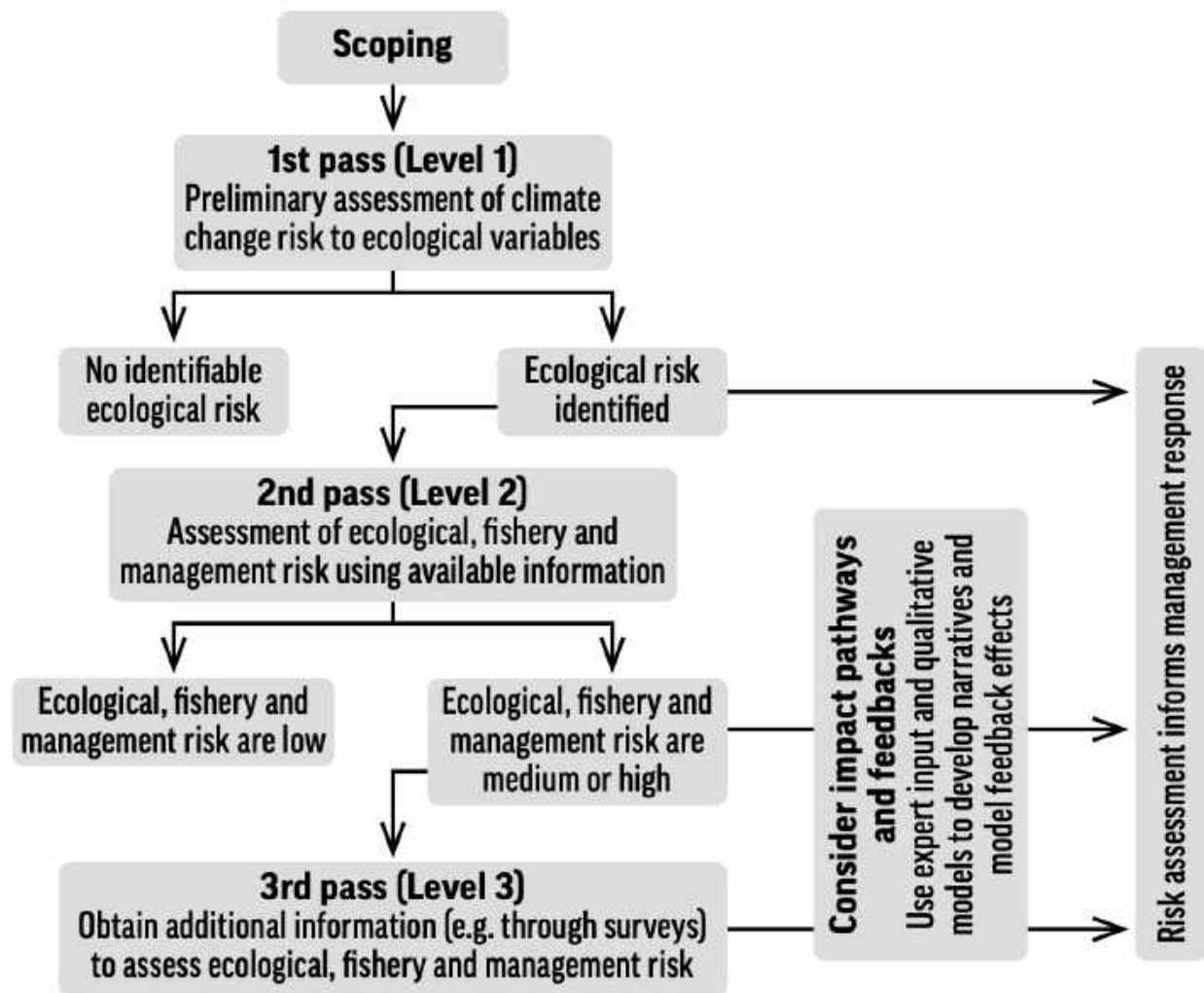
# Process flow



How pressing is the need for the risk assessment?

What resources and information is available?  
*(low and no new information gathered)*

How high is the risk and are resources and key information available?  
*(high risk and resource requirements, additional information collected)*



# Scoping Shapes Form of Risk Assessment

- Information from scoping dictates what is possible
- Level of risk assessment possible depends on
  - aim
  - focus
  - available data types
  - analytical capacity
  - cost (and available resources)
  - level of pre-caution desired



# Scoping Shapes Form of Risk Assessment

Assessment characteristics	1 <sup>st</sup> pass (level 1)	2 <sup>nd</sup> pass (level 2)	3 <sup>rd</sup> pass (level 3)
<b>Aim</b>	Develop a preliminary understanding of climate change risks.	Build on 1 <sup>st</sup> pass assessment to commence climate change risk related discussions among stakeholders within and outside the organisation.	Similar to 2 <sup>nd</sup> pass assessment, to be used where detailed modelling or hazard studies are required before implementation or investment decision-making.
<b>Focus</b>	General broad focus.	Focus on specific sectors, areas or aspects that were identified as being at-risk.	Develop a better understanding of site-specific climate change-related risks.
<b>Data types</b>	Qualitative (typically expert based).	Semi-quantitative. Can be used in combination with local expert knowledge to identify the likelihood of a given climate change risk and its consequence.	Quantitative. Required if the consequences of system failure are severe or if a higher degree of precision is required for making decisions. This step also often involves incorporating qualitative decisions from stakeholders on how they might respond.
<b>Cost (time)</b>	Cheaper.	More time consuming and requiring more resources.	Detailed – highest costs in terms of time and resources needed.
<b>Analysis</b>	All ecological units at a gross level.	Consideration of ecological, fisheries and management risks at least at a qualitative level. Where sufficient resources and data are available, statistical analysis of the most vulnerable units (i.e. those components connected to ecological groups at moderate to high risk in 1 <sup>st</sup> pass).	Full quantitative assessment (with spatial and temporal dynamics), using a mix of process-based and statistical methods, currently typically of individual units/stocks.
<b>Screen out</b>	Low consequence activities affecting components.	Low risk units.	Do not screen out anything (screening done in previous steps – but still leads to priorities).



# Scoping

\*\* Ignoring interconnections means can ignore drivers, constraints or options

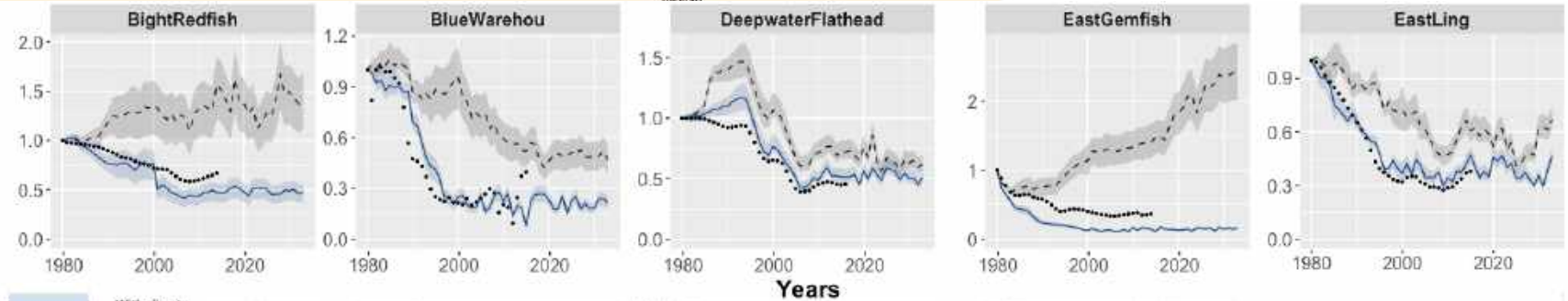
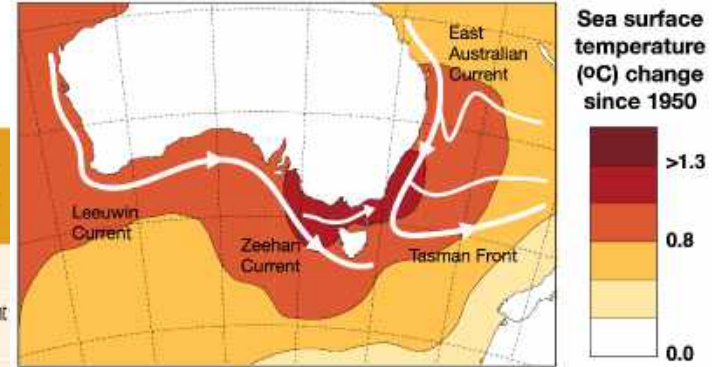
Aspect	Importance
Setting Aims & Objectives	Defines complexity of expectations to be managed & whether substantially different from current state (new policies etc may be needed)
Species of Interest**	Defines ecological complexity and information needed (whether single species or multiple species with variable information levels)
Sector of Interest**	Dictates information needed and people to include
Spatial extent**	Dictates information needed and people to include
Temporal extent (how far into the future)	Dictates information needed (climate projections), but needs to be meaningful for decisions & planning
Participation & Values	Influences species/sectors to include and helps infer adaptive capacity / robustness (motivations for fishing dictates constraints)
Inventory of “Current”	Provides baseline (used when determining fisher/management changes that may be needed to enable fishery adaptation); system attributes (can help infer adaptive capacity / robustness)



# Information & Modelling

- Existing data/knowledge

Biological impact categories	Description of the change and implications for fisheries	Species attributes that affect their sensitivity to climate change	Low sensitivity (1)	Medium sensitivity (2)	High sensitivity (3)
Abundance	Change in total (or local) population size, which alters the location specific availability of a particular marine species.	Fecundity	> 20,000 eggs per year	100-20,000 eggs per year	< 100 eggs per year
		Recruitment period	Consistent recruitment events every 1-2 years	Occasional and variable recruitment period	Highly episodic recruitment event
		Average age at maturity	≤ 2 years	2 - 10 years	> 10 years
		Generalist versus specialist	Reliance on neither habitat or prey	Reliance on either habitat or prey	Reliance on both habitat and prey
		Sensitivity to ocean acidification	Not shelled and no reliance on shelled species	Not shelled, but reliant on shelled species (as prey or habitat)	Shelled species



- Counterfactuals & projections

# Expert Understanding Elicitation Methods

- Impact pathways
- Step planning
- Surveys
- Expert input

Effects of warmer oceans on a hypothetical fishery (Hvish)

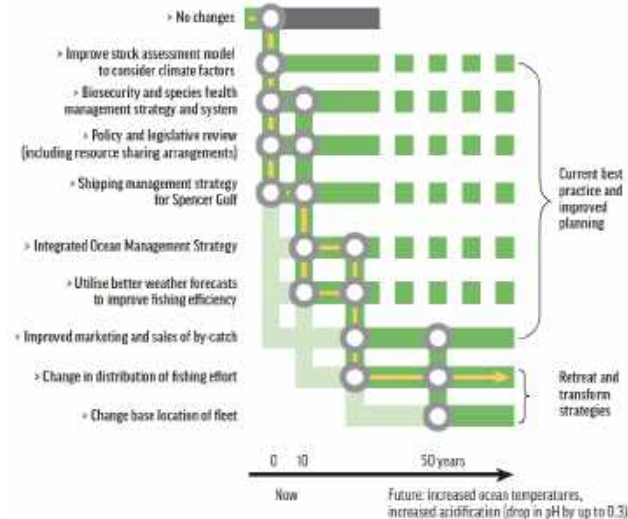
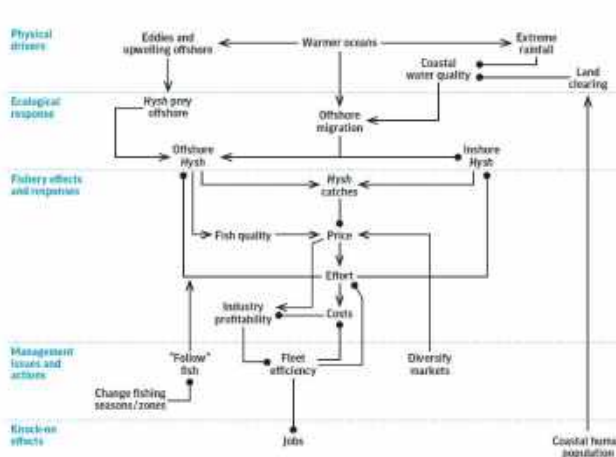


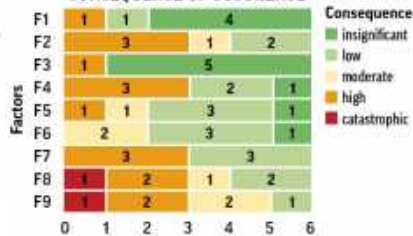
TABLE 1 Likelihood of implementing different adaptive responses to abundance change.

Behavioural change	Likelihood that you would do this in response to a decline in abundance	What is the direction of your response (decrease / increase)
Change the amount of fishing effort		
Move to another fishing location		
Switch to a different target species		
Stop fishing for the target species altogether		
Invest in new technology or assets		
Change the amount of quota trade (this could be effort or catch, whichever is appropriate)		
Change the sale price of fish		
Change supply chain management		
Improve fish handling methods		
Diversify markets		
Value add to the product		
Seek information about adaptation options		
Communicate with concerned stakeholders		

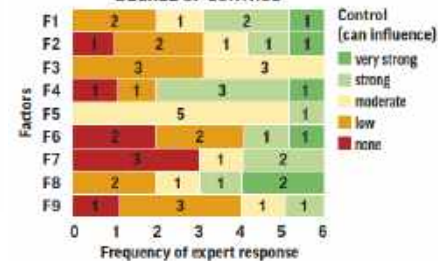
LIKELIHOOD OF OCCURRENCE



CONSEQUENCE OF OCCURRENCE



DEGREE OF CONTROL

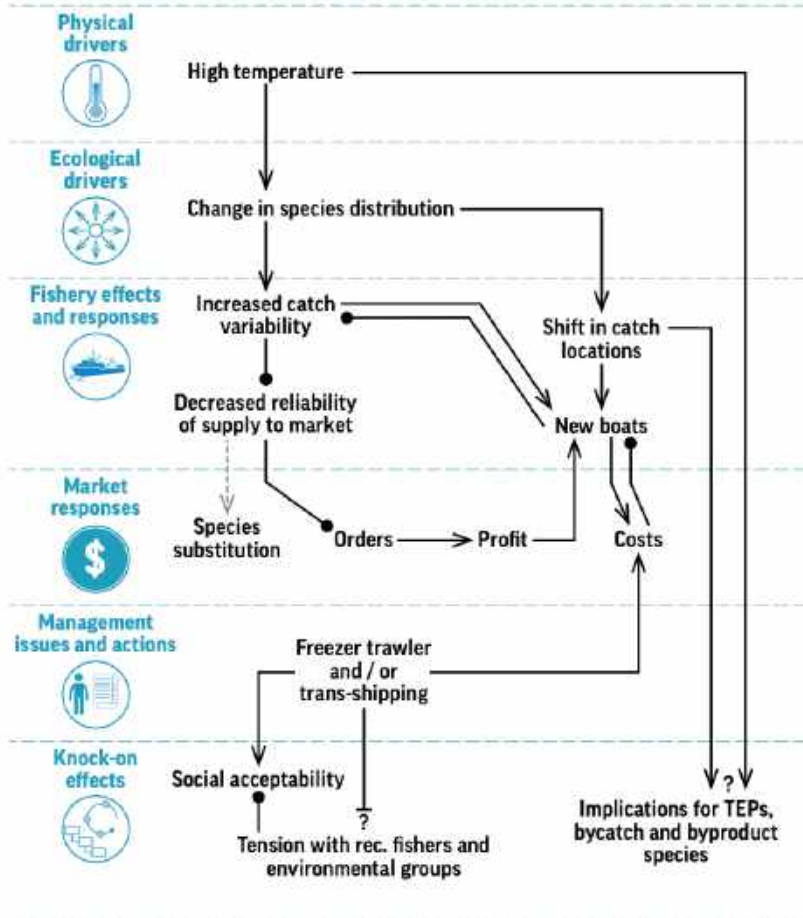




# Impact pathways for understanding & comparing response options



## Small pelagic fishery



## Pathway 1: Changing distribution

Temperatures shift along with plankton productivity.

Fish move off the shelf, or to upwelling locations, to stay around 14°C and to follow food.

Need for increased mobility of the fleet. If gear is inadequate the fleet cannot fish off the shelf. Pressure to shift from small boats to larger mobile vessels (to ensure the quality of the product).

Unreliable supply may lead to a reduced number of orders in the following year; the market may also substitute alternative sources or species.

The loss of market share and the costs associated with the new infrastructure potentially negatively effects profits.

Need for increased mobility of the fleet and management flexibility.

The changed fleet activity could negatively effect public perception - both in terms of the environmental NGOs and with the recreational fishers (who may also be seeing a change in the availability of large pelagies and may assume it has to do with prey availability or fleet interactions).

# Example outcome summary

Sensitivity	Low	Medium	High	Confidence	Low	Low-Med	Medium	High	Not Available
	Low	Medium	High		Low	Low-Med	Medium	High	Not Available

Species	Sensitivity	Preliminary projection	Confidence in projection	Comments on projection	Fisher Options	Management Recommendations
Tiger flathead		Uncertain		While ▲ 10-50% possible (especially in short term), if the environment continues to change declines are possible as suitable habitats are lost (but not for a few decades)	Move location to follow traditionally targeted species or switch to new species as they become established (will require building market interest potentially). Access forecasts on desirable conditions.	Use climate aware assessments and reference points. Check that spatial zoning still delivers on objectives. Look to relocate infrastructure as species range shift. Check implications for companion species assumptions in baskets and any multispecies rules.
Ocean perch		NA				
Ocean jacket		NA				
Jackass morwong		▼ upto 20%		Patchy but decline more in the northern extent of the fishery		
Silver trevally		NA				
Eastern school whiting		▲ 10-50%				
Latchet		▲ 10%		Spatially uniform		
Silver warehou		Uncertain		▼ 30% through to ▲ 5-20%. Declines (if they happen) begin in the GAB first.		
Blue warehou		▼ 15%				
Eastern gemfish		Uncertain		▼ 20% through to ▲ 10%. Spatially uniform		
Red gurnard		▼ 40%		Decline in shallows, increase in eddies	Change handling practices, diversify markets and value add to make the most (sale price) of catch that is accessible. Invest in vessels robust to increased wave strength at sea.	
Redfish		▲ 10-100%				
Bight redfish		Uncertain		▼ 20% through to ▲ 10%.		
Deepwater flathead		Uncertain		▼ 20% through to ▲ 10%.		
Mirror dory		▼ 15%				
John dory		▼ 40%				
King dory		▼ 15%				
Silver dory		▼ 15%				
Pink ling		▼ 40%		Spatially uniform		
Royal red prawn		Uncertain				
Frostfish		▼ 15%		Spatially uniform		
Blue grenadier		Uncertain		▼ 15% through to ▲ 60%. Spatially uniform		
Blue-eye trevalla		▲ upto >50%		Decline more in the east, may increase in Bonney upwelling area.		

# Application Experience

- Substantial observation of change
- Autonomous fisher action already underway (not always mentally connected to climate)
- Can have reluctance to acknowledge need (actual denial, financial implications, other pressure, always coped with change)
- Variable capacity to respond
  - Handbook as entry point (some still struggle as “want answer”, others already want quantification)
- Stages together and stages apart (things managers/industry thinking about not ready to share)



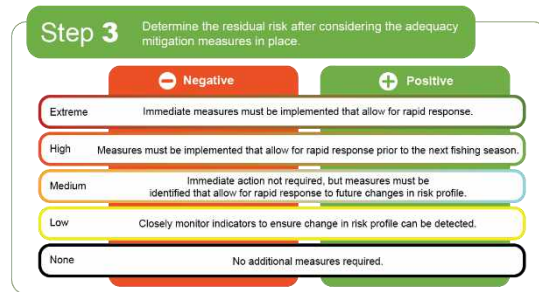
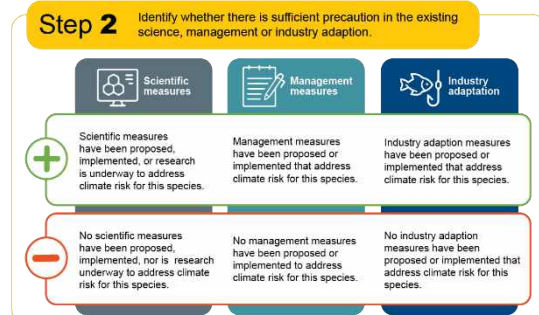
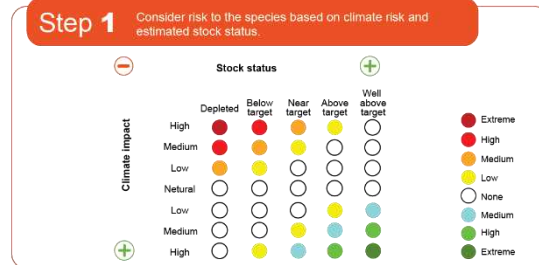
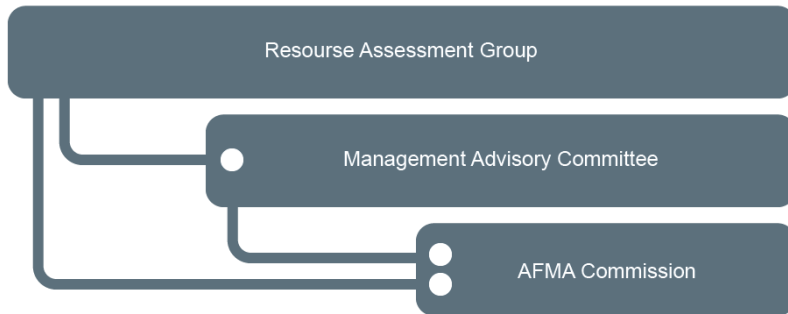
# AFMA Climate Risk Framework

**Step 1** Consider risk to the species based on climate risk and estimated stock status.

**Step 2** Identify whether there is sufficient precaution in the existing science, management or industry adaption.

**Step 3** Determine the residual risk after considering the adequacy mitigation measures in place.

**Step 4** Provide advice to the AFMA Commission on any additional measures required to respond to climate risk.

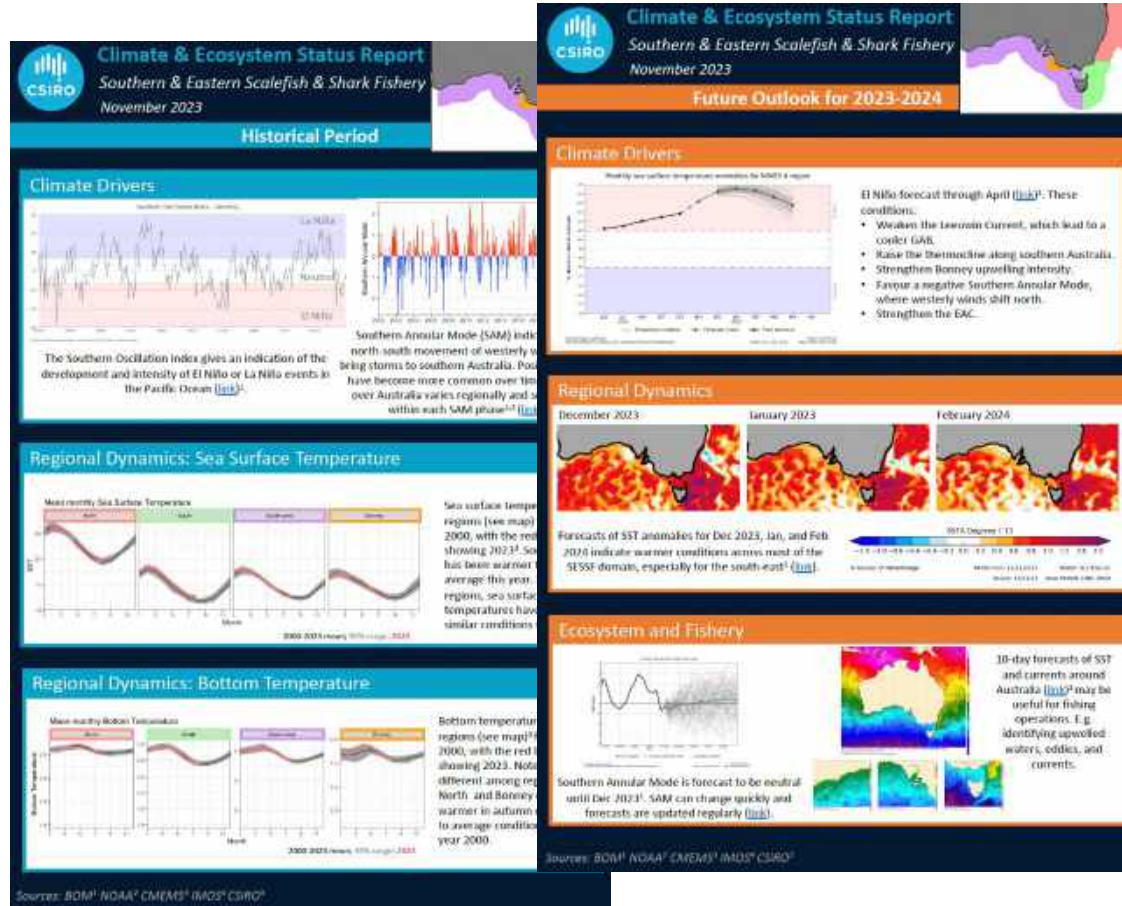


**Step 4** Provide advice to the AFMA Commission on any additional measures required to respond to climate risk.

Provide advice to the AFMA Commission regarding what additional proportionate measures (if any) should be taken to mitigate the risk of climate change.

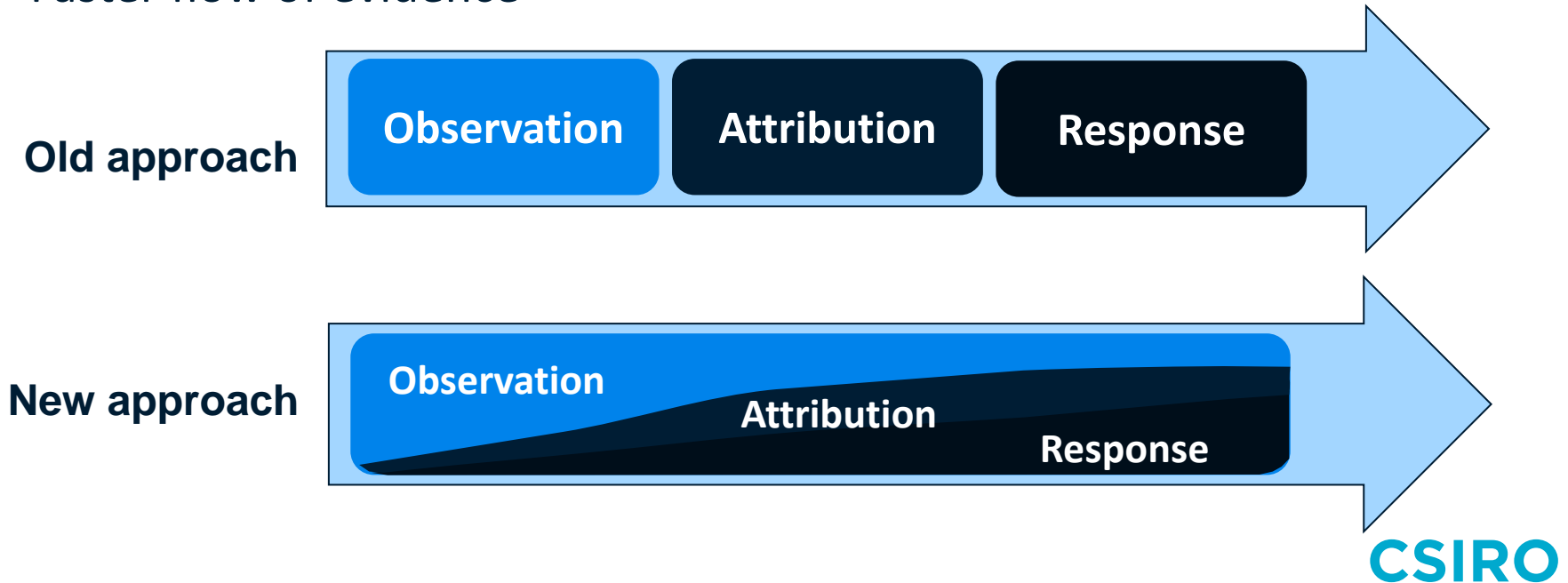
# Additional Supporting Information

- Report cards (current vs historical; projections)
- Plankton trends
- Stock exposures > preferred temperatures
- System level indicators
- Analogous years
- Pre-caution warnings
- Data collection priorities



# New Approach to Evidence & Decisions

- No/Low regrets decisions
- Flexibility: make decisions that are updated as more is known
- Faster flow of evidence



# Summary

- Handbook applied in each Australian jurisdiction (each now following own path)
- Scoping important (keeping things manageable, right people in the room)
- Science: synthesis of what's been seen, what's forecast, evidence base for options list
  - ongoing information (support)
- Beyond science: what is preferred, responses
- No regrets = best can aim for as things changing fast





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