

Taking stock:

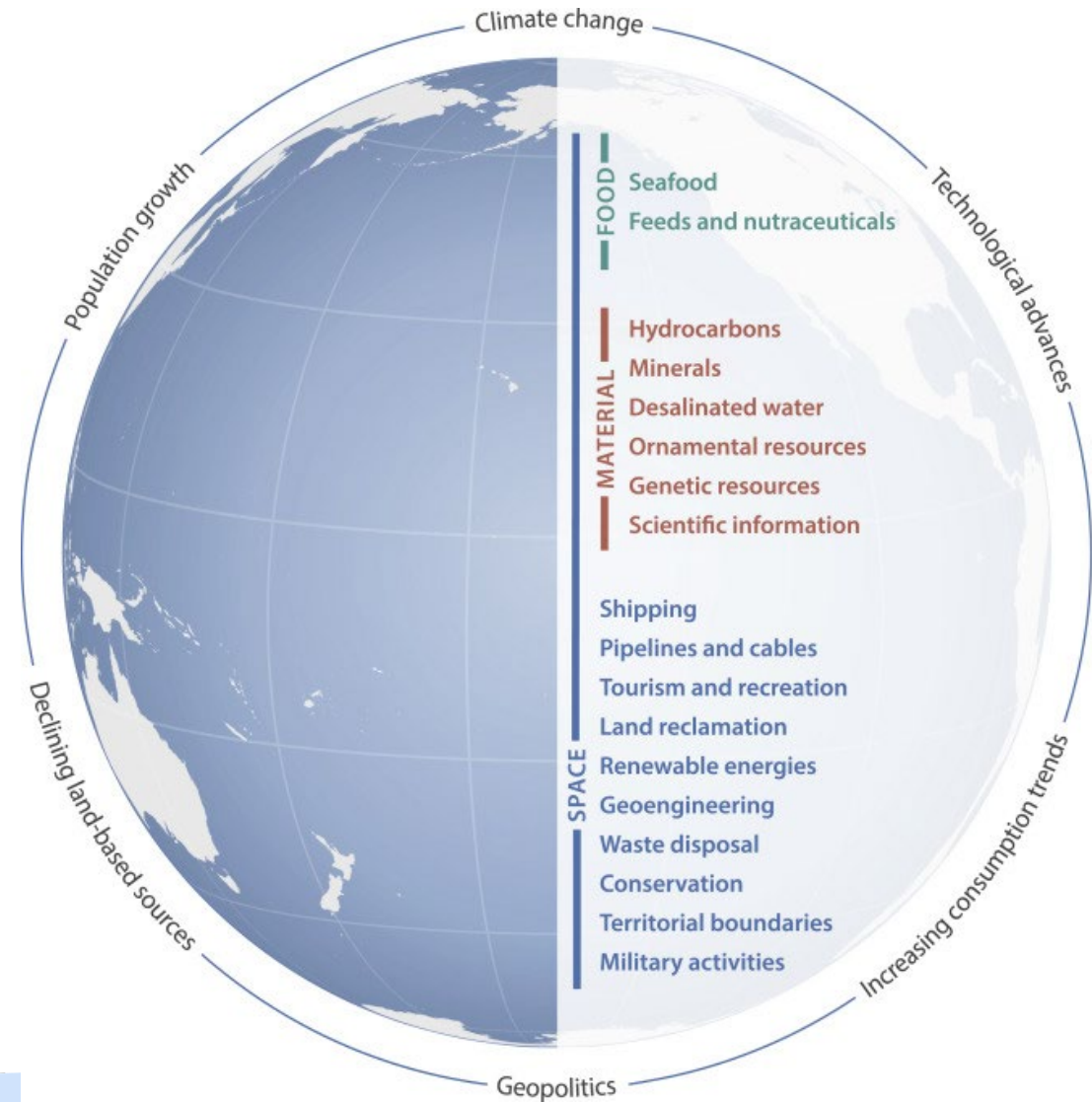
How are interdisciplinary research and cross-sectoral approaches serving marine governance?

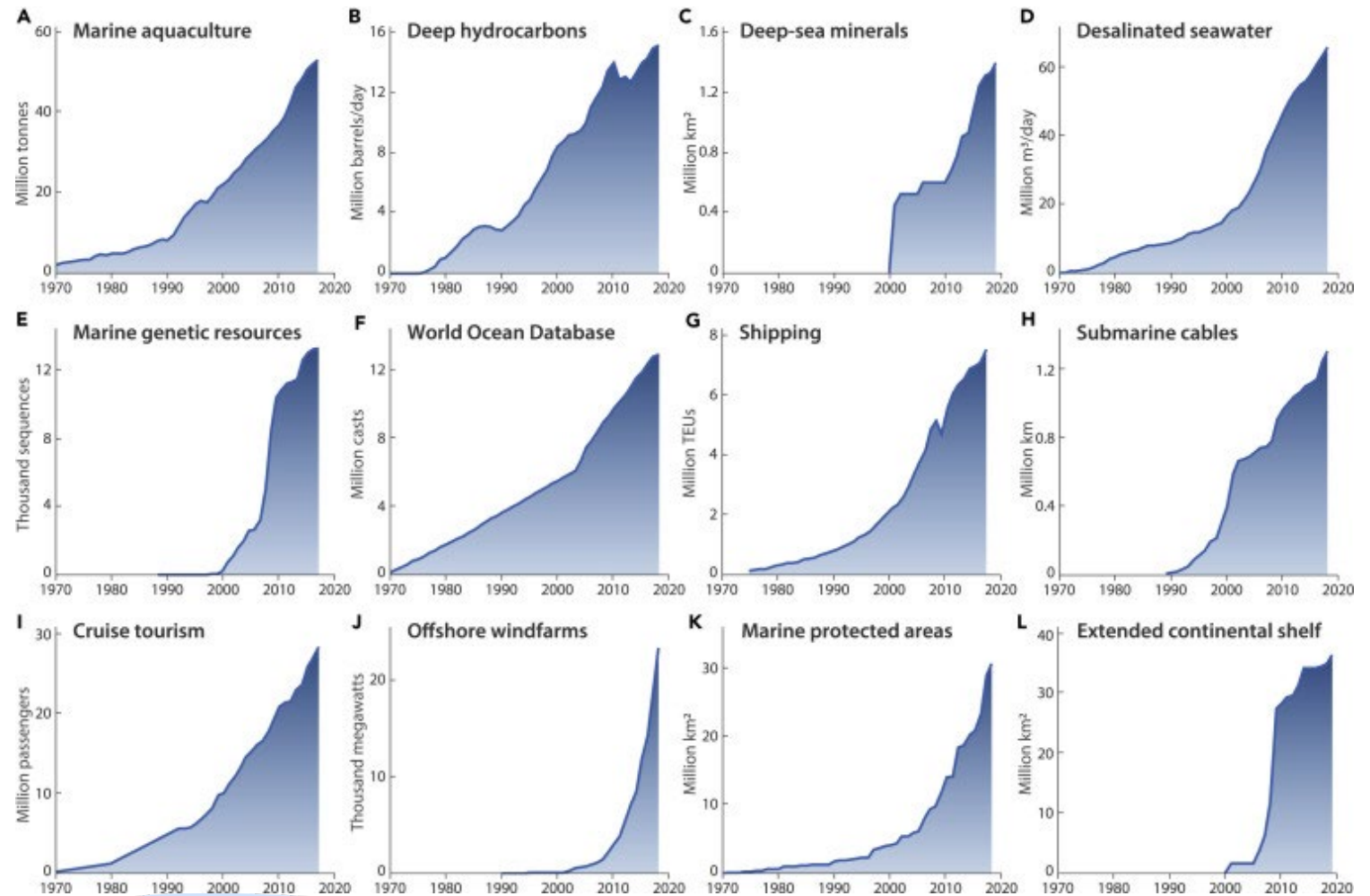
Vignettes and provocations from southern waters

Emily M. Ogier^{1,2}, Michael Murunga^{1,2}



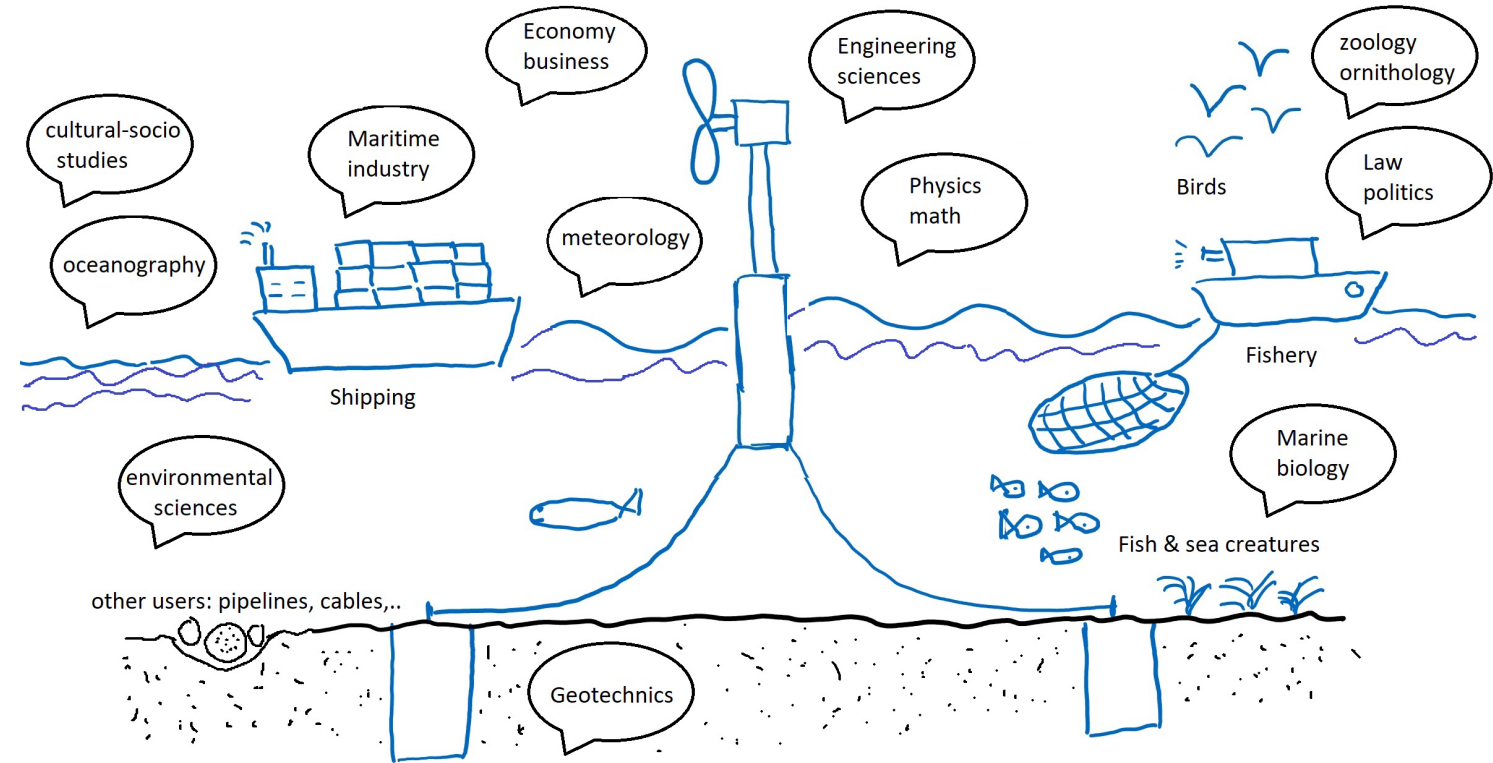
A complex 'blue' world







Interdisciplinary marine science for a complex world

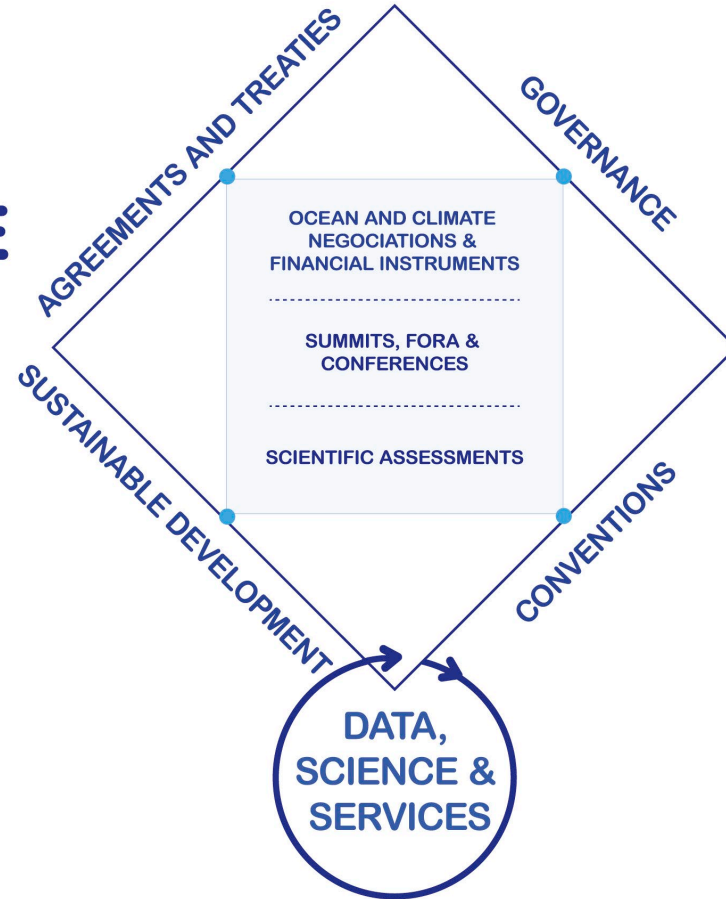


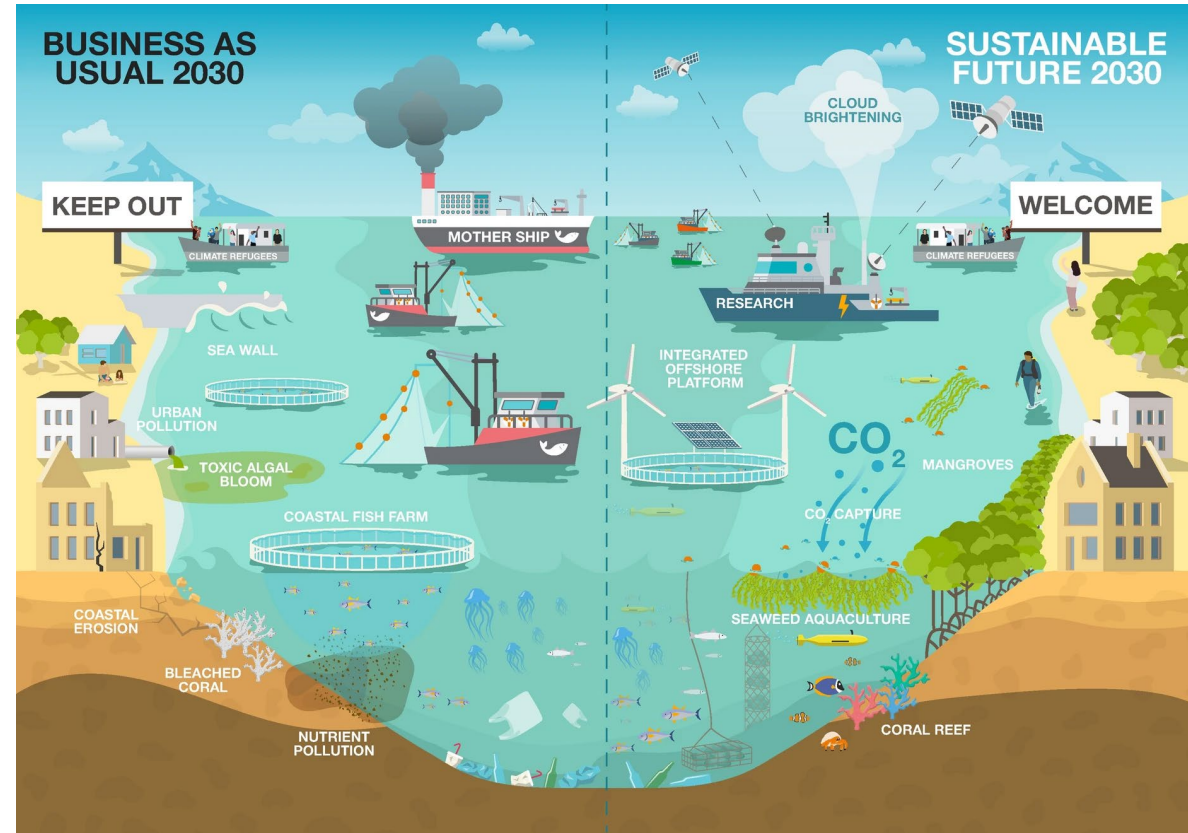
A non-exhaustive overview of interdisciplinary sciences related to offshore wind development. Source: [A Need for Interdisciplinary Education in Ocean Fields | Features \(ecomagazine.com\)](https://ecomagazine.com)



The new knowledge services interdisciplinary marine science offers

THE OCEAN CLIMATE NEXUS

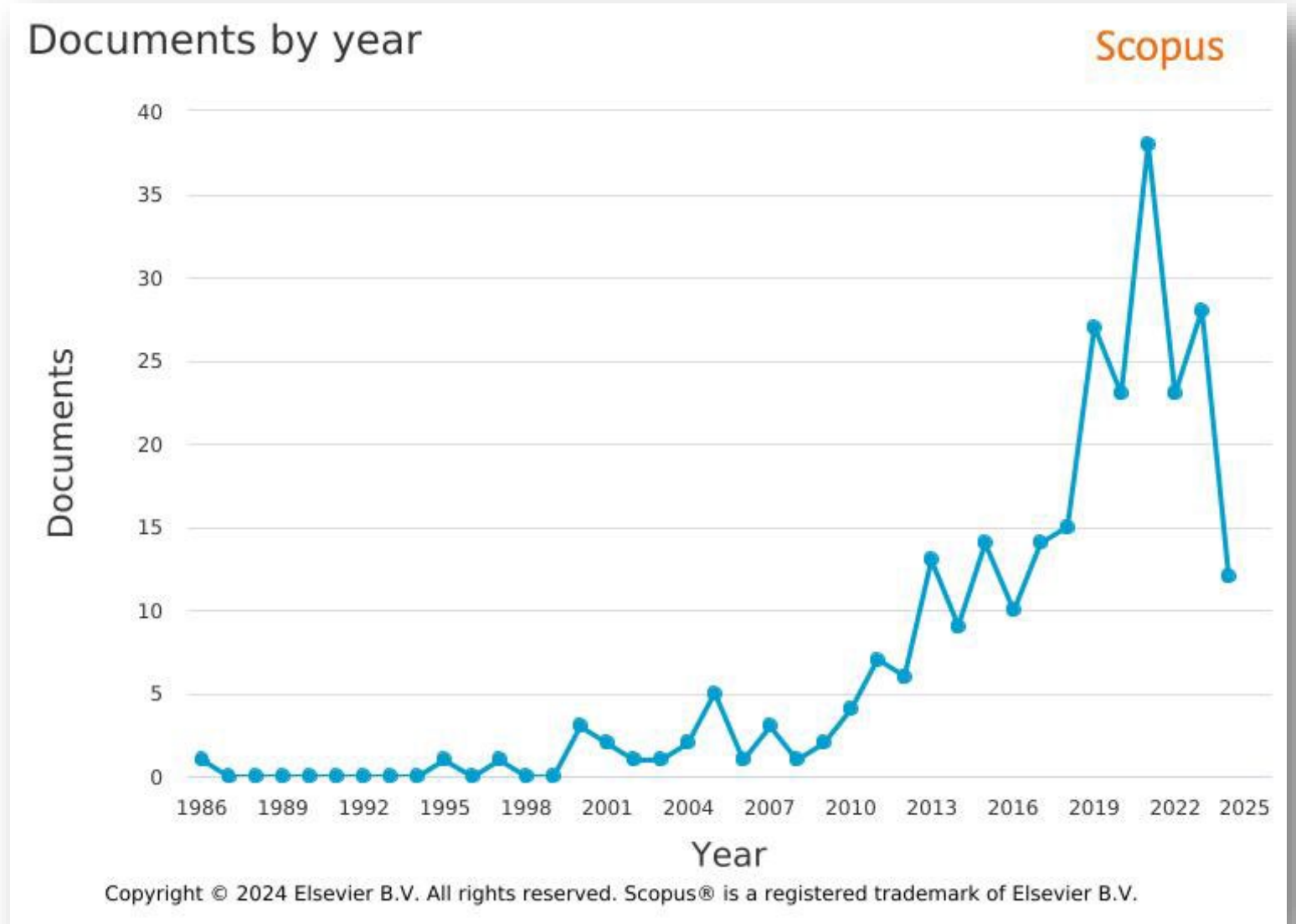




Trebilco et al. 2021



The project is to inform marine governance

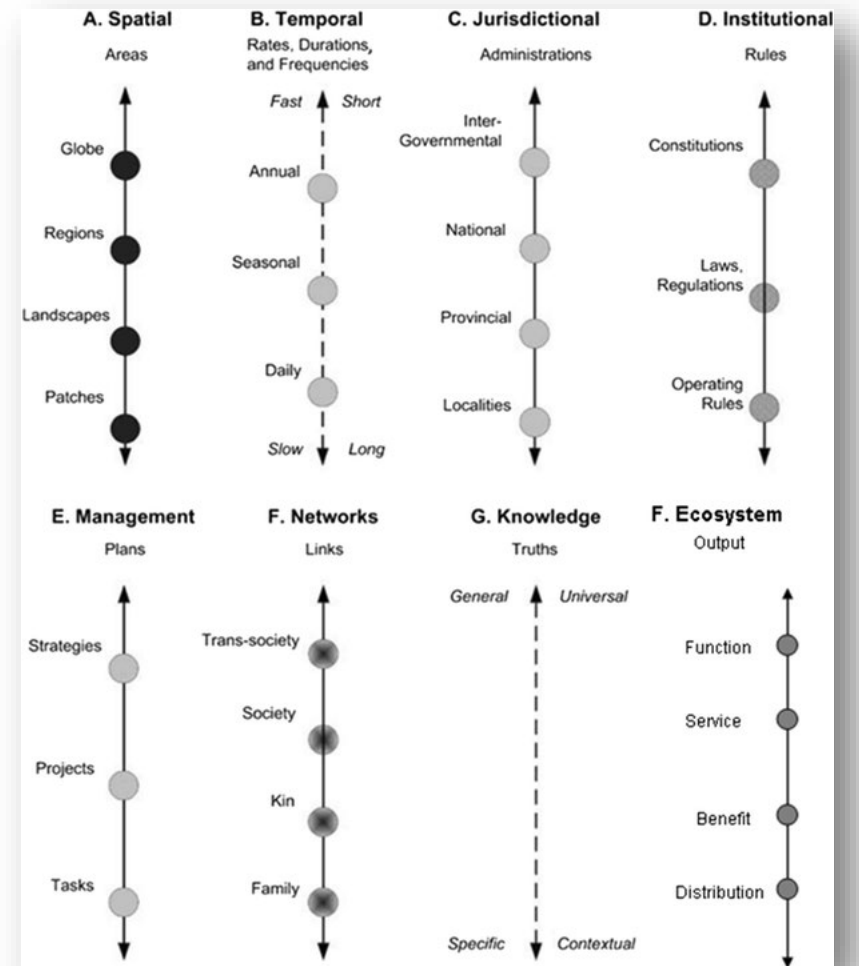


Glaeser et al. 2014

Interdisciplinary marine science AND Policy



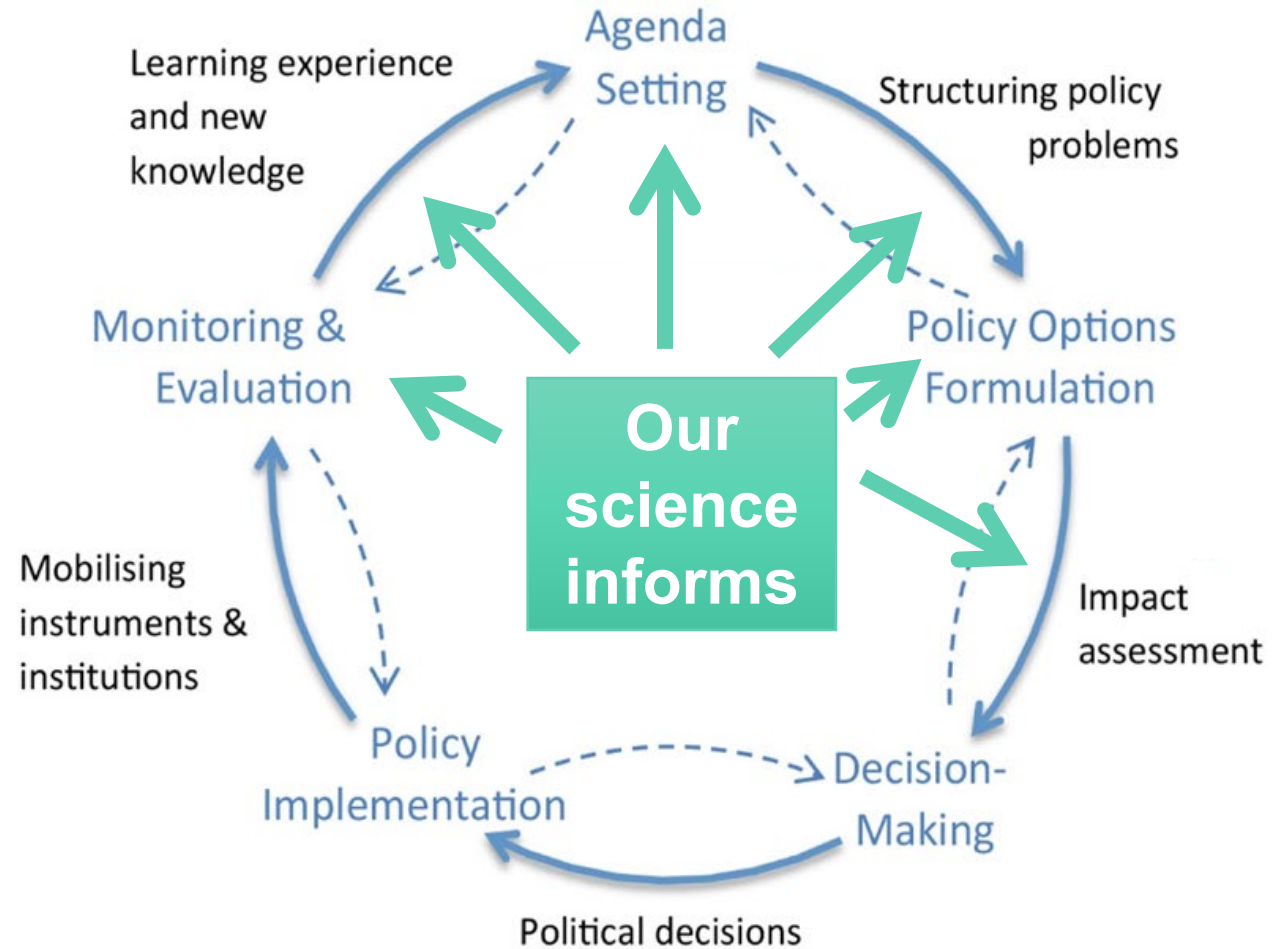
<https://marine.gov.scot/sma/assessment-theme/what-assessed>



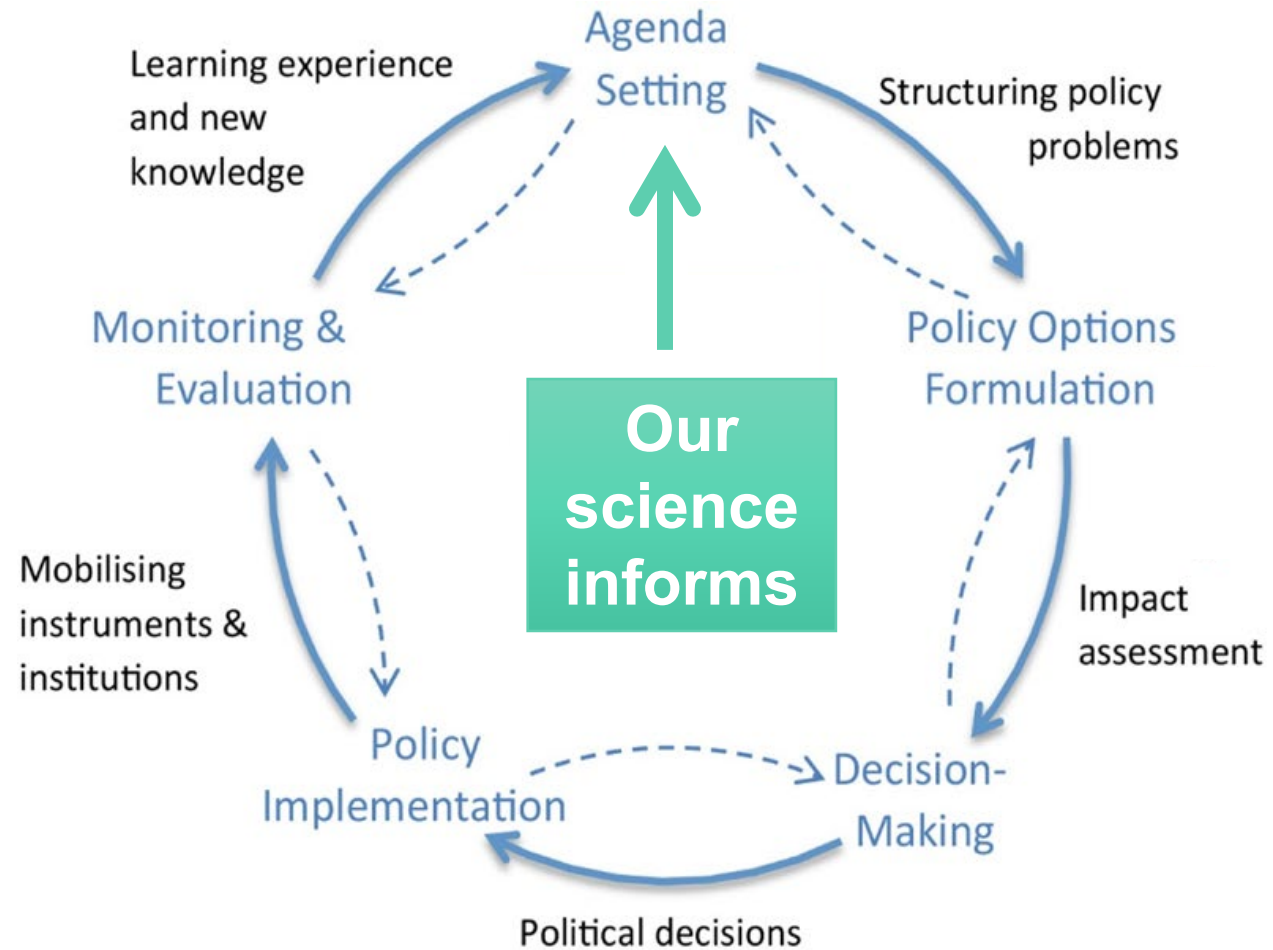
Glaeser et al. 2014



Can it usefully inform?



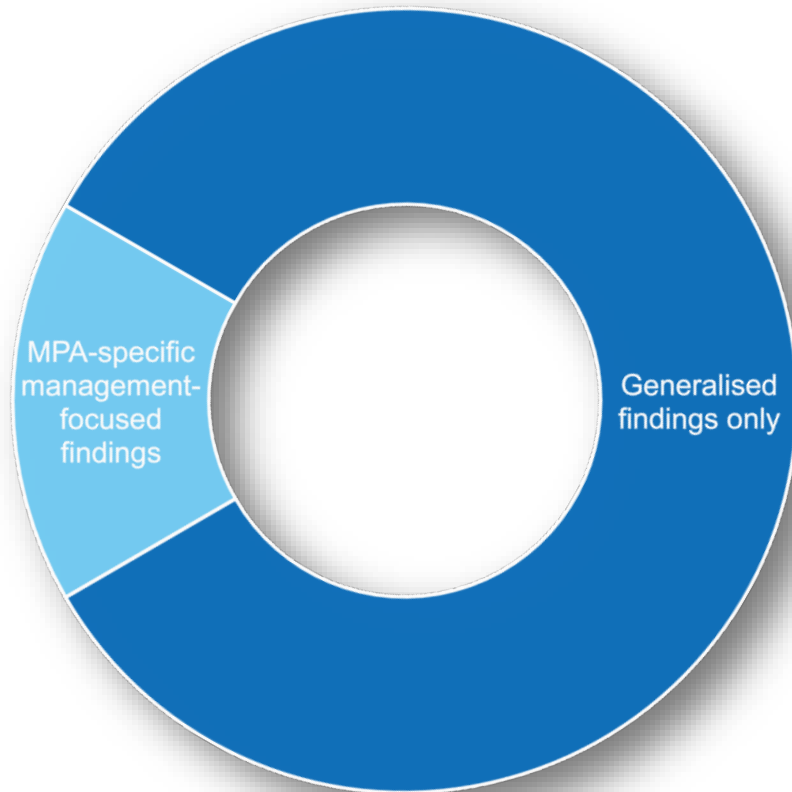
“...interdisciplinary research has... opened up new opportunities for knowledge production and **created additional challenges** for collaborations among researchers, practitioners, and policymakers.” [emphasis added] Peek and Guikema (2021)



Adapted from Pollit et al. (2024)

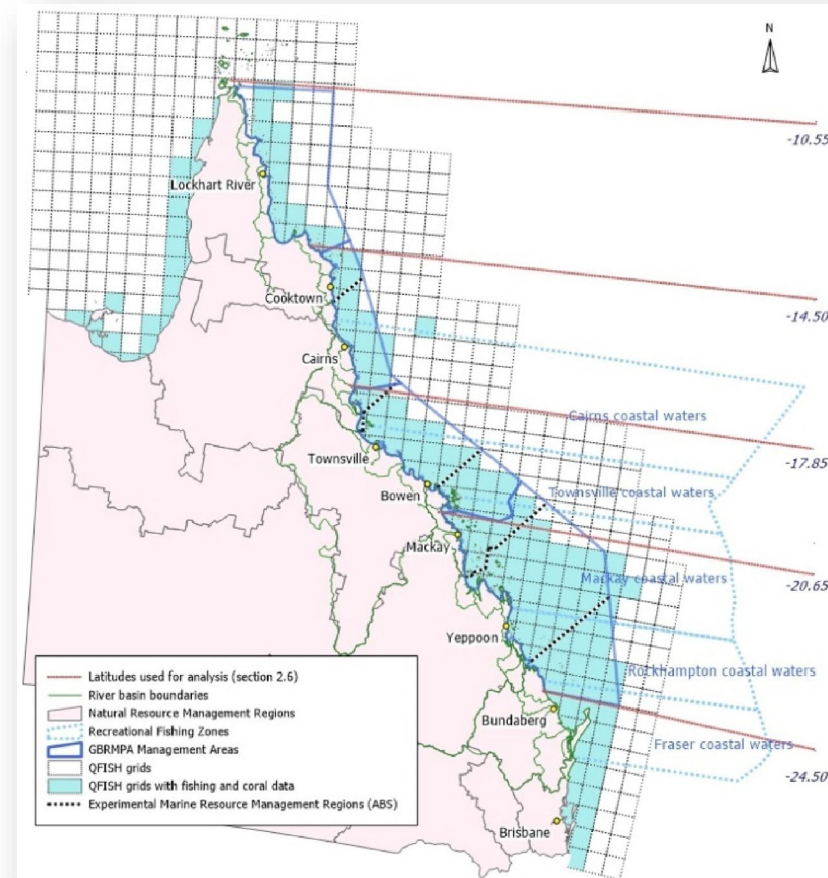
Interdisciplinary science is seen by policy makers as a “general source of information” on the issues at hand, and not an implementable science of exploring solutions. Pollit et al. (2024); Dilling and Lemos (2012)

Notwithstanding the interdisciplinary 'turn', useability is a challenge



Proportion of published studies of Climate change AND Australian MPAs (n=78).

Harrison *et al.* (in prep)



Stoeckl *et al.* (2021)



This presentation

● Insights from Science for Actionable Knowledge

● Vignettes from Southern Waters

● Take-aways

The 'turn' to useable science

Science for Actionable Knowledge: State of Interdisciplinary science

Knowledge 'lens' predominates (not a governance 'lens')

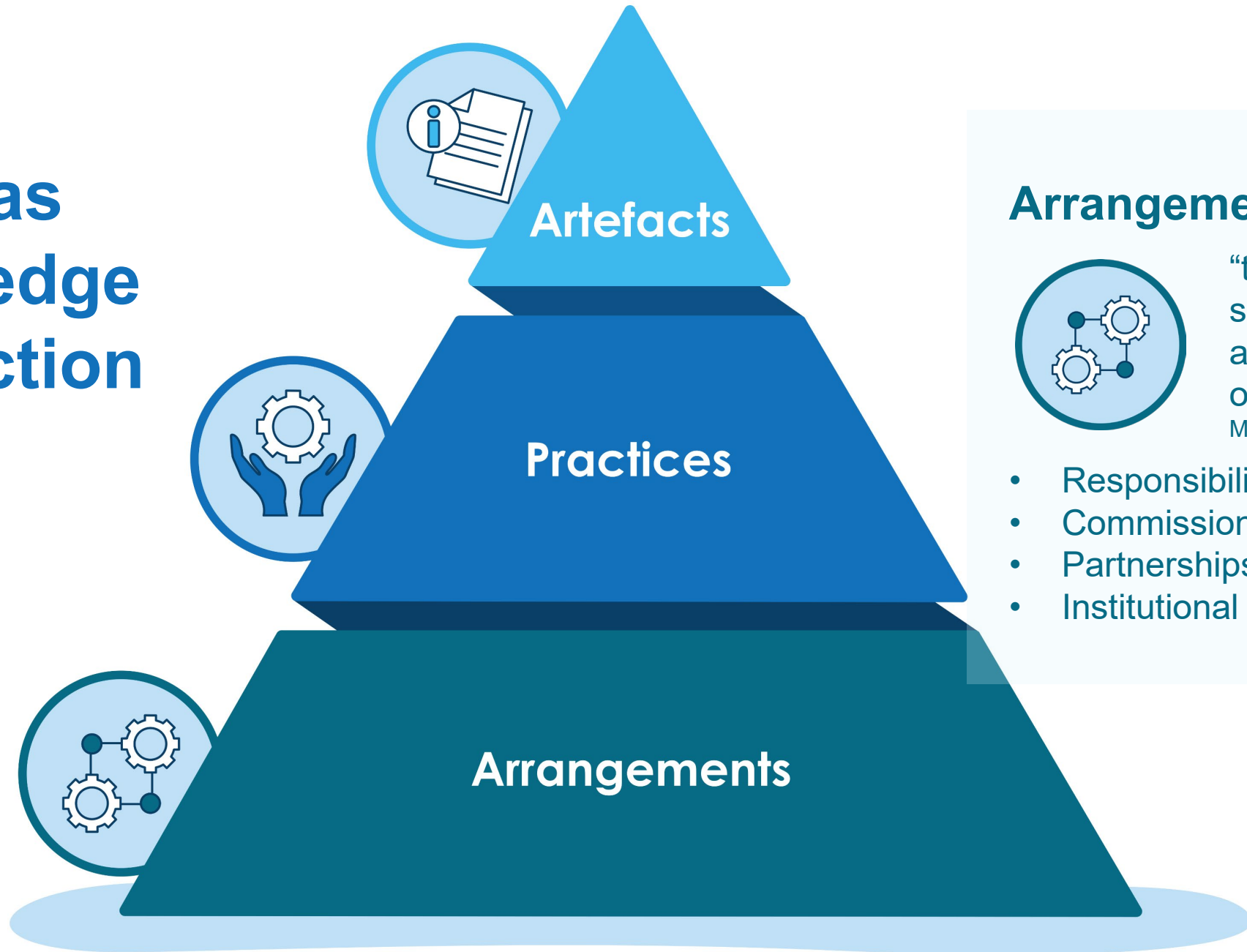
Linear modes of science-to-policy more pervasive compared with expected/desired extent of co-production modes

Strong norm that science should be actionable, therefore interdisciplinarity is required axiomatically

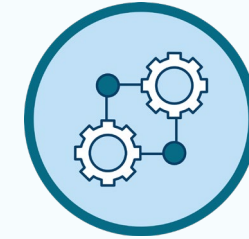
Useability (relevant, credible, legitimate) can be increased through proven strategies

1

See it as
knowledge
production



Arrangements



“the different ways
science-policy
arrangements are
organised”

Maas et al. (2022)

- Responsibilities & authority
- Commissioning & procurement
- Partnerships & agreements
- Institutional organisation

Top-down

Global assessments & observations



Government science advisors (councils & committees)



Expert commissions



Government research institutions (& programs)



Trans-disciplinary research programs (& institutions)



Mandate or invited science-for-policy

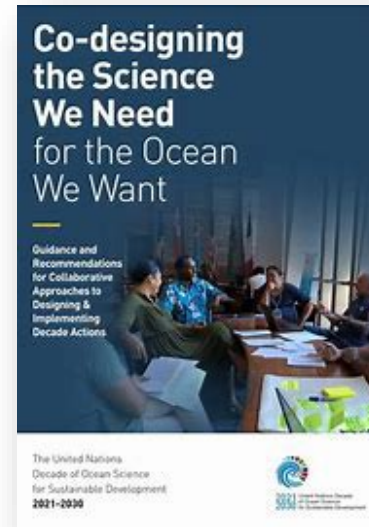


Practices

The acts and activities between scientists and policymakers concerned with knowledge production for a given program



Maas et al. (2022)



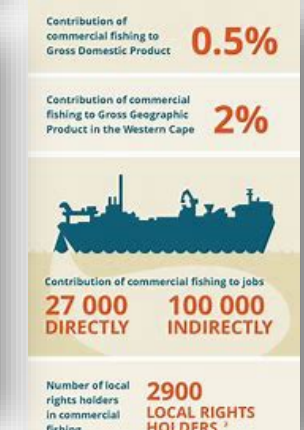
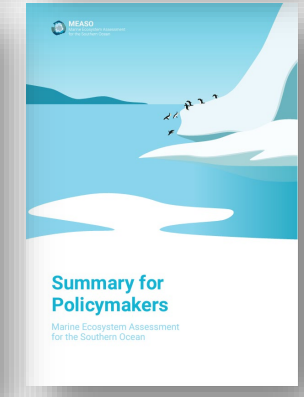
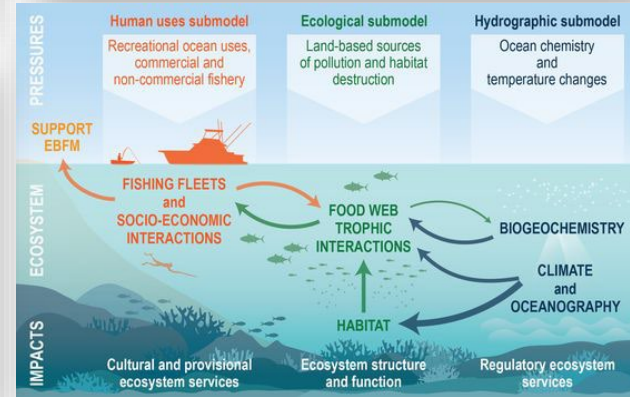
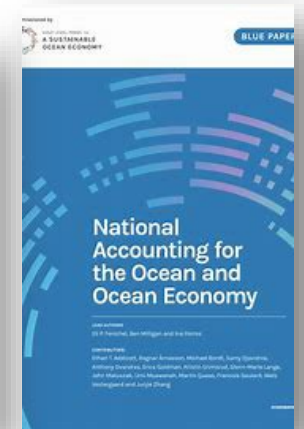
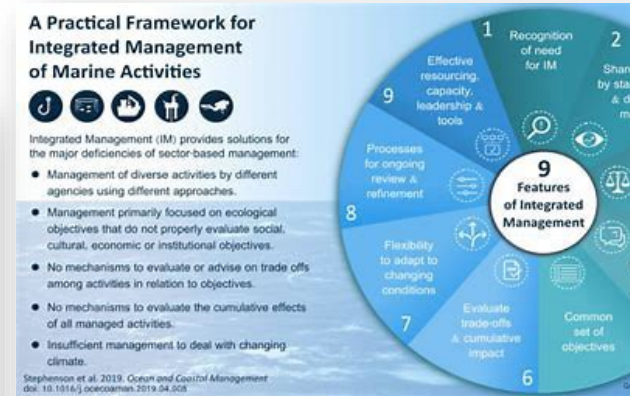
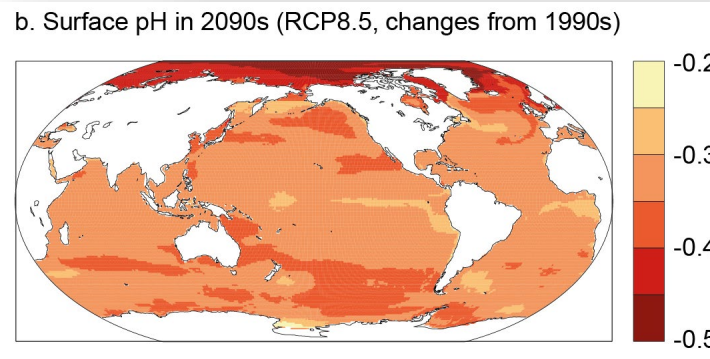


Artefacts

Artefacts are the products of science-policy arrangements and practices



Responses	Scenarios				
+ - ?	1. More small/fewer large phytoplankton	2. Gelatinous zooplankton increase	3. Baleen whales increase	4. Uncontrolled krill fishery	5. Uncontrolled toothfish fishery
Krill target species	+	-	-	-	-
Toothfish target species	-	-	-	-	-
Conservation of krill specialists	-	-	-	-	-
Conservation of fish/squid specialists	-	-	-	-	-
Conservation of baleen whales	-	-	-	-	-
Carbon export potential	+	+	+	+	+



2

Find out what governors and policy makers are seeking



Example of key policy functions

Policy stakeholders	Evidence synthesis	Policy dev.	Scrutiny	Implement-ation	Impact evaluation	Campaign-ing
MPs			Dark		Light	Light
Parliamentary Staff	Light		Dark		Light	
Ministers		Dark		Light	Light	Light
Civil servants	Dark	Dark		Light	Light	
Local councillors		Dark	Light	Light	Light	Light
Local/ regional authority staff	Light	Light		Dark	Light	
Non-Departmental public bodies	Light			Dark	Light	
Intermediaries/NGOs	Light		Light		Light	Dark

Note: predominant function indicated in dark shade (Adapted from Reid and Chaytor 2022)



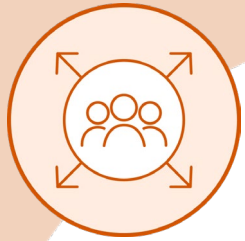
1. Interplay

“generating a weakly institutionalized ‘in-between space’, in which researchers and policymakers interact to find more inclusive ways of tackling complex challenges”

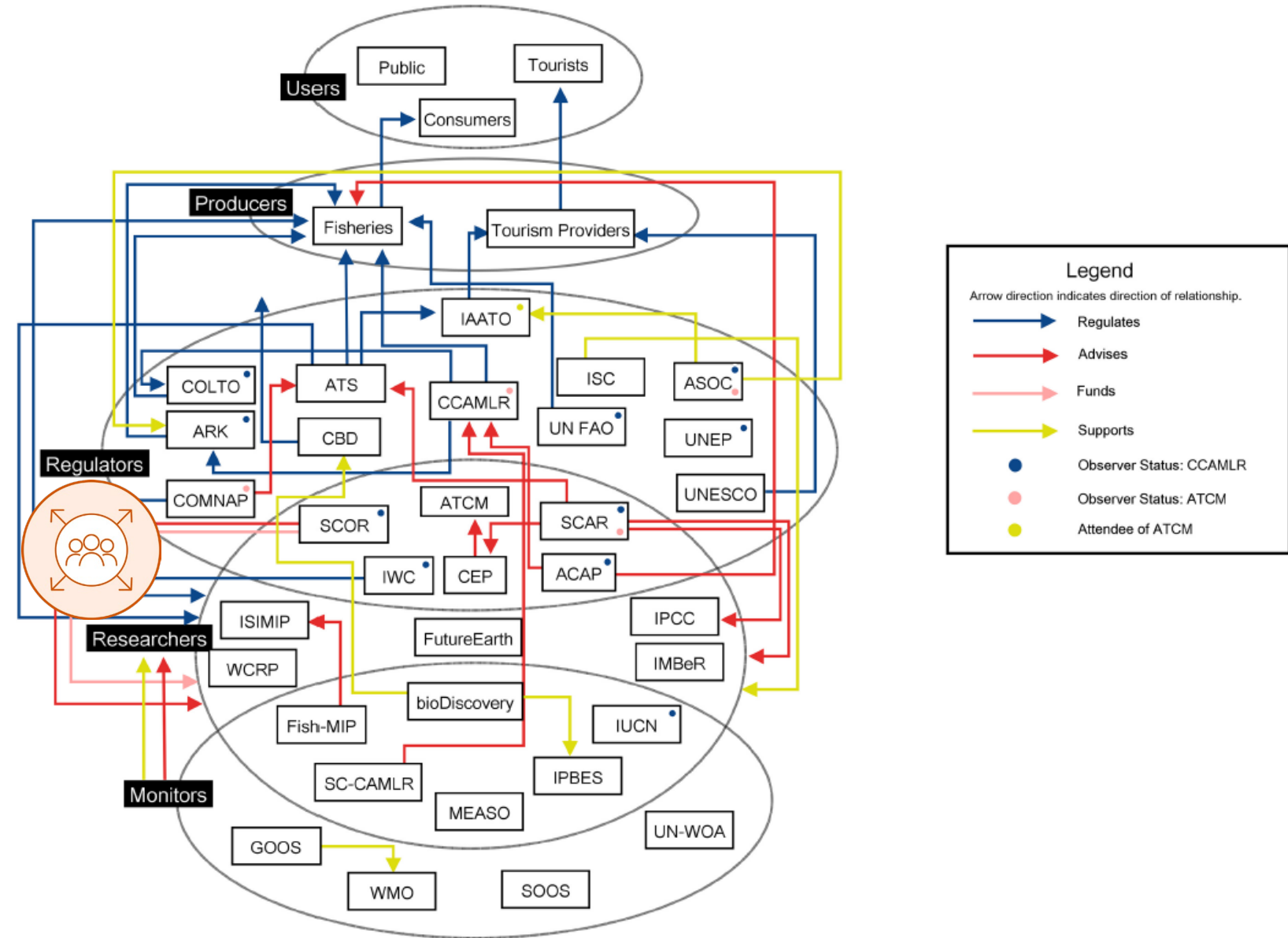
Molinengo et al., (2021)

“continuous engagement with clear goals and iterative steps was found to be one of the success factors”

Karcher et al., (2024)



1. Interplay through practices



Solomonsz *et al.* 2021

FIGURE 2 | Network visualization of relationships between key stakeholders in Southern Ocean ecosystem management, grouped by their functional role in ecosystem management as per methods. Some individual stakeholders do not have direct connections to other stakeholders, although their parent stakeholder groups, labeled as black text boxes, are connected with other stakeholder groups or with individual stakeholders.

3

Adopt (proven) strategies for improved knowledge useability



Relate new information to current



Value-add by converting data to informed knowledge, and informed knowledge to productive knowledge



Retail data by scaling for key end users & wholesale to those who can further convert/downscale for wider groups of users



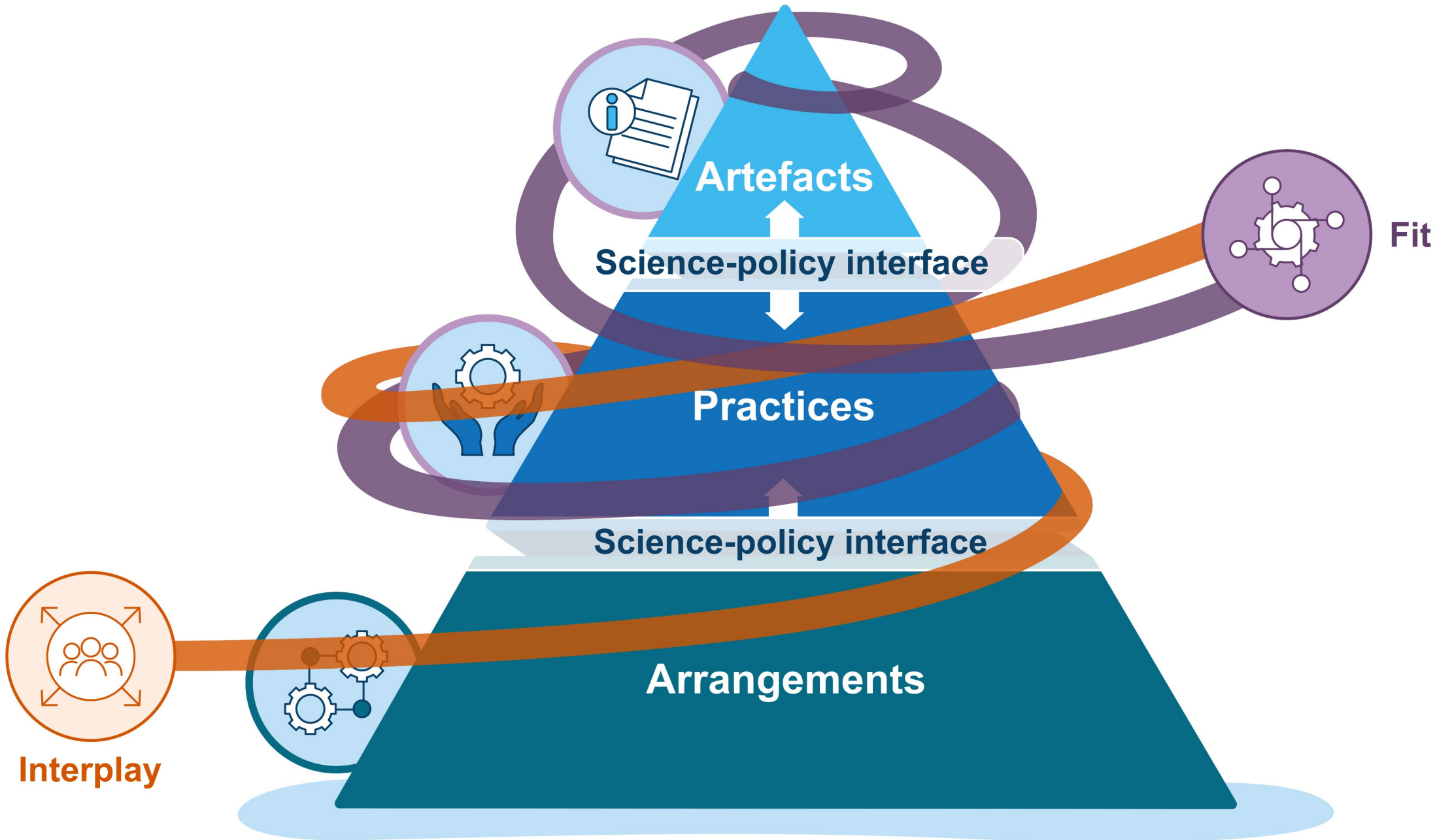
Customise by adjusting or framing data to meet individual users needs for useable information



2. Fit through interplay

“Level of fit reflects the process through which the knowledge being produced increasingly matches the information stakeholders believe they need to address problems they have defined.

Goodness of fit may be evaluated as achieving: **relevance** (i.e., it addresses the problem at hand), **usefulness** (i.e., it is provided in forms and at temporal and spatial scales that fit with user practices and needs), and **usability** (i.e., stakeholders can actually access and use the information in the form that it has been delivered), for the intended uses and user communities.”





Marine Ecosystem Assessment for the Southern Ocean (MEASO)

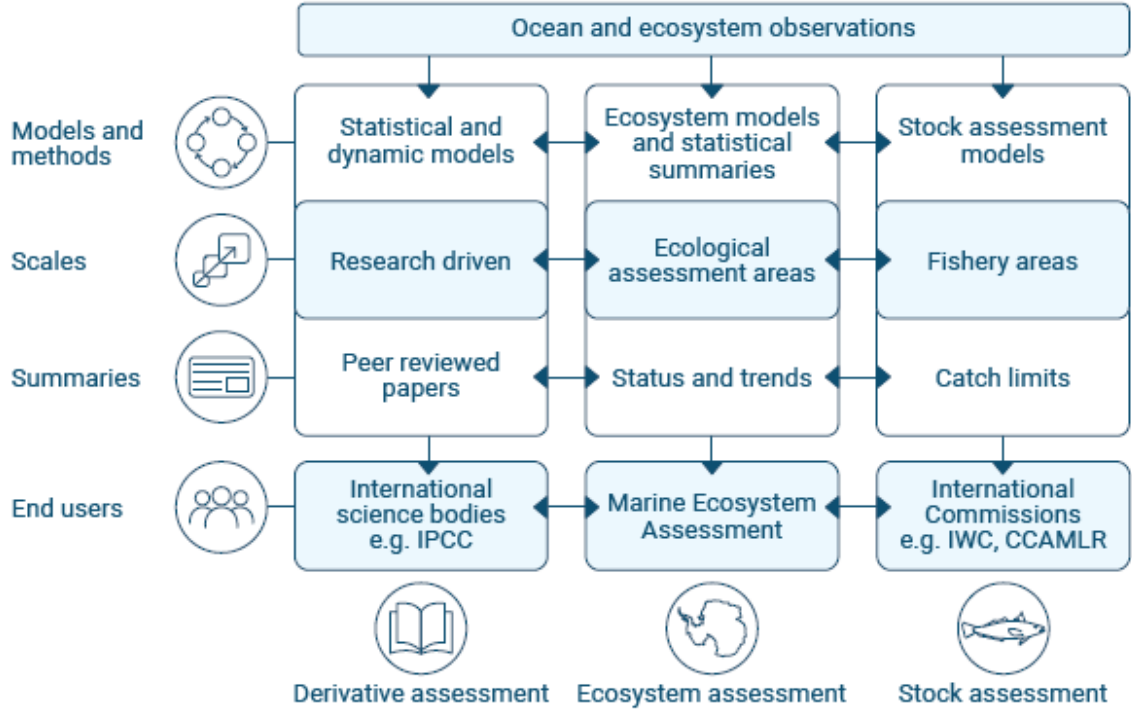
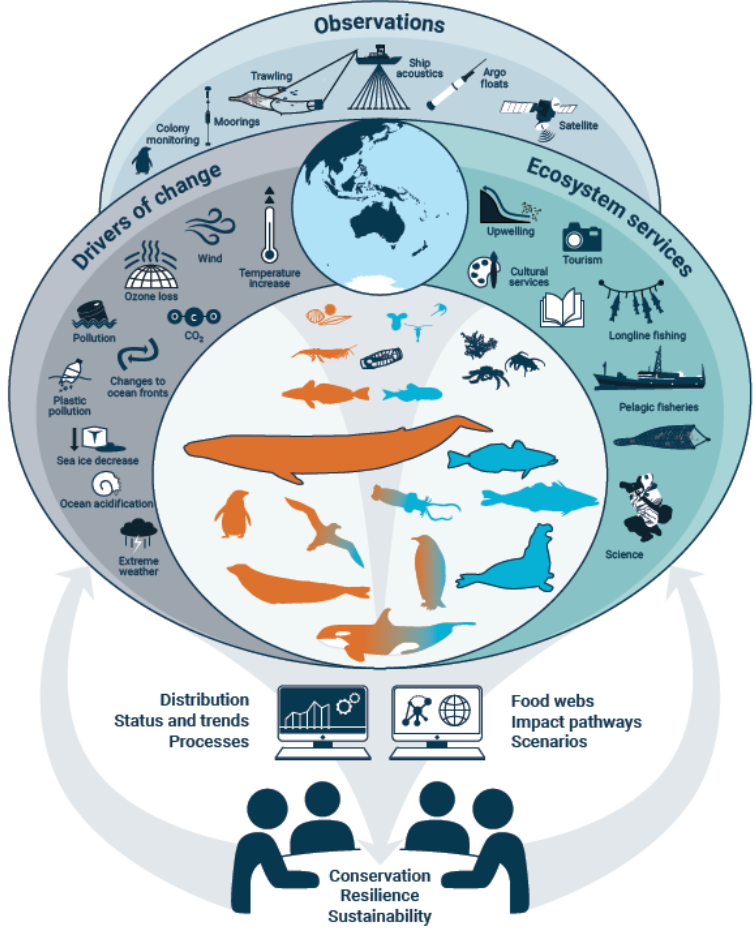


Figure 18: How research fits in to providing advice for future marine ecosystem assessments for the Southern Ocean. Adapted from Brasier et al., 2019

MSEAO assessment knowledge production



Scope of the first MSEAO assessment



Risk assessment for Southern Ocean ecosystem services

The below table summarises the risk assessment for Southern Ocean ecosystem services with associated confidence indicated as:

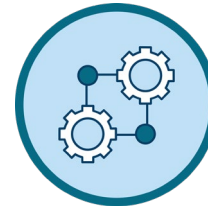
- High confidence
- Medium confidence
- Low confidence
- No assessed level of confidence available

Key

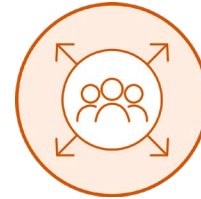
- High-level risk
- Intermediate risk
- Low-level risk
- Insufficient evidence to assess level of risk

Ecosystem services	Drivers						Overall risk rating
	Sea ice	Ocean temperature	Ocean acidification	Stratification	Glaciers, ice shelves, & ice sheets	Ocean circulation	
<i>Provisioning</i>							
Antarctic krill	●●	●●	●			○	High-level risk
Toothfish		●					Intermediate risk
Other harvested species		●					Intermediate risk
<i>Regulating</i>							
Blue carbon pathway	○	○	○	○	●●	○	Low-level risk
<i>Supporting</i>							
Primary production (open ocean)	●●		●	●●		○	Intermediate risk
Primary production (coastal)	●●		●●	●	●●		High-level risk
Nutrient cycling	○			○	○	○	Low-level risk
<i>Cultural</i>							
Tourism and recreation	●●*				○		Intermediate risk

*there is medium confidence for the effects on wildlife, but no assessment on the level of confidence for the effect of sea-ice change on tourism and recreation overall.



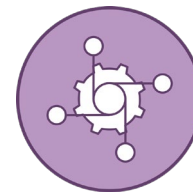
- Non-mandated but invited
- Strong links and cross-membership with CCAMLR



- CCAMLR interaction
- Government advisor interlocuter
- Pre/post workshop development



- Technical workshops & conferences
- Inclusion and diversity practices
- CCAMLR briefings

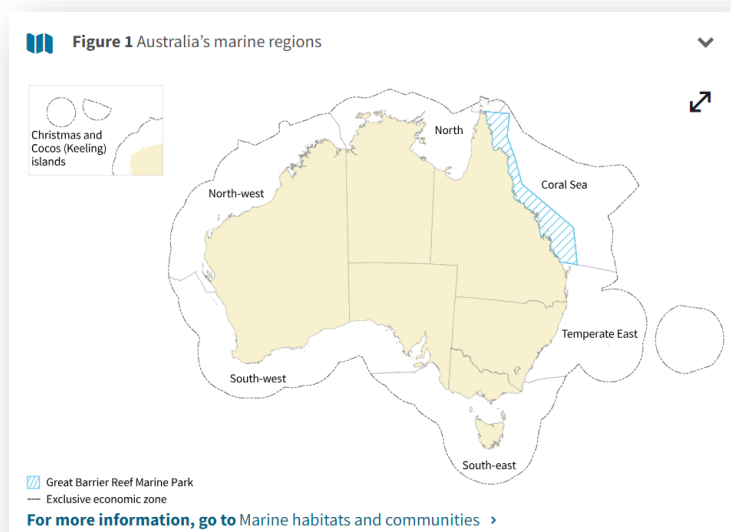


- Customisation for IPCC
- Customisation for IWC
- Customisation for CCAMLR

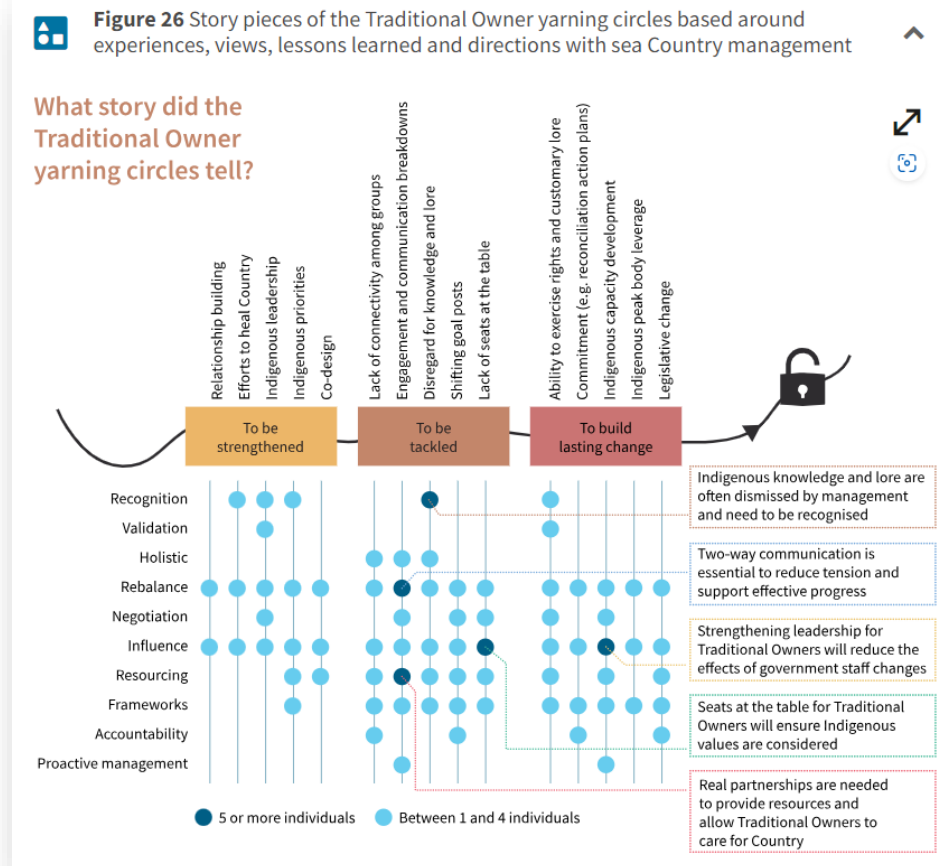


- Models
- Ecosystem & risk assessments
- Status reports & papers
- Summary for policy makers

Australia state of the environment 2021: marine (SoE-M)



- National, 5yr monitoring timeframe
- Panel of independent authors
- Synthetic & Expert-based assessment
- Outlook and impacts, Environment, Pressures, Management effectiveness for key marine assets
- Inclusion of Indigenous experts



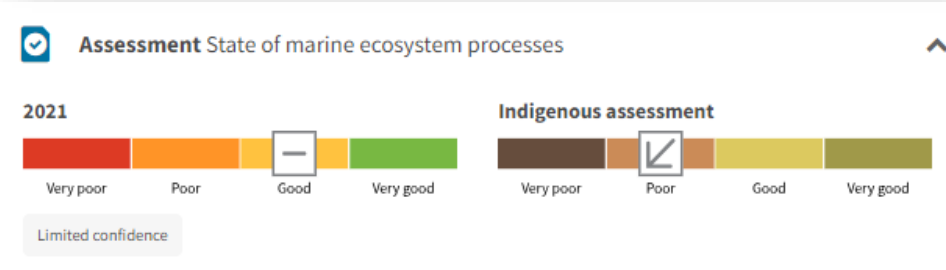
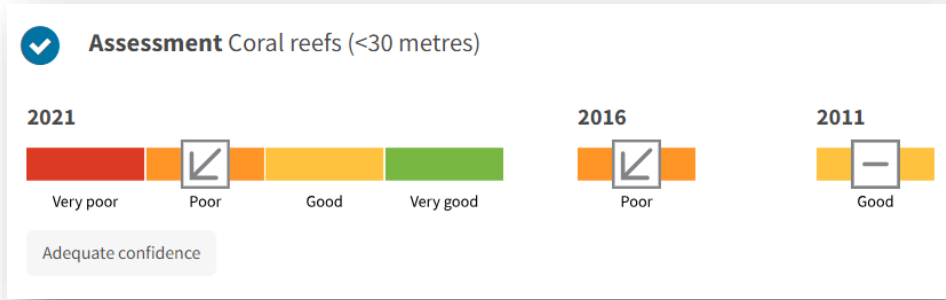
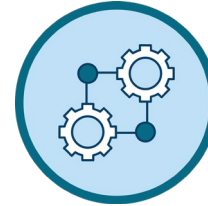


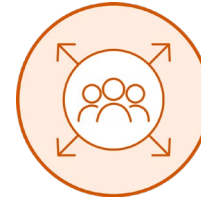
Table 1 Summary of the association between outcomes and human wellbeing, and the implications of outcome grades for the state and trend of human wellbeing

Component	Assessments			Links to wellbeing components							Implication of outcome for wellbeing		
	Assessed grade	Assessed trend	Assessed confidence	Health	Living standards	Community and social cohesion	Security and safety	Freedom, rights, recognition and self-determination	Cultural and spiritual fulfilment	Connection to Country and nature	Wellbeing state	Wellbeing trend	Wellbeing confidence
State and trend of marine habitats and communities	Good	Stable	Limited	N	N	N	Y	N	Y	Y	Positive	Stable	Limited
State and trend of marine species	Good	Unclear	Limited	N	Y	Y	Y	N	Y	Y	Positive	Unclear	Limited
State and trend of marine ecosystem processes	Good	Stable	Limited	Y	Y	N	Y	N	N	N	Positive	Stable	Limited
Pressures on the marine environment associated with climate change and associated extremes	Very High impact	Deteriorating	Adequate	Y	Y	Y	Y	Y	Y	Y	Very negative	Deteriorating	Adequate
Pressures on the marine environment associated with population growth	High impact	Stable	Adequate	N	Y	N	Y	N	N	Y	Negative	Stable	Adequate

Trebilco, et al. (2021)



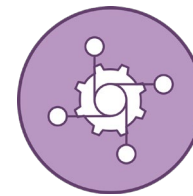
- Mandated but not linked to specific decisions
- Strong links with Federal Env agency



- Federal agency interaction
- Indigenous scholars on team
- Highly-networked science team



- Online surveys & meetings
- Indigenous assessment development
- Continuous agency briefings



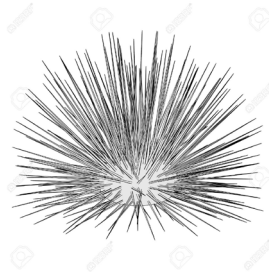
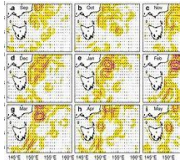
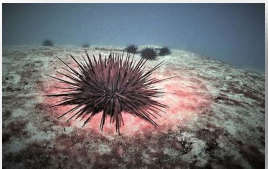
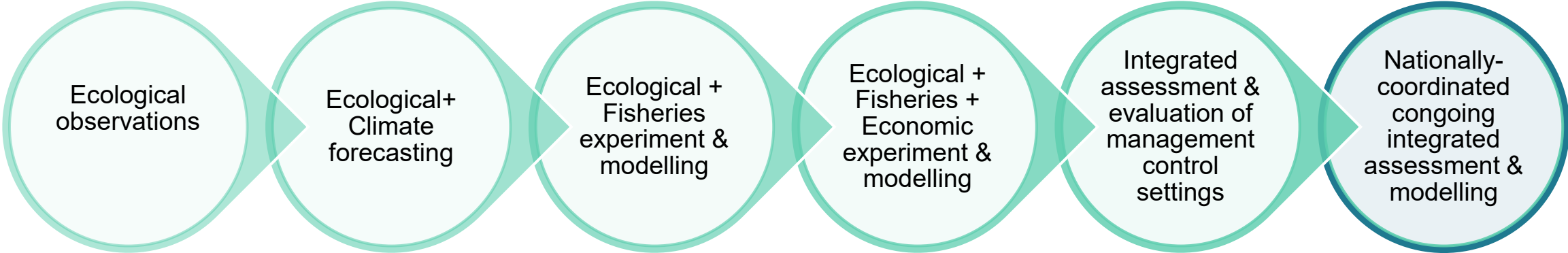
- Development of parallel Western & Indigenous assessments
- Customisation for DCCEEW internal purposes

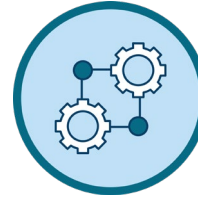
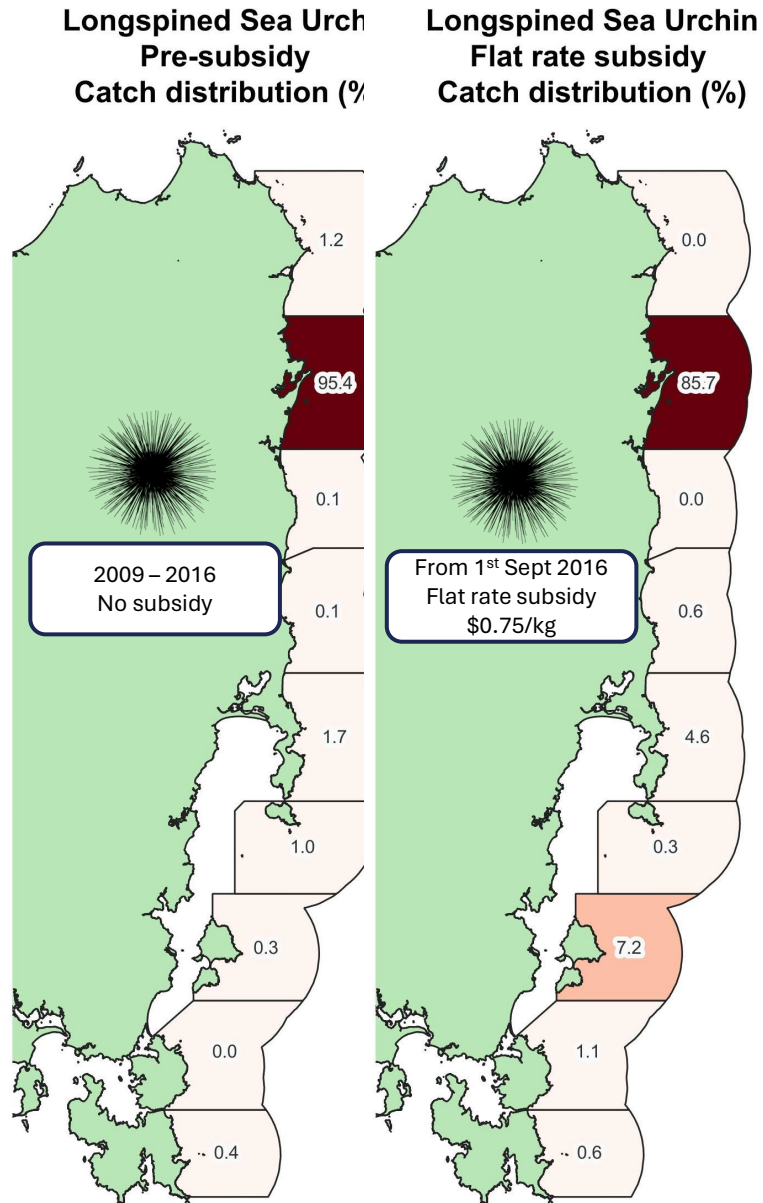


- High-level assessments
- Method development (Indigenous)
- Matrix linking outcomes to wellbeing

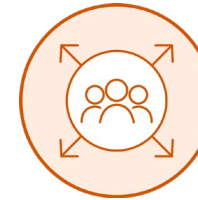


Long-Spined Urchin Science program (Australia)





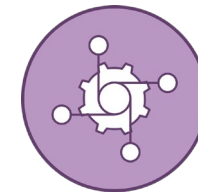
- Non-mandated through to mandated
- Strong links with management agency
- Industry & govt R&D funding for solutions



- High frequency, many forms
- Permitting negotiations
- Industry and research site tours



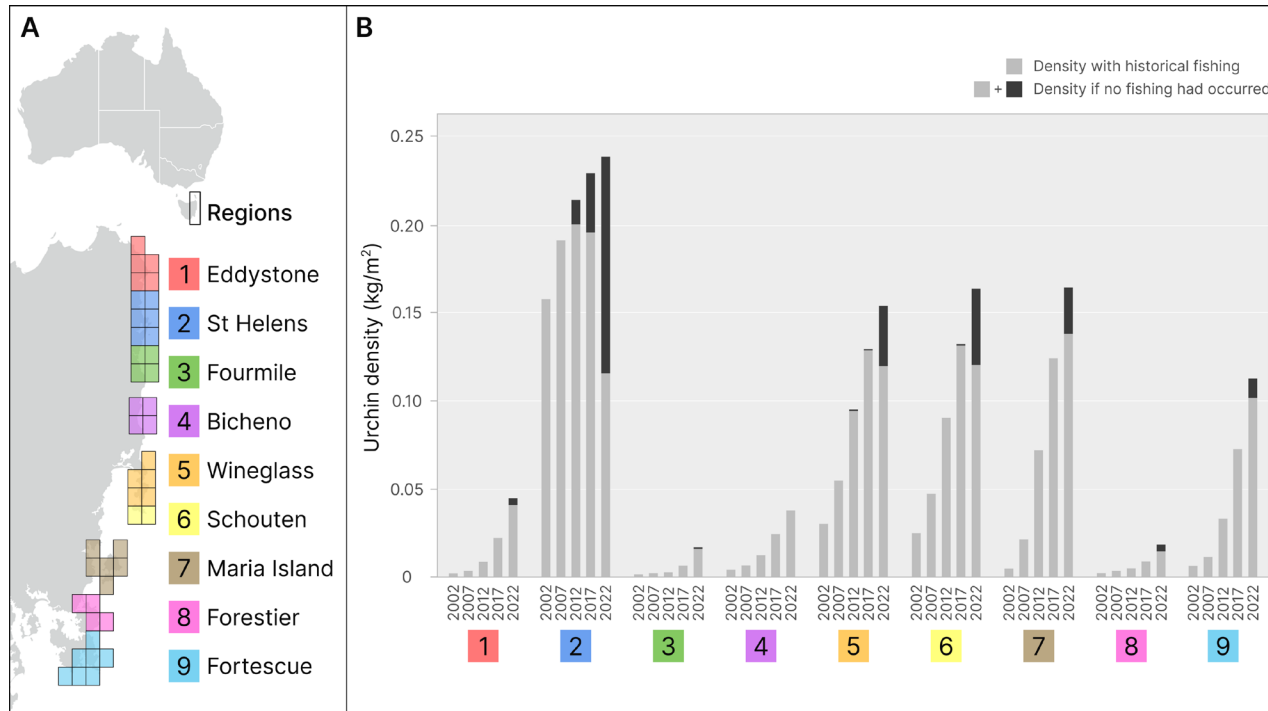
- Workshops with industry & govt
- Commercial trials and evaluations under research permits
- Use of commercial vessels and crew



- Customisation for Fisheries Advisory, Environmental regulators, and industry investors

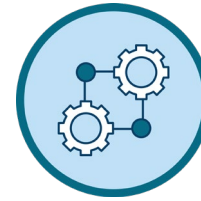


- New fishery stock assessments
- Ecosystem & risk assessments
- Subsidy reviews
- Science plan for a national management framework

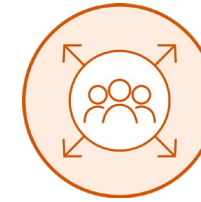


Impact of fishing on urchin populations (kelp protection): A size-structured stock assessment model

Creswell *et al.*, 2024 (submitted)



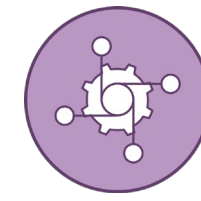
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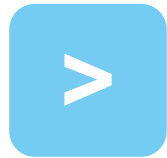
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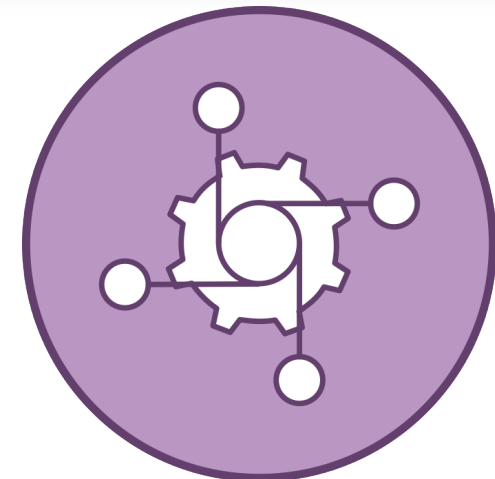
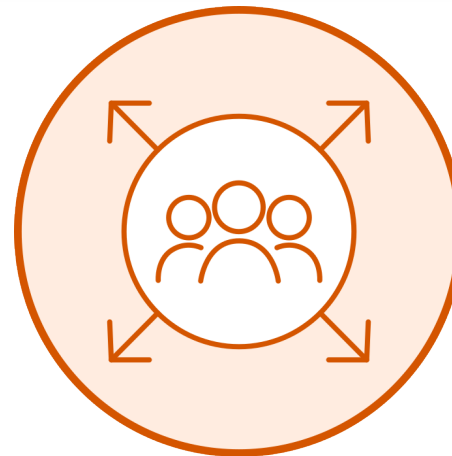
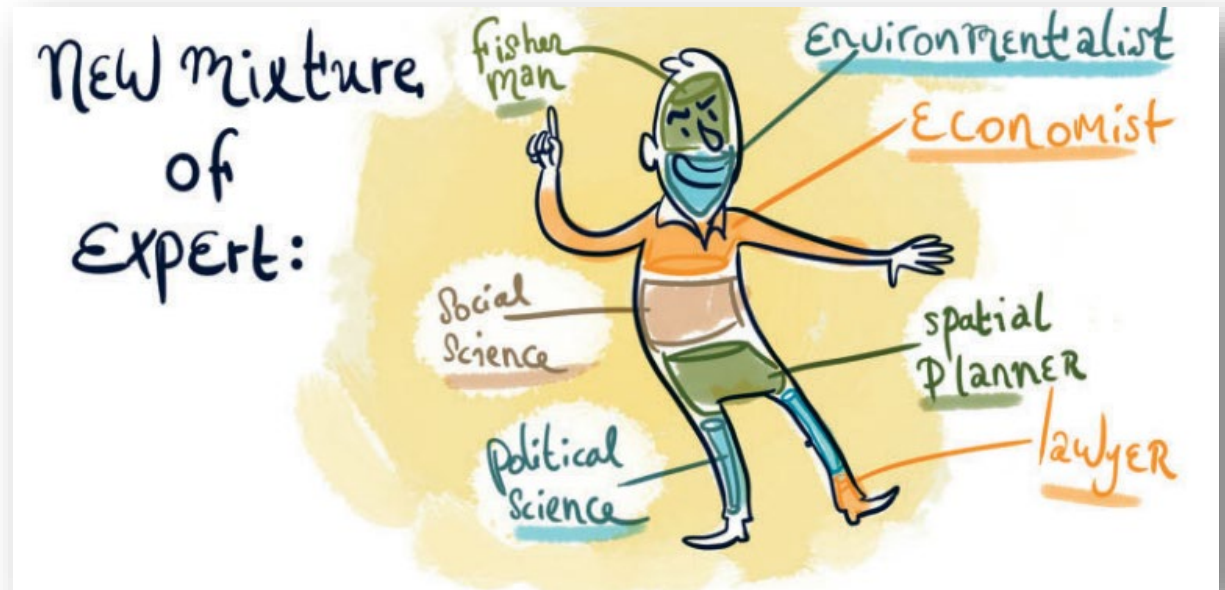
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Take aways

Opportunity to improve useability:

1. See what you do as knowledge production
2. Find out from governors what they are seeking
3. Adopt proven strategies for improved knowledge useability - Interplay & Fit



With thanks to:

Marta Ballesteros, Maria Carmen Lemos, Tony Press, Gretta Pecl, Jess Melbourne-Thomas, Marcus Haward, Ian Dutton, Maree Fudge, Rowan Treblico, John Keane