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CO-ORDINATION AND SUPPORT ACTION

WP4 Ecosystem Approach to Ocean Health & Stressors

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Tools for credible decision making;

an analysis of successful tool application in ecosystem based management.

Dickey-Collas, Rindorf, Daníelsdóttir, Fay, Johannesen, Townsend, Snelgrove, Anderson, Stephenson

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Tools for trade-off analysis in Ecosystem Based Management (EBM)

Atlantic Ocean Research Alliance (AORA) created a task group to improve our understanding of the process leading to successful development & uptake of tools in the EBM process.

USA, Canada & EU

https://www.atlanticresource.org/aora/site-area/publications/ea2ohs-wg/tools-ecosystem-based-management

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The talk in a nutshell…

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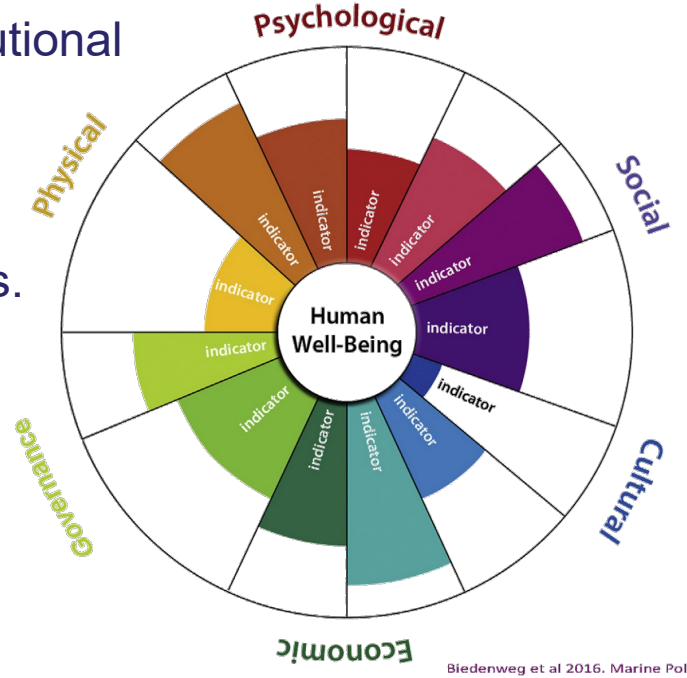
EBM & trade-offs

EBM recognizes the interconnections between the physical, biological, social (incl. cultural) & economic components of marine ecosystems.

Trade-off “A choice that involves losing one quality or service (of an ecosystem) in return for gaining another quality or service. Many decisions affecting ecosystems involve trade-offs, sometimes mainly in the long term.” TEEB (2010)

A portfolio of ecosystem, economic, social, & institutional management objectives exists in all jurisdictions.

Many tools have been developed to deal with the daunting complexity & breadth of trade-offs.



Biedenweg et al 2016. Marine Policy

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Best practice for developing tools for EBM

- **credible methods** to construct the evidence (documented, reviewed with broader social acceptance than required for journal publication)
- **legitimate process** of tool development as outcomes used in public decision-making, likely develop through co-creation/participation
- address **uncertainties** openly
- **realistic cost** of tool development & application
- **quality control** the process for use of the tool, incl. training of users
- ensure **socially accepted treatment** of data, data management & decision-making (FAIR principles, Aarhus Convention)
- **test the tool** in range of situations to ensure that it is robust & useful

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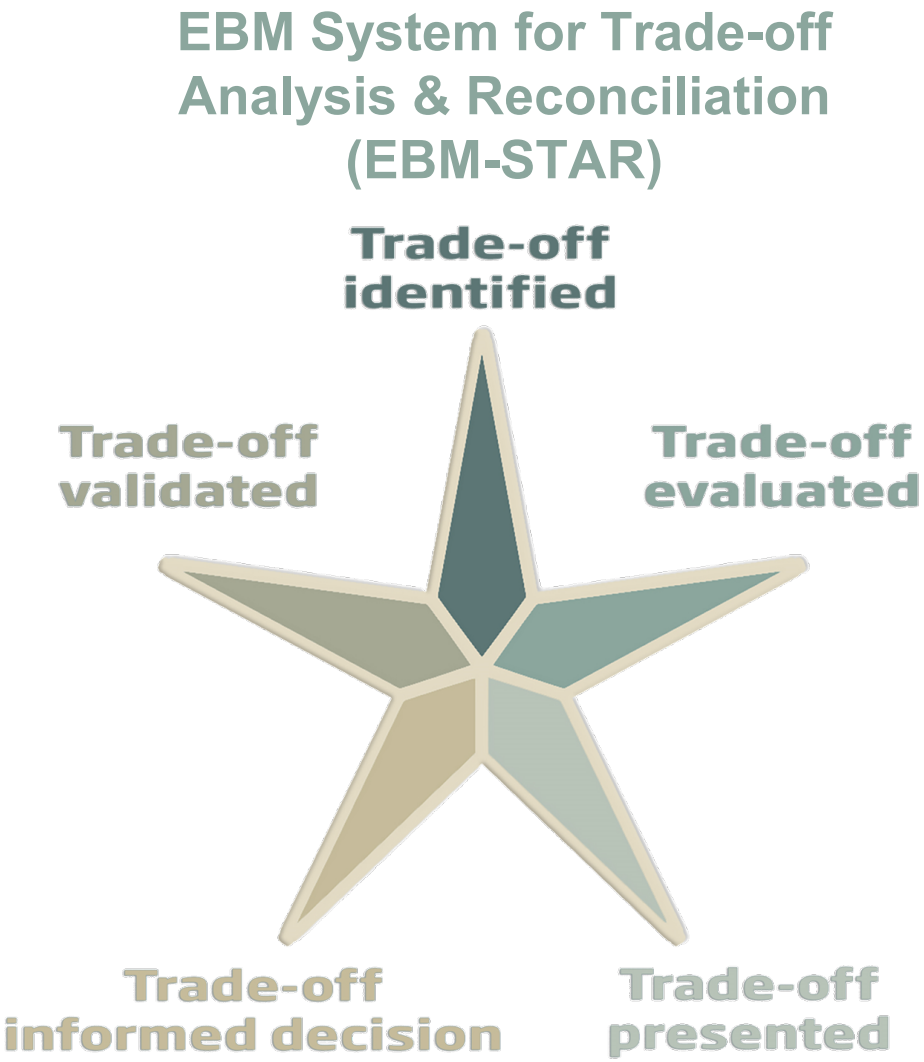
Framework for analysis of use of tools

How to assess successful application of tools for EBM trade-off considerations?

A successful application of a tool would cover some elements of identification, evaluation, & presentation of trade-offs; evidence of the use of the tool in decision-making; & validation of the trade-offs as part of an iterative & adaptive process.



Types of tools considered:

Case studies of operational EBM tools were assessed using EBM-STAR from a range of **broader** & **specific** tools:

- Risk assessment
- Management strategy evaluation
- Multi-criteria decision making
- Ecosystem services framework
- Strategic environmental assessment
    - Conceptual modelling
    - Static spatial planning & evaluation tools
    - Models of intermediate complexity
    - Strategic simulation models
    - Bayesian belief networks
    - Dynamic spatial models

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EBM-STAR applied to case studies, including:

Ecosystem Services Framework of Belize Coastal Zone Management Plan (InVEST)

Risk Assessment-Pathways of Effects of Anguniakvia Niqiqyuam Marine Protected Area Planning (risk assessment).

Strategic Simulation Models (End-to-end models) of Mississippi River Hydrodynamic & Delta Management

Dynamic spatial fisheries models to determine impacts of closed areas on species impacted by fisheries in the Adriatic

Multi-criteria Decision Making (MCDM) for Horseshoe crab fishery and Red Knot conservation.

MSE to determine long term management targets for small pelagics

MICE to determine short term impact of advised catch levels on bycatch of porpoises

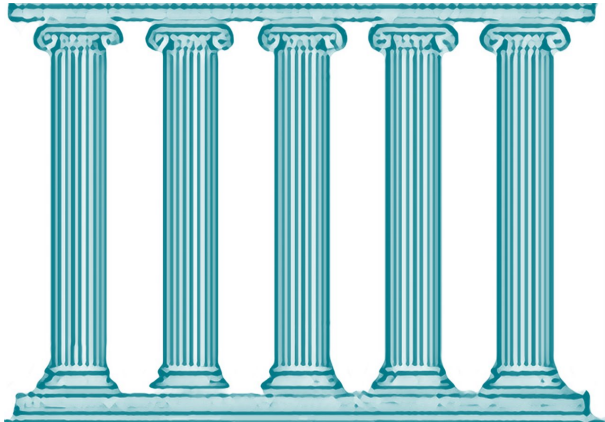
Worked example…. Mississippi river hydrodynamic & delta management study (end to end models)

Suite of physical models (flow & sediment) coupled with habitat suitability models & food web models to allow stakeholders to explore choices on wetland morphology & salinity on the fisheries ecosystem (1° production, fish & mammals).

de Mutsert et al 2017 Ecological Modelling

Tools not applied uniformly across management objective pillars.

- many tools can potentially examine trade-offs between management objective pillars
- few operationally applied to social & even fewer to institutional objectives
- although many marine EBM trade-off decisions implicitly incorporate social & institutional objectives; the use of evidence base in those decisions, & actual decision making process is opaque & difficult to assess
- current examples of EBM offer little indication of explicit evidence use & transparent decision making for social & institutional management objectives (pillars)



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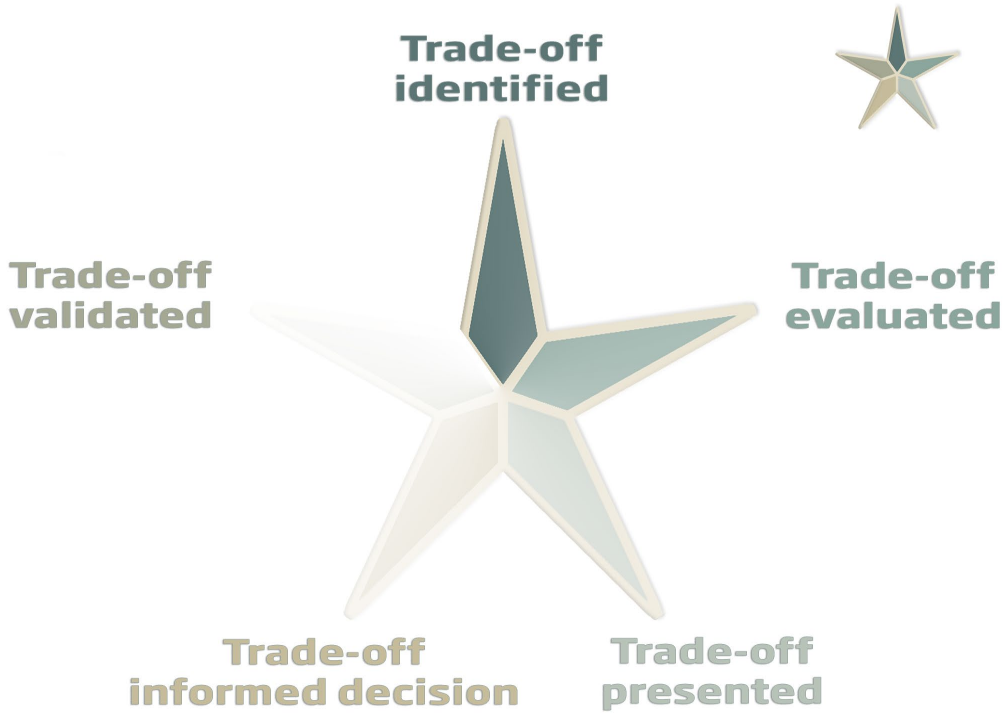
Analysis hampered by paucity in reported use & validation

Analysing EBM-STAR elements of presentation, usage & informing decision making process, & validation of application of tools generally appears outside the primary research literature.
Adds to opaque nature of the evidence base by which to assess success of tool application.

Confidential processes & implicit decision-making further prevent systematic assessment of success in opaque parts of EBM-STAR.



What have we learnt?

- Best practice for developing tools often not used
- Most AORA jurisdictions lack any national or international arena, or governance structure in which to use trade-off tools (regional – yes)
- Lack of incentive for validation of tools & models
- Tools differ between sectors & disciplines; integration of tools represents a major challenge
- Information on some objectives is usually not presented
- Many of the elements from EBM-STAR are outside current mechanisms for rewarding academic & institutional researchers

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Conclusions

Much invested in developing tools for EBM across AORA jurisdictions & host of tools exist to support trade-off analysis (assess state & explore possible options & consequences of decisions).

Only a proportion of the tools have been operationally applied/used.

Provision of tools for societal decision-making requires that researchers operate beyond the traditional boundaries of their training.

Workshop could not analyse the success rate of tool application of tools for trade-offs in marine EBM.

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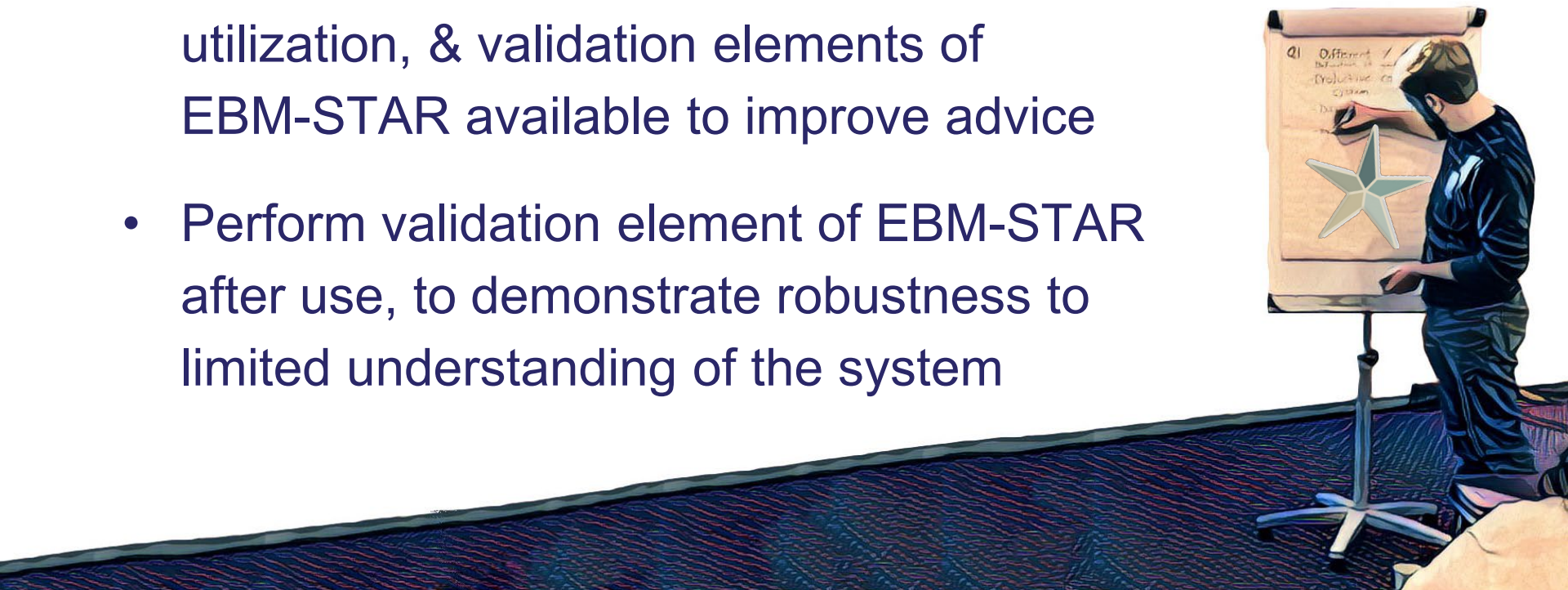
Recommendations

- Adapt tool development to ensure that social & institutional trade-offs become as explicit as ecosystem & economic trade-offs.
- Make data & information from the presentation, utilization, & validation elements of EBM-STAR available to improve advice
- Perform validation element of EBM-STAR after use, to demonstrate robustness to limited understanding of the system



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