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Integrating management of marine activities in Australia

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ABSTRACT

Integrated management (IM) has been widely proposed, but difficult to achieve in practice, and there remains the need for evaluation of examples that illustrate the practical issues that contribute to IM success or failure. This paper synthesises experiences of academics and practitioners involved in seven Australian case studies in which there have been attempts to integrate or take a broader, holistic perspective of management. The evaluative framework of Stephenson et al. (2019a) was used as a lens to explore, through workshops and a questionnaire survey, the nine key features and five anticipated stages of IM in the Gladstone Harbour Project, the Great Barrier Reef, the Northern Prawn fishery and regional development, the South-East Queensland Healthy Waterways Partnership, the Australian Oceans Policy, the New South Wales Marine Estate reforms, and progress toward Integrated Management in the Spencer Gulf. Workshops involving experts with direct experience of the case studies revealed that most of the key features (recognition of the need; a shared vision for IM; appropriate legal and policy frameworks; effective process for appropriate stakeholder participation; comprehensive suite of objectives (ecological, social, cultural, economic and institutional); consideration of trade-offs and cumulative effects of multiple activities; flexibility to adapt to changing conditions; process for ongoing review, evaluation and refinement; and effective resourcing) were seen as important in all case studies. However, there are only a few examples where key features of IM were implemented 'fully'. A subsequent questionnaire of participants using 'best-worst' scaling indicated that an appropriate legal and institutional framework is considered to have most influence on IM outcomes, and therefore is the most important of the key features. This is followed in salience by effective stakeholder participation, effective resourcing, capacity and tools, and recognition of the need for IM. Key features may change in relative importance at different stages in the trajectory of IM.

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1. Introduction

It is recognized that marine space, especially the coastal zone, is increasingly crowded (Jouffray et al., 2020, O'Hara Casey et al., 2021). There is, therefore, a growing need for integrated management (IM, also called Integrated Ocean Management) of activities. Currently, activities are usually managed sectorally, often by different authorities with overlapping jurisdictions and mandates. Such management systems are unable to adequately address conflicts, identify and manage trade-offs, equitably distribute benefits, or address cumulative effects. There is an increasing need to integrate across activities and sectors and to achieve more comprehensive social-ecological outcomes founded on a definition of sustainability that includes ecological, social/cultural, economic and institutional considerations (e.g. Stephenson et al., 2021). There is also a growing need for integration of holistic adaptation to climate and social change and plan for the use of new frontiers, such as offshore high energy environments and the deep ocean (Novaglio et al., 2021; Kaikkonen and Putten, 2021), while considering human and ecological connections and development needs in the coastal zone (Sheaves et al., 2016).

IM and related concepts including ecosystem-based management and marine spatial planning have been part of marine policy for many years (Day et al., 2019; Winther et al., 2020), but IM has been difficult to achieve in practice. There has been little evaluation of examples that illustrate the practical issues that contribute to IM success or failure. IM is a hard thing to simulate *in silico*, difficult to practice before implementation, and there is limited opportunity for replication. One cannot easily run virtual or field experiments/simulation across diverse managed activities and across all ecological, economic, social/cultural and institutional considerations of sustainable use. While some individual initiatives have received attention (for example the Great Barrier Reef, Dobbs et al., 2011) there has been insufficient systematic evaluation of previous IM attempts (but see Bellamy et al., 2001). Given these limitations, a comparative analysis of what has been done can guide practitioners and give them confidence in choosing between options for implementing IM.

Stephenson et al. (2019a) proposed a framework for evaluating IM marine activities based on incremental adjustment and alignment of existing management systems, rather than undertaking radical shifts in governance structure and management process and building anew (Fig. 1). The framework can be implemented incrementally, with differing stages of maturity and readiness of sectors across a range of locations and spatial scales.

This paper uses the Stephenson et al. (2019a) framework to elicit and evaluate the experiences of academics and practitioners involved in seven Australian attempts to integrate or take a broader, holistic perspective of management. Australia has a long history of seeking integration in marine management (Vince et al., 2015) and several examples of its implementation are well known. Together these case studies cover a diverse range of ecosystem types, varying degrees of coastal development and marine uses, and differing approaches to IM.

Through this comparative analysis, we aim to contribute to IM theory and practice by testing the value of the Stephenson et al., 2019a framework in answering the following questions:

Were the nine key features and five phases identified by Stephenson et al., (2019a) reflected in previous IM case studies?
Is there a priority among the key features?

2. Methods

We used a mixed method comparative case study approach to examine IM implementation in seven Australian case studies. Our evaluation included application of a standard framework or lens in workshops to elicit input from participants with direct experience of the case studies. We also canvassed experienced participants about priorities for IM, using a questionnaire.

2.1. The evaluative framework for IM

We applied the evaluative framework for IM developed by

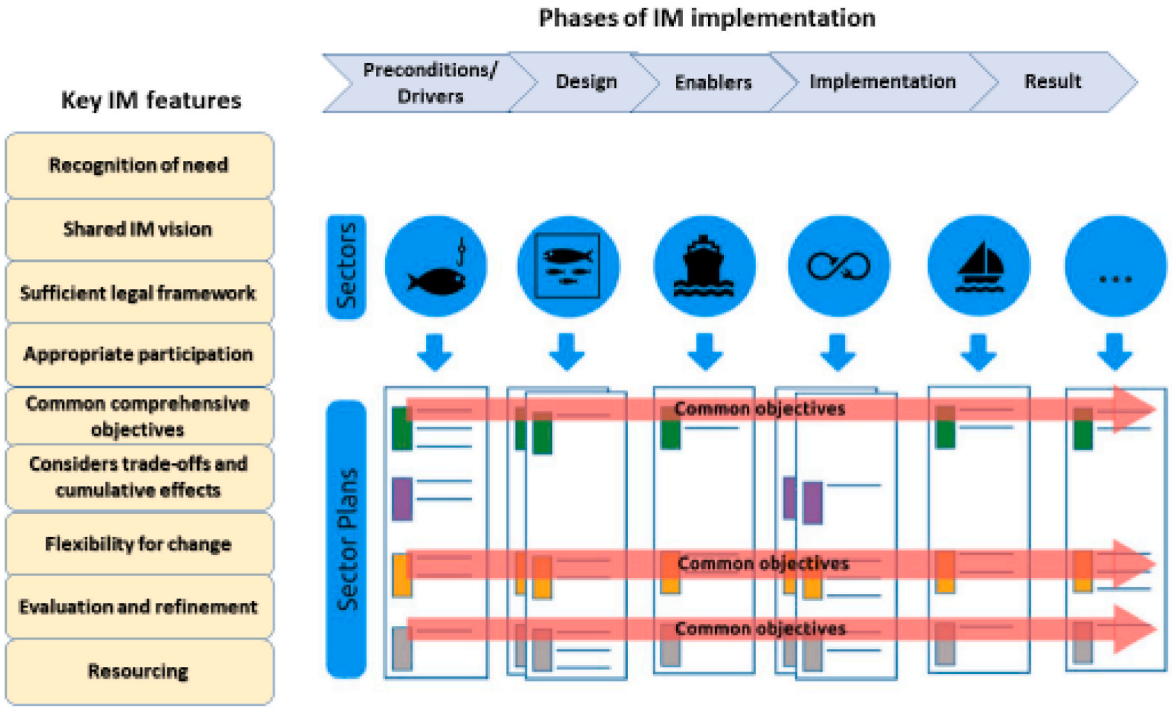

Fig. 1. Vision for a practical framework for integrated management (IM) (after Stephenson et al., 2019a). IM is a process that influences the planning and management of diverse activities through nine key features and five phases of implementation. According to this vision, IM is seen as linking existing planning by influencing sector-based plans to include a common set of objectives for ecological, social/cultural, economic and institutional values that can form a basis for evaluation of trade-offs and cumulative effects.

Stephenson et al. (2019a), which specifies nine key features and five phases that form both a framework for implementation and a lens for evaluation of IM processes (Fig. 1). Individuals with both scientific and operational knowledge of a range of potential Australian IM case studies met in two face-to-face workshops (Hobart, March 27/28, 2018 and Brisbane, April 9/10, 2018). Participants (many co-authors of this paper) with experience in case studies of interest, knowledge and experience of IM in Australia or in the development of the investigative lens, were selected to contribute their experience and theoretical sensitivity to the project (Strauss and Corbin 1998).

The group reviewed a set of possible case studies and settled on the final seven at the first workshop. The full descriptions of most of these cases studies were not fully written/synthesized in the literature, so it was essential to have the presence of people with direct expertise. Additional details are presented in a workshop report (Stephenson et al., 2019b).

2.2. Selection of the seven case studies

The seven case studies (Appendix 1) represent a broad spectrum of types and degree of IM and were selected as information-rich cases to provide variation in practice and enabling us to elucidate diverse perspectives on the implementation of IM (Flyvbjerg, 2006). While there are other examples of movement towards IM in Australia (e.g. Western Australia, 2021) the selected case studies include different geographic location, size, longevity, jurisdiction and activities. The Australian Oceans Policy (AOP, 2001–2012) offers important lessons despite the attempt to implement widespread, nation-wide IM being unsuccessful. The Great Barrier Reef management arrangements comprise a long-standing process that has evolved from management of an MPA through spatial planning to IM (Day et al., 2019). The South-East Queensland Healthy Waterways partnership (SEQHWP, Queensland) and Gladstone Healthy Harbour Partnership (GHHP, Queensland) initiatives were established to overcome problems (crises) that were not being addressed (or able to be addressed) by management of individual activities. The New South Wales Marine Estate case study is a contemporary attempt to reform governance and management using a 'whole of government' approach. The evolving Spencer Gulf planning process seeks to put in place an integrated framework to guide anticipated future development without compromising existing activities and ecosystem services, but to date the process has largely stalled. Finally, the Northern Prawn fishery (NPF, Gulf of Carpentaria) case study offers a perspective of the potential path of activity-based planning in an area in which anthropogenic modification of catchments that influence prawn production with other activities are increasing. The NPF cannot be considered (and was not established to be) IM, but is included as an example of how IM might incrementally emerge from internal and external drivers.

2.3. Workshops

Through a facilitated deliberative process, the workshop participants reviewed the framework developed by Stephenson et al. (2019a) and then examined each of the nine key features and five phases of development of IM (articulated in Fig. 1) for each case study. Participants collaborated in plenary sessions and breakout groups to populate the 9 × 5 table of features and phases. Group discussions were captured via written notes by the project team, and photos of whiteboard work. They were verified with case study experts during and following the workshops. Workshop notes were compiled, verified with literature available for each case study, and the results were further compared iteratively with the participants. In the Results, we provide select examples of the evidence (including literature) that existed at the time of the workshop. Some aspects of each case study may have evolved since these workshops. We have made minor adjustments to ensure the tabulated results are not misleading for current circumstances, but have not attempted to provide comprehensive updates on events that have occurred since the time of the workshops.

2.4. Questionnaire survey of workshop participants

Following the workshops, a best-worst scaling (BWS) survey (Louviere et al., 2015) was used to assess individuals' evaluation of the nine key IM features (BWS literature refers to these features as attributes). The survey was conducted after the workshops, but before the draft workshop report, so was informed by individual experience of case studies, and discussions of the key features and phases of IM in the workshops.

BWS belongs to the conjoint analysis family of methods (Marley and Louviere 2005; Louviere et al., 2015), which collectively serve to identify preferences and trade-offs that contribute to individuals' choices with respect to "goods." These methods have been noted for their cognitive and administrative simplicity. It was not possible to present all combinations of the nine features because this would have resulted in a very large set of questions. To develop the optimal combination of the nine IM-features, a balanced incomplete block design (BIBD) was implemented (Fisher and Yates 1974). A BIBD can be implemented so that the probability of the variables that are compared in a 'block' is the same for all combinations. This allows statistical techniques (i.e. ANOVA) to be used for analysis. The final survey contained 18 repeat questions (sets) with different combinations of four of the nine IM-features. Each IM-feature occurred 8 times over the 18 questions (see Appendix 2).

We conducted the BWS survey in 2019 with 21 workshop participants. The BWS survey was emailed to participants who were asked to choose the most and least important key-IM-feature out of choices of 4 in each of multiple questions. We analysed BWS response data in two ways. The first was simply as frequency counts for the number of times each attribute was chosen as most important and least important across the series of 18 sets presented to each respondent. The second was as a standardized "score" for each IM-feature. Each score was calculated as the difference between the frequency of being chosen as most vs least important divided by the availability of each attribute (meaning the number of times it appeared across the design (8) × number of respondents (21) (Louviere and Flynn 2010)). The standardized score indicates the relative strength of influence, or *salience*, of the IM-feature on IM outcomes across all respondents. Standardized scores are on a scale from −1.0 to +1.0, with scores toward +1.0 indicating most salience and scores toward −1.0 as having least influence on IM outcomes.

The BWS survey also asked the respondents to rate the importance/relevance of each IM-feature on five different phases of IM that were previously identified in the 'lens' using a three-point rating scale where 0 = 'not relevant', 1 = 'relevant', and 2 = 'essential'. Using the nine different IM-features (the same ones as in the BWS survey) and 5 different phases (preconditions and drivers of change, intentional design + rearrangement, enablers of/barriers to change, features of resulting IM, and evaluation and modification) the respondents were asked to rate 45 (5 × 9) different combinations of IM features and phases.

3. Results

3.1. Case study workshop results

Results for all seven case studies are summarized in Table 1. Rather than attempting a summary of all case studies for all features and phases, this section describes examples of strengths or accomplishments and gaps or shortcomings of the implementation of IM.

3.1.1. Evidence of the key features of IM

Recognition of need – The case studies show longstanding and widespread recognition of a need for integration in the management of

Table 1
Summary of accomplishments/strengths and shortcomings/gaps of the nine features and five phases of Integrated management for seven Australian case studies: Australian Oceans Policy (AOP), Great Barrier Reef (GBR), South-East Queensland Healthy Waterways partnership (SEQHWP), Gladstone Healthy Harbour partnership (GHHP) New South Wales Marine Estate (NSWME). Spencer Gulf South Australia (SGSA) and the Northern prawn fishery (NPF).

Case – AOP	Strengths/Accomplishments	Gaps/shortcomings
Features:		
Recognition of need	• Second in the World to develop a comprehensive Oceans Policy (Australia's Oceans Policy AOP, 1998) • Resource Assessment Commission articulated need for comprehensive approach • Experience of evolving considerations in GBR (GBRMPA)	• Different expectations of what planning and integration meant and lack of clarity on how to implement integrated management
Shared vision	• AOP articulated a clear vision	• Vision was not as inclusive as anticipated and as a result the vision was not adequately shared and major stakeholders questioned the vision
Sufficient legal framework	• National policy was created (AOP) • Attempted to build integrated management using the suite of pre-existing laws and policies • Stakeholders were used to management and governance control	• AOP was policy rather than legislation (insufficient political will for legislative approach) • Arrangements reinforced sectoral management • Too many laws and regulations, which were sometimes conflicting
Effective stakeholder participation	• Considerable effort devoted to achieve extensive engagement • Stakeholders knew each other due to previous processes • Participant stakeholders understood what the AOP framework was about	• Process wasn't agreed to by all parts of government, and some sectoral interests pulled it down • Suspicion between state and federal players; some stakeholders were negative due to failed previous processes • Lack of continuity of engagement process (engagement is not an end to the process)
Comprehensive objectives	• AOP articulated principles and objectives	• No clear process on how to link objectives of local initiatives into AOP • ENGO's were critical, wanted more
Consideration of trade-offs and cumulative effects	• While AOP did not explicitly mention trade-offs, this was widely considered by stakeholders to be a major objective • AOP process of engagement, and consensus approach, contributed positively to resolve trade-offs	• No explicit process to analyse trade-offs or cumulative effects. • Identified need to develop tools to evaluate trade-offs
Flexibility to adapt	• As a policy (rather than legislation) AOP could be changed • Early flexibility (first five years)	• After 2005, AOP became rigid and mired in its own processes related to marine environmental protection • Needed to build flexibility in the design of policy – e.g. regular reviews
Process for review, evaluation and refinement	• Requirement for review was explicit within the AOP • Planned process for evaluation (2002) was outsourced	• AOP failed to complete all of its objectives within the first five years, and ended before there was opportunity for refinement
Effective resourcing, capacity and tools	• Relatively well resourced at first	• Task of national planning was too large, complex, and novel, with many jurisdictional complications
Phases:		
Preconditions and drivers	• International commitment (UNCED) • Built on a decade of collaboration on the needs for more unified and comprehensive approaches	• Insufficient will for legislative action, so AOP was policy layered over existing sectoral based legislation
Intentional design	• Resulted in a national structure for IM, with clearly articulate vision	• A bold vision but insufficient architecture for implementation (a policy design issue)
Enablers (barriers)	• Initial start-up had good funding and resources.	• Consensus-based approach became a barrier to progress • Sector voices were stronger than the policy
Resulting features	• Establishment of National Ocean Office • Attempted to link management agencies in a set of common governance arrangements	• National Ocean Office located in regional location away from key agencies • Became targeted as an environmental issue rather than a broader governance issue
Evaluation and review	• Early success in consultation around IM • Australia recognized as international leader • Pieces of AOP design have been used in later initiatives	• AOP without legislation had to rely on collaboration in use of existing management pieces • AOP in original form was short-lived. Revised mandate provided a framework for marine protected areas network

Case – GBR	Strengths/Accomplishments	Gaps/shortcomings
Features:		
Recognition of need	• GBRMP Act (1975) recognized need for long-term protection of GBR while allowing for ecological sustainable use. • 'Emerald Agreement' (1979) articulated a clear vision for complementary management of federal waters and adjoining state (Queensland) waters within GBR Region; this means the management arrangements from High water out to seaward edge of GBRMP are common/shared. • GBR World Heritage listing (1981) recognized importance of considering islands and seas together (integrity) as part of the Outstanding Universal Value of the entire GBR	• Various external pressures from outside the GBR Region (e.g., poor water quality, climate change) are now well recognized, but the implications to address these pressures are far more complex because they occur across jurisdictions (or in the case of climate change, are global issues).
Shared vision	• Original 'Emerald Agreement' articulated a clear vision; this agreement has been periodically updated to reflect contemporary issues and arrangements with Queensland (known today as the 'GBR Intergovernmental Agreement') • GBR's management approach began with spatial zoning, then added site-based planning and has evolved to include a range of complementary management tools incorporating concepts of EBM and IM.	• The vision of GBR Indigenous Traditional Owners (TOs) for co-governance of their sea-country is difficult to achieve; however, considerable improvements towards that vision have occurred over the last 20 years including accreditation by the federal and Queensland governments of 'Traditional Use of Marine Resource Agreements' • Further opportunities exist to strengthen collaboration/cross jurisdictional management with Torres Strait and the Coral Sea Marine Park.
Sufficient legal framework	• GBRMP Act (1975) has had regular amendments, most recently in 2018.	• There is still National legislation that duplicates some approvals and permits associated with the GBRMP.

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Table 1 (*continued*)

Case – GBR	Strengths/Accomplishments	Gaps/shortcomings
	• Subordinate legislation (e.g., Zoning Plan) and Regulations also periodically reviewed and amended. • Complementary Queensland legislation ensures common approach across state and federal jurisdictions. • Linkages with national legislation to streamline processes for approvals and permitting.	• Traditional Owners aspire for a GBR wide tripartite agreement to be established with governments. • Many Sea Country native title claims remain unresolved. • Further opportunities exist to strengthen collaboration across and between governments to maximize delivery of management activities and reduce duplication.
Effective stakeholder participation	• Public engagement requirements for zoning have been mandated since the 1975 legislation; engagement for RAP/rezoning went well beyond mandated requirements • Considerable effort devoted to achieve extensive engagement to understand management arrangements. • Additional regional presence since 2005 • Partnership approach underpins delivery of 30 year strategic plan (Reef 2050 Plan).	• The number of stakeholders involved in GBR matters has dramatically increased since the GBRMP was originally established. • While Indigenous Traditional Owners (TOs) are not stakeholders (they are Rightsholders), and TOs are being more effectively engaged, further improvements still need to occur.
Comprehensive objectives	• GBRMP Act has a clear hierarchy of objectives and the Emerald/GBR Intergovernmental Agreement clearly articulates principles • Each GBR zone type has a clear objective which also assists management. • Reef 2050 Long-term Sustainability Plan includes an articulation of objectives (with measurable indicators introduced in 2021)	• Knowledge gaps prohibit manager's ability to measure progress against objectives.
Consideration of trade-offs and cumulative effects	• Cumulative impact policy and policy on net benefits agreed for the GBR as part of implementation of the Reef 2050 Plan • Formal stakeholder engagement occurs for some permit applications, for policy and plans as well.	• Effectively addressing the synergistic and additive aspects of cumulative impacts is much harder than the policy implies; further work is still required. • Some impacts (e.g., climate change) are occurring at a rate requiring management to regularly adapt; other impacts (e.g., COVID19) require innovative ways to address the resulting issues or to address the processes associated with loss. • Clear guidance for the implementation of offsets within the marine environment is still required.
Flexibility to adapt	• GBRMP has remained relevant, innovative and has adapted to changing impacts and government priorities for over 45+ years. • Shift in management approach to support the ongoing resilience of the GBR to better withstand the impacts of climate change and system-wide declines.	• Being able to regularly review and adapt approaches are subject to resource constraints and shifting priorities.
Process for review, evaluation and refinement	• Mandatory 5-yearly Outlook Reports • 10-yearly review of Regulations as per Legislative Instruments Act • International reporting obligations including World Heritage Periodic Reporting • Well-established, and often bipartisan, structured decision making process in place for operational and tactical management responses. • 5-yearly review of the Reef 2050 Plan	• Whilst there is a recognized need to establish a whole of GBR integrated monitoring framework to provide quantitative data (where appropriate) to establish management effectiveness, this has not yet been fully developed and implemented. • Knowledge gaps on the condition, trend, thresholds and tipping points of key habitats, species, processes, social-ecological and economic values prohibit comprehensive evaluation and assessment. • Limited integration of Traditional knowledge into a social-ecological approach to monitoring and evaluation.
Effective resourcing, capacity and tools	• GBRMPA is relatively well resourced • Reef 2050 Plan identifies funding priorities although lacked mechanisms to secure stable funding to deliver the plan across all sectors. • Australian and Queensland governments will have invested over $3 billion (over 10 years 2014–15 to 2023–24) to implement the Reef 2050 Plan.	• Funding needs not fully identified or commensurate with the need to fully address all of the issues • Insufficient funding to build capacity for all Traditional Owner groups to engage and manage Sea Country.
Phases:		
Preconditions and drivers	• The iconic status of the GBR, wide community support and an international profile have helped when addressing key challenges. • The economic significance of the GBR to the Australian economy is a key driver (worth ~ A$6 billion pa – pre-COVID)	• The key emerging driver is climate change • Another important driver is technological change and population dynamics which have implications for social and cultural changes
Intentional design	• The GBRMP multiple-use management approach has evolved over 45+ years, and today considers EBM, cumulative impacts and IM • The systematic and representative planning approach utilised during the RAP/rezoning has become a global exemplar for many MPAs.	• Being able to measure outcomes and demonstrate one or more management actions achieved their intended effect.
Enablers (barriers)	• Iconic status of the GBR, wide community support and an international profile have all been key enablers. • Individual leaders within government, the GBRMPA and within key sectors have led to significant reforms and enabled innovative initiatives to occur.	• Effectively addressing cumulative impacts is a barrier to effective management • The governance and funding model are complex with the range of players and the ever increasing issues which need to be addressed.
Resulting features	• The initial multiple-use concept has evolved into effective IM. • GBRMPA regularly shares IM experiences (e.g. zoning) nationally and internationally	• While effective IM, has been largely achieved, there is still requirement to remain adaptable to changing ecosystem and government priorities.
Evaluation and review	• The 5-yearly GBR Outlook Report (OR) is a comprehensive and repeatable framework for systematically evaluating values (condition and trend, as well as forward projections) • OR includes an independent assessment of management effectiveness as part of 5-yearly reporting cycle • Systematic and periodic reporting (e.g., water quality report cards) also enable reviews of progress for adjoining areas • Reef 2050 Plan includes objectives underpinned by measurable indicators.	• Whilst there is a recognized need to establish a whole of GBR integrated monitoring framework to provide quantitative data (where appropriate) to establish management effectiveness, this has not yet been fully developed and implemented. • Knowledge gaps on the condition, trend, thresholds and tipping points of key habitats, species, processes, social-ecological and economic values prohibit comprehensive evaluation and assessment. • Limited integration of Traditional knowledge into a social-ecological approach to monitoring and evaluation.

Case – SEQHWP	Strengths/Accomplishments	Gaps/shortcomings
Features:		
Recognition of need	• Stages in the evolution of the evolution of the successful HW initiative, including 'eras' characterized by Community champions, Political champions, heightened scientific work and increased partnerships. The Lord Mayor of Brisbane personally attended and "drove" the agendas and meetings of the early Brisbane River forums. • Standardised method to calculate water quality grades from sub-catchments to catchments	• Identified triggers for Healthy Waterways including: the threat of legislation for protecting water quality in the Logan River, concerted and persistent lobbying by a powerful and authoritative environmental group and ongoing frustration within Brisbane City Council (BCC) about the fragmented management of river issues.
Shared vision	• A vision for SEQ waterways and Moreton Bay was established early in the process. Expert panels provided scientific oversight and integrated rigour • Marketing campaign, websites, branding indicate shared vision • People were proud of partnership. HWP offered annual awards (including local council and industry, volunteer, lifetime achievement.	• Degrading water quality from catchments to Moreton Bay
Sufficient legal framework	• Established under state government legislation (Queensland Environment Protection Act, 1994). Worked across jurisdictions. • Partnership linked diverse objectives of different councils. • Supported by the SEQ Regional Management Plan	• Was subject to 3 levels of government (national, state and local councils) although the SEQHWP sought to address this problem through a cooperative approach. • Management arrangements reflected the complexity of diverse administrative interest (especially local and state organisations) and a reference group of relevant stakeholders. • Limited buy-in from local councils. The Partnership was largely voluntary, but a few committed local councils applied pressure to ensure all councils participated • Participating local councils were different sizes and had different capacity, at different stages.
Effective stakeholder participation	• Previous community activism re poor water quality in Moreton Bay. • Dedicated communications staff and strategy that kept stakeholders engaged long term. • 'Values were regarded as vital to HWP's 'culture' and key values were identified as: Commitment by all players; Transparency of decisions and operations; Credibility of the science and of the projects; Accountability; Optimism or a sense of a positive future; Quality of work and of relationships; Clean water; and Peoples' expertise and their personalities across all sectors.	• No gaps or shortcoming identified in effective stakeholder participation
Comprehensive objectives	• Annual report cards with clear criteria and reporting structures • Objectives and results of annual report cards are communicated to the general public through websites and social media • Additional social objectives have been included as data has become available	• Ongoing water quality declines and intensifying urban development through SEQ • Have had to reduce sampling to calculate report cards due to cutbacks
Consideration of trade-offs and cumulative effects	• Reporting on Cumulative impacts on waterways was initial aim of the report card	• Cumulative impacts on water quality of development, land use etc.
Flexibility to adapt	• Public trust in report card system (other report cards have built themselves on the reputation of the SEQ Healthy Waterways report card) • HWP characterized as a 'change management' process that included vision, clarity and unity of process, champions, appropriate structures and processes, and resourcing	• Partnership has changed over the years due to merger and cuts in science funding • Contributions from SEQ Councils have altered over time but not sufficiently to allow all Councils to continue in the partnership
Process for review	• Expert science panels in early stages	• This has since changed due to changing partners and disbanding of expert science panels
Effective resourcing, capacity and tools	• Partnership was supported by Councils (and Queensland government) leading to 'Adequate financial resources generated through creative alliances of governments, industry and community, sourced externally and matched by an increased level of self-funding over time' was identified as critical success factor. • Critical success factor is related to good quality science. • People stepped up to contribute. Academics contributed student thesis effort. Tender processes for specific studies facilitated by the Partnership; Competitive studies. As a result 'The Partnership has produced evidence-based outcomes which have led to significant cost savings in the protection of water quality and ecosystem resources by its stakeholders'.	• Since financial resourcing has dwindled over time the monitoring program has been diminished in terms of scientific rigour • New real-time sensing of water quality has not yet been implemented
Phases:		
Preconditions and drivers	• The Partnership was supported by local councils and the Queensland (state) government • Previous community activism re poor water quality in Moreton Bay. • Commitment: People and institutions (e.g. universities) were proud to be associated with the HWP and wanted to contributed to improve water quality in the region	• Ongoing water quality declines some severe and known intensifying urban development through SEQ • Partnership has changed over the years due to merger and cuts in science funding
Intentional design	• A vision for SEQ waterways and Moreton Bay was established early in the process. • Community champions, Political champions, heightened scientific work and increased partnerships • Partnership linked diverse objectives of different councils and had dedicated communications staff and strategy that kept stakeholders engaged long term	• Councils all signed on with agreed sliding scales for contributions

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Table 1 (*continued*)

Case – SEQHWP	Strengths/Accomplishments	Gaps/shortcomings
Enablers (barriers)	• High level champion: 'The Lord Mayor of Brisbane personally attended and "drove" the agendas and meetings of the early Brisbane River forums.' • Expert panels provided scientific oversight and integrated rigour • Value-based decisions were critical to HWP's culture. key values were identified as: Commitment by all players; Transparency of decisions and operations; Credibility of the science and of the projects; Accountability; Optimism or a sense of a positive future; Quality of work and of relationships; Clean water; and Peoples' expertise and their personalities across all sectors.	• No barriers or enablers were identified?
Resulting features	• 'Adequate financial resources generated through creative alliances of governments, industry and community, sourced externally and matched by an increased level of self-funding over time' was identified as critical success factor. • Standardised method to calculate water quality grades from sub-catchments to catchments • The Partnership has produced information-based outcomes which have led to significant cost savings in the protection of water quality and ecosystem resources by its stakeholders.	• The monitoring program has had to reduce sampling frequency due to cutbacks. • Reliance on modelled results in some years seeks to balance the reduced sampling • Healthy Waterways brand is still recognized despite legislative changes and the annual report card program has persisted.
Evaluation and review	• High public awareness of water quality grades, trends and pressures on water quality • Scientific rigour and independent review of data and calculation of annual water quality grades	• Annual reviews by the Independent Scientific Panel now conducted at less frequent intervals
Case – GHHP	**Strengths/Accomplishments**	**Gaps/shortcomings**
Features:		
Recognition of need	• Diverse participants in the largest multi-commodity port in Queensland recognized need to work together to overcome several natural and anthropogenic impacts on the health of the harbor • Driven by need to obtain social licence to operate	• Distrust amongst some stakeholders, including environmental NGO's, and some were unwilling to participate.
Shared vision	• Shared vision evolved in first phase of a partnership initiative led by stakeholders	• No *a priori* vision of what should be created, or what was required
Sufficient legal framework	• Partnership developed a clear governance arrangement/framework by MOU	• No legislative authority to do anything
Effective stakeholder participation	• Partnership includes many stakeholders • Regular community events engage others including general community	• Not all partners are equally able to engage in the partner activities
Comprehensive objectives	• Report card includes quadruple bottom line (cultural, social, economic, environmental) with performance indicators	• Maintaining this level of coverage with a changing (declining) funding base has been challenging • It took some time to achieve balance across objectives, with some areas (social or higher trophic levels, like endangered species) delivered at coarser scales or more slowly than originally desired
Consideration of trade-offs and cumulative effects	• Initiative was driven by cumulative impacts • To date there has not been an issue(s) identified by the report card that requires a 'trade off'	• No formal management outcome is triggered once a tradeoff is recognized
Flexibility to adapt	• Open partnership, so can adapt • Has evolved with changing conditions	• High social profile and dynamic location, with new issues arising all the time • Local community issues now focus (moving away from environment) therefore there is danger of moving to less tangible issues
Process for review	• Voluntary partnership with ear to the ground on regulatory requirements and attentive to community desires	• No formal process for review and evaluation • Too early to say
Effective resourcing, capacity and tools	• Partnership contributions are mandatory and funding requirements clear	• Voluntary partnership could fall apart • Dependent on what partners are willing to contribute
Phases:		
Preconditions and drivers	• partnership arose out of a definite need to work together to improve the health and quality of the harbour	
Intentional design	• Evolved as a close partnership around a quadruple bottom line outcome-based action plan, with report card	• Was not always clear how it would deliver on this through a report card and so the design and ratings systems was revised a few times (in part because of changing context of report cards along the Queensland coast). This caused some confusion and distrust among stakeholders
Enablers (barriers)	• Key industry and government stakeholders facilitated/enabled process	• Distrust among some stakeholders
Resulting features	• Voluntary collaboration that has had success in reducing key negative issues • Partnership has persisted	• The voluntary nature has meant funding arrangements have been variable through time
Evaluation and review	• An evaluation of the report card was conducted in 2016/2017 and recommended some improvements and developments	• No formal mechanism for review • Relatively early in the process (too early to tell).
Case – NSWME	**Strengths/Accomplishments**	**Gaps/shortcomings**
Features:		
Recognition of need	• Integrated triple bottom line (environmental, social including cultural and economic) approach • An integrated view recognized the need to address a range of threats across the NSW marine estate, not just those managed in marine parks.	• Poor understanding of social considerations • No integrated framework in place so had to develop new robust approaches that took time and resources

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Table 1 (*continued*)

Case – NSWME	Strengths/Accomplishments	Gaps/shortcomings
	• Establish Marine Estate Management Authority (MEMA) to set the strategic framework and priorities for management of the entire marine estate	
Shared vision	• The State government identified a need for a shared vision and a specific vision statement was developed early on • There was a successful development and communication of the marine estate vision and guiding principles. Broad acceptance and recognition of the vision. • Vision and principles speak to all marine user groups in NSW and identifies community wellbeing as a key component.	• No prior integrated vision across marine agencies. No recognition of marine estate as a management unit • Fragmentation and lack of view around what was being sought, which had to be overcome.
Sufficient legal framework	• A range of new legislation, regulation and policy frameworks developed to provide improved integration, including: Marine Estate Management Act (2014), Threat and Risk Framework and the Marine Estate Management Strategy	• A number of related legislative and governance reforms and policy initiatives occurring in parallel. Lots of recent related reforms, all going for different lengths of time.
Effective stakeholder participation	• Clear MEMA communication and engagement plans were developed. These plans allowed adequate feedback channels for stakeholders to communicate their concerns. • Cross agency commitment and contribution to the multi-stakeholder engagement. • The foundation of the Marine Estate Management Strategy was established through evidence and extensive consultation of the Statewide threat and risk assessment	• Need for a dedicated group focused on engagement and communications • Stakeholders and delivery partners are diverse with different needs and expectations • Stakeholder fatigue
Comprehensive objectives	• Explicitly multi-sectoral, and triple bottom line, with an overall objective of considering all activities and relating threats to benefits that the community derive from the marine estate. • The Marine Estate Management Strategy has defined initiatives that integrate environmental, social, cultural and economic objectives. • Increasing stakeholder awareness for social, cultural and economic objectives.	• Absence of information for how to identify and how to integrate social, cultural and economic objectives (relative to biophysical objectives)
Consideration of trade-offs and cumulative effects	• Threat and risk assessment provided information that allowed consideration of trade-offs • Specific evaluation framework was developed among groups according to ten principles with a trade-off/evaluation and guideline for decision makers paper developed. • The NSW Statewide threat and risk assessment identified a number of areas of cumulative risk, including environmental, economic, cultural and social. Trade-offs were considered during the evaluation of management options that led to targeted actions in the Marine Estate Management Strategy.	• Lack of understanding about interactions prevents estimation of cumulative impacts • Some 'legacy' problems (i.e. result of cumulative impacts over many years), can't be easily corrected by current management.
Flexibility to adapt	• Marine Estate Management Strategy built on principles of adaptive management with the development of an specific integrated monitoring and evaluation framework • Clear identification of the MEMA five step process that identifies monitoring, evaluation and review step. • The Marine Estate Management Strategy has a mid-program review after 5 years to evaluate the success of management initiatives. New and emerging risks will be considered and addressed in management actions.	• Requires long term funding
Process for review	• Establishment of a fit for purpose Marine Integrated Monitoring Program (MIMP) and framework that includes ecological, social, cultural and economic components, and will have formal 5 year check. • The MIMP and framework provides the structure required for review and refinement of management initiatives.	• Complex and ambitious monitoring and evaluation framework that requires significant resources
Effective resourcing, capacity and tools	• Government funding allocation has been significant for the first 3 years of implementation • Building increased capacity and understanding with partners and stakeholders	• Long term program but current funding is short term
Phases:		
Preconditions and drivers	• Existing approach was too limited, • Independent Scientific Audit of Marine Parks in NSW (the Audit report) provided impetus on change and triple bottom line evidence-based approach for managing the NSW marine estate	• Identify how to best integrate social, cultural, economic with environmental component.
Intentional design	• Governance of the NSW marine estate was reorganized by bringing the entire marine estate under one legislative and administrative structure. • Improved cross agency integration and shared vision including the establishment of the Marine Estate Management Authority, with independent chair and science advisory panel, the Marine Estate Expert Knowledge Panel (MEEKP).	• MEMS is complex and wide ranging with many diverse stakeholders
Enablers (barriers)	• Good funding and resources for stage 1 and 2 of the MEMS (first 3 years) • Establishment of MEMA allows for improvement in cross-agency collaboration creating improved decision making and efficiencies	• Short-term funding has resulted in staff insecurity • MEMS is ambitious and complex • Machinery of Government changes
Resulting features	• MEMS is changing the way agencies and stakeholders interact • First time cooperative management of the marine estate is occurring • Explicitly multi-sectoral, and triple bottom line approach,	• Funding uncertainty

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Table 1 (*continued*)

Case – NSWME	Strengths/Accomplishments	Gaps/shortcomings
	• Strong legislated, evidence-based strategy with a strong governance framework	
Evaluation and review	• The integrated monitoring and evaluation framework for the MIMP was developed to guide monitoring and assessment of progress of delivering the MEMS. • The MIMP sets out a high-level approach for assessing progress against outcomes that management actions are expected to collectively achieve. Evaluation of the MEMS includes following stages: baseline evaluation, mid-term evaluation and summative evaluation. • The MIMP will enable MEMA, responsible agencies and relevant Ministers to report on progress of the MEMS in meeting clearly defined outcomes, highlight success and consider areas that need attention	• The implementation of the integrated monitoring and evaluation framework requires significant resources to evaluate the MEMS over three stages
Case –SGSA	**Strengths/Accomplishments**	**Gaps/shortcomings**
Features:		
Recognition of need	• SA Government recognized need for ecosystem-based management of marine and coastal environments in early 2000s • Established Living Coasts Strategy (DENR 2004), Marine Planning Framework for SA (Government of SA 2006) and draft Spencer Gulf Marine Plan • Spencer Gulf Ecosystem Development Initiative (SGEDI) established in 2011 as a collaboration among industry (mining, manufacturing, ports, fishing and aquaculture) and researchers, who recognized benefits of a more integrated approach	• In 2000s, the need for integrated approach was not recognized by agencies other than Department of Environment and Heritage (DEH) or by industry • Since 2011, the need for integrated approach has been recognized by SGEDI industries, some parts of government and researchers, but not by most SA Government agencies • Integrated approach was not adopted. Government focus went to establishing Multiple Use Protected Areas, now called Marine Parks
Shared vision	• Vision in early 2000s was driven by the Department of Environment and Heritage (DEH), with strong focus on conservation • SGEDI vision shared by industry, some parts of government and researchers	• Vision of DEH not shared by other government agencies or stakeholders • SGEDI vision not adopted by government
Sufficient legal framework	• Living Coasts Strategy outlined legislative and policy framework including establishment of a Marine and Coast Authority • SGEDI had no legislative basis	• Proposed legislative framework not adopted • No legislative framework
Effective stakeholder participation	• DEH undertook consultation with industry and other government agencies • SGEDI undertook extensive consultation with stakeholders including community	• Limited buy-on by stakeholders • Government involved in stakeholder workshops but did not buy-in to overall concept
Comprehensive objectives	• Living Coast Strategy had six high level objectives: 1) to provide a legislative and policy framework for ecologically sustainable development; 2) to conserve and safeguard the natural and cultural heritage; 3) to control pollution; 4) to protect environmental assets; 5) to improve understanding; and 6) to develop and maintain partnerships between state and local governments, community and industry • SGEDI aimed to streamline approvals process to reduce potential costs and time delays thus assisting economic development, reduce conflicts among users, ensure community support and public comment were likely based on evidence	• Specific objectives (to operationalize high level objectives) not developed. • Overall vision was for a thriving gulf region where progressive developments occur, community opportunity is optimized and the unique ecosystem protected and enhanced. Specific objectives were not developed
Consideration of trade-offs and cumulative effects	• Living Coast Strategy provided framework for ecologically sustainable development (i.e. balance ecological, social and economic objectives • SGEDI aimed to develop a decision-support system to progress integrated marine management in Spencer Gulf including consideration of cumulative and long-term environmental stressors	• No framework was established for considering trade-offs or cumulative impacts • Some research undertaken on assessment of cumulative impacts in Spencer Gulf
Flexibility to adapt	• Living Coast Strategy not adopted • SGEDI could not adapt to financial downturn (reduced funding from industry)	• Mining downturn meant less interest in Spencer Gulf and development in this region
Process for review	• Not incorporated in either Living Coast Strategy or SGEDI	• Living Coast Strategy not adopted • SGEDI not reviewed
Effective resourcing, capacity and tools	• Implementation of Living Coasts Strategy not resourced • SGEDI initially resourced by industry, with some government funding.	• Needed buy-on from whole of government • Funding decreased as price of iron ore decreased and port development wasn't progressed further
Phases:		
Preconditions and drivers	• Establishment of AOP by Commonwealth Government in 1998 set scene for DEH to establish Living Coasts Strategy in early 2002 • DEH recognized need for Marine Spatial Planning and establishment of Marine Protected Areas • SGEDI established due to conflicts among stakeholders (e.g. mining and fishing) and view of potential rapid increase in development associated with new iron ore mines and associated ports	• No gaps/barriers identified
Intentional design	• Living Coast Strategy designed but not adopted	
Enablers (barriers)	• AOP was an enabler for Living Coast Strategy. Lack of support by other agencies and industry was the major barrier. Focus shifted to Marine Parks • SGEDI enabled by recognition of need by industry and researchers. Barrier was lack of support by government	
Resulting features	• Living Coast Strategy not adopted	

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Table 1 (*continued*)

Case –SGSA	Strengths/Accomplishments	Gaps/shortcomings
	• SGEDI established stakeholder consultation process, sharing of data among industry and decision support tools.	
Evaluation and review	• Nil	
Case – NPF	**Strengths/Accomplishments**	**Gaps/shortcomings**
Features:		
Recognition of need	• Industry recognise need to engage with agencies considering water development as these would impact productivity of banana prawns • Climate change could impact banana prawns (via change in amount and timing of annual rainfall) and tiger prawns (increasing temperatures and cyclone impacts on seagrass) and less known impact of mangrove die-back potentially on prawn stocks	• Although projects funded to consider and model potential impacts –these are yet to be included in integrated water development plans. Requires formal process to negotiate over conflicting interests to achieve an outcome that would reflect integrated management.
Shared vision	• AFMA and Industry have shared vision • Agriculture department and agriculture industry have shared vision	• No clear shared vision among fisheries, agriculture and conservation sectors. High level policy decisions could be made without consulting all affected parties.
Sufficient legal framework	• For Fisheries sector law - yes • For Agricultural sector law - yes	• Lack of legal framework for multi-jurisdictional authority to oversee integrated management. • Process for justice and compensation via federal courts
Effective stakeholder participation	• Fisheries sector with indigenous and recreational stakeholders are engaged given impact on more than just prawn stocks	• Limited potential for stakeholder participation across sectors unless regional development authority is formed that can administer across sectors and across federal, state and local authorities, and that would be cognizant of Indigenous heritage
Comprehensive objectives	• Only within each sector separately	• Unlikely that objectives which take into account all the sectors are easily established, or that the tradeoffs will be made explicit
Consideration of trade-offs and cumulative effects	• Not at this stage as no cost benefit analysis has been untaken to account for all the development scenarios	• There is a risk that water development could impact fisheries sector with inadequate compensation to fishing Industry.
Flexibility to adapt	• Industry over the years has initiated change in order to meet requirements under bycatch laws, MPAs, and fleet reductions	• Uncertainty with regard to industry's adaptive capacity to limit the impact of water development on their economic viability without compensation. • Future risks include climate change, increasing fuel costs, changes in markets and developments in the region where there are interacting or unmitigated footprints of operation (the region has long been seen as an area of future development, though this has been slow to be realized)
Process for review	• Participation within NPRAGs are reviewed. Has not been a review of stock assessment methodology for a while (>10 years)	• Science behind modelling of ecosystem process requires review as various models available which could differ in predictions; however using model ensembles is a useful practice.
Effective resourcing, capacity and tools	• AFMA fund's fisheries research. • FRDC funded study of impact of water development on prawns and other key species, building on previous NESP, FRDC, NAWRA projects • Agriculture funding research on river modelling, scenarios and crop yields.	• Not enough research on long-term cumulative impacts on ecosystems • Field data lacking given geographic extent of fishery.
Phases:		
Preconditions and drivers	• Increased interest in water development in North • Observed climate change (e.g. mangrove die-back)	• Limited knowledge on which water development projects will go ahead at this stage. • Uncertainty still exists although research to improve knowledge of physical/biological linkages at all scales to model potential climate impacts is underway
Intentional design	• Regional authority that considers all the sectors not formed	• Would require resources
Enablers (barriers)	• Export food market to China worth considerable amounts ($ Billions)	• Barriers include investment investment money and impact of current pandemic and supply chain issues
Resulting features	• None at this stage (except project funded)	
Evaluation and review	• None that this stage, as no large scale water development projects initiated in NPF region	• There may not be funding directly for post - evaluation of impacts of water development on prawn stocks

coastal marine activities. For example, in the GBR, it had been recognized since the late 1970's (evidenced by the 1979 Emerald Agreement establishing joint management arrangements between the Australian (Commonwealth) government and the State of Queensland). The Australian Government articulated the need for nation-wide IM in a headline speech by the Prime Minister in 1995[1] and the Australian Oceans Policy (1998) (AOP). Similarly, in the early 2000s the South Australian Government's Department of Environment and Heritage recognized the need to establish a more integrated approach to management of coastal, estuarine and marine environments, articulated through the Living Coast Strategy (Government of South Australia 2006a; Day et al., 2008; Paxinos et al., 2008). In New South Wales, recognition of the need for integrated planning and management of the marine estate grew out of industry dissatisfaction with the narrow considerations of Marine Protected Area planning and management (Jordan et al., 2016; Brooks and Fairfull 2016).

Gaps or shortcomings in the recognition of need included different expectations of what planning and integration meant and lack of clarity

[1] Keating, P. J. *Oceans Policy: Statement*, Press Release, the Prime Minister, the Hon P. J. Keating,No. 144/95, dated 8 December 1995: "the overall goal of the policy should be to provide the vision that will promote the efficient, sustainable use of Australia's marine resources in the EEZ while conserving the biological base of those resources".

over how to implement IM in the AOP. Recognition of need in the GHHP initiative was hampered by distrust amongst some stakeholders, who were divided over controversial new developments in the region and local incidences of, for example, fish disease and turtle deaths (Wesche et al., 2013).

Shared vision – The vision of IM in Australia has evolved over time and differs across the case studies. While the AOP had a general vision for IM of Australia's entire coastal zone,[2] it struggled to deal with areas outside the jurisdiction of the Commonwealth marine area (i.e. generally within three nautical miles of shore, governed by State and Territory Governments). Although envisaged as a 'whole of government' process, the AOP case study demonstrated that the policy vision articulated by senior levels of government (including the Prime Minister) was not established in a workable format for shared implementation. In the case of SGSA, the South Australian Living Coast Strategy and Marine Planning Framework outlined a whole-of-Government approach to managing current and future activities within the capacity of the ecosystem whilst maintaining a healthy and productive marine, coastal and estuarine environments (Government of South Australia 2006b; Day et al., 2008; Paxinos et al., 2008). The Spencer Gulf Marine Plan articulated a vision for ensuring the conservation and ecologically sustainable use of the Gulf by integrating marine and land use management through partnerships between community, industry and government. Although the strategy, framework and plan were intended to involve a whole of government approach it was driven by the South Australian Department of Environment and Heritage and the focus was on conservation rather than IM. The vision was not implemented and there is currently no shared vision for IM in South Australia including the SGSA.

In terms of gaps or shortcomings, in GBRMP, the vision of Indigenous Traditional Owners for co-management of their sea-country has been difficult to achieve, although there have been considerable advances towards that vision over the last 20 years, including accreditation by the federal and Queensland governments of 'Traditional Use of Marine Resource Agreements'. More recently, the Aboriginal and Torres Strait Islander Heritage Strategy for the GBR Marine Park was developed in consultation with the Indigenous Reef Advisory Committee and many Reef Traditional Owners and is predicated on the need for stronger partnerships to assist in managing complex external pressures via increasing co-management with Reef Traditional Owners (GBRMPA 2019). Further opportunities exist to strengthen collaboration and cross jurisdictional management with Torres Strait Traditional Owners and the Coral Sea Marine Park.

Sufficient legal framework – Legal and policy frameworks are typically critical to IM, and the seven case studies illustrate a broad spectrum of arrangements. The AOP case study points out that there was no political will for a legislative approach at that time, but the AOP was clearly articulated Government policy, with a National Oceans Office established to oversee implementation. Long-established arrangements in marine sectors (e.g. fisheries legislation) eroded and effectively disabled the integrative ambition of the AOP. In 2005, regional marine planning was brought under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*) – Australia's national environmental law. This gave the process legislative backing, but reduced the scope of bioregional planning to predominantly environmental outcomes. By contrast, the *Great Barrier Reef Marine Park Act 1975* (*GBRMP Act 1975)* established an independent statutory authority for IM of the GBR. That Act, along with subordinate legislation, has been reviewed regularly and updated over the past 40 years to incorporate contemporary concepts and governance arrangements. Similarly, the NSW *Marine Estate Management Act 2014* required a threat and risk assessment to be undertaken and the development of a Marine Estate Management Strategy (MEMS). Parallel legislative and governance reforms also aimed to coordinate previously disparate management aspects. In the case of the NPF, amendments to the *Fisheries Management Act 1995* (Commonwealth), emerging sea country claims and State-Territory-Commonwealth jurisdictional agreements under the Offshore Constitutional Settlement have facilitated the move towards greater IM, though none explicitly require it.

The regional initiatives for Gladstone Harbour and Spencer Gulf are examples of action and progress where no specific legislative mandate existed – but we consider, based on the case studies, that a legal mandate and framework is important for the longer term. The NSWME case demonstrates that the many legislative and governance reforms, required to lay the foundations for IM across multiple agencies, may take a long (and different lengths of) time.

Process for effective stakeholder participation – Stakeholder participation was recognized as an essential element across case studies. The vision for the draft Spencer Gulf Marine Plan was to ensure the conservation and ecologically sustainable use of SGSA by integration of marine and land use management through partnerships between community, industry and government. However, the marine planning framework and draft marine plan were not implemented and the partnerships were not established. The Spencer Gulf Ecosystem Development Initiative involved a diverse group of stakeholders and had a management board with an independent chair. There was some tension over the high level of government participation in the initiative, although it was strongly supported by the mining and shipping industries (Begg et al., 2015). Comprehensive public participation has long been a fundamental aspect of effective marine conservation in the GBR (Day, 2017).

The SEQHWP brought together and combined the work of government, industry and community, and its proactive stance on community involvement was a critical success factor. It had committees that engaged stakeholders (including broader community groups, industry and government, NGOs), scientists and politicians. All stakeholders agreed on the 'culture' and key values and there was transparency of decisions and operations. The Gladstone Harbour project was driven by the need to gain social licence so it was rooted in community participation and communication in a bottom-up approach. Community members of management committees share power with the government and industry representatives.

Comprehensive objectives – The move to IM is entwined with the need to achieve a more diverse set of objectives (or to recognise a greater suite of values), and this was reflected in all the case studies. The AOP had a comprehensive suite of objectives, although it was not able to implement them in practice. There was also no clear process on how to link objectives of local and state initiatives into AOP. The SEQHWP report card contained objectives related to diverse aspects including ecosystem health, community values, access, and economic benefit. Likewise, the GHHP used a report card to report on a quadruple bottom line of cultural, social, economic and environmental objectives (Mcintosh et al., 2014). These were defined in an extensive, dedicated participatory effort supported by literature review for best practices across all dimensions.

Most sector plans of the NPF recognise a triple bottom line (although economic objectives dominate) (Pascoe et al., 2017), but there has been little recognition to date of the formal need for IM encompassing other resource users or external sectors and objectives are not defined in the same way across sectors/plans. The participatory NPF co-management reflects good governance and thus addresses a major social objective, and some other social aspects are included in existing objectives. Further development of objectives is seen as a productive pathway toward IM. The NPF case study represents the fishery sector, however, in light of proposals to develop Northern Australia agriculture in the river catchments which influence prawn production (and hence fisheries) a regional authority may be needed to consider trade-offs in diverse objectives when managing water resources across the sectors.

[2] The first paragraph of the policy stated: "Australia's Oceans Policy sets in place the framework for integrated and ecosystem-based planning and management for all of Australia's marine jurisdictions".

Consideration of trade-offs and cumulative effects – The mechanisms to resolve (or at least to articulate) trade-offs and address the cumulative effects of multiple activities are largely missing from current management and are among the most compelling reasons for moving to IM (Stephenson et al., 2019a). Despite their importance in IM processes, the attention to trade-offs and cumulative effects was variable and generally weak in the case studies. The AOP was explicitly intended to consider trade-offs, and some significant trade-offs were addressed through engagement and negotiation, and as a result further trade-offs were then taken up more broadly by individual sector management mechanisms. However, AOP contained no specific mechanism for undertaking trade-offs and was unable to achieve trade-offs across all sectors. Within the multiple use context of the GBRMP, managing trade-offs has been a feature of planning and management arrangements (Day 2020), while cumulative effects are addressed largely through planning exercises. However, effectively addressing synergistic, cumulative effects is much harder than the policy implies, and further work is still required. Some changes are occurring so fast that management must constantly adapt.

The SGSA has no framework for considering trade-offs or cumulative effects. The focus of draft SGSA Spencer Gulf Marine Plan was on conservation and there was limited consideration of trade-offs or cumulative impacts. SGEDI funded an ecological risk assessment (Doubleday et al., 2017) including on threatened, endangered and iconic species (Robbins et al., 2017) and assessment of spatial cumulative effects in the Spencer Gulf (Jones et al., 2018; Stockbridge et al., 2021).

Flexibility to adapt – All case studies revealed that circumstances evolve and that an IM process must be able to adapt. The SEQHWP has had to change over the years due to a merger of SEQ Healthy Waterways with SEQ Catchments (and are now known as Healthy Land and Water) and cuts in science funding. Contributions from SEQ Councils have changed over time but not sufficiently to allow all Councils to continue in the partnership. The SEQHWP has been characterized as a 'change management' process though this may be easier for an initiative with no formal requirements or mandated outcomes (Maher and Nichols 2002). The 10-year NSW MEMS that commenced in mid-2018 has 53 management actions that are being delivered through a staged approach to ensure foundations are laid, progress is periodically assessed, and management can be adaptive. There is also a scheduled review after 5 years: a 'health check' to evaluate the success of management and adapt if required.

Established process for review – All case studies recognized the need for review. The AOP, for example had a planned process, and an external evaluation was undertaken in 2002. That 5-year review significantly changed the policy direction and was the cause (or the beginning) of its demise. The AOP process did not continue long enough to see if the established process for further review could have helped the process adapt. AOP failed to complete all of its objectives within the first five years, and ended before there was opportunity for refinement. The NSW MEMS will be subject to performance evaluation at three separate stages (baseline/formative evaluation (2020), mid-term evaluation (2023), and summative evaluation (2027–2028). The baseline/formative evaluation of the MEMS found the first two years of implementation (Stage 1, 2018–2020) have built strong foundations for future success, achieved change against all short-term outcomes, and set a trajectory for achieving intermediate and long-term outcomes (Aither 2021). This complex and ambitious monitoring and evaluation framework in NSWME requires significant resources.

The NPF has an established process for ongoing review in the form of a standing resource assessment group and a management advisory committee that meet at least twice a year. However, that review is limited to aspects of the prawn fishery; and is not inclusive of all the stakeholders (i.e. including water developers), with no review mechanism that could address the perspective of broader participation.

Effective resourcing, capacity and tools – All the case studies demonstrated the importance of effective resourcing, and the diverse aspects of resourcing, capacity and tools. The AOP was relatively well resourced but the task of national planning was too complex and novel, and had too many jurisdictional complications for the resourcing available. Achieving a 'whole of government' approach was complex and difficult, especially with the National Oceans office being located outside in a regional centre, outside Australia's capital city Canberra.

The GBRMPA is relatively well resourced. The recent investment framework for the Reef 2050 Plan shows that across governments, industry and the community, more than A$1.25 billion was committed over five years, focused solely on delivering actions in the Reef 2050 Plan. From the perspective of the Australian and Queensland governments, the framework will be used to channel new investment toward identified priorities and to inform the use of regulatory and policy levers that, along with investment, are critical tools to support the achievement of these priorities. However, the funding is not considered commensurate with fully addressing all the issues in a timely manner, and the window for addressing some issues is getting smaller. For example, there has been insufficient funding to effectively address the increasing impacts of climate change nor build capacity for all Traditional Owner groups to engage and manage Sea Country. For the private sector, the framework identifies partnership opportunities and strategies for their involvement.

The SEQHWP initiative had sufficient resourcing for over a decade (Maher and Nichols 2002), but a substantial reduction in State government funding forced major changes in the partnership in 2012. Dwindling financial resourcing of the monitoring program has diminished its scientific rigour, and new real-time sensing of water quality has not yet been implemented.

3.1.2. Evidence of the five phases of IM implementation

Preconditions and drivers of change – The seven case studies illustrate diverse preconditions and drivers for change. Most showed governments grappling with the need to: implement and integrate Marine Protected Areas into broader coastal management; manage the full extent of marine jurisdictions and coastal zone in a unified way (e.g. NSW Marine Estate); and plan effectively in relation to the conflicts and trade-offs of proposed new developments (e.g. Spencer Gulf, Northern Prawn fishery considerations). Rapid urbanisation and associated problems were important preconditions to two initiatives in Queensland. Urban areas in SEQ and Gladstone Harbour were growing rapidly, leading to unacceptable environmental outcomes and human health concerns. There was increasing recognition of the linkages between effective management, healthy fisheries, good water quality, and social-economic values. Governments were realizing the need to work across jurisdictions and public and non-governmental organisations were increasingly weighing in on resource management. At the same time, industry was becoming concerned with maintaining a positive public image.

Intentional design –The seven case studies represent different levels of intentional design. The AOP was an attempt to implement a national IM framework. While it had a clearly articulated vision, it failed in the architecture of implementation. The NSWME reforms are an emerging attempt to rearrange the management of the marine estate to ensure a more holistic, coordinated and transparent approach that will reduce the major threats to the environmental, social, cultural and economic values of the estate.

In South Australia, the Living Coast Strategy, Marine Planning Framework (Government of South Australia 2006a; Day et al., 2008) and draft Spencer Gulf Marine Plan (Government of South Australia 2006b; Paxinos et al., 2008) developed in the 2000's were specifically designed to preserve coastal, estuarine and marine environments, to provide a sustainable base for fishing, tourism and recreation. The stakeholder-driven Spencer Gulf Initiative that began in 2011 was an attempt at integrated planning for future development and avoidance of conflicts in a major coastal area. Neither design was adopted.

Enablers and barriers to change – The case studies show evidence

of diverse enablers of, and barriers to, the change that IM requires. Some of these factors are matters of context and are related to the drivers of change. For example, the desire to get Gladstone Harbour out of the negative media spotlight and obtain 'Social Licence to Operate' from both the local and wider community were strong drivers for the GHHP. The iconic nature of the GBR has contributed to public and government willingness to invest in the region and make IM work (Day 2020). More generally, international pressure – such as the World Heritage Committee's ongoing interest in GBR, or commitment to UNCED in the case of AOP – can enable IM initiatives.

A change in government, or of public opinion, can also act as an enabler or barrier to change. The Marine Planning Framework for South Australia was meant to complement the process for establishing marine protected areas and intended to involve a whole-of-Government approach, but there was considerable opposition to the establishment of marine parks from some stakeholders, especially commercial and recreational fishers. While the South Australian Departments of Environment and Water and Primary Industries and Regions have supported projects that aimed to progress a more integrated approach to marine management (e.g. Tanner et al., 2019) and establish demonstration decision-support tools (Bailleul and Ward, 2019), there has been little interest or efforts at a departmental or whole-of-government level to implement changes needed to establish IM in South Australia despite some sectors indicating a strong desire.

The case studies show clearly the positive impact of individual political leaders or champions. Major facilitators include the CEO of GBRMPA and the federal Environment Minister in the GBR rezoning (Day 2020), and the Lord Mayor of Brisbane in the case of SEQHWP (Maher and Nichols 2002; Dutra et al., 2010, 2014). Leadership is essential at multiple levels (from the political level) through agencies, and to leaders in the key sectors (e.g. Gutierrez et al., 2011; Day 2020). Effectiveness of stakeholder participation is also an enabler, while poor management participation can undermine IM attempts.

The case studies also provide strong evidence of diverse additional disablers. These included: suspicion and distrust among participants, and differences in influence or power among participants (e.g. the oil and gas industry versus other marine sectors in the case of AOP); ineffective leaders; complex bureaucratic structures; participant recourse to political lobbying; and changing economic circumstances (such as the drop in iron ore prices that reduced the urgency for IM in the Spencer Gulf).

Features of the resultant IM – The case studies differ in their evidence of the nine features of IM. In most cases the implemented process had deficiencies that became apparent over time due either to insufficient attention to structure and function at the start, or to changes in participants of political context during the process. An area of considerable difference among the case studies has been their legal and institutional framework. The AOP provided a national policy basis for a coordinated, transparent and evidence-based approach to IM but was not enshrined or authorised in legislation. The GBR has long had specific and effective legislative framework (e.g. the statutory Zoning Plan is subordinate legislation to the *GBRMP Act 1975*), and the legislation has been periodically amended to address contemporary and evolving issues. The NSW marine estate reforms, on the other hand, included legislative and policy mandates and a reorganized governance structure that is facilitating IM. GHHP and SEQHWP were voluntary initiatives that engaged diverse participants in attempts to improve performance. Despite an extensive planning process IM has not been formally adopted in South Australia, largely due to lack of support for the approach within key government agencies (Begg et al., 2015).

All case studies emphasized the importance of sufficient and effective processes for stakeholder participation. There was general evidence for the need to achieve a greater set of objectives (for example a 'triple bottom line'), but the specifics of that differed across cases. Consideration of trade-offs and cumulative effects were seen as important, but to date these have not been addressed comprehensively in any of the case studies. Resourcing, capacity, and tools differed among case studies, but remained an issue in all cases. IM requires resourcing commensurate with the diverse needs of a new and complex process; different information will require new skillsets and tools. There is a need for both 'policy capacity' and 'institutional capacity' (Vince and Nursey-Bray 2016).

Evaluation of success, review and improvement – Most case studies recognized the importance of flexibility to adapt to changing conditions and the need for ongoing review and refinement but differed in the degree to which this was implemented. This is particularly true in those case studies that have been long-lived and able to adapt, especially the GBR.

3.1.3. *Questionnaire survey results*

The questionnaire survey was undertaken after the workshops, but before workshop results were compiled. Results are summarized in the following figures. The detailed results, including frequency counts for the number of times each IM-feature/attribute was chosen, and the relevance of features across phases of the implementation of IM are shown in Appendix 2.

A high proportion of survey responses indicated that all features were important (relevant or essential) to IM (Fig. 2). Effective resourcing (62%) and stakeholder participation (61%) were considered most essential. In contrast the flexibility to adapt was considered least essential (only 35%).

The standardized survey scores indicate a gradient of perceived influence of the nine features (Fig. 3): Participants considered appropriate legal and institutional framework (score = 0.356) to have most influence

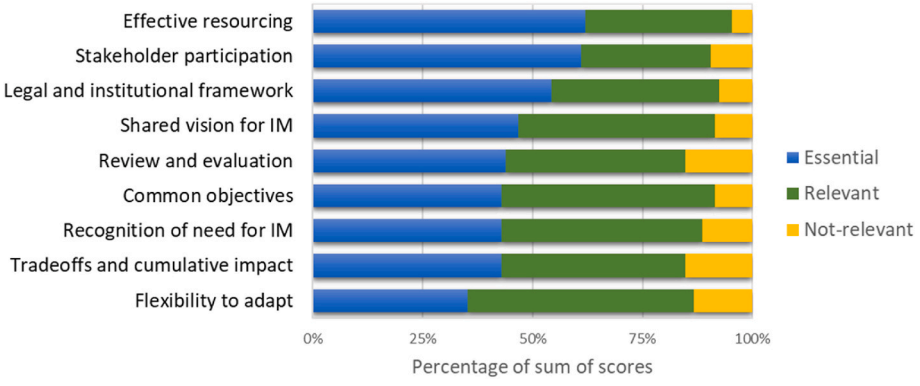

Fig. 2. Summary of the importance of each of the nine features to the five phases of IM. Percentage of the scores of 21 respondents to the classification of 'essential' (blue), 'relevant' (green) and 'not relevant' (yellow) over all five phases (preconditions and drivers of change, intentional design + rearrangement, enablers of/barriers to change, features of resulting IM, and evaluation and modification).

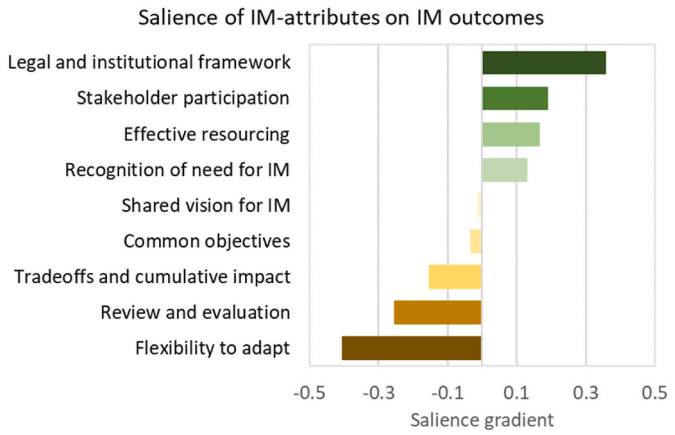

Fig. 3. Gradient of salience, or the relative strength of influence, of the nine features on IM outcomes as rated by 21 respondents. Standardized scores are on a scale from −1.0 to +1.0, with a score of 0 indicating no salience, and scores toward ±1.0 indicating increasing positive or negative salience.

on IM outcomes, and therefore to be the most important of the key features. Sufficient and effective stakeholder participation (0.190), effective resourcing, capacity and tools (0.167), and recognition of the need for IM (0.131) have around the same moderate (mid-level) amount of influence. Having process flexibility to adapt to changing conditions was considered to have least salience (−0.405).

4. Discussion

The key features of IM put forward in our 2019 paper and discussed here have been supported by recent independent literature related to Marine Spatial Planning (e.g. Zuercher et al., 2022), Blue Economy (e.g. Cisneros-Montemayor et al., 2021), and implementation of Marine Protected Areas (e.g. Collier 2020). There seems to be convergence in the scope of major sustainability-related concepts (Stephenson et al., 2021) and emerging consensus on the breadth of features required of integrated management. This includes greater appreciation of enabling and disabling conditions and of the importance of appropriate institutional framework participation and process support (see for example Stojanovic and Gee 2020).

The case studies in this analysis differ in history and form and were not all set up *a priori* to be models of IM. But they represent many of the major initiatives in Australia over the past two decades to move towards a more holistic approach to marine and coastal management and are therefore useful for examining the evolution of IM. In evaluating the case studies, we recognized that perspectives of the performance of management initiatives may have changed with time, and that the criteria for IM have evolved. Importantly, the legal and policy framework has evolved over the time of these case studies, toward greater awareness of the full scope of IM that we are using in this paper.

Were the nine key features and five phases identified by Stephenson et al. (2019a) reflected in IM case studies?

The majority of key features were evident in most case studies, but there are no examples of all nine features being implemented 'fully'. Our investigation of the case studies demonstrates that here is a gradient of accomplishment of the key features – most features were given some consideration, but few were implemented completely. Implementation of some key features may be limited due to the short duration of case studies to date, but it also results from a lack of implementation of comprehensive integrated management such as that illustrated in Fig. 1.

Is there a priority among the key features?

The case studies and our survey emphasize the importance of both legal authority and effective governance. Effective governance, based on principles of good governance, can enable the other key features (Lockwood et al., 2010). The authority, framework or mandate to govern is seen as necessary for IM, but it is insufficient on its own. The type or structure of governance is also important. Governance frameworks can be formal or informal, and within each of those can be flexible and fluid or quite rigid and strict. A spectrum of governance arrangements was reflected in the case studies and there is no strict structure that works across all case studies. The AOP was considered to be flexible to achieve IM outcomes, whereas the management of GBRMP had rigid objectives and processes, consistent with its legislative foundation. Informal and flexible frameworks depend on interpretation by those doing the implementation. While there is some evidence in the case studies that IM can prevail, at least temporarily, with informal arrangements and the good will of participants (e.g. Gladstone Harbour, Spencer Gulf South Australia), it is clear that those tasked with implementing IM require authority for long term success.

A major challenge for many IM initiatives has been overlapping jurisdictional responsibility which has necessitated greater cooperation among agencies and across levels of government. This is by no means unique to IM and has long been recognized as a problem facing environmental governance in Australia (Australian Government State of the Environment, 2016). Even with commitment to participate, differing priorities within and among jurisdictions and groups has reduced traction. There is a major challenge in creating 'whole of government' initiatives, and yet governments can be reticent to create the alternative, which would be a new IM, overarching body or agency. One example of this being done in an Australian jurisdiction is the NSW Marine Estate Management Authority (MEMA), which was established to work across four government departments to deliver social, cultural, economic and environmental benefits to the community from the marine estate. In the GBR, the current inter-governmental arrangements between the federal and Queensland governments enable all waters from the high-water mark out to the seaward edge of the GBRMP up to 250 km offshore, to be managed in a complementary way. Complementarity means the laws are virtually the same, and the zones are 'mirrored' on either side of the jurisdictional boundary. Without such complementary arrangements, the management of the GBR would potentially be exceedingly complex (Day 2020).

The case studies also show that IM has occurred reactively to external pressures rather than following a strategic path. An important precondition for IM seems to be a recognized urgent need to address crises and resolve conflicts. A new management arrangement is more palatable when a conflict or crisis is severe enough or there is a major disruption, as was the case with Gladstone Harbour. Conflicting objectives and competition between activities (e.g. fisheries, aquaculture and water management in NPF and the proposal for new ports in Spencer Gulf) is an increasing driver for IM.

The case studies also show that a well-supported participatory structure with a common vison is very important for ongoing success. Recognition of the importance of participation was widespread in the case studies. Stakeholder/rightsholder participation is essential, but there is a spectrum of potential approaches to enable their effective participation in the management process. For example, top-down or bottom-up stakeholder participation might make a difference in success in a specific area, and most importantly, where top-down and bottom-up approaches converge to facilitate learning about issues and solutions (Butler et al., 2015). Further, stakeholders will differ in their appreciation and ability to participate in participatory approaches. Impediments may arise where not all sectors have an equal voice, and a few dominant players (stakeholders/sectors/agencies/politicians) can influence or subvert processes. This shows the critical role of governance in structuring interactions between actors and between actors and resources.

Implementation of any of the features alone will not achieve IM. Rather, success comes from combinations of features. Moreover, some features facilitate the progress of others. For example, Day (2020) examined the inter-relationship between the four primary determining factors for the success of the GBR rezoning, with the political aspects recognized as the factor most dependent upon the other key factors.

The relative priority and influence of elements of an IM initiative are likely to change over time according to developments in the context and experience of management. For example, recognition of need, appropriate legal framework and stakeholder participation are critical to the establishment of the initiative, whereas review, evaluation and flexibility to adapt are important to ongoing success. Practitioners should choose which elements to emphasize or different elements that are essential depending on the specific context (i.e. devote resources to the critical aspects for the stage/phase of implementation). An important part of the implementation of IM is simply "staying the course" and working through any issues and inadequacies. Too often, IM experiments are abandoned too early (i.e. Australia's National Oceans Office and South Australia's Living Coast Strategy). In some cases, the IM journey is abandoned if the "need" or crisis seems to ease. Spencer Gulf is a good example: as mining and iron ore prices declined, the pressure for integrated responses relaxed, industry commitment declined and so the incentive was lost.

IM requires effort and commitment, and can therefore be viewed as 'costly'. It takes effort for diverse government departments to work together to achieve a 'whole of government' approach. It also takes time and effort for the participation of stakeholders and rightsholders in more holistic IM initiatives that may be in addition to sector-based management. On the other hand, some form of IM is essential in overcoming the inadequacies of current sector-based approaches. While additional costs and effort of IM are required, the return in terms of improved management has generally been seen as worthwhile.

The results of this analysis shows that Stephenson et al. (2019a) evaluative lens does reveal the major strengths and impediments or shortcomings of IM experience. It offered a tool for evaluating IM effort, which suggests its value as a guide for implementation of IM across a group of activities. Further, Fig. 3 indicates the relative importance that we consider should be paid to institutional framework, stakeholder participation, effective resourcing, and recognition of need, in future IM planning. Eger et al. (2023) also found the framework to be useful in evaluating Canadian case studies in management integration.

While case studies demonstrate that any given feature can change in importance or prominence over the course of IM implementation, all features are relevant. The particular social, ecological and political conditions of an initiative will influence which features require more emphasis for successful implementation, and this can change over the trajectory of IM. Further, the interplay and relative importance of various elements depends in part on the size of the geographic area being managed. Through application of an IM lens to case studies, we have been able to identify issues that have impeded the success of IM, and to confirm the relevance of the key features and phases. We suggest that the IM framework we developed (Stephenson et al., 2019a), and tested (this paper) is useful 1) as a lens for evaluation of performance of management, 2) as a framework to retrofit or enhance current management, and 3) as a template for the design of new integrated management situations. While we developed the framework with the view that it would assist gradual transition of current management, the same framework would form appropriate guidance for any new management structure.

We predict that the framework will facilitate implementation of comprehensive ecosystem-based management, marine spatial planning, and the aspirations of blue economy (e.g. Voyer et al., 2018) in which there is the need to link multiple activities through a comprehensive suite of objectives in a unified approach. The framework will be useful for navigating the integration of new activities (for example, establishing IM to include addition of offshore wind energy development, or multi-trophic aquaculture), where there is a need to consider potential displacement, trade-offs among objectives in relation to activities, and the relative benefit (pros and cons) of alternate management scenarios. The framework will also be beneficial in the modifications and required improvement in management of existing activities (e.g. retrofit of management to reduce conflict, address trade-offs, better share available space, consider cumulative effects of management of multiple activities).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgements

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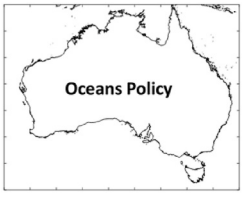
Appendix 1. Summaries of the Integrated Management case studies and timelines of critical events

Case Study	Overview of IM initiative	Timeline
	**Australian Oceans Policy** Australia's first national approach to oceans governance that aimed to integrate across sectors and jurisdictions Began as a response to UNCED Agenda 21 that called for integrated approaches to oceans governance Commonwealth governments, state governments and stakeholders all involved in the development until mid 1998 when the policy became a Commonwealth rather than a national policy and states were left out of the process	1996–1997 – Political commitment background papers and documents 1998 (December) – AOP launched 2000–2004 – First regional plan developed 2004 – Review of process and institutions 2005–2012 – Regional plans completed, new focus marine bioregional planning – supporting national representative system of MPAs 1996 – Integrated policy approach announced 1997 – Background and Issues papers released and draft oceans policy 1998 (mid) – States left out of the policy development process 1998 (December) – AOP released

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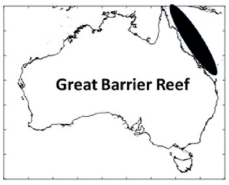
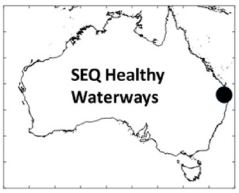
Case Study	Overview of IM initiative	Timeline
	It was an example of large scale integration based on ecosystem based management. Bioregions were identified rather than jurisdictional borders.	2003–5 year review – AOP given new directions, only South East Regional Marine Plan exists, Bioregional Marine Planning through EPBC Act begins 2003 – National Oceans Office is no longer an executive agency but an office within the Dept of Environment 2008 – AOP officially defunct
	**The Great Barrier Reef** (GBR) has two complementary multiple-use Marine Parks and is a World Heritage Area. The Commonwealth's GBR Marine Park Act established an independent statutory authority (GBR Marine Park Authority), and complementary State legislation was also developed (supported by the GBR Intergovernmental Agreement, originally known as the Emerald Agreement). Effective stakeholder participation has been a priority throughout the history of management of the GBR Marine Park area. GBR management process has had success building a foundation of strong consultative and participatory engagement processes and trusted relationships among participants. The GBR has had clear objectives and outcomes across a suite of values including environment, biodiversity, heritage values and sustainable uses. A comprehensive assessment of the World Heritage Area and adjacent coastal zone examined drivers and impacts affecting the GBR's values to support the design of actions required to better protect values and reduce threats. The GBR Marine Park Authority continues to develop a fit for purpose integrated monitoring, modeling and reporting program which will ensure indicators for ecological, social, economic and cultural values continue to be reviewed and updated. The Reef 2050 plan and associated policies include consideration of a more comprehensive set of objectives and explicit consideration of cumulative impacts. Modern plans and GBR management are built on the principles of adaptive management, with explicit review periods and built-in contingency plans to adapt to changing circumstances. GBR management has been supported by longstanding joint agreement on co-funding among State and Federal governments. The process has had access to outstanding scientists, experiential knowledge among managers, and a long legacy of reef research. While relatively well funded, there is still an issue of keeping up with expanding issues	1975 – Great Barrier Reef Marine Park Act established Great Barrier Reef Region and Great Barrier Reef Marine Park Authority 1979 – Emerald Agreement signed providing for complementary management including the joint Commonwealth/Queensland Field Management Program – now the Great Barrier Reef Intergovernmental Agreement 1981 – First Zoning Plan came into effect - the Capricornia Section 1981 – GBR declared a World Heritage Area 1987- GBR Wonderland opened as National Education Centre for the Great Barrier Reef (now Reef HQ Aquarium) 1990 – International Maritime Organisation declares the Marine Park as the world's first Particularly Sensitive Sea Area 1993 – Environmental Management Charge introduced 1994–25 Year Strategic Plan for the GBRWHA 1995 – Act amended to include a member to represent Aboriginal communities 1998 – Plans of Management gazetted for high tourism use areas in Cairns and Whitsundays 2000 – East Coast Trawl Fishery Management Plan came into effect 2003 – First Reef Water Quality Protection Plan commenced. Now in its 4th iteration 2004 – First time a single zoning plan was declared for the entire GBRMP. Queensland soon followed, declaring Great Barrier Reef (Coast) Marine Park to complement the federal Zoning Plan 2005 – GBRPMA opens offices in Cairns, Mackay and Rockhampton to enhance community partnerships; accreditation of the first Traditional Use of Marine Resources Agreement (Girringun) 2009 – First Great Barrier Reef Outlook Report including independent assessment of management effectiveness (released every 5 years) 2011 – Reef Guardians program expands from schools and councils to include farmers and fishers 2014 – Comprehensive Strategic Assessment published for the Great Barrier Reef World Heritage Area 2015 – Reef 2050 Long-term Sustainability Plan launched providing a shared pathway for all parties to work together for the long-term protection of the Great Barrier Reef World Heritage Area 2016 & 2017 – consecutive back-to-back mass bleaching events affected two-thirds of the GBR 2018 – New governance arrangements for Chairperson and Chief Executive Officer come into effect. 2019 – Third GBR Outlook Report released; overall outlook for the GBR was assessed as 'very poor' 2020 – Launch of the Reef Knowledge System – an online access point for integrated monitoring and reporting (with publicly accessible components). It provides a 'first stop shop' or portal, linking to monitoring information drawn from multiples sources, links to Program partner systems and interactive maps and information. 2021 – Revised Reef 2050 Long-term Sustainability Plan released.
	**SEQ Healthy Waterways Partnership** initiative (SEQ HWP) resulted from recognition of the need for integrated efforts across catchments and coastal waters in order to achieve improved water quality of waterways flowing into Moreton Bay. Water quality had been declining across the region and further declines were forecast due to increasingly development and particularly urbanisation of catchments. Local Councils were incapable of making improvements individually, and it was recognized that collective action was required. There was widespread public awareness of deteriorating water quality and appreciation of the need for an integrated approach to improve waterways health. An ambitious vision was established early in the process, and marketed widely to achieve public support. The SEQ HWP initiative was largely voluntary, but there was pressure from Councils that they needed complete participation and that they should act together. Queensland State Government was supportive and a partner of the initiative. The Partnership was supported by a series of legislation and plans including Queensland's Coastal Protection and Management Act (1995), the State Coastal Management Plan (2002), and the SEQ Regional Plan (2009). Stakeholder participation was critical from the beginning, and the reports refer to a 'whole of	1991 – SEQ Regional Growth Management Framework – designed and implemented by the Queensland government (first of its kind for Qld) 1993 – Brisbane River Management Group (BRMG) established - For community, government and industry leaders who wanted to see an improvement in the bay and river areas, the group aimed to design and administer catchment management 1996 – Integrated Catchment Management commenced – with Queensland Government providing policy and strategic direction and a long-term planning framework for sustainable management of land, water, vegetation and biological resources 1998 – SEQ Healthy Waterways Partnership established – initiated by the Policy Council of the Brisbane River Management Group based on the objectives and scientific strategies of the Brisbane River and Moreton Bay Wastewater Management Study program. It was also known as the Moreton Bay and Catchments Water Management Partnership 2000 – Healthy Waterways Awards established – to celebrate the achievements of groups and individuals working toward improving and protecting SEQ waterways 2001 – National Action Plan for Salinity and Water Quality - ensuring

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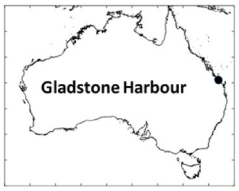
Case Study	Overview of IM initiative	Timeline
	community' approach, a 'pro-active stance on community involvement and participation', and to a set of values including transparency. The Partnership developed a report card for its waterways that included aspects of ecosystem health, access, economic benefit, contribution to drinking water and other community values. The reports of all local councils provided an evaluation of cumulative performance across the catchments. The SEQ HWP has evolved over time in function (sampling approach), structure and funding. Sufficient resourcing was maintained for quite a while, but State funding was reduced with a change in government (the incoming Newman government) in 2012. This resulted in changes in the way the HWP operated in the region.	the effective future management of salinity and water quality 2001 – Healthy Waterways report cards commenced - using data from the year-long Ecosystem Health Monitoring Program (EHMP) and made available to individuals, communities, government and industry groups 2005 - SEQ Catchments formed - National Resource Management SEQ and SEQ Western Catchments Group merged to form the group with local government members and 22 catchment leaders. 2009 - Healthy Waterways Ltd formed – the HWP becomes a registered organisation and independent from Brisbane City Council. 2009 – Approval of the SEQ Natural Resource Management Plan 2009–2011 - it supported the sustainability framework around the SEQ Regional Plan and Healthy Waterways' planning was implemented in the strategy. 2012 – Major changes to environment and NRM policy and planning with change of government – this was the end of SEQ Regional Coordination Group and CEO's Committee for NRM SEQ and as a result of the discontinuation of the NRM Plan, Queensland's vegetation protection and environmental planning were no longer high priorities. 2014 - Ecosystem Health Monitoring Program incorporates social and economic indicators – to indicate social and economic benefits from waterways are linked to environmental condition. The Waterways Benefits rating was included from the 2015 – Report Cards. 2016 – Healthy Land & Water formed – these two not-for-profit entities Healthy Waterways Ltd and SEQ Catchments merge and report cards continue annually. Officially launched in January 2017. 2016 – SEQ Natural Resource Management Plan – is endorsed by the Australian Government.
	**Gladstone Harbour** is a large multi-commodity port and the world's third largest coal terminal. The port supports diverse uses including commercial fisheries, extensive urban areas, one of Queensland's major power stations, local heavy industry (including Liquefied Natural Gas (LNG) and one of the world's largest aluminium smelters), and is an export conduit for the inland mining and gas industries. Further, there are extensive terrestrial parks to the north and northwest of the port and the harbour is within the Great Barrier Reef World Heritage Area. Tension around development, and issues related to environmental quality (including air quality and fish kills) resulted in public outcry, and in 2012/2013 to establishment of the Gladstone Healthy Harbour Project (GHHP). The recognition of need for an integrated approach to management was widespread, and included high-level State government support. A period of consultation at the start of the GHHP resulted in development of a clear vision for a partnership, supported by an independent science panel, to monitor health of the port using a report card. While GHHP has no regulatory authority, it brings industries and port operators together to evaluate activities and to inform current management and future port development, and is therefore a collaborative integrated management example. GHHP has 26 partners across industry, indigenous representatives, regulatory bodies, community groups and academia. The partnership and processes (including governance arrangements) are laid out in a Memorandum of Understanding. The GHHP oversees the reporting of the monitoring program; synthesising the information to produce a report card that includes environmental, social, economic and cultural indicators; and uses a range of tools (including systems models) to provide advice to policy, management and regulatory agencies, as well as industry and other stakeholders. The GHHP is driven by consideration of cumulative impacts, and has identified some trade-offs, but does not have a mechanism for resolving, or managing these interactions. GHHP has evolved with changing conditions and has considerable local impetus. It remains a voluntary partnership that is aware of emerging regulatory requirements and community desires, and is able to work collaboratively when new issues arise. GHHP has been able to assemble resources from diverse sources (especially from members) to continue.	2010 – Major flooding as Awoonga dam overflows resulting in fish kills 2011: Cyclone Yasi cat 5 impacts central Queensland 2011 - Dredging for Western Basin Dredging and Disposal Project (WBDDP) commences 2011 (June) – Bund wall performance issues raised 2011 (Sept–Oct) – Harbour fisheries closed 2012 – UNESCO representatives monitoring mission to check on potential impacts on GBR Outstanding Universal Values 2012 – Gladstone Fish Health Scientific Advisory Panel report tabled 2012 – Funding for GHHP announced by Queensland Government 2012 – Independent Science Panel appointed to provide expert advice and recommendations 2013 – Harbour Fish Health Investigation final report completed by Queensland Government 2013 – WBDDP dredging concludes 2013 – Tenders awarded to various collaborative research teams to develop harbour model and report card elements for monitoring and measuring of environmental, economic, social and cultural indicators and a data information management system 2013 (July) – Independent Review of the Port of Gladstone report by Commonwealth 2013 (Nov) – Launch of GHHP including Memorandum of Understanding with all partners 2014 (April) – Independent review of bund wall report by Commonwealth 2014 (Dec) – GHHP release pilot report card 2015 – Annual report cards released 2015 – Tender awarded to develop Indigenous cultural heritage performance measures and monitoring 2017 – Review of report card design by experts that are not part of the ISP 2020 – Annual report cards continue to be released however less frequent assessments for some components such that some indicators are carried over year to year
	The NSW Marine Estate initiative arose out of stakeholder discontent in relation to the implementation and management of marine parks, which led to a scientific audit of marine parks. The scientific audit identified a need for more comprehensive governance arrangements for the entire marine estate. In 2013 the NSW Government established the Marine Estate Management Authority (MEMA) to work across four primary State agencies involved in coastal management to develop a Marine Estate Management Strategy (the Strategy) that addresses the priority threats to the social, cultural, economic and environmental	2011 – Independent Scientific Audit of Marine Parks – The NSW Government appointed a committee to conduct an independent scientific audit of marine parks in NSW to advise the government on future management directions for marine parks and on better management of the NSW marine environment generally. 2012 – Government response to the Independent Scientific Audit of Marine Parks in NSW addresses the principal recommendations of the Audit relating to the future governance of the NSW marine estate. 2013 – MEMA Managing the NSW Marine Estate: Purpose,

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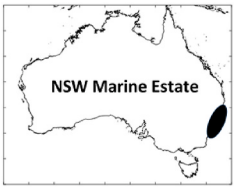
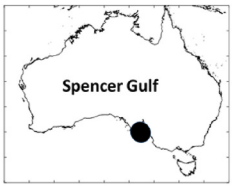
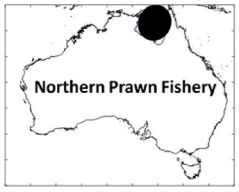
Case Study	Overview of IM initiative	Timeline
	benefits derived by the communities across the whole of New South Wales from the marine estate. The vision for the MEMA was to coordinate efforts so as to achieve a new vision of "a healthy coast and sea, managed for the greatest wellbeing of the community, now and into the future". The legislative and governance frameworks were revised to establish the single new authority to implement this vision. A new *Marine Estate Management Act 2014* was established, the previous Marine Parks Act was abolished, and there were several related governance reforms. The Marine Estate Management Act established two governance bodies (MEMA and Marine Estate Expert Knowledge Panel). The Strategy was developed by MEMA to ensure the management of the marine estate is strategic, transparent, evidenced-based and coordinated. The MEMA process is explicitly multi-sectoral and triple bottom line, with the threat and risk including distinct environmental, social, cultural and economic components. This allowed the identification and prioritisation of management actions in the Strategy that aim to reduce threats to community benefits. A Marine Integrated Monitoring Program, that includes ecological, social, cultural and economic aspects, provides a structure for review and performance evaluation of management actions.	Underpinning Principles and Priority Setting 2014 – *Marine Estate Management Act 2014* enacted and provides for strategic and integrated management of the whole marine estate. The Act establishes two advisory committees (Marine Estate Management Authority and Marine Estate Expert Knowledge Panel) 2014 – Marine Estate Community Survey Final Report. The marine estate community survey was critical to the development of the marine estate reforms 2015 – Threat and Risk Assessment Framework for the NSW Marine Estate 2017 – Marine Estate Management Regulation 2017 2017 – NSW Marine Estate Threat and Risk Assessment Report. The threat and risk assessment is an evidence based tool that is a key input into the development of the marine estate management strategy by focussing the most important threats to enhance benefits that the NSW community derives from the marine estate 2018 – NSW Marine Estate Management Strategy 2018–2028 ensures the management of the marine estate is strategic, transparent, evidenced-based and coordinated 2019 – Development of the Marine Integrated Monitoring program for the NSW marine estate
	There was an attempt to establish IM in South Australia in the early 2000s. The Living Coast Strategy outlined a range of actions that included the establishment of a Coast and Marine Authority and a Marine Planning Framework. The framework was based on the principles of ecologically sustainable development and adaptive management. Spencer Gulf was chosen as a pilot study to refine the application of the framework because of its economic, social and environmental importance. The draft Spencer Gulf Marine Plan defined goals, objectives and strategies for four ecological zones. Its vision was to ensure the conservation and ecologically sustainable use of the gulf through integrated management and partnerships between community, industry and government. The Marine Planning Framework for South Australia was not implemented and has not been developed further than the initial pilot project in Spencer Gulf. The Spencer Gulf Ecosystem and Development Initiative (SGEDI) was established in 2011 because a broad range of stakeholders recognized the need for a more integrated approach to industrial development. SGEDI has been important in bringing stakeholders together. The focus of SGEDI has been to develop pilot tools to support IM and demonstrate the benefits of a more integrated approach. There is currently no shared vision or legal framework for IM in South Australia however Introducing IM in Spencer Gulf remains aspirational.	2004 – SA Government published Living Coast Strategy which articulated vision for IM 2006 – SA Government published Marine Planning Framework which outlined a whole of government approach for ecosystem-based management of marine, coastal and estuarine ecosystems 2006 – Draft Spencer Gulf Marine Plan articulated vision of integrated management 2011 – SGEDI established to facilitate interaction among stakeholders and fund research to develop more integrated approach to management of the gulf 2011 – Present range of research progress projects undertaken to progress IM in Spencer Gulf 2015 – International Workshop on IM, with focus on Spencer Gulf 2019 – Integrated assessment of the ecosystems, industries and communities of Spencer Gulf completed Currently – IM not implemented in SA
	The Northern Prawn Fishery (NPF) is located across the north of Australia with a large proportion of catch coming from the Gulf of Carpentaria. The fishery is managed under a Total Allowable Effort (TAE) limit with tradeable effort shares that are set at levels to ensure sustainability and maximise economic returns. The TAE is supported through additional input controls including limited entry, seasonal closures, permanent area closures and gear restrictions. The NPF is a co-managed fishery between the Australian Fisheries Management Authority (AFMA) and the Northern Prawn Fishery Industry Pty Ltd. (NPFI). As a normal part of its business, the NPF regularly engages a diverse array of management, industry, NGO, scientists and state stakeholders through its Resource Assessment Group and Management Advisory Committee. The NPF uses substantial stock monitoring as well as scientific input into the bio-economic modeling of its fisheries, towards a goal of economic sustainability. As per a recent amendment to Australia's Fisheries Management Act 1991, consideration is currently be made of need for recreational and indigenous members representation is being sought for the NPF resource assessment group and/or management advisory committee. NPF is seeking further engagement with development initiatives for rivers in northern Australia, which have been identified as potential risks to the fishery. Three (3) aspects to IM initiatives i) Past and current initiatives with conservation measures as part of bycatch policy and marine protected areas ii) Recently legislated need for greater stakeholder engagement not yet in practice (Indigenous and recreational) iii) Proposed (by fishing industry) broader regional development initiatives to capture and be inclusive of water and agriculture development plans that would impact on water flow and thus prawn production	1980's – Proposed initiatives by agriculture sector led to concerns for fisheries, but development did not materialise apart from dam on river Ord (Northern Territory) 2000 – Process began in the 1990's and been ongoing since 2000 till late 2000s with Harvest strategy adopted circa 2012. 2007 – NPFI formed which incorporates 95% of licence holders and co-manages the fishery 2009–2011 – Co-management trial with official co-management in place from 2012 2017/2018 – Legislation but no stakeholders from new groups as of 2019/2020, with no date provided to achieve process 2018 – Amendment to Fisheries Management Act 1991 requiring consideration of recreational fishers and Indigenous interests 2019 – Considering benefits and need for recreational and/or Indigenous membership to NPF Resource Assessment Group and/or Management Advisory Committees 2021 – Fisheries Research and Development Corporation (FRDC) has funded a project to look at the impact of water development (and climate change) on the Gulf of Carpentaria (GoC) prawn stocks and other biological assets (mudcrabs, barramundi)

Appendix 2. Additional details of BIBD design and questionnaire survey results

Questionnaire survey of workshop participants method.

The balanced incomplete block design (BIBD) contained 18 repeat questions (sets) with different combinations of four of the nine IM-features. Each IM-feature occurred 8 times over the 18 questions as in the following table:

[Question] - four features compared
[1,] 1 3 4 6
[2,] 1 4 5 8
[3,] 3 5 6 7
[4,] 2 5 6 9
[5,] 2 4 8 9
[6,] 2 3 7 8
[7,] 1 2 5 6
[8,] 4 6 7 9
[9,] 3 4 6 8
[10,] 1 2 4 7
[11,] 3 5 8 9
[12,] 1 2 3 9
[13,] 4 5 7 9
[14,] 1 6 8 9
[15,] 2 3 4 5
[16,] 1 5 7 8
[17,] 2 6 7 8
[18,] 1 3 7 9

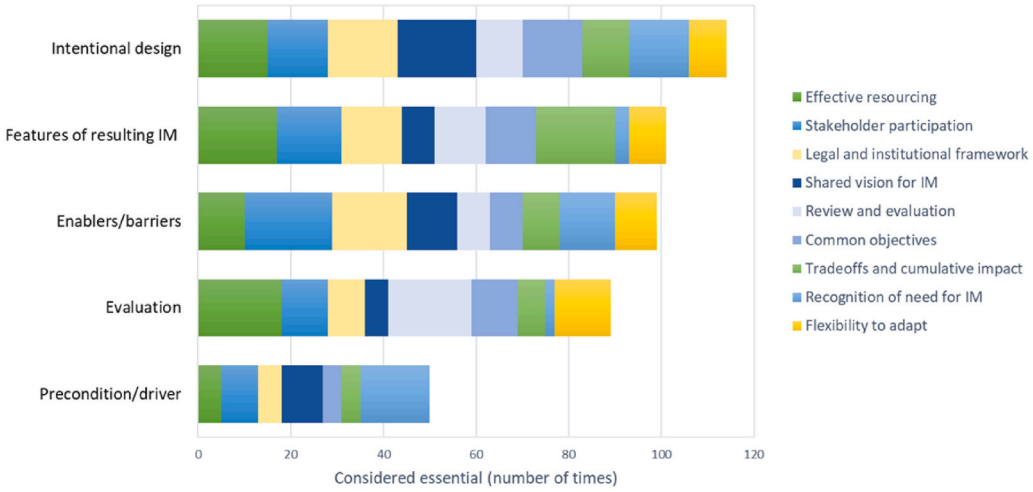
The BWS survey also asked the respondents to rate the importance/relevance of each IM-feature on five different phases of IM that were previously identified in the 'lens' using a three-point rating scale where 0 = 'not relevant', 1 = 'relevant', and 2 = 'essential'. Using the nine different IM-features (the same ones as in the BWS survey) and 5 different phases (preconditions and drivers of change, intentional design + rearrangement, enablers of/barriers to change, features of resulting IM, and evaluation and modification) the respondents were asked to rate 45 (5 × 9) different combinations of IM features and phases.

Additional questionnaire survey results

The frequency counts for the number of times each IM-feature/attribute was chosen by 21 respondents in the BIBD survey. Note that the counts for choice of most and the least important are not mirror images (i.e. the ones that are most frequently chosen as most important are not most infrequently chosen as least important). For instance, recognition of the need for IM was the second most important IM-attribute but it was also chosen 45 times as the least important IM-attribute.

IM- attribute	most important (count)	least important (count)
Appropriate legal and institutional frameworks	82	22
Recognition of the need for IM	67	45
Effective resourcing, capacity and tools	49	21
A shared vision for IM	47	49
Sufficient and effective stakeholder participation	43	11
A common, comprehensive suite of objectives	37	43
Consideration of trade-offs and cumulative impact	24	50
Process flexibility to adapt to changing conditions	15	83
Process for ongoing review, evaluation and refinement	14	57

The following figure shows the distribution of the number of times features were considered 'essential' (blue bars of Fig. 2 in the paper) across the five phases of IM. Only six features were seen as critical preconditions or drivers, and these six features thus provide a starting point for considering how to improve the success of IM. Recognition of the need for IM was considered more essential in this early phase (which we labelled precondition/driver). Respondents considered all nine features to be essential to the other four phases. In the intentional design phase the features were indicated as essential the highest number of times. Stakeholder participation is considered most essential in the enablers/barriers phase.



Distribution of scores of 'essential' from 21 respondents of the nine key features in relation to the five phases of IM.

References

Aither, 2021. Baseline Evaluation of the Marine Estate Management Strategy. A final report prepared for NSW DPI.

Australian Government, State of the Environment, 2016. Australia State of the Environment Report. (Accessed 6 June 2022).

Bailleul, F., Ward, T.M., 2019. Socio-ecological Assessment of the Ecosystems, Industries and Communities of Spencer Gulf: 'Gulfview' Interactive Platform. Goyder Institute for Water Research Technical Report Series No. 19/02.

Begg, G.A., Stephenson, R.L., Ward, T.M., Gillanders, B.M., Smith, A.D., 2015. Practical steps to implementation of integrated marine management. In: Final Report for the Spencer Gulf Ecosystem and Development Initiative and the Fisheries Research and Development Corporation. South Australian Research and Development Institute (Aquatic Sciences). SARDI Publication No, Adelaide, p. 165pp. F2015/000465-1. SARDI Research Report Series No. 848.

Bellamy, J.A., Walker, D.H., McDonald, G.T., Syme, G.J., 2001. A systems approach to the evaluation of natural resource management initiatives. J. Environ. Manag. 63, 407–423.

Brooks, K., Fairfull, S., 2016. Managing the NSW coastal zone: restructuring governance for inclusive development. Ocean Coast Manag. https://doi.org/10.1016/j.ocecoaman.2016.10.009.

Butler, J.R.A., Wise, R.M., Skewes, T.D., Bohensky, E.L., Peterson, N., Suadnya, W., Yanuartati, Y., Handayani, T., Habibi, P., Puspadi, K., Bou, N., Vaghelo, D., Rochester, W., 2015. Integrating top-down and bottom-up adaptation planning to build adaptive capacity: a structured learning approach. Coast. Manag. 43, 346–364.

Cisneros-Montemayor, A.M., Moreno-Báez, M., Reygondeau, G., et al., 2021. Enabling conditions for an equitable and sustainable blue economy. Nature 591, 396–401. https://doi.org/10.1038/s41586-021-03327-3.

Collier, C.E., 2020. Enabling conditions for community-based comanagement of marine protected areas in the United States. Mar. Pol. 122, 104244 https://doi.org/10.1016/j.marpol.2020.104244. ISSN 0308-597X.

Day, V., Paxinos, R., Emmett, J., Wright, A., Goecker, M., 2008. The Marine Planning Framework for South Australia: a new ecosystem-based zoning policy for marine management. Mar. Pol. 32, 535–543.

Day, J.C, 2017. Effective public participation is fundamental for marine conservation—lessons from a large-scale MPA. Coast. Manag. 45 (6), 470–486. https://doi.org/10.1080/08920753.2017.1373452.

Day, J.C., 2020. Ensuring Effective and Transformative Policy Reform: Lessons from Rezoning Australia's Great Barrier Reef, 1999-2004. PhD Thesis, James Cook University. https://doi.org/10.25903/afyp%2D6s09. Access to this file is available from:

Day, J.C., Kenchington, R.A., Tanzer, J.M., Cameron, D.S., 2019. Marine zoning revisited: how decades of zoning the Great Barrier Reef has evolved as an effective spatial planning approach for marine ecosystem-based management. Aquat. Conserv. Mar. Freshw. Ecosyst. 29, 9–32.

Dobbs, K., Day, J., Skeat, H., Baldwin, J., Molloy, F., McCook, L., et al., 2011. Developing a long-term outlook for the Great Barrier Reef, Australia: a framework for adaptive management reporting underpinning an ecosystem-based management approach. Mar. Pol. 35 (2), 233–240.

Doubleday, Z.A., Jones, A.R., Deveney, M.R., Ward, T.M., Gillanders, B.M., 2017. Eight habitats, 38 threats and 55 experts: assessing ecological risk in a multi-use marine region. PLoS One 12, e0177393.

Dutra, L., de la Mare, W., Perez, P., Ellis, N., Tickell, S., Cannard, T., Thebaud, O., Pascual, P., Bayliss, P., Moeseneder, C., Dichmont, C., Boschetti, F., Pascoe, S., 2010. Healthy Waterways Management Strategy Evaluation: Scoping Study for the Development of a 'catchment-To-Coast' MSE in SE Queensland - Phase 2 - Final Report 131.

Dutra, L.X., Ellis, N., Perez, P., Dichmont, C.M., de la Mare, W., Boschetti, F., 2014. Drivers influencing adaptive management: a retrospective evaluation of water quality decisions in South East Queensland (Australia). Ambio 43 (8), 1069–1081. https://link.springer.com/article/10.1007/s13280-014-0537-4.

Eger, Sondra L., Ban, Natalie C., Boaler, Chelsea, Brueckner-Irwin, Irene, Courtenay, Simon, Epstein, Graham, Hoover, Carie, McIsaac, Jim, Stephenson, Robert L., 2023. Bright spots in integrated management of Canada's oceans and coasts. In: Sumaila, U.R., Armitage, D., Bailey, M., Cheung, W.W.L. (Eds.), Canada's Oceans: Pathways to Sustainability in a Sea of Change. University of British Columbia Press, Vancouver, B.C., Canada, forthcoming.

Fisher, R.A., Yates, F., 1974. Statistical Tables for Biological, Agricultural and Medical Research/. Longman, Harlow.

Flyvbjerg, B., 2006. Five misunderstandings about case-study Research. Qual. Inq. 12, 219–245. http://arxiv.org/ftp/arxiv/papers/1304/1304.1186.pdf.

GBRMPA, 2019. Aboriginal and Torres Strait Islander Heritage Strategy for the Great Barrier Reef Marine Park. Great Barrier Reef Marine Park Authority, Australia.

Government of South Australia, 2006a. Marine planning framework for South Australia. In: Coast and Marine Conservation Branch, Natural and Cultural Heritage, Department for Environment and Heritage, Adelaide, p. 34. https://cdn.environment.sa.gov.au/environment/docs/mp_framework.pdf.

Government of South Australia, 2006b. Draft Spencer Gulf Marine Plan. Department for Environment and Heritage, Adelaide.

Gutierrez, N.L., Hilborn, R., Defeo, O., 2011. Leadership, social capital and incentives promote successful fisheries. Nature 470, 386–389.

Jones, A.R., Doubleday, Z.A., Prowse, T.A., Wiltshire, K.H., Deveney, M.R., Ward, T., Scrivens, S.L., Cassey, P., O'Connell, L.G., Gillanders, B.M., 2018. Capturing expert uncertainty in spatial cumulative impact assessments. Sci. Rep. 8 (1), 1469.

Jouffray, J.-B., Blasiak, R., Norström, A.V., Österblom, H., Nyström, M., 2020. The blue acceleration: the trajectory of human expansion into the ocean. One Earth 2 (1), 43–54. https://www.sciencedirect.com/science/article/pii/S2590332219302751.

Jordan, A., Fairfull, S., Creese, B., 2016. Managing threats to the marine estate in New South Wales (Australia) to maximise community wellbeing. Mar 3 J. Coast Res. 75, 642–646. https://doi.org/10.2112/SI75-129.1, 10075.

Kaikkonen, L., Putten, I.v., 2021. We may not know much about the deep sea, but do we care about mining it? People and Nature. https://doi.org/10.1002/pan1003.10224.

Lockwood, M., Davidson, J., Curtis, A., Stratford, E., Griffith, R., 2010. Governance principles for natural resource management. Soc. Nat. Resour. 23 (10), 986–1001. https://doi.org/10.1080/08941920802178214.

Louviere, J.J., Flynn, T.N., 2010. Using best-worst scaling choice experiments to measure public perceptions and preferences for healthcare reform in Australia. Patient-Patient-Centered-Outcome-Res 3, 275–283. https://doi.org/10.2165/11539660, 2010.

Louviere, J., Flynn, T., Marley, A., 2015. Best-Worst Scaling: Theory, Methods and Applications. Cambridge University Press, Cambridge, UK.

Marley, A.A.J., Louviere, J.J., 2005. Some probabilistic models of best, worst, and best–worst choices. J. Math. Psychol. 49 (6), 464–480.

Maher, M., Nichols, P., 2002. Healthy Waterways Project Model: A Study to Identify and Examine the Transferability of the Critical Success Factors of the Healthy Waterways Project Model, p. 94. Final report. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.197.2134&rep=rep1&type=pdf. (Accessed 22 December 2021).

Mcintosh, Emma, Poiner, Ian, Members, G.H.H.P., 2014. Gladstone Harbour report card framework. Prepared for the Gladstone Healthy Harbour Partnership Management Committee. https://doi.org/10.13140/RG.2.1.1194.4800 (PDF) Gladstone Harbour

Report Card Framework. Prepared for the Gladstone Healthy Harbour Partnership Management Committee. (researchgate.net).
Novaglio, C., Bax, N., Boschetti, F., Emad, G.R., Frusher, S., Fullbrook, L., Hemer, M., Jennings, S., van Putten, I., Robinson, L.M., Spain, E., Vince, J., Voyer, M., Wood, G., Fulton, E.A., 2021. Deep aspirations: towards a sustainable offshore Blue Economy. Rev. Fish Biol. Fish. https://doi.org/10.1007/s11160-020-09628-6.
O'Hara Casey, C., Frazier, M., Halpern Benjamin, S., 2021. At-risk marine biodiversity faces extensive, expanding, and intensifying human impacts. Science 372 (6537), 84–87. https://doi.org/10.1126/science.abe6731. https://science.sciencemag.org/content/372/6537/84.
Paxinos, R., Wright, A., Day, V., Emmett, J., Frankiewicz, D., Goecker, M., 2008. Marine spatial planning: ecosystem-based zoning methodology for marine management in South Australia. J. Conserv. Plann. 4, 37–59.
Pascoe, S.D., Plagányi, É.E., Dichmont, C.M., 2017. Modelling multiple management objectives in fisheries: Australian experiences. ICES (Int. Counc. Explor. Sea) J. Mar. Sci. 74 (2), 464–474.
Robbins, W.D., Huveneers, C., Parra, G.J., Möller, L., Gillanders, B.M., 2017. Anthropogenic threat assessment of marine-associated fauna in Spencer Gulf, South Australia. Mar. Pol. 81, 392–400.
Sheaves, M., Sporne, I., Dichmont, C.M., Bustamante, R., Dale, P., Deng, R., Dutra, L.X.C., Putten, I.v., Savina-Rollan, M., Swinbourne, A., 2016. Principles for operationalizing climate change adaptation strategies to support the resilience of estuarine and coastal ecosystems: an Australian perspective. Mar. Pol. 68, 229–240.
Stephenson, Robert L., Hobday, Alistair J., Cvitanovic, Christopher, Alexander, Karen A., Begg, Gavin A., Bustamante, Rodrigo, Dunstan, Piers K., Stewart, Frusher, Fudge, Maree, Fulton, Elizabeth A., Haward, Marcus, Macleod, Catriona, McDonald, Jan, Nash, Kirsty L., Ogier, Emily, Pecl, Gretta, Plagányi, Éva E., van Putten, Ingrid, Smith, Tony, Tim, M., Ward, 2019a. A practical framework for implementing and evaluating integrated management of marine activities. Ocean Coast Manag. 177, 127–138. https://doi.org/10.1016/j.ocecoaman.2019.04.008.
Stephenson, R.L., Hobday, A.J., Cvitanovic, C., Fudge, M., Ward, T., Butler, I., Cannard, T., Cowlishaw, M., Cresswell, I., Day, J., Dobbs, K., Dutra, L., Frusher, S., Fulton, B., Gibson, J., Gillanders, B.M., Gollan, N., Haward, M., Hutton, T., Jordan, A., Macdonald, J., MacLeod, C., Pecl, G., Plaganyi, E., Van Putten, I., Smith, T., Poiner, I., Vince, J., 2019b. Report of Workshops on integrated management (IM) of marine activities. FRDC Report 2017-214. 62pp. available at. https://www.frdc.com.au/project/2017-214.
Stephenson, R.L., Hobday, A.J., Allison, E.H., Armitage, D., Brooks, K., Bundy, A., Cvitanovic, C., Dickey-Collas, M., Grilli, N.M., Gomez, C., Jarre, A., Kaikkonen, L., Kelly, R., López, R., Muhl, E.-K., Pennino, M.G., Tam, J.C., van Putten, I., 2021. The quilt of sustainable ocean governance: patterns for practitioners. Front. Mar. Sci. 8, 630547 https://doi.org/10.3389/fmars.2021.630547, 10.3389/fmars.2021.630547.
Stockbridge, J., Jones, A.R., Gaylard, S.G., Nelson, M.J., Gillanders, B.M., 2021. Evaluation of a popular spatial cumulative impact assessment method for marine systems: a seagrass case study. Sci. Total Environ. 780, 146401.
Stojanovic, T.A., Gee, K., 2020. Governance as a framework to theorise and evaluate marine planning. Mar. Pol. https://doi.org/10.1016/j.marpol.2020.104115.
Strauss, A., Corbin, J., 1998. Basics of Qualitative Research Techniques. Sage publications, Thousand Oaks, CA.
Tanner, J.E., Bailleul, F., Bryars, S., Doubell, M., Foster, N., Gaylard, S., Gillanders, B.M., Goldsworthy, S., Huveneers, C., James, C., Jones, A.R., Maher, J., Nursey-Bray, M., van Ruth, P., Ward, T.M., 2019. Potential Social, Economic and Ecological Indicators for Integrated Ecosystem Assessment of Spencer Gulf. Goyder Institute for Water Research Technical Report Series No. 19/32.
Vince, J., Nursey-Bray, M., 2016. Policy capacity in oceans governance: Rio+20 and Australia's outcomes. Aus. J. Marit. Ocean Aff. 8 (3), 165–179. ISSN 1836-6503.
Vince, J., Smith, A.D.M., Sainsbury, K.J., Cresswell, I.D., Smith, D.C., Haward, M., 2015. Australia's Oceans Policy: past, present and future. Mar. Pol. 57, 1–8.
Voyer, M., Quirk, G., McIlgorm, A., Azmi, K., 2018. Shades of blue: what do competing interpretations of the Blue Economy mean for oceans governance? J. Environ. Pol. Plann. 20 (5), 595–616.
Wesche, S., Lucas, T., Mayer, D., Waltisbuhl, D., Quinn, R., 2013. Gladstone Harbour Fish Health Investigation 2011–2012. State of Queensland, p. 78.
Western Australia, 2021. Coastal zone management program 2020-21 achievements. In: Department of Planning, Lands and Heritage Communications Branch. Coastal Zone Management Program 2020-21 Achievements. www.wa.gov.au.
Winther, J.-G., Dai, M., Rist, T., Hoel, A.H., Li, Y., Trice, A., et al., 2020. Integrated ocean management for a sustainable ocean economy. Nat. Ecol. Evol. 4, 1451–1458.
Zuercher, Rachel, Natalie C. Ban, Wesley Flannery, Anne D. Guerry, Benjamin S. Halpern, Rafael Almeida Magris, Shauna L. Mahajan, Nicole Motzer, Ana K. Spalding, Vanessa Stelzenmüller, Jonathan G. Kramer, Enabling conditions for effective marine spatial planning, Mar. Pol., Volume 143, 2022 https://doi.org/10.1016/j.marpol.2022.105141.