Assessing the Social and Economic Value of Man-made Marine Structures:

A Guidebook

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Introduction

This guidebook provides support to those making decisions regarding the design, installation, adaptation and maintenance of man-made marine structures (e.g. policy makers, private sector managers): their use, development, placement and management. In particular, it guides users in selecting an approach to evaluate the social and economic values associated with man-made marine structures (MMS). The definition of MMS is broad, including: existing infrastructure (e.g. O&G or wind turbines), in particular when this infrastructure is decommissioned and either left *in situ* or re-located; manmade reefs; wrecks (purposefully or accidentally occurring); and piers and jetty's. The guidebook has been developed based on an identified need to support stakeholders in understanding the social and economic values of man-made marine structures and their underpinning rationale for those values across a range of sectors. Thus stakeholders will be able to incorporate this understanding within their decision-making.

Aiding Decision-Makers
Good decisions take place when a detailed and nuanced understanding is held of the situation/topic. Carrying out social-economic analysis provides valuable insight into a) the breadth of stakeholder values, b) the impact values have on one another and c) identification of economic and social values and opportunities that inform sustainable, supported, and nuanced decision outcomes.

By understanding the importance people place on the marine environment, the infrastructure within it, and its associated uses, a more informed case can be made for the installation or removal of MMS, taking into account considerations such as effective resource allocation, community engagement, and the wider context (thus avoiding unsustainable decisions from being made).

Scope of the guidebook

The guidebook was created as an output of an FRDC funded research program entitled 'Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures' (Project No

2018-053). In this project, the social and economic values (also collectively termed 'social-economic values') of man-made marine structures were elicited for structures within Western Australia. The learnings from this project informed the design of this guidebook. The guidebook focuses predominantly on the methodologies that were applied in this project. However, there exist alternate and complementary approaches and methodologies that can obtain the desired information. Some such methodologies are discussed herein (e.g. stakeholders interviews), but the methodologies captured in this guidebook are not definitive. For further information on the range of social and economic assessment methods, refer to, for example: Bickman and Rog 2008 (social research) and Pannell et al (2013) (who provide a framework for evaluation of environmental projects from an economic perspective).

Social-economic values defined

Social and economic values associated with man-made marine structures are the values that people hold arising from the use (e.g. both direct and indirect use) and non-use (e.g. the existence of marine life) of man-made marine structures. Social-economic values are shaped by, and shape an individual's perceptions and behaviours, can be either positive or negative, and interact and change over space and time. Values therefore evolve in response to the social, economic, political and environmental context.

Why understand social and economic values?

Decommissioning Oil and Gas structures
When oil and gas infrastructure comes to the end of its operational life, a decision has to be made about how it is disposed of. Evaluating the economic values of alternative end states quantifies in monetary terms the benefits to different users different of decommissioning alternatives, while understanding the social values of stakeholders impacted (both directly and indirectly) can provide information to support decision-making on the options that will best address (i) social licence to operate; (ii) potential stakeholder conflicts; and (iii) provide social benefit to multiple stakeholders.

Designing Artificial Reefs
Artificial reefs can play an important role in environmental sustainability, protecting erodible coastlines, and as sites of subsistence, commercial and recreational activities. An assessment of the economic value of an artificial reef can provide the business case for its implementation and/or explore the potential value trade-offs across stakeholder groups (e.g. recreational fishers and divers) based on site location and user access. Social value assessments can, for example, contribute an understanding of stakeholders' views on artificial reefs and how these compare across sites or stakeholders, uncover potential stakeholder conflicts relating to access; and demonstrate the benefits or impacts to multiple stakeholders.

How to use this guidebook

In the following sections, we guide you through the identification of social and economic values, commencing with economic followed by social valuation approaches. A pre-cursor to this is, in some cases, the identification of the consequences of the MMS on the ecological system. For example, the quantification of economic and social values can require a quantification of the changes in the ecological values associated with the change in status of the MMS. Or there may be no changes in

the ecological system *per se* (e.g. changing access to an MMS), but there will still be a need to understand the change in environment that is being made *accessible*. The guidebook has been designed on the assumption that this information has been (or will be) obtained, if required.

At the start of each section, we briefly describe the nature of the values that can be identified. By navigating through the questions, users are provided with one or more approaches they can adopt to understand social and/or economic values. For both, different approaches can give information of different depths, and these are described.

The approaches are classified into three categories reflecting a different depth of understanding: basic, medium and detailed. A basic level of understanding of social and/or economic values of MMS might be sufficient where stakeholders have limited concerns or only have a limited budget. A basic level of understanding also might be enough where stakeholders do not desire to build a case to influence policy or where the alternatives are non-controversial. A detailed assessment might be necessary when regulators require an in-depth level of understanding of a case study (e.g. to accept a certain decommissioning scenario), where stakeholder's interests could be affected (particularly in situations where there can be competing interest), or when alternative scenarios of the management of MMS are complex.

Social and economic valuation approaches provide different yet complementary information. While the approaches are presented separately, they can be combined for more comprehensive and robust coverage, to inform subsequent methods and/or to answer multiple questions. For example, a survey-questionnaire can identify and quantify social and economic values, while a focus group workshop can understand the nuance of survey elicited preferences and their impact on one another. For other examples of the benefits of integrating social and economic values see Harvey et al (2021).

Integrating information on social and economic values

There are several ways to integrate social and economic research. Data from a survey could be augmented through a focus group which seeks to understand the values in more depth. For example, triggers (e.g. safe access) or opportunities (e.g. refuge for endangered species) can be identified. The survey data can also be examined against economic data to determine where perception and fact diverge.

Understanding Economic Values

The defining aspect of economic values is that they are represented in monetary terms. This includes values that may be determined through markets (e.g. profits or expenditures), but also values that may be seen as intangible (e.g. the value of the recreational experience to the fisher). Placing all values in a common monetary metric allows for an easy comparison of outcomes across different stakeholders. Man-made marine structures can generate various value types for different stakeholder groups. These values include:

- *Commercial value:* The impact on commercial enterprises that directly interact with the MMS e.g. commercial fishers who may fish on the structures. This would typically be measured through changes in profits.
- *Recreational user value:* The benefits to the recreational users of MMS through that use, which is measured by the 'consumer surplus' associated with their use. This is the direct benefit to those users (recreational fishers, divers, tourists etc), and which should be differentiated from:
- *Community value:* The contribution of users of MMS to the local/regional economy through their expenditures, and potentially measured through the jobs that are supported by that expenditure
- *Existence value:* The values that the community may hold for changes in the ecological conditions arising from the MMS, that arise simply from it occurring, without any need for the person to directly interact with the MMS. For example, this could be positive if the MMS improves the status of endangered species that are valued by the community, or negative if the presence of the MMS is deemed to compromise those values.
- *Subsistence and cultural value:* The values a community may derive from the direct consumption of fish harvested due to the MMS (food security), or the ability to maintain cultural usage of marine resources.

It is important to frame values by a counterfactual: what value does this infrastructure in the water provide, compared to the situation where it is removed – what additional value would the creation of this MMS provide, compared to the situation where it is not. Quantifying the counterfactual is necessary and challenging, as one needs to identify the full extent of people's adaptation in behaviour in response to the change in the state of the MMS.

A particular value can be quantified in different ways. Table 1 gives an overview to the different approaches that quantify these values in monetary terms, including the consumer surplus and existence values. These approaches generate different levels of understanding: from those that are relatively low in resource needs, and which may generate relatively imprecise values (Basic), to those that are medium or high in resource needs, can be framed to be context specific, and which can give a richer and more accurate insight into the values (Medium/Detailed). The table also gives a summary of the main outputs one gets from each of the approaches.

Which approach might be the most suitable can be further explored in the question section below. Each of these approaches could stand alone, or they could be combined, depending on the interest of the user of this guidebook. For example, if there is a mixed fishery around the MMS, approaches on commercial and subsistence fisheries apply. Moreover, some approaches can estimate more than one value type. A Random Utility Model of site choice for instance can quantify the value to recreational user, and also estimate community values (expenditures) associated with that activity.

Economic Value: Section 1 Recreational users

Q1 Is there a potential recreational use of MMS (recreational fishing, diving, and/or other tourism)?

No: Go to Economic Value: Section 2

Yes: Q2 Is there currently any recreational use in the region of a (prospective) MMS?

No: Q3 Could the MMS create new recreational use?

No: Go to Economic Value: Section 2

Yes: Q4 Are you interested in:

Recreational user value?
Community value?

Existing and/or new MMS
Basic: *Benefit transfer*

Yes: Q5 Are you interested in:

Recreational user value?

Existing and/or new MMS
Basic: *Benefit transfer*
Detailed: *Random Utility Model*
Existing MMS only:
Medium: *Travel cost method*

Community value?
Existing and/or new MMS
Basic: *Benefit transfer*
Medium: *Random Utility Model*
Detailed: *Economic impact assessment*
Existing MMS only:
Medium: *Travel cost method*

Economic Values: Section 2 Commercial fisheries

Q6 Is there a potential commercial fishery on the MMS?

No: Go to Economic Values: section 3

Yes: Q7 Is there any commercial fishery in the region of the (prospective) MMS?

No: Q8 Could the (prospective) MMS create new commercial fisheries?

No: Go to Economic Values: section 3

Yes:

Basic: *Benefit transfer*

Yes:

Basic: *Benefit transfer*
Medium/detailed: *Survey of commercial enterprises*

Economic Values: Section 3 Subsistence fisheries

Q9 Is there any subsistence fishery in the region of the (prospective) MMS?

No: Go to Economic Values: section 4

Yes:

Basic: *Benefit transfer*

Detailed: *Sustainable livelihood assessment*

Economic Values: Section 4 General public

Q10 Is there any sign that the MMS potentially generates non-use/existence values to the general public?

No: There are no further economic values, you may want to continue to social values.

Yes:

Basic: *Benefit transfer*
Medium/detailed: *Contingent Valuation Method/Discrete Choice Experiment*

Question	Sub-question	Level of understanding	Primary Output	Approach
Recreational users	Recreational user value	Basic	Aggregate consumer surplus based on non-case study specific user values that users derive/lose from the provision/removal of MMS	*Benefit transfer*
		Medium	Case study specific consumer surplus per trip and on aggregate that users lose from the removal of MMS	*Travel cost method*
		Detailed	Change in use of MMS and the region at large	*Random Utility Model*
			Case study specific consumer surplus per trip and on aggregate that users derive/lose from the provision/removal of MMS	
	Community value	Basic	Aggregate market value based on non-case study specific community values that users derive/lose from the provision/removal of MMS	*Benefit transfer*
		Medium	Market value per trip and on aggregate that users lose from the removal of MMS	*Travel cost method*
		Medium	Change in use of MMS and the region at large	*Random Utility Model*
			Case study specific market value per trip and on aggregate that users derive/lose from the provision/removal of MMS	
		Detailed	Case study specific market values per trip and on aggregate that users derive/lose from the provision/removal of MMS	*Economic impact assessment*
Commercial fisheries	Commercial value	Basic	Aggregate market values based on non-case study specific commercial values that users derive/lose from the provision/removal of MMS	*Benefit transfer*
		Medium to detailed	Case study specific aggregate market value of commercial fishery that users derive/lose from the provision/removal of MMS	*Survey of commercial enterprises*
Subsistence fisheries	Food security	Basic	Non-case study specific aggregate market price of fisheries catch	*Benefit transfer*
	Social-economic and cultural values	Detailed	Economic, social and/or cultural impact of MMS on the livelihood of subsistence fishers. Can identify pathways to enhance, supplement and/or diversify livelihoods	*Sustainable livelihood assessment*
General public	Existence value	Basic	Aggregate consumer surplus based on non-case study specific existence values that people derive/lose from the provision/removal of MMS	*Benefit transfer*
		Detailed	Case study specific per unit and aggregate existence values that people lose from the removal of MMS	*Contingent Valuation Method/Discrete Choice Experiment*
			Use value that people would derive/lose from the provision/removal of the MMS	

Table 1: Management questions, level of understanding sought, and associated outputs provided by different economic valuation approaches.

Understanding Social Values

Social value can be seen as denoting the degree of importance of an object or action, with the aim of determining what actions are best to do, or what way is best to live, or to describe the significance of different actions in relation to a societal decision. Social values are influenced by, and influence, how people interact with and view man-made marine structures. In regard to social values and their use in the management, design and implementation of man-made marine structures, there are often three core areas of interest:

- Understanding how people use or interact with MMS
- Understanding the values that people derive from MMS
- Understanding people's perceptions of MMS (including the opportunities and issues associated with MMS)

Each of the three areas of interest could comprise a standalone question or they could be combined depending on the stakeholders' interest, for example, whether they seek a partial or 'whole of system' understanding. Each area is interrelated: an individual's perceptions can influence their behaviour, which in turn can shape their values; an individual's values can influence their perceptions and in turn their behaviours; finally, an individual's actions can change their perceptions and values (Figure 1).

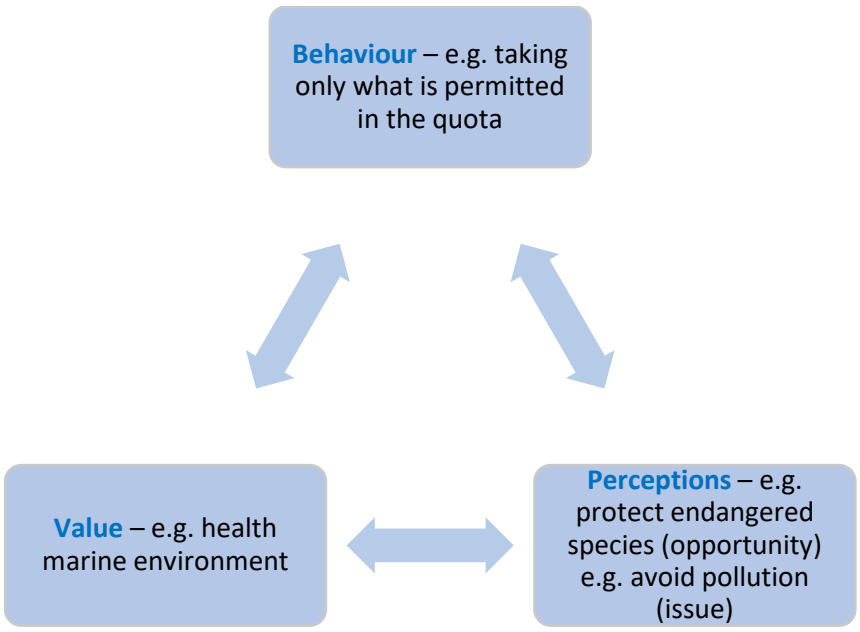

Figure 1: Illustration of core areas of interest showing their interactive nature

Furthermore, for each question, there are different levels of understanding that can be obtained, and different data collection techniques that contribute to that level of understanding. We broadly describe these across three levels:

1. Basic: Provides a partial understanding of use/behaviour/ values/perceptions of stakeholders. Does not provide information on what influences uses/behaviours.

2. Moderate: Provides an understanding of the uses/values/perceptions and the factors influencing use/values/perceptions; but does not explain why those influencing factors are important or how values, behaviours, and perceptions interrelate.
3. Detailed: Provides the information missing from the two prior levels of understanding, i.e. explanation for the influencing factors and any interrelationships between behaviour/values/perceptions.

We summarise these in the boxes below and then present them as questions leading to alternate approaches.

Why conduct a social values assessment?

Decommissioning Oil and Gas Structures

Understanding perceptions of key stakeholders in order to decide whether or not to convert a platform to an artificial reef.

- Basic understanding – number of society pro or against a rigs to reef decision
- Moderate understanding – a sense of which values are affected by the decision and to what degree
- Detailed understanding – articulation of the range and interconnectivity of the issues (e.g. invasive species) and opportunities (protecting endangered species)

Policy Makers

If seeking to modify stakeholders' use of an existing structure, understanding the values and perceptions of stakeholders to support equitable decisions that can reduce potential conflicts arising from management choices.

- Basic – number of users of the current structure and potential users of the modified structure
- Moderate – insight into how different groups perceive the modification (positively or negatively) and why (values associated).
- Detailed – comprehensive understanding of the different appetites for the modification along with explanations regarding the perceived issues and opportunities associated.

Peak Body

If seeking to present the case for installation (or maintenance) of an MMS, understanding the values users obtain (or could obtain) from these structures is important.

- Basic – number of interested parties, % of sampled population
- Moderate – information regarding the impact on a set of values affected by the installation (positively/negatively)
- Detailed – understanding of the range of concerns held by the community e.g. services overloaded, ambience of location adversely affected

It is important to note that the level of detail obtained through application of different social research methods varies depending on the design and implementation of the tool. For example, an online survey questionnaire can include short, multiple choice questions sent to a discrete number of stakeholders, or it could include i) multiple Likert scale questions based on existing literature or theoretical models, or ii) open-ended questions and be distributed to a representative sample of stakeholders. In general, however, the depth of understanding gained through approaches lies on a continuum from Basic to Detailed as shown in Figure 2:

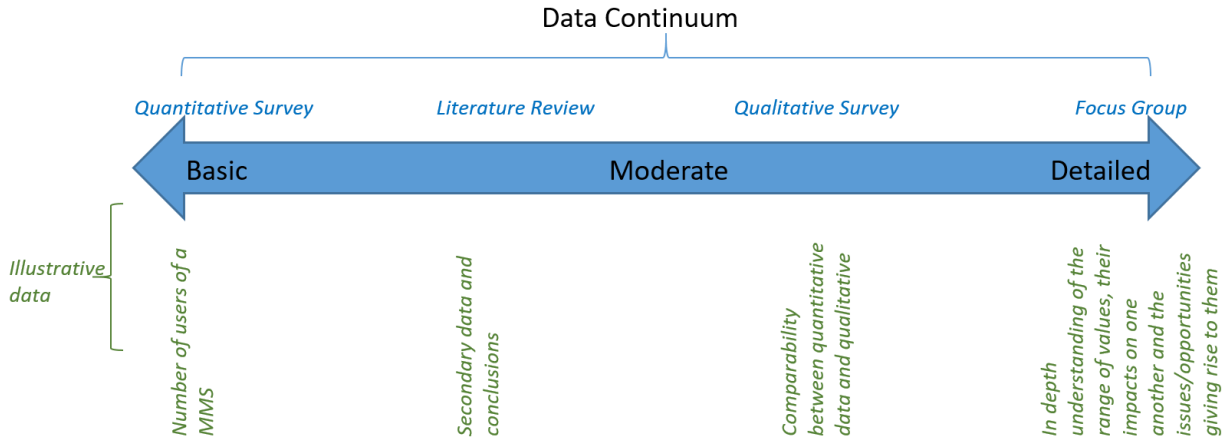

Figure 2: Social value data continuum

See Social Value: Approaches, for further detail on each approach.

To help guide the selection of a research method, let's consider ***what you would like to know:***

1. **How people use or interact with MMS**
    a. Do you want to know who uses MMS?
        i. If Yes apply: *Quantitative survey (online or face-to-face)*
    b. Would you also like to know why they are using MMS?
        i. If Yes apply: *Literature review and/or Quantitative survey (online or face-to-face) and/or Focus group/Workshop*

2. **People's perceptions/views on MMS**
    a. Do you want a basic understanding of people's views of MMS?
        i. If Yes apply: *Quantitative survey (online or face-to-face)*
    b. Do you want a moderate level of understanding of how people's views differ and what influences their views?
        i. If Yes apply: *Literature review and/or Quantitative and Qualitative survey (online or face-to-face) and/or Focus group/Workshop*
    c. Do you want a detailed and systemic understanding of people's views so that you can explain why those views are held and what influences them and plan outcomes that are more likely to be accepted (social licence)?
        i. If yes, apply: *Qualitative survey (online or face-to-face), and/or Interviews and/or Focus group/Workshop*

3. **The values people derive from MMS**
    a. Do you want a moderate level of understanding of the values people derive from MMS and potential influencing factors?
        i. If yes, *Literature review and/or Quantitative and Qualitative survey (online or face-to-face)*
    b. Do you want to be able to explain why those values are held, what are the issues and opportunities underpinning the values, how they change over time, how they impact on one another and the degree of homogeneity in values?
        i. If yes, apply: *Interviews and/or Focus group/Workshop*

Table 2: Management questions, level of understanding sought, and associated outputs provided by different data collection approaches

Question	Sub-question	Level of understanding	Output	Approach
1) Use of MMS	a) Who uses MMS	Basic	Number of users	Quantitative survey *(online or face-to-face)*
	b) Why are they using MMS	Moderate	Number of users	Literature review
			Influencing factors	Quantitative survey *(online or face-to-face)*
		Detailed	Number of users	Literature review
			Influencing factors	Quantitative survey *(online or face-to-face)*
			Explanation	Qualitative survey *(online or face-to-face)*, *Interviews*, *Focus group/Workshop*
2) Perceptions of MMS	a) General perceptions	Basic	Ranking	Quantitative survey
	b) Sub-groups of perceptions (e.g. by stakeholder group or MMS type)	Moderate	Ranking	Literature review
			Influencing factors	Quantitative survey *(online or face-to-face)*
		Detailed	Ranking	Literature review
			Influencing factors	Quantitative survey *(online or face-to-face)*
			Explanation	Qualitative survey *(online or face-to-face)*, Interviews, *Focus group/Workshop*
3) Values of MMS	a) General values	*Basic not possible*		
		Moderate	Ranking	Literature review
			Influencing factors	Quantitative survey *(online or face-to-face)*
	b) Sub-groups of perceptions (stakeholder group / MMS type)	Detailed	Ranking	Literature review
			Influencing factors	Quantitative survey *(online or face-to-face)*
			Explanation	Qualitative survey *(online or face-to-face)*, Interviews, *Focus group/Workshop*

Approaches

Economic Value: Approaches

In this section, the advantages and limitations of different approaches are summarised, and examples of their application provided.

Benefit transfer

Advantages

- Does not require any (or limited) primary data collection
- Potentially can be applied to any of the economic values identified.

Disadvantages

Requires there to be values in the literature that are relevant to the current context, and those values become less reliable the further from the current context those values are drawn from (e.g. transferring values across countries, or different ecological systems)

Input Requirements

- Access to (or creation of) a literature base from which to identify relevant values
    - The Environmental Valuation Reference Inventory www.evri.ca is a database for non-market values such as the consumer surplus of recreational users and existence values held by the general public
    - For commercial activities (e.g. fisheries or tourism) one needs market values such expenditures or profits
    - For subsistence fisheries one needs the market value of the catch.
- Given values are often per unit (e.g. value per trip), the quantum of use (e.g. number of trips, volume of fish caught) still needs to be estimated.

Outputs

- Estimate of the aggregate value, in monetary terms associated with the MMS.

Examples

- "The potential Economic Value Associated with the Development of Artificial Reefs in Western Australia" in Harvey et al (2021) Appendix 4.

Literature Examples

- Rogers, A.A., Nedosyko, A., McLeod, I.M., Gillies, C. and Burton, M.P. (2018). Benefit-Cost Analysis of the Windara shellfish reef restoration project. Report to the National Environmental Science Program, Marine Biodiversity Hub. The University of Western Australia
- Subroy, V., Gunawardena, A., Polyakov, M., Pandit, R. & Pannell, D. J., 1 Oct 2019 Ecological Economics. 164, 106374.
- Johnston, R.J., J. Rolfe, R.S. Rosenberger and R. Brouwer, eds. 2015. Benefit Transfer of Environmental and Resource Values: A Guide for Researchers and Practitioners. Dordrecht, the Netherlands: Springer
- Food and Agriculture Organisation (2005) Increasing the contribution, role and importance of small-scale fisheries in poverty alleviation and food security. FAO Fisheries Technical Paper No.481, Rome, Italy.

Travel cost method

Advantages

- Is based on observed behaviour
- Is relatively easy to implement in terms of data requirements

Disadvantages

- Can only be used to value an existing MMS, not prospective MMS, as it relies on a survey of users.
- It can only identify the recreational use values (and the expenditures associated with them) but not existence values.

Input Requirements

- There are a variety of methods available, which differ in the data collected, but all require a survey that identifies the level of use by individuals, and an estimate of the costs they incurred in order to access the MMS. Mostly commonly employs an on-site survey.
- If sufficiently comprehensive, the survey will provide an estimate of the aggregate use of the MMS, otherwise an external source for that information is required.

Outputs

- Estimate of the "consumer surplus" per trip to the MMS (i.e. the value to the user over and above the amount they have spent on the activity).
- Combination of the value per trip and an estimate of aggregate use leads to an estimate of the value of the MMS to the users.
- If information on all costs is collected (i.e. both travel and local expenditure), estimates of the value of the activity to the regional economy can also be generated.

Examples

- Appendix 5 "The Economic Value of the Exmouth Navy Pier and Busselton jetty, Western Australia" in Harvey et al (2021) "Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures", FRDC project No 2018-053.

Literature Examples

- Chen J., Chuang C., Jan R., Liu L., Jan M. (2013) Recreational benefits of ecosystem services on and around artificial reefs: a case study in Penghu, Taiwan. Ocean and Coastal Management, 85: 58-64.
- Lupi,F., Phaneuf,D.J., von Haefen,R. (2020) Best practices for implementing recreational demand models. *Review of Environmental Economics and Policy*, volume 14, issue 2, Summer 2020, pp. 302–323
- Pendleton L. (2005) Creating underwater value: The economic value of artificial reefs for recreational diving. Report for the San Diego Oceans Foundation, San Diego, USA.

Random Utility Model

Advantages

- Is based on observed behaviour
- Once developed it can simulate the consequences (and hence value) of prospective MMS at different locations
- It can identify the substitution effects arising from the change in MMS i.e. the way that users shift effort in space as a result of removing/introducing an MMS

Disadvantages

- It can only identify the recreational use values (and the expenditures associated with them) but not existence values.
- It has a relatively data intensive approach, requiring information on all site choices that are possible substitutes for the MMs of interest (i.e. diving trips to natural sites as well as to the MMS that one may be interested in), and a full complement of data about all potential sites, even if not selected by a respondent.

Input Requirements

- Data from a survey of users identifying all relevant trips within the area of interest, including site specific information on costs of accessing site, and expectations (or proxies thereof) of the expected outcomes/experience of the visit (e.g. expected catch rates, species caught, expected species seen). This data needs to be extrapolated to all available 'sites' even if an individual has not visited them through e.g. an estimated expected catch function.
- Statistical analysis is relatively complex.

Outputs

- Estimate of the "consumer surplus" per trip to a specific MMS (i.e. the value to the user over and above the amount they have spent on the activity), derived through simulating their site choices with the MMS present v those when it is not.
- Combination of the value per trip and an estimate of aggregate use leads to an estimate of the value of the MMS to the users.
- An estimate of the change in use (i.e. visitation rate/level of effort) applied at the MMS and ***all other sites*** as a result of MMS removal/creation.
- If information on all costs is collected (i.e. both travel and local expenditure) estimates of the value of the activity to the regional economy can also be generated.

Examples

- Appendix 6 "The use value of man-made marine structures in Western Australia: A random utility model" in Harvey et al (2021) "Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures", FRDC project No 2018-053.

Literature Examples

- Raguragavan, J., and Hailu, A. (2013). Economic valuation of recreational fishing in Western Australia: statewide random utility modelling of fishing site choice behaviour. *Australian Journal of Agricultural and Resource Economics*. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-8489.12009.

Economic impact assessment

Advantages

- Can quantify the monetary value that an MMS contributes to the economy in a specified area
- Is based on observed behaviour

Disadvantages

- Strictly speaking, the relevant measure of the economic impact is the business profit. However, this measure is typically hard to quantify because few businesses are willing to provide this sensitive information. This is why other measures are used as proxy for profit.

Input Requirements

- Data from users on expenditures associated with an activity on a MMS
- Interview(s) with relevant businesses on employment, expenditures in the local economy and profits

Outputs

- Value is typically measured as direct and indirect business revenues, employee salaries and job creation and/or business profit

Examples

- Appendix 4 “The potential Economic Value Associated with the Development of Artificial Reefs in Western Australia” in Harvey et al (2021) “Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures”, FRDC project No 2018-053.

Literature Examples

- Brock (1994). Beyond fisheries enhancement: Artificial reefs and ecotourism. Bulletin of Marine Science, 55(2-3): 1181-1188.
- Brandini (2014). Marine biodiversity and sustainability of fishing resources in Brazil: a case study of the coast of Parana state. Reg. Environ. Change, 14: 2127-2137
- Crabbe M., McClanahan T.R. (2006). A biosocioeconomic evaluation of shipwrecks used for fishery and dive tourism enhancement in Kenya. Western Indian Ocean J. Mar. Sci., 5(1): 35-53.
- Dowling R.K., Nichol J. (2001). The HMAS Swan Artificial Dive Reef. Annals of Tourism Research, 28(1): 226-229.

Contingent Valuation Method/Discrete Choice Experiment

Advantages

- The only approach that can identify the existence values associated with a change in MMS that are held by those who do not directly use the MMS
- Can potentially capture both use and non-use values if the definition of the sample used is representative and sufficiently large.

Disadvantages

- Based on stated preferences, in hypothetical contexts.
- Can potentially conflate existence values and use values, so may lead to double counting if one has estimates of use value elsewhere in the analysis.
- Can be relatively resource intensive if a large representative study is to be undertaken.

Input Requirements

- A survey of the relevant population, who may hold values for the outcomes associated with changes in MMS. Typically this will need to be 1000+ for robust results, and if subsectors within the sample are to be identified.
- There are a variety of approaches that can be employed, depending on the specific context: contingent valuation techniques are relatively straight forward, but value the MMS as a whole, while the more complex discrete choice models allow the decomposition of value between the elements of the MMS, and allow one to value prospective MMS provision.

Outputs

The existence values associated with the MMS, held by those who may never use the MMS. Potentially, given the sampling frame and the context of the question (e.g. a national reefing program) it may include user's evaluation of the use value that they would derive/lose from the provision/removal of the MMS (as respondents are typically asked to value the resource, and not categorise the source of those values). If information on actual (or prospective) use is included then one may be able to segregate different groups of stakeholders, and draw inferences about why values may be different. If a representative sample is drawn, then aggregate values can be made for regional or national populations.

Examples

- Appendix 7 "Community perceptions of rigs-to-reefs in Western Australia" in Harvey et al (2021) "Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures", FRDC project No 2018-053.

Literature Examples

- Börger T., Hooper T.L., Austen M.C. (2015) Valuation of ecological and amenity impacts of an offshore windfarm as a factor in marine planning. Environmental Science and Policy 54: 126-133.
- Chi-Ok Oh, Robert B. Ditton & John R. Stoll (2008) The Economic Value of Scuba-Diving Use of Natural and Artificial Reef Habitats, Society & Natural Resources, 21:6, 455-468, DOI: 10.1080/08941920701681953

- Morgan O.A., Huth W.L., Hindsley P. (2018) Examining the perceptions and effects of survey consequentiality across population subgroups. J. Benefit Cost Anal., 9(2): 305-322. doi:10.1017/bca.2017.32

Survey of commercial enterprises

Advantages

- One gets direct estimates of the economic data relevant to identify profits of commercial enterprises working with the MMS
- Can provide detailed information on expenditure/jobs potentially at a regionally specific level.

Disadvantages

- Unless a sector is entirely dependent on the MMS one has to infer contribution of MMS to the aggregate profit
- High level of detail required, and dependent on cooperation of industry to provide commercially sensitive information

Input Requirements

- A survey of the relevant population, identifying information on costs and revenues, preferably at a level of disaggregation that allows one to attribute values to the MMS of interest.

Outputs

- Estimates of profit per unit output/effort, that reflect the economic value of the activity to the business.
- Estimates of the total expenditure, which may give indication of the contribution to local economies.

Literature Examples
Pascoe, S., Innes, J., Tobin, R., Stoeckl, N., Paredes, S. and Dauth, K. (2016) Beyond GVP: The value of inshore commercial fisheries to fishers and consumers in regional communities on Queensland's east coast July 2016 FRDC Project No 2013-301

Sustainable livelihood assessment

Advantages

- Can identify and estimate a wide range of impacts on subsistence fisheries (economic, social, cultural)
- Is able to integrate economic and social approaches to assessing values
- Applies an ecosystem-based approach to fisheries management

Disadvantages

- In contrast to other classical economic approaches, this approach does not quantify all impacts in monetary terms

Input Requirements

- Surveys with relevant members of the fisheries community to collect information on diversity of coastal people, their capacity to adapt to risks, the incentives that influence their decisions and sources of their vulnerability.

Outputs

- Economic, social and/or cultural impact of MMS on the livelihood of subsistence fishers
- Can identify pathways to enhance, supplement and/or diversify livelihoods

Literature Examples

- Pomeroy R.S. (2013) Sustainable livelihoods and an ecosystem approach to fisheries management. Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security Report, Jakarta, Indonesia.
- Islam et al. (2014) Economic impact of artificial reefs: A case study of small scale fishers in Terengganu, Peninsular Malaysia. Fisheries Research 151: 122-129.

Social value: Approaches

In this section, the advantages and limitations of different approaches are summarised, and examples of their application provided. While the approaches are separated here, they can be combined for more comprehensive coverage, to inform subsequent methods or to answer multiple questions. See for example: Harvey et al 2021, Evans et al 2017, Barclay et al 2017.

The 'best' approach will vary depending on the depth of information sought, the target group, the education and engagement levels sought, available resources, and geographic scope. Appendix 1 provides a 'checklist' from which users of this guidebook can quickly see the advantages and disadvantages of the different data collection techniques. By adopting more than one approach, the limitations of one can be offset by another. This is termed data triangulation.

Literature Review

Advantages

- Does not require independent data collection which can be time and resource intensive
- Provides a baseline that can be used to guide/inform future research.

Disadvantages

- If a topic of limited current knowledge, a literature review will provide limited contribution to understanding your questions
- The findings are often not related to your specific context (e.g. different geographic location; different user groups) and therefore whether the outputs are transferrable to your context remains unclear in the absence of independent data collection.

Input Requirements

- Time to complete the review
- Cost of accessing literature databases (e.g. Universities have licences to access these systems)

Outputs

Provides a broad understanding of the depth and breadth of current knowledge in relation to the research question. This knowledge may or may not be specific to the location or users of interest to the individual conducting the literature review.

The results can be used to inform/guide additional research into the proposed questions. For example, the literature review may identify key topics that are of interest; and/or provide examples and lessons that inform/shape future research.

Examples

- Appendix 2, "Socioeconomic Values Associated with Man-made Aquatic Infrastructure Academic Literature Review" in Harvey et al (2021) "Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures", FRDC project No 2018-053.

Literature Examples

- Sutton S.G., Bushnell S.L. (2007) Socio-economic aspects of artificial reefs: Considerations for the Great Barrier Reef Marine Park, Ocean and Coastal Management, 50(10): 829-846
- Stolk P., Markwell K., Jenkins J.M. (2007) Artificial reefs as recreational scuba diving resources: A critical review of research, Journal of Sustainable Tourism, 15(4): 331- 350
- Lima, J.S., Zalmon, I.R. and Love, M., 2019. Overview and trends of ecological and socioeconomic research on artificial reefs. Marine Environmental Research, 145: 81-96.

Online Survey (Quantitative, Qualitative or both)

Advantages

- Low cost of data collection due to limited researcher costs
- Obtain large sample sizes through maintaining active survey online
- Random choice of respondent, hence no researcher bias associated with sampling
- Automated recording of responses in format amenable for statistical analysis
- Able to provide incentives to boost response rates if necessary
- Low cost of subscription to well-known and professionally managed survey sites (e.g. Qualtrics)
- Survey can be retitled and given online URL with a catchy or memorable phrase to aid publicity

Disadvantages

- Survey cannot be overlong, hence tendency to focus on methods to achieve quick responses (Likert scale; closed option responses) which do not provide opportunity for respondent comment, reaction or discussion
- Limited opportunity for triangulation to verify responses
- No control over choice of respondent: potential for bias due to multiple or duplicate responses requires surveyor to verify each survey response manually
- Unable to ensure respondents are representative of a particular stakeholder group or population
- Limits respondents to those with internet access
- Lack of interaction with surveyor opens possibility for respondent misunderstanding of questions
- Slight risk of survey being hacked or respondent data otherwise illegally accessed. Complete respondent anonymity is usually essential.

Input requirements

- Time costs are mostly incurred when designing the survey. Questions and sub-routines (eg 'if answer to Q1 is Yes, then skip to Q5') must be completely internally consistent. All questions must be completely clear, with no words or phrases that could be interpreted in a different way. Instructions to respondent must be absolutely clear and as simple as possible. Survey must be road tested by multiple respondents to ensure that there are no 'dead ends' or incorrect sub-routines through the survey.
- Having designed the survey, costs are minimal. The only costs required are occasional checking of the survey status online and the costs of promotion and/or advertising.

- Analysis costs will vary, but if the survey is mostly quantitative then automated processes of data conversion and analysis can be used. Any qualitative responses (i.e. 'have you any comments to make on X') must be treated separately and coded manually for analysis, which can be time consuming.

Outputs

- End users obtain a highly detailed dataset of mainly quantitative responses to questions. These can be analysed as a whole (e.g. X% of survey respondents stated that...), cross tabulated to show relationships between variables or subjected to a wide variety of more advanced analysis and modelling. The choice of technique depends upon the objective of the research, but given a sufficient sample size, a wide range of techniques are available.
- If qualitative questions are employed then these can enrich data analysis through providing direct insights into why respondents answer questions in a certain way. Quotations also enhance the impact of the final report.

Examples

- See Sections 'Social Value Individual', in Harvey et al (2021) "Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures", FRDC project No 2018-053.

Literature examples

- Kirkbride-Smith A.E., Wheeler P.M., Johnson M.L. (2013) The Relationship between Diver Experience Levels and Perceptions of Attractiveness of Artificial Reefs - Examination of a Potential Management Tool, PLoS ONE, 8(7)
- Belhassen, Y., Rousseau, M., Tynyakov, J., & Shashar, N (2017) Evaluating the attractiveness and effectiveness of artificial coral reefs as a recreational ecosystem service, Journal of Environmental Management, 203 (1): 448 – 456
- Sue,V.M., Ritter,L.A. Conducting online surveys (2011) Sage Publishing

In-person Survey (Quantitative, Qualitative or both)

Advantages

- Ability to clearly explain and clarify any questions respondents have to ensure accurate interpretation of survey questions
- Ability to obtain more detailed responses to open-ended survey questions, as respondents are often more willing to 'discuss' their views, than to physically write them down.
- Control over the choice of respondents to ensure they are representative of the target stakeholder group

Disadvantages

- Survey cannot be overlong, as interviewee is often taking peoples time from their work or recreation activities; therefore there is a tendency to focus on methods that achieve a quick response (i.e. the inclusion of Likert scale, close option responses) despite the ability for more in-depth interaction with respondents.
- Higher costs of data collection, as requires researchers to physically meet and run-through survey with each participant

- Potential research bias as targeting select groups. To avoid bias, strategies such as surveying every X number of users, can be adopted.
- Smaller sample sizes as constrained by researcher times/costs and site-collection
- Depending on collection technique, e.g. hand written at point of collection, can require additional time to convert responses into digital database/record

Input requirements

- Time and travel costs associated with getting to survey sites and data collection
- Analysis costs will vary, but if the survey is mostly quantitative then automated processes of data conversion and analysis can be used. Any qualitative responses (e.g. 'have you any comments to make on X') must be treated separately and coded manually for analysis, which can be time consuming.

Outputs

- End users obtain a geographically-specific or user-specific dataset of mainly quantitative responses to questions. These can be analysed as a whole (e.g. X% of survey respondents stated that...), cross tabulated to show relationships between variables or subjected to a wide variety of more advanced analysis and modelling. The choice of technique depends upon the objective of the research, but given a sufficient sample size, a wide range of techniques are available.
- If qualitative questions are employed then these can enrich data analysis through providing direct insights into why respondents answer questions in a certain way. Quotations also enhance the impact of the final report.

Literature Examples

- Ramos, J., Santos, M., Whitmarsh, D., & Monteiro, C. (2011b) Stakeholder analysis in the Portuguese artificial reef context: winners and losers, Braz. J. Oceanogr, 59: 133-143
- Hooper T., Ashley M., Austen M. (2015) Perceptions of fishers and developers on the co-location of offshore wind farms and decapod fisheries in the UK, Marine Policy, 61: 16- 22
- Shani A., Polak O., Shashar N. (2012) Artificial Reefs and Mass Marine Ecotourism, Tourism Geographies, 14 (3): 361-382

In-person or online Interviews

Advantages

- Ability to obtain more detailed responses than open-ended survey questions and in-person surveys, as respondents are able to more broadly discuss their views, rather than being confined to answering set discrete questions. The interviewee also has the ability to ask additional questions and delve more deeply into specific topics that are raised during the interview process
- Interviews are conducted over a long period of time (e.g. average of 1 hour) allowing ample opportunity to explore a topic/question in-depth.
- Control over the choice of respondents to ensure they are representative/key stakeholders of the target stakeholder group

- The descriptive nature of interviews provides useful quotes that can applied to demonstrate key research themes or to provide additional depth to quantitative research if being conducted in combination with quantitative methods.

Disadvantages

- Higher costs of data collection, as requires time to conduct, transcribe and analyse transcripts each interview. Specialist skills in social research required for data analysis.
- Potential research bias as targeting select stakeholders.
- Smaller sample sizes as constrained by researcher times/costs and (when not conducted online) site-collection

Input requirements

- Time and travel costs associated with getting to survey sites (for in-person interviews) and data collection
- Analysis costs will vary depending on the number of interviews conducted, but each interview must be coded manually for analysis, which can be time consuming.

Outputs

- End users obtain an in-depth understanding of the target issue, from the perspective of the interviewees
- If coupled with other research techniques, such as surveys, interviews provide an enriched data analysis through providing direct insights into why respondents answer questions in a certain way. Quotations also enhance the impact of the final report.

Literature Examples

- Lima J.S., Zappes C.A., Di Beneditto A.P.M., Zalmon I.R. (2018), Artisanal fisheries and artificial reefs on the southeast coast of Brazil: Contributions to research and management, Ocean and Coastal Management,163: 372-382
- Pike, K., Johnson, D., Fletcher, S., Wright, P., & Lee, B (2010), Social Value of Marine and Coastal Protected Areas in England and Wales, Coastal Management, 38(4): 412 - 432
- Ten Brink T.S., Dalton T. (2018) Perceptions of commercial and recreational fishers on the potential ecological impacts of the Block Island Wind Farm (US), Frontiers in Marine Science, 5: 439

Workshops/Focus groups

There are multiple techniques for running group workshops/focus groups. In this section we focus on three approaches, all involving causal mapping – a structuring technique. Two of the approaches adopt software (as applied in Harvey et al, 2021), and one that does not apply software. See Table 3 below for a summary. However, it is also possible to run focus groups with a facilitator capturing the views on a flip chart, using brainstorming to generate material into content-oriented clusters, or simple group electronic prioritisation systems.

Table 3 Illustrating the techniques

Technique/application	Manual F2F	Software supported F2F	Software supported on-line
Causal mapping – structured conversations	Use of Oval Mapping	Group Explorer	*Strategyfinder*
Brainstorming	Facilitator as scribe Post it exercise on wall	Group electronic prioritisation systems	Miro and other software packages

Face to face software supported mapping-oriented focus groups

Advantages

- Able to capture a wide range of issues and opportunities through participants having direct entry allowing for simultaneous contribution = highly productive use of time
- Reduce conformity pressures through anonymity allowing for greater openness and thus representativeness of view
- Capture participant's contributions accurately rather than risks of paraphrasing or getting lost = ownership increased
- Able to understand how issues and opportunities impact one another and thus capture the systemic nature of the focal issue – better systemic understanding
- Ability to identify clusters - content oriented themes - helping participants navigate the material and ensuring that complexity is managed, not simply reduced.
- Ability to ask why issues matter enabling participants to reflect on values that drive them rather than responding to provided values (bounded list) or those that are currently topical and given lip service to -> Able to tease out values 'in action' – those that are acted upon and drive behaviour
- Able to prioritise themes, issues, values and opportunities to determine degree of consensus as well as priorities
- Able to develop a network of issues, opportunities and values (through chains of argument) which can be analysed for key properties such as dominant issues/opportunities, feedback dynamics etc and can feed into more quantitative models. A series of workshops can be reviewed and analysed to determine intra and inter levels of homogeneity etc.
- Enables participants to gain a deeper more nuanced understanding of the topic being focused upon and increased ownership for outcomes

Disadvantages

- Complex maps which are challenging to read by those not involved in generating them

- An array of issues to tackle when considering MMS (or whichever topic is focused upon) which may feel overwhelming and may raise expectations in the minds of those involved
- Non quantifiable data but the map's structure can be used to develop quantifiable models (e.g. MCDM, SD simulations etc.)

Input requirements

- 3-3.5 hours participant time
- Software availability
- Facilitator time (including time expended for set up, managing the workshop, analysing the data, producing the report)
- Trained facilitators
- Group Support System equipment
- Appropriate venue

Outputs

- Policy makers are provided with a clear sense of the priorities, concerns and aspirations of particular communities/cohorts and how these impact one another – thus able to make more robust and sustainable decisions
- Policy makers/local government have clarity re competing values/aspirations of stakeholder groups - enabling increased 'buy-in' and facilitating communication
- Policy makers are able to use the information to feed into semi-quantitative and quantitative models (through provision of structure) for further analysis
- Oil and Gas industry are able to make decisions about decommissioning which take account of community views (both issues and opportunities)
- Regulators are provided with a mandate to work with stakeholder groups to develop effective and evidence based (informed by identified research needs) regulations reflecting the diversity of values
- Recreational and Commercial fishing decision makers are given insight into the competing uses
- Participants gain a deeper understanding of the topic, allowing them to understand more effectively their own views and seeing them in the context of others thus building shared understanding, alignment of view and a platform for action
- All are made aware of the multiple different stakeholder cohorts and the variations of issues, opportunities and values both within and across cohorts

Examples

- See Sections 'Social Value Group', in Harvey et al (2021) "Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures", FRDC project No 2018-053.

Literature Examples

- Ackermann, F. and Eden, C. (2020) Group Support Systems: Concepts to Practice. In C. Eden and M. Kilgour (Eds) Handbook of Group Decision and Negotiation. Springer
- Bryson, J., F. Ackermann, and C. Eden. 2016 **"**Discovering Collaborative Advantage: The Contributions of Goal Categories and Visual Strategy Mapping. Public Administration Review 76 p912-925

- Franco, L.A., Rouwette, E.A.J.A. (2011) Decision development in facilitated modelling workshops. European Journal of Operational Research, 2011, 212(1), pp. 164–178

On-line software supported mapping based focus groups

Advantages

- Able to capture a wide range of issues and opportunities through participants having direct entry allowing for simultaneous contribution = highly productive use of time
- Reduce conformity pressures through anonymity allowing for greater openness and thus representativeness of view. On line system yields greater degrees of anonymity and also provides time for reflection increasing quality of surfaced material
- Capture participant's contributions accurately rather than risks of paraphrasing or getting lost = ownership increased
- Able to understand how issues and opportunities impact one another and thus capture the systemic nature of the focal issue – better systemic understanding
- Ability to identify clusters - content oriented themes - helping participants navigate the material and ensuring that complexity is managed, not simply reduced.
- Ability to ask why issues matter enabling participants to reflect on values that drive them rather than responding to provided values (bounded list) or those that are currently topical and given lip service to -> Able to tease out values 'in action' – those that are acted upon and drive behaviour
- Able to prioritise themes, issues, values and opportunities to determine degree of consensus as well as priorities
- Development of a network of issues, opportunities and values (through chains of argument) which can be analysed for key properties such as dominant issues/opportunities, feedback dynamics etc and can feed into more quantitative models. A series of workshops can be reviewed and analysed to determine intra and inter levels of homogeneity etc.
- Able to involve those that are geographically dispersed (no costs - time or $$)
- Enables participants to gain a deeper more nuanced understanding of the topic being focused upon and increased ownership for outcomes

Disadvantages

- Complex maps which are challenging to read by those not involved in generating them
- An array of issues to tackle when considering MMS (or whichever topic is focused upon) which may feel overwhelming and may raise expectations in the minds of those involved
- Non quantifiable data but the map’s structure can be used to develop quantifiable models (e.g. MCDM, SD simulations etc.)
- less building of a team/a shared sense of commitment
- relies on a good internet access speed

Input requirements

- 3-3.5 hours participant time x # participants
- Software requirements
- Facilitator time (including time expended for set up, managing the workshop, analysing the data, producing the report)
- Trained facilitators

Outputs

- Policy makers are provided with a clear sense of the priorities, concerns and aspirations of particular communities/cohorts and how these impact one another – thus able to make more robust and sustainable decision making
- Policy makers/local government have clarity re competing values/aspirations of stakeholder groups - enabling increased 'buy-in' and facilitating communication
- Policy makers are able to use the information to feed into semi-quantitative and quantitative models (through provision of structure) for further analysis
- Oil and Gas are able to make decisions about decommissioning which take account of community views (both issues and opportunities)
- Regulators are provided with a mandate to work with stakeholder groups to develop effective and evidence based (informed by identified research needs) regulations reflecting the diversity of values
- Recreational and Commercial fishing decision makers are given insight into the competing uses
- Participants gain a deeper understanding of the topic, allowing them to understand more effectively their own views and seeing them in the context of others thus building shared understanding, alignment of view and a platform for action
- All are made aware of the multiple different stakeholder cohorts and the variations of issues, opportunities and values both within and across cohorts

Examples

- See Sections 'Social Value Group', in Harvey et al (2021) "Enhancing the Understanding of the Value Provided to Fisheries by Man-made Aquatic Structures", FRDC project No 2018-053.

Literature Examples

- Not currently available.

Face to face manual mapping-based focus groups

Advantages

- Able to capture a wide range of issues and opportunities through participants writing views on post-it notes allowing for simultaneous contribution = highly productive use of time and more even distribution of contribution.
- Reduce conformity pressures through a degree of anonymity allowing for increased openness and thus representativeness of view. Avoiding conformance pressures can be ensured through good facilitation – by, for example, ensuring silent time for all to write down their thoughts, providing participants with identical pens to avoid easily distinguishing authors.
- Capture participant's contributions accurately rather than risks of paraphrasing or getting lost = ownership increased
- Able to understand how issues and opportunities impact one another and thus capture the systemic nature of the focal issue
- Ability to identify clusters - content oriented themes - helping participants navigate the material and ensuring that complexity is managed, not simply reduced.
- Able to tease out values 'in action' - through asking why issues matter, participants reflected on values that drive them rathe rather than espoused values
- Able to prioritise themes, issues, values and opportunities to determine degree of consensus as well as priorities
- Development of a network of issues, opportunities and values (through chains of argument) which can be analysed for key properties such as dominant issues/opportunities, feedback dynamics etc. and can feed into more quantitative models
- Able to involve those that are geographically dispersed – cutting out travel costs in terms of both participant time or $$ expended.
- Enables participants to gain a deeper more nuanced understanding of the topic being focused upon and increased ownership for outcomes
- Familiar and easy to set up approach

Disadvantages

- Complex maps which are challenging to read by those not involved in generating them
- An array of issues to tackle when considering MMS (or whichever topic is focused upon) which may feel overwhelming and may raise expectations in the minds of those involved
- Non quantifiable data but the map's structure can be used to develop quantifiable models (e.g. MCDM, SD simulations etc.)
- Either needs to be captured into a software package or analysed manually which is challenging
- Requires strong facilitation to avoid dominant members hijacking the meeting

Input requirements

- 3-3.5 hours participant time x # participants
- Appropriate Venue
- Facilitator time (including time expended for set up, managing the workshop, analysing the data, producing the report)
- Trained facilitators

Outputs

- Policy makers are provided with a clear sense of the priorities, concerns and aspirations of particular communities/cohorts and how these impact one another – thus able to make more robust and sustainable decision making
- Policy makers/local government have clarity re competing values/aspirations of stakeholder groups - enabling increased 'buy-in' and facilitating communication
- Policy makers are able to use the information to feed into semi-quantitative and quantitative models (through provision of structure) for further analysis
- Oil and Gas are able to make decisions about decommissioning which take account of community views (both issues and opportunities)
- Regulators are provided with a mandate to work with stakeholder groups to develop effective and evidence based (informed by identified research needs) regulations reflecting the diversity of values
- Recreational and Commercial fishing decision makers are given insight into the competing uses
- Participants gain a deeper understanding of the topic, allowing them to understand more effectively their own views and seeing them in the context of others thus building shared understanding, alignment of view and a platform for action
- All are made aware of the multiple different stakeholder cohorts and the variations of issues, opportunities and values both within and across cohorts
- NOTE: to fully leverage the material capturing the data into a software package would facilitate usage

Literature examples

- Eden, C. and Ackermann, F. (1998) Making Strategy: The Journey of Strategic Management. Sage: London
- Bryson, J. B.; Ackermann, F.; Eden, C., and Finn, C. (2004) The Oval Mapping Process: Identifying Strategic Issues and Formulating Effective Strategies. Strategic Planning for Public and Non-Profit Organisations. San Francisco: Jossey Bass; 2004; pp. 355-376.
- Ackermann, F. and Eden, C. (2020) Strategic Options Development and Analysis. In M. Reynolds and S. Howell Systems Approaches to Managing Change: A Practical Guide. Springer Verlag

Brainstorming approaches

Advantages

- Familiarity with the process of brainstorming – natural to all participants
- Easy to set up and manage
- (when using software) anonymity and speed of capture

Disadvantages

- Unstructured data making it hard to understand how to use this information for decision making.
- Lack of clarity in terms of meaning as the language used can be ambiguous
- Software access and participant devices required

Input requirements

- 3-3.5 hours participant time x # participants
- Appropriate Venue
- Facilitator time (including time expended for set up, managing the workshop, analysing the data, producing the report)
- Trained facilitators

Outputs

- Lists or clusters of material that can be used to inform decision making

Literature Examples

- Osborn, A.F. (1963) Applied imagination: Principles and procedures of creative problem solving (Third Revised Edition). New York, NY: Charles Scribner's Son
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Appendix 1

Table A1 Summary of the advantages and limitations of different data collection approaches

	In-person survey	Online survey	Stakeholder Interviews	Workshops/ forums
To what extent will the data...				
Represent all stakeholders				
Provide depth of understanding				
Uncover system interrelationships (systemicity)				
Is the data…				
Quantifiable				
Context sensitive				
Does the approach…..				
Engage multiple stakeholder groups (direct)				
Engage multiple stakeholder groups (indirect)				
Increase the awareness/understanding of those that participate				
Require significant resource investment to implement				

Legend – green = considerable contribution, orange = moderate contribute and red = low to no contribution

Notes:

1. Surveys can include both quantitative and qualitative questions. Ratings assigned based on predominantly quantitative survey questions that allow quick completion.
2. Note, that 'literature review' is not included in the table, as the availability of published information on any chosen topic will differ by context and over time. **Click** on the column heading to see further information on that approach.
3. In principle an in-person survey could provide the same outcomes as an online survey if resources are available to achieve the same number and same representativeness of respondents, but this is likely to be prohibitively expensive in many circumstances.
4. The administrative ease of online surveys is conditional upon the availability of representative panels of online respondents to draw from, and an established infrastructure to distribute surveys.