

Seafloor exploration and mining in Australia: Stakeholder reactions, expectations and desired level of engagement.

SYNTHESIS REPORT

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Executive summary

Australia's seafloor exploration and mining (SEM) industry is small, new and unknown relative to its onshore (or terrestrial mining) counterpart. However, it is set to grow and the opportunity exists to establish a comprehensive understanding of the social, environmental and economic impacts of this new and emerging industry. This report summarises the findings of a suite of social research studies seeking to understand the impact and acceptability of Australia's nascent SEM industry. This research was undertaken in 2009-10 and has the following objectives:

1. Determine what information stakeholders need in order to be able to assess the acceptability of SEM.
2. Establish the conditions under which SEM is acceptable to stakeholders.
3. Ascertain the levels at which potential environmental and social impacts become unacceptable to stakeholders.
4. Assess whether stakeholders consider different factors when evaluating the acceptability of SEM proposals as compared to onshore exploration and mining proposals.
5. Explore the characteristics of a best practice regulatory framework for SEM.

This synthesis distils the findings from five studies and is published as an overview of the research. Together, these studies provide insight into the concerns and expectations of stakeholders, their information needs and desired level of engagement, and thus into the conditions surrounding the 'social licence to operate' for SEM in Australia.

The findings from this research reveal that some stakeholders have reservations regarding the development of SEM in Australia, primarily driven by their environmental concerns. Regardless of their stance, most stakeholders believe further information is needed to objectively weigh up the potential costs and benefits of the industry. This suggests that environmental values do not completely outweigh all other values in this area. Decisions about the acceptability of SEM appear to involve trade-offs between multiple objectives (i.e. environmental vs. economic vs. social).

Stakeholders need to feel confident that there are mechanisms (i.e. regulatory frameworks, watchdogs, independent research, stakeholder consultation) in place to ensure their interests are protected. If SEM were to expand in Australia, the industry might consider:

1. Building trust amongst stakeholders by addressing and communicating about:
 - a. the current level of scientific knowledge about the marine environment;
 - b. the processes that will be used to ensure comprehensive and impartial information about the impacts of SEM; and
 - c. the integrity of the regulatory system governing SEM.
2. Engaging stakeholders and giving them a more complete picture of costs and benefits of SEM.

Overall, a precautionary approach towards SEM was favoured by stakeholders, supported by rigorous scientific analysis of the potential environmental impacts, transparent and socially responsive management processes, and genuine stakeholder engagement.

Findings from the social science component of this research is being used to help inform the future direction of scientific research undertaken by CSIRO and the way in which findings are communicated to stakeholders. Ultimately, the combined social and environment research will contribute to the development of a sophisticated knowledge base that can be used to inform the SEM industry.

I Introduction

CSIRO's Wealth from Oceans Flagship aims to foster enduring social, environmental and economic wealth from Australia's vast ocean territory through an understanding of ocean systems and processes. One prospective ocean-based industry is seafloor exploration and mining (SEM), which is, in part, driven by Australia's growing demand for mineral resources, some of which can be sourced from its marine territories (Johns, 2008). Australia's SEM industry is small, new and unknown relative to its onshore counterpart (Parsons *et al.*, 2010). However, as an emerging industry (AIMS, 2010) the opportunity exists to establish a comprehensive understanding of the social, environmental and economic impacts of this new and emerging industry.

Near shore aggregate mining has been identified as a likely prospect for early development of SEM in Australia (Johns, 2008). Drivers include: sources of aggregate material closer to major urban centres; mitigation of coastal erosion due to sea level rise; and re-evaluation of the environmental management of terrestrial and marine resources (Johns, 2010). There are existing Federal regulatory frameworks and government processes for the licensing of SEM in Australia, but there are few examples of the application and implementation of these regulations (Littleboy & Boughen, 2007). Despite legislation, it is evident that expansion of the SEM industry will not occur without political support. To develop the currently small SEM industry, the industry must, in addition to working within existing legislative and environmental frameworks, be prepared to address public environmental concerns, media representation, and government opinions; the value proposition must be acceptable to society (Littleboy & Boughen, 2007).

In 2006, the Wealth from Oceans Flagship embarked on a first phase of research aimed at understanding the social dimensions of an expanded SEM industry in Australia. The first phase of research suggested that the future viability of SEM in Australia is highly dependent on Australia's ability to:

1. Build an information base
2. Enhance communication between stakeholders
3. Improve understanding of the policy and legislative process (Littleboy & Boughen, 2007).

This report outlines the second research phase (2009-2010) that seeks to address the above three issues by employing social research methods to inform the design and implementation of biophysical research investigating the environmental impact of SEM in Australia's near shore¹ (see Figure 2, p.3). Social researchers investigated stakeholder reactions and information needs relating to the proposition of SEM in Australia, and examined whether expectations associated with SEM differ from those associated with onshore mining. This research focused on more established international industries to examine how effective governance and stakeholder engagement can be achieved. This integrated approach of both biophysical and social science was designed to ensure that the biophysical research is responsive to stakeholders' information needs and concerns, and that stakeholders have the necessary information to assess the acceptability of a SEM industry in Australia.

¹ In this report, 'near shore' is defined as on Australia's Continental Shelf

1.1 The research programme

This synthesis report summarises five studies that formed the social research component of the second phase of research (2009-10). The relationship between the studies undertaken and the research objectives are outlined in Figure 1 below.

OBJECTIVES	STUDIES
1. Identifying the information stakeholders need in order to be able to assess the acceptability of aggregate seafloor exploration and mining.	Informing research into the environmental impact of near shore exploration and mining: Interviews with stakeholders (Mason & Boughen, 2009)
2. Establish the conditions where aggregate exploration and mining is acceptable to stakeholders; and	Informing research into the environmental impact of near shore exploration and mining: Results from community workshops (Paxton & Mason 2009)
3. Ascertain the levels at which potential environmental and social impacts become unacceptable to stakeholders.	Supporting stakeholder engagement in marine aggregates mining: Experiences in the United Kingdom and the United States (Paxton, Parsons & Boughen 2010)
4. Assess whether stakeholders consider different factors when evaluating the acceptability of offshore exploration and mining proposals as compared to onshore exploration and mining proposals.	Public expectations for seafloor exploration and mining in Australia: Comparisons with onshore mining (Parsons, Paxton, Mason & Moffat 2010)
5. Explore the characteristics of a best practice regulatory framework for aggregate seafloor exploration and mining	International regulatory regimes and stakeholder consultation for the offshore aggregate industry: Models for good practice in Australia (Johns 2010)

Figure 1. The relationship between the five studies and research objectives.

Figure 2 shows the relationship between the outcomes of Phase 1 and the studies undertaken in Phase 2 of the research programme. At least one study was completed for each outcome.

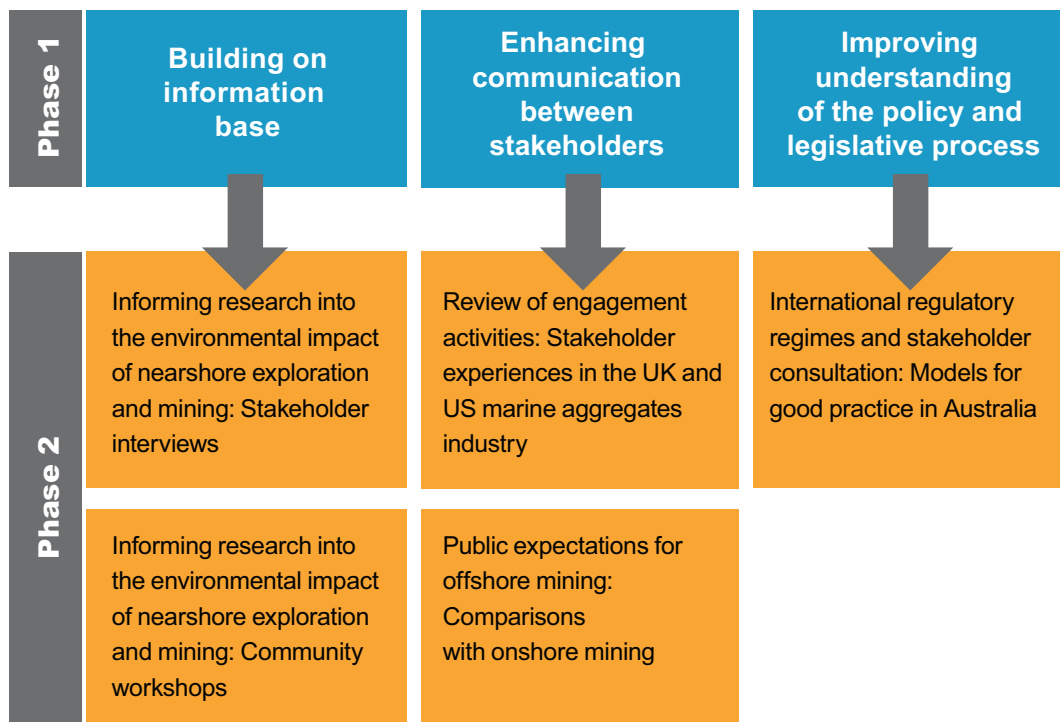


Figure 2. Relationship between the outcomes of Phase 1 and the Phase 2 Research Programme

2 METHODS

A range of methods were used to address the research objectives, including interviews with key stakeholders, a desktop study and focus groups with community representatives. Each approach is outlined in more detail below.

2.1 Stakeholder interviews

Study 1 (Mason & Boughen, 2009)

Aim: To explore the reactions of key² stakeholders and information needs relating to SEM in Australia.

To explore reactions and questions about SEM, and more particularly, near shore aggregate exploration and mining, a series of 30 telephone interviews with professionals directly involved with and aware of the SEM industry were conducted. Participants were drawn from key stakeholder groups including legislative authorities, industry, federal and local government, non-government organisations, other marine industries and social researchers. The interviews were open and unstructured so that interviewees were not limited in the aspects of SEM they could discuss. The interview questions were designed to explore:

1. Questions and concerns relating to SEM in Australia;
2. The information needed for decision-making around the acceptability of SEM in Australia;
3. Concerns about the environmental impact of SEM; and
4. Opinions as to what CSIRO's environmental research should achieve.

Interviews were not conducted with representatives of Australian community members at this point. Representatives from this stakeholder group were asked similar questions at a later date, using a focus group approach, as outlined below. Please refer to the report, *Informing research into the environmental impact of near shore exploration and mining: Interviews with stakeholders* (Mason & Boughen, 2009) and subsequent journal article *Exploring stakeholder reactions to the prospect of seafloor exploration and mining in Australia* (Mason et al., 2010) for more details.

Study 3 (Paxton et al., 2010)

Aim: To capture learning's from experiences with stakeholder engagement practices in countries with an established SEM industry

Interviews were conducted with 18 representatives from various stakeholder groups in the United States (US) and the United Kingdom (UK). These interviews captured first-hand experiences, and opinions of, stakeholder engagement practices undertaken in two countries where SEM, in terms of their offshore aggregate exploration and mining activity, is well established. Data from these interviews were analysed to identify the key elements in accounts of these engagement activities, and to identify those characteristics which differentiated constructive engagement experiences from difficult or negative engagement experiences. Please refer to the report, *Supporting stakeholder engagement in marine aggregates mining: Experiences in the United Kingdom and the United States* (Paxton et al., 2010) for more details.

2.2 Focus groups

Study 2 (Paxton & Mason, 2009)

Aim: To explore the reactions of community stakeholders 2 and information needs relating to SEM in Australia

Two focus groups were held in April-May 2009 in Newcastle, NSW and Brisbane, QLD. Participants for the workshops were recruited by market research firms, who were instructed to create groups that were representative of the voting population in their community in terms of gender, educational background, ethnicity, and age. Participants were not told the subject of the workshop prior to their arrival to ensure unbiased selection and minimise opportunities for participants to consider their positions on SEM prior to the workshop. Focus groups were deemed a more suitable method because it gave these stakeholders, who are generally unacquainted with the

² In this report, 'key stakeholders' are defined as stakeholders who are directly involved with and aware of the SEM industry; as opposed to 'community stakeholders' which are defined as members of the Australian general public.

industry, access to an expert to provide background information about the industry and to address any questions they had.

In these focus groups (consisting of 19 participants), an expert gave a background presentation on the SEM industry, particularly focusing on the types of minerals and mining processes that might be the focus for future development of the industry. The purpose of this presentation was to ensure that participants all have a basic level of information about the industry from which to formulate their reactions and questions. Participants were then asked to respond to the same key questions from the stakeholder interviews. Qualitative analysis of the workshop data (transcribed audio-recordings) was undertaken to explore the concerns the Australian public have in regard to SEM, and the information they would need to evaluate the acceptability of future SEM operations in Australia. Please refer to the report *Informing research into the environmental impact of near shore exploration and mining: Results from community workshops* (Paxton & Mason 2009) and subsequent journal article, *Exploring stakeholder reactions to the prospect of seafloor exploration and mining in Australia* (Mason et al., 2010) for more details.

Study 4 (Parsons et al., 2010)

Aim: To identify whether societal expectations or conditions attached to SEM differ from those attached to onshore mining

Additional focus groups were also used to identify whether societal expectations or conditions attached to SEM differ from those attached to onshore mining. This question is important in terms of establishing whether different processes or standards may be required to regulate and manage SEM in Australia, as compared to onshore mining.

Recruited in the same way as previous focus groups (described above), these focus groups were again held in Brisbane and Newcastle during 2009 and attended by a total of 50 members of the general public. Three of the six workshops focused on onshore mining, and the other three focused on SEM mining. Each workshop began with a technical presentation by a CSIRO mining expert, followed by a structured group discussion designed to encourage participants to think deeply about their expectations of, and objectives for, either the onshore or SEM industry in Australia. Discussions were transcribed and analysed by social researchers, who sought to identify and compare themes emerging from the workshops. Please refer to the report, *Public expectations for seafloor exploration and mining in Australia: Comparisons with onshore mining* (Parsons, Paxton, Mason & Moffat 2010) for more details.

2.3 Desktop study

Study 5 (Johns, 2010)

Aim: To explore international best practice for SEM regulatory regimes and stakeholder consultation

A desktop study of existing international regulatory frameworks, including prescribed stakeholder consultation processes, was conducted. The review focussed on the international offshore aggregate industry in the UK, US, and Japan in terms of their regulatory regimes and practices in stakeholder consultation. These three countries were chosen because they illustrate different stages, types of involvement and legislation requirements of an offshore aggregate industry. The desktop study involved extensive literature searches, legislation review, internet searches, and an interview with two private consultants for the offshore aggregate industry in the UK. This study was conducted in parallel with international stakeholder interviews, as described in section 2.1. Please refer to the report, *International Regulatory Regimes and Stakeholder Consultation for the Offshore Aggregate Industry: Models for Good Practice in Australia* (Johns 2010) for more details.

3 KEY FINDINGS

The findings from these five pieces of research are integrated below to provide an overall picture of reactions to SEM, information needs, expectations and experiences with stakeholder consultation and regulatory regimes.

3.1 Reactions to seafloor exploration and mining

In each study undertaken as part of this research, stakeholders' reactions ranged from those who would not support development of SEM under any conditions to those who were very positive about the potential outcomes offered by the development of SEM. Most stakeholders, however, were sufficiently open to the proposition of SEM to suggest that further information is needed to enable them to weigh up the potential costs and benefits of the industry (Mason *et al.*, 2010).

Positive reactions were generally (although not exclusively) expressed by industry representatives, who saw the industry as offering economic benefits and the potential to do mining in a cleaner, safer and more innovative way. Some stakeholders, from both key and community groups, were positive about the opportunity to explore the seafloor and learn about its ecosystems and resources (Mason *et al.*, 2010). More negative reactions tended to be expressed by representatives of community and non-government organisations, but were also evident among other marine users. For the majority of those that were reluctant to see development of SEM in Australia, it was primarily because of concerns about the industry's potential environmental impact (Mason *et al.*, 2010). Further explanation and details surrounding these reactions are discussed below.

3.1.1 Fear of negative environmental impacts

Some stakeholders, particularly community members, had quite fearful initial reactions to SEM. This fear appears to be related to the following underlying assumptions:

- SEM will have negative effects on a fragile and pristine environment;
- We do not fully understand the marine environment;
- Humans cannot be trusted to put the environment and the community above money and materialism;
- The onshore mining industry has affected the environment and the community negatively (Paxton & Mason, 2009).

A distinction was, however, made between exploration activity and mining activity, particularly by key stakeholders, with many having a lower level of concern about the environmental impact of exploration activity (Mason & Boughen, 2009). Nevertheless, there was a broad expectation of a higher level of environmental protection to apply to SEM than for onshore mining (Parsons *et al.*, 2010).

3.1.2 Need for more information

Because the impacts of SEM are currently unclear, many stakeholders, in both key and community groups, felt that more information is needed before it will be possible to determine whether the development of SEM in Australia is desirable. Some felt that a better understanding of the marine environment is required before a full picture of the impact of SEM can be achieved (Paxton & Mason, 2009; Mason & Boughen, 2009; Paxton *et al.*, 2010).

3.2 Information requirements of stakeholders

The information needs of both key and community stakeholders fell into the following five categories:

1. The nature and location of industry activity
2. Potential environmental impacts
3. Understanding the complexities of the relevant marine habitats
4. Relative costs and benefits
5. How the industry is managed

Further explanation and details surrounding these information needs are discussed below.

3.2.1 The nature and location of industry activity

Stakeholders not closely involved with the industry sought information that provided a better sense of what development of this industry might look like. More specifically, they wanted information about likely locations for mining activity, the types of minerals that would be mined, and the technologies and processes that would be used (Paxton & Mason, 2009; Mason *et al.*, 2010).

The location of SEM was identified by all stakeholders to be critical for a few reasons. First, areas of significant biodiversity value were seen by many, particularly key stakeholders, to be 'no go' areas (Mason & Boughen, 2009). These stakeholders indicated they would be more concerned if SEM occurred in or near critical marine habitats such as seagrass, sea mounts, coral reefs and migratory pathways, or other natural resources that were highly valued by the community. Second, key stakeholders were concerned that SEM might interfere with recreational use of the environment or other marine industries such as shipping, fishing and oil and gas mining operations (Mason & Boughen, 2009). Finally, the preservation of marine areas with historical significance (e.g. ship wreck sites, archaeological sites) was highlighted and seen as an important factor for planning, particularly for key stakeholders in the UK (Mason & Boughen, 2009; Paxton *et al.*, 2010).

3.2.2 Potential environmental impacts

All stakeholders sought further information on potential environmental impacts (Mason & Boughen, 2009; Paxton & Mason, 2009; Mason *et al.*, 2010; Paxton *et al.*, 2010; Parsons *et al.*, 2010). Concerns about the potential environmental impacts of SEM fell into two broad categories:

1. Impacts on marine life; and
2. Impacts on coastal features, particularly beaches.

In terms of marine life, a range of concerns were discussed by both key and community stakeholders. Most commonly the disturbance of sediment on the seafloor, leading to increased turbidity and sediment plumes. In terms of coastal features, both groups of stakeholders felt that the dynamic connection between the seabed and the beach meant that the removal of aggregate from the seabed might lead to beach erosion or accretion (Mason *et al.*, 2010). Concerns were also raised about the potential for accidents and extreme weather events to create additional environmental issues. The interconnectedness of ecosystems was stressed, with concern over how the impacts of mining activity would affect what was perceived to be a complex and inter-related marine ecosystem (Mason & Boughen, 2009; Paxton & Mason 2009; Mason *et al.*, 2010).

Rate of recovery was seen as an important indicator within the ecosystem for both key and community stakeholders (Mason & Boughen, 2009; Paxton & Mason 2009; Parsons *et al.*, 2010). Among many community stakeholders, there was an expectation that rehabilitation would be carried out at a higher level than that associated with onshore mining (Parsons *et al.*, 2010). After mining a site, the minimum expectation expressed by community stakeholders was that the company would "return it to its original state". They also expected the marine environment to be rigorously and independently monitored for signs of degradation. Some community stakeholders suggested that rehabilitation work should aim to leave the environment not just in a state no worse than before, but "to a standard that is even better" than it had been (Parsons *et al.*, 2010).

Environmental concerns were also raised in discussions about stakeholder engagement processes, both in the US and the UK. They were seen to be the key issue needing to be addressed through stakeholder engagement strategies (Paxton *et al.*, 2010).

3.2.3 Understanding the complexities of the relevant marine habitats

Many stakeholders, from both key and community groups, believe current understanding of the biodiversity of the marine environment is insufficient, and in particular, the inter-relationships amongst the different elements within that environment, such as marine habitats, ocean currents and ocean temperatures (Mason & Boughen, 2009; Paxton & Mason, 2009; Mason *et al.*, 2010). Some key stakeholders also felt that there is a need for a better understanding of the ocean floor and the way in which wind, waves, tides and currents impact on the morphology of the ocean floor. This perceived lack of understanding meant both key and community stakeholders questioned whether there is enough knowledge about the marine environment to be able to identify environmentally sensitive and culturally significant areas (Mason & Boughen, 2009; Paxton & Mason, 2009; Mason *et al.*, 2010).

Stakeholders who were actively involved in the industry also wanted detailed geological information and an understanding of the physical processes that might affect the viability of an operation (Mason & Boughen, 2009).

3.2.4 Relative costs and benefits

In addition to environmental impact data, many key and community stakeholders' required social and economic data in order to evaluate a SEM proposition. They wanted knowledge of the full range of impacts associated with SEM, including impacts on other marine users, economic benefits from the industry, effects on local communities and visual impact (Mason & Boughen, 2009; Paxton & Mason, 2009; Mason *et al.*, 2010).

Some stakeholders, from both key and community groups, thought a cost-benefit analysis for the industry would be required to make a judgement about the acceptability of the industry, and whether or not the potential benefits were sufficient to justify the development of this industry in Australia. They wanted to know whether there was sufficient value in the resource to be obtained to justify the costs and impacts associated with mining it from the seafloor (Mason & Boughen, 2009; Paxton & Mason, 2009; Mason *et al.*, 2010).

The 'cost' of greatest interest was environmental impact, as outlined above, with many questions raised regarding the nature and extent of this impact. However there were also concerns about aesthetics and the social impact of the industry for coastal communities. That is, how it would likely affect businesses, employment and general amenity in those communities. There were also concerns that SEM might have a negative impact on other marine industries (Mason & Boughen, 2009; Paxton & Mason, 2009; Mason *et al.*, 2010).

As well as needing information to help evaluate the potential costs, stakeholders from both key and community groups, also wanted to understand the potential benefits. As with the potential costs, stakeholders made value-based judgements about what the SEM industry should achieve. It was thought that CSIRO might have a role to play in weighing up the costs and the benefits associated with SEM (Mason & Boughen, 2009).

3.2.5 How the industry is managed

Stakeholders, and in particular community stakeholders, wanted to know more about the regulation of the industry and in particular, how public participation in decision-making about the industry could be facilitated if the industry were to proceed. There was also a desire for strong regulation and more research to support environmental protection (Paxton & Mason, 2009).

3.3 Stakeholder expectations of seafloor exploration and mining

Broadly speaking, community stakeholders expect SEM to benefit Australia's economy, to benefit Australia's standard of living, to be environmentally responsible, and to be socially responsible (Parsons *et al.*, 2010). Nevertheless, comparison between SEM and onshore expectations revealed community representatives have higher expectations for SEM compared to onshore mining. For example, when arguing that the mining industry should provide economic benefits to Australia, community stakeholders demonstrated greater nationalistic sentiment in their responses; when discussing environmental issues they expressed heightened sensitivity towards damage to the marine environment; and when making statements on social responsibility they sometimes framed it as a categorical imperative (Parsons *et al.*, 2010). A list of expectations for a best practice regulatory system and scientific research also became evident through discussions with key and community stakeholders, both in Australia and internationally.

Stakeholder expectations of SEM fell into the following four categories:

1. Benefit to Australia
2. Responsible mining companies
3. Stringent and auditable regulations
4. Scientific research

Further explanation and details of these expectations are outlined below.

3.3.1 Benefit Australia

Community stakeholders value the economic benefits derived from mining for Australia. They view these economic benefits as a means of advancing Australia's international standing. This expectation seems to be underscored by an assumption that not enough economic benefit from mining in general remains in Australia. Thus, a common demand was that should minerals be dredged or mined offshore, they should be for Australia's use, and not exported. Community stakeholders want to see operations owned by Australian companies, and employing Australian labour. Overseas mining companies are seen as less responsible, trustworthy and accountable than Australian companies.

They are also wary of the power of large mining companies to dominate the industry, and do not think mining should enjoy preferential treatment over other industries (Parsons *et al.*, 2010).

Community stakeholders often spoke of economic and social wellbeing as mutually reinforcing. That is, when minerals companies operate successfully, employment is created, community infrastructure is improved, and people can buy the things they need or want. The capacity of minerals companies to provide employment is therefore seen as a critical social function (Parsons *et al.*, 2010).

The term 'quality of life' was often mentioned in this context, making the connection between mining employment and enhanced standard of living. For example, the community stakeholders argued that the industry should adopt a localised approach to employment; and if this is not feasible, nationally (not overseas). It was also thought the industry should train and nurture unskilled workers (Parsons *et al.*, 2010).

3.3.2 Responsible mining companies

Environmental impacts appeared to be the most contentious aspect of mining, both onshore and offshore. Community stakeholders acknowledged that some environmental damage is inevitable, but they were adamant that damage must be minimised and sites must be conscientiously rehabilitated (Mason & Boughen, 2009; Paxton & Mason, 2009; Parsons *et al.*, 2010). While some described these as objectives in their own right, even as a moral imperative, closer consideration suggests that the underlying rationale is a focus on the interests of future generations. For some community stakeholders, however, responsible mining itself is elusive, or even contradictory. For them, mining is an inherently unsustainable and disruptive enterprise (Parsons *et al.*, 2010).

Additionally, community stakeholders expect mining companies to perform in a socially responsible manner, by:

- looking after local communities;
- ensuring the safety of workers and local communities; and
- engaging the public (Parsons *et al.*, 2010).

3.3.3 Stringent and auditable regulations

A number of community stakeholders expressed expectations associated with the regulatory regime for SEM in Australia. A higher level of concern for environmental impacts of SEM translated into expectations of stronger regulation. While it might be assumed that the public would expect similar practices as those in the onshore domain, they appeared to perceive a need for stronger regulation and auditing when discussing SEM. In particular, community stakeholders want companies to be held accountable for instances of "non-compliance", "malpractice", and "mismanagement". They also seemed to expect rehabilitation to be carried out at a higher level than they observed for onshore mining (Parsons *et al.*, 2010).

In addition, some community stakeholders expressed distrust regarding the role of the regulator, the independence of the scientific assessments, and a possible bias towards industry stakeholders. They suggested regulators use "independent experts" to conduct "independent environmental audits", in order to check that operations are not destroying ecosystems, habitats, and species (Parsons *et al.*, 2010).

3.3.4 Scientific research

The following expectations of scientific research were outlined by both key and community stakeholders.

Independent

There was a strong call, from both key and community stakeholders, for independent research examining the environmental impact of SEM. The need for a 'transparent' and inclusive research process incorporating consultation and peer review was also highlighted. Researchers must therefore maintain independence and undertake the research in an open, transparent, rigorous and careful manner (Mason & Boughen, 2009; Paxton & Mason, 2009; Mason *et al.*, 2010; Parsons *et al.*, 2010; Paxton *et al.*, 2010).

Stakeholders expect information to be provided by a group that has technical expertise but with no commercial stake in the industry (Mason & Boughen, 2009). They want to see rigorous, independent research into the impacts of SEM. In the light of their experience with onshore mining, community stakeholders in particular, are unwilling to trust research conducted or funded by mining companies, on the grounds that the profit motive inevitably corrupts sound research (Parsons, *et al.*, 2010).

There were varying degrees of trust expressed in the CSIRO. However, overall responses indicated support for the role of the CSIRO in undertaking the environmental research, as opposed to industry or government organisations (Paxton & Mason, 2009).

Comprehensive

Many key stakeholders felt that the contribution of environmental impact research would be dependent on the quality of the baseline data collected on the marine environment. They felt researchers should collect comprehensive baseline environmental data so that the full range of impacts on the complex marine environment could be identified (Mason & Boughen, 2009).

Many key stakeholders felt it would be inappropriate to specify a timeframe for environmental research. Instead, it was suggested that data should be used to determine how long to continue monitoring the site (Mason & Boughen, 2009). Rigour was the key criterion for timeframe, with many community stakeholders responding that an acceptable timeframe for monitoring potential impacts was “as long as it takes to produce sound, trustable results” (Paxton & Mason, 2009).

Representative

There was concern that small scale experiments would not provide a representative picture of the impacts associated with mining on a larger scale. Although some of these issues might be addressed through the design of the research, key stakeholders want researchers to clearly identify how representative the research findings were and the extent to which they generalise to other locations and other types of activity (Mason & Boughen, 2009).

If the research findings are to have value, the location needs to be representative of potential extraction sites for the industry. While key stakeholders acknowledged that each site would have unique characteristics, it was thought that researchers should aim to find a location whose characteristics were more typical of the sites where SEM might occur (Mason & Boughen, 2009).

It was felt that environmental research should be undertaken in an area which is representative of likely areas for industry activity, but where the potential for significant impacts on the marine environment and other marine users is minimised. Finally, some key stakeholders felt that onshore impacts associated with the industry should be included in the broader analysis of environmental impact (Mason & Boughen, 2009).

Informed

Field-based research should be carried out in a location where there is existing knowledge. Some key stakeholders felt that researchers should ensure that they are abreast of research evaluating the environmental impact of dredging activity, so as not to replicate work that has already been done (Mason & Boughen, 2009).

Engaging

Stakeholders, from both the key and community groups, expressed concerns about the impacts associated with ‘test case’ research, and recommended that processes of community consultation and peer review be adhered to. Given stakeholder concern about potential impacts associated with a test case and the history of strong community reactions to SEM proposals, researchers should carry out some form of community consultation and peer review (Mason & Boughen, 2009).

Cautious

In line with the high level of concern associated with environmental impacts, some community stakeholders recommended that the research ‘err on the side of caution’. It was suggested that any conclusions drawn from the research should be based on the most conservative standards possible and that ‘worst case scenarios’ should be used to decide what should or should not go ahead. In addition, some felt the research itself should not have a lasting impact on the environment, and that it should be stopped if it were found that negative impacts were significant. Some community stakeholders had such strong feelings they said they would not support ‘test case’ research because of its potential to affect the environment (Paxton & Mason, 2009).

In light of the need to protect the marine environment, some key stakeholders suggested that the research should be lab-based before any field-based activity. Another suggested option was to conduct case studies of existing operations that used the same extraction processes (Mason & Boughen, 2009).

Finally, one key stakeholder felt the expectations of research and its outcomes need to be carefully managed to ensure people do not assume that once research is completed, SEM would automatically be able to proceed (Mason & Boughen, 2009).

3.4 Conditions to foster positive stakeholder engagement

Accounts of engagement in relation to marine aggregates mining in the UK and US, whether negative or positive, revolved around three themes - relationships, information and regulation. These three themes were pivotal to both positive and negative accounts of stakeholder engagement. In positive accounts, relationships were seen as collaborative, information was trusted, and regulation provided certainty to the engagement process. In negative accounts, relationships were conflicting, information was not trusted, and regulations provided little certainty (Paxton *et al.*, 2010). The characteristics of each theme are discussed in more detail below and illustrated in Figure 3.

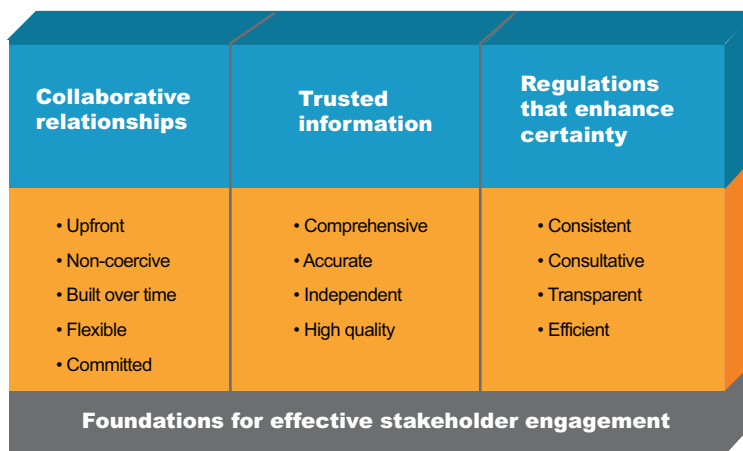


Figure 3. Three foundations for effective stakeholder engagement in marine aggregates mining

3.4.1 Collaborative relationships

Relationships are critical to the perceived effectiveness of stakeholder engagement processes, with positive experiences reflecting collaborative relationships, and negative accounts reflecting conflict.

Collaborative relationships were described as involving:

1. upfront, non-coercive communication
2. formalised stakeholder partnerships
3. relationships built over time
4. industry commitment (Paxton *et al.*, 2010)

3.4.2 Trusted information

Access to trustworthy information relating to the industry and its impacts was seen to be critical for effective stakeholder engagement. In positive accounts of stakeholder engagement, participants described the availability of knowledge and educational material regarding the marine environment, the impact of marine aggregates mining activities, and the processes underlying decisions made regarding these activities. These factors appear to promote feelings of trust and confidence that decisions are based on a sound knowledge base, which facilitates more positive experiences of stakeholder engagement (Paxton *et al.*, 2010).

In negative accounts of stakeholder engagement, the quality/accuracy of the information shared during the engagement process was disputed. These disputes often centred on the perceived lack of knowledge regarding the environmental impacts, including concerns over the adequacy of baseline data and ongoing monitoring of impacts. In addition, suspicion based on a perceived lack of independence of scientific investigations and environmental impact assessments was central in negative accounts of stakeholder engagement (Paxton *et al.*, 2010).

3.4.3 Regulation to enhance certainty

The final foundation for effective stakeholder engagement was a supportive regulatory framework. In positive accounts of stakeholder engagement, regulations were seen to provide certainty - by fostering transparent decision making processes, clear timeframes and good relationships between stakeholders. Participants also mentioned the importance of having stringent mechanisms to maximise compliance with legislation. Negative accounts, in contrast, were characterised by a perceived insufficiency of legislation to protect the environment, a distrust of the motives of the regulator, and inefficient processes leading to consultation fatigue (Paxton *et al.*, 2010).

Based on initial understanding of the regulatory frameworks underpinning the marine aggregate industry globally, some indicators of good practice are:

1. Consistent industry-specific legislation in state and federal waters
2. Environmental studies and local/regional management plans
3. Stakeholder consultation associated with the environmental impact assessment (EIA) process
4. Active public stakeholder consultation surrounding the offshore aggregate industry through government and industry programs (Johns, 2010).

4 DISCUSSION AND RECOMMENDATIONS

This research indicates that both key and community stakeholders have reservations about the development of SEM in Australia. These concerns are based on the potential environmental impacts, reflecting a desire to protect habitats and ecosystems and therefore indirectly their own lifestyles - from local communities to national well-being (Mason *et al.*, 2010; Mason & Boughen, 2009; Paxton & Mason, 2009; Parsons *et al.*, 2010). Participants' comments regarding the complexity of the marine ecology, the significance of the oceans in Australian culture and the right of future generations of Australians to enjoy the natural environment (Mason & Boughen, 2009; Paxton & Mason, 2009; Parsons *et al.*, 2010) all point to the fact that development of a SEM industry will bring economic values into conflict with environmental and social values. However, to the extent that mining activity is seen as meeting important needs and desires of the human population, stakeholders are willing to accept some trade-offs to existing lives and lifestyles. Questions around potential locations for SEM suggest that some locations are considered less environmentally sensitive and culturally significant than others, and therefore might be more acceptable as sites for SEM (Mason & Boughen, 2009; Paxton & Mason, 2009). In addition to information on environmental impacts, information on social and economic impacts was also actively sought, suggesting that environmental values do not completely outweigh all other values in this area and that decisions about the acceptability of SEM may be open to trade-offs between multiple objectives (Mason & Boughen, 2009; Paxton & Mason, 2009).

In order to endorse any trade-offs, stakeholders need to feel confident that there are systems (regulatory frameworks, watchdogs, independent research, stakeholder consultation) to ensure that their interests are protected (Mason & Boughen, 2009; Mason *et al.*, 2010; Paxton & Mason 2009, Paxton *et al.*, 2010). Thus, a 'social licence' for SEM can be understood as involving two decisions:

1. Whether the benefits associated with a mining operation represent an acceptable trade-off against any detrimental effects, for example, environmental impact.
2. The trustworthiness of the system of information provision and regulation surrounding the industry. Without confidence in that system, stakeholders cannot be sure that they have accurate information about the costs and benefits involved, nor that their interests will be protected as the industry develops (Parsons *et al.*, 2010).

These decisions - around trust and costs/benefits - are discussed below in more detail.

4.1 Build trust among stakeholders

In the onshore mining domain, trust has been identified as a key determinant of acceptance of a mining operation (Muradian *et al.*, 2002). Building trust between stakeholder groups, a dynamic variable that evolves over time in relationships (Mayer *et al.*, 1995), is a critical task for the mining industry to ensure its sustainability (Sheehy & Dickie, 2002). Findings from this research suggest that lack of trust may inhibit the debate regarding the acceptability of a SEM industry in Australia. Trust might be enhanced by:

- Elevating the level of scientific knowledge about the marine environment;
- Ensuring that comprehensive and impartial information about environmental, social and economic impacts of the industry is collected and made widely available; and
- Providing clear communication of the regulatory system governing the industry (Mason *et al.*, 2010).

A knowledge base that is responsive to the needs of stakeholders can empower them to have meaningful input into any debate regarding the future of SEM in Australia. There is, therefore, value in clarifying the state of scientific knowledge relating to the marine environment, focusing in particular on how scientists go about predicting the level, nature and scope of impacts associated with marine mining and the confidence with which they can make these predictions. This research suggests stakeholders want to understand how any impacts will play out within the larger marine ecosystem, thus providing information about large-scale and long-term impacts as well as more immediate impacts is also important (Mason *et al.*, 2010).

Stakeholders seek confirmation that mechanisms exist through which their interests will continue to be represented as new ideas emerge or more is learned. Creating transparency around the processes through which information will be disseminated, how decisions will be made, and how stakeholders' values and interests will be represented in these processes, will also be important for fostering trust in the SEM domain (Mason *et al.*, 2010).

4.2 Explore and communicate costs and benefits

In this research we have found stakeholders seek information about social and economic impacts in addition to environmental impacts (Mason & Boughen, 2009; Mason *et al.*, 2010; Paxton & Mason, 2009; Parsons *et al.*, 2010). Furthermore, stakeholder comments about the need to weigh up costs and benefits (Mason & Boughen, 2009; Mason *et al.*, 2010; Paxton & Mason, 2009) suggest that stakeholders' decisions about the acceptability of SEM involve trade-offs between multiple objectives. Further research exploring how stakeholders' value different attributes of the marine environment, could provide direction regarding how best to manage the social, economic and environmental values associated with the marine environment.

5 CONCLUSIONS

Stakeholders favoured a precautionary approach towards the industry, supported by rigorous scientific analysis of the potential environmental impacts, transparent and socially responsive management processes, and meaningful engagement with stakeholders (Mason & Boughen, 2009; Mason *et al.*, 2010; Paxton & Mason, 2009; Paxton *et al.*, 2010; Parsons *et al.*, 2010; Johns, 2010). Below, conclusions are drawn in line with the objectives set for this phase of research.

5.1 Information needed to assess acceptability

Environmental impacts are central to stakeholder concerns about SEM, and are compounded by concerns that not enough is known about the marine environment (Mason & Boughen, 2009; Paxton & Mason, 2009). These concerns, coupled with the expectation that any prospective SEM should minimise environmental impacts, indicate that a trusted information base – one that is accessible, comprehensive and developed independently of industry decision makers – will be pivotal to the future viability of the SEM industry (Parsons *et al.*, 2010; Paxton *et al.*, 2010). Australia is in an advantageous position to maximise its understanding of the environmental impacts of SEM, and to ensure that these environmental impacts are given consideration by stakeholders prior to industry development (Paxton *et al.*, 2010).

Stakeholders seek to understand social and economic impacts, so that they can evaluate the overall costs and benefits associated with industrial development. Furthermore, stakeholders seek to compare the costs and benefits of onshore mining and SEM in order to inform their decisions about any future developments (Mason & Boughen, 2009; Paxton & Mason, 2009).

5.2 Management of SEM compared to onshore mining

Stakeholders have similar expectations and objectives relating to SEM as they do with onshore mining, however, they articulate these expectations in more extreme or intense ways (i.e. the language used and the strength of opinion expressed). This distinction, between SEM and onshore mining, seems to derive from a view of the Australian marine environment as an iconic yet unknown realm, whereas the impact of terrestrial mining is perceived as 'known'. In the marine environment, which is described as relatively 'unexploited' and 'pristine' and where there is a poor understanding of the potential impact of SEM, stakeholders fear the unknown and adopt a precautionary approach (Parsons *et al.*, 2010). In contrast, impressions of the environment and onshore mining are formulated more by established practice and experience. The impacts and inherent trade-offs of onshore mining are relatively well understood. Furthermore, onshore mining is deeply embedded in (European) Australian culture; therefore its validity as a social practice, despite any adverse impacts, is widely accepted. In summary, onshore mining is generally accepted as intrinsic to Australia's identity, and its nature is relatively known, whereas SEM is an uncertain practice, and its nature and impacts are relatively unknown (Parsons *et al.*, 2010).

The 'social licence' requirements for SEM in Australia, therefore, may be more demanding than those for onshore mining. Any SEM industry is likely to encounter close public scrutiny - and may need rigorous industry practices if it is to secure the trust of the Australian public. Industry regulation in turn, may need to be proportionately more stringent (Parsons *et al.*, 2010).

5.3 Characteristics of a best practice regulatory framework

In order to evaluate the acceptability of a future SEM industry in Australia, stakeholders require clarity regarding how SEM in Australia would be regulated to ensure interests of the environment and of stakeholders are supported. Regulations that provide certainty – through more transparent decision-making processes, clear timeframes, good relationships between stakeholders, and stringent mechanisms to maximise compliance with legislation – are more likely to support positive stakeholder experiences (Paxton *et al.*, 2010).

Indicators of good practice regulatory frameworks underpinning the marine aggregate industry globally include:

1. Consistent industry-specific legislation in state and federal waters
2. Environmental studies and local/regional management plans
3. Stakeholder consultation associated with the environmental impact assessment (EIA) process
4. Active public stakeholder consultation surrounding the offshore aggregate industry through government and industry programs (Johns, 2010).

Effective processes of stakeholder engagement will therefore be pivotal to ensuring that stakeholder interests are supported throughout any decisions made regarding the future of SEM in Australia (Paxton *et al.*, 2010).

6 FUTURE RESEARCH

The findings from this research strongly support the use of an integrated research approach, using both the social and bio-physical sciences to iteratively understand the impacts of a potential SEM industry. Research areas of high priority should be focussed on:

1. Baseline studies in key areas that provide an understanding of the marine environment, including pelagic and benthic fauna, oceanographic conditions and seabed geology.
2. Resilience studies of marine ecosystems to assess the potential long-term impact of SEM and predictive models to help assess the potential social and environmental impacts of SEM.
3. An analysis of stakeholder issues and a cost - benefit analysis to inform debate and to help inform policy and regulatory frameworks.
4. Integrated environmental, social and economic impact analyses that draw comparisons with other industries, such as onshore mining and port and harbour development.

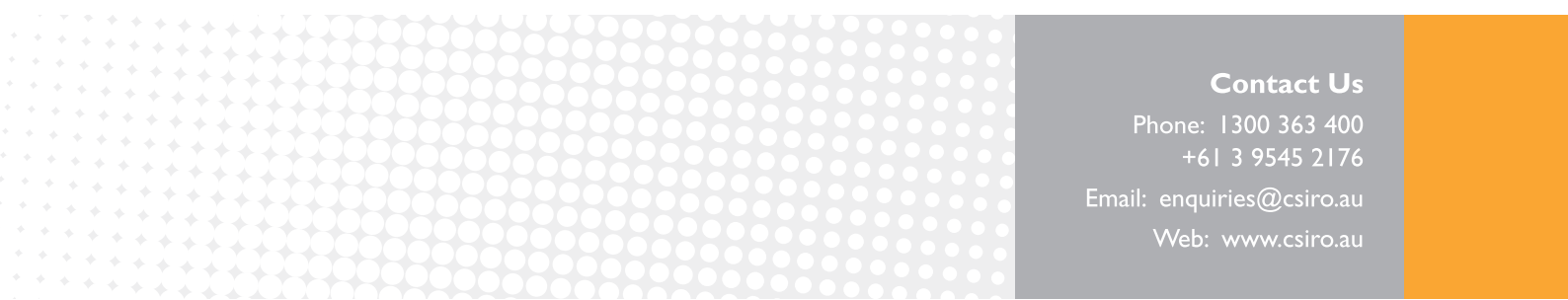
Social research will play a pivotal role in future phases of the research, as community and key stakeholders gain greater knowledge about the actual environmental impacts and benefits from a potential SEM industry. A future social research agenda may include:

1. Understanding the underlying values that drive public perceptions of SEM;
2. Examining how community stakeholders make trade-offs between conflicting values and objectives (e.g., environmental and economic) when evaluating the acceptability of an SEM operation;
3. Better understanding the terms of a social licence for the SEM industry in Australia.

Such information will provide insight into the conditions surrounding social licence for SEM in Australia, inform planning decisions by government agencies and industry, and provide data which allow stakeholders to make informed decisions about the acceptability of SEM. Ultimately, the combined social and environmental research will contribute to the development of a sophisticated knowledge base that can be used to inform the regulation of this nascent industry.

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