COMMUNITY UNDERSTANDING OF COASTAL HAZARDS

Improving preparedness and community adaptation to coastal storms and sea level rise

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Introduction

In June 2016, large storm waves associated with an East Coast Low cyclonic system caused extreme beach erosion and significant infrastructure damage along many parts of the NSW coast (Hannam & Kembrey, 2016). Media reports of the event, particularly at Narrabeen/Collaroy beach in Sydney, captured affected homeowners casting blame on coastal councils for not having prepared the coastline for the damage that ultimately occurred (Houghton, 2016). Yet these homeowners chose to live in a location in close proximity to an ocean beach that is well established as a coastal erosion hotspot (McClennan, 2009; 'NSW Govt. Move to Protect Homes', 2009; Smith & O'Rourke, 2002;). Immediate attention on the impacts of such extreme storm events often tends to involve blame and who is at fault. After the events, the focus then shifts to the economic impact and damage the storms have caused (Patterson & Swain, 2016; Houghton, 2016; O'Rourke, 2015; '3 dead', 1974; 'Death toll', 1974). This generally leads to questions of 'who pays for the damage', 'why weren't we prepared?' and 'who is responsible for preventing this type of damage in the future?'. These questions raise particular issues for coastal councils, (as primary caretakers of the coastal environment) as more often than not, the expectations regarding the hazards, preventative actions and adaptation strategies vary considerably among their constituents.

What the public knows and thinks about coastal hazards has a range of implications for the design of coastal management adaptation efforts (Fairfull *et al.*, 2014; Thomsen *et al.*, 2009; Morgan, 1997). The way in which the public perceives the associated risks of these hazards, and how these risks will affect their personal values, identity and social space, significantly influences the way in which they may engage in adaptation actions (Grant *et al.*, 2015), often determining their success, or failure (Leitch & Inman, 2012). Knowledge of this type of public perception is therefore of significant interest to those, such as coastal councils, involved in managing the coast from coastal hazards. While there is an abundance of literature that analyses natural disaster risk perception (NOAA 2016a; Slovic, 2000a; Slovic, 2000b; Kates, 1962;), climate change risk perception (Buckley *et al.*, 2017; Akerlof *et al.,* 2016; Barnett *et al.*, 2013; Buckley, 2008; Eden, 1996) and perceptions of adaptation efforts (Barnett *et al.*, 2013), there are very few studies that specifically investigate how the public understand coastal hazards such as coastal erosion and inundation, and their associated risks, both temporally and spatially, within New South Wales (Fairfull *et al.*, 2014; Bulkeley, 2000).

This study will explore how NSW coastal communities understand both the hazards of coastal erosion and inundation (exacerbated by coastal storms and sea level rise), and their perceptions of management options available to adapt to these hazards. Existing community understanding will then be compared with existing scientific understanding of the projected impacts of climate change on coastal hazards, coastal risks and coastal risk management. In doing so, this project will highlight areas of commonality and differences between these understandings, which will enable future community engagement efforts to target particular "gaps", but also to better tailor communication

efforts to different coastal communities about these coastal hazards and their risks. This will in turn, assist both coastal communities and coastal management decision-makers to create successful adaptation schemes for the future sustainability of the NSW coast.

Coastal hazards, climate and people

Many studies have been conducted, both internationally and within Australia, to describe various scenarios of sea level rise (Church *et al.,* 2016; O'Donnell & Gates, 2013; Leitch & Inman, 2012; DCCEE 2009), and corresponding coastal hazards, such as coastal erosion and inundation, that will be exacerbated by a rise in sea level (Church *et al*., 2016; Graham *et al*., 2013; Leitch & Inman, 2012; Aboudha & Woodroffe, 2009; Ablain *et al*., 2009; Church & White 2006; Tomlinson 2001; Mulrennan & Woodroffe, 1998). Other areas of academia have attempted to define how to plan for the future impacts of these hazards, and the pros and cons of engineering solutions such as the construction of seawalls (Betzold & Mohamed 2016; Sydney Coastal Councils Group 2013; Friesinger & Bernatchez 2010; Hume & Blackett 2007; US Army Corps of Engineers 1991; Kraus, 1988; Pilkey and Wright III 1988) and groynes (Brown *et al.* 2016; Phillips *et al.,* 2005; Dong, 1970), beach nourishment (Blumberg 2017; Dhakal *et al*., 2015; Cooke *et al*., 2012; Kirkpatrick 2012; Watson 2012; Nielsen *et al*., 2011; Withycombe *et al*., 2009; Cameron & Corbett 2000; Thom 2003; Lord *et al*., 1995), dune restoration (Khan 2015; Beardsmore *et al*., 2014; De Lillis *et al*., 2004; Gómez-Pina *et al*., 2004; Rozé & Lemauviel 2004) or retreat solutions (Alexander *et al.,* 2011; Svikis & Lofthouse 2011; Leitch 2009; Hellman *et al*., 2007; Ryan *et al*., 2007). Many of these coastal hazards are already being experienced and indeed, many of the above measures are already being trialled at various locations throughout New South Wales. For example, seawalls along the Narrabeen/Collaroy stretch of beach have been implemented to reduce coastal erosion, along with ongoing dune management and periodic episodes of beach nourishment in the form of sand replacement from the entrance of the Narrabeen Lagoon (Northern Beaches Council, 2017). After the June 2016 storm event, there has been a call to implement further and more robust seawalls along this coast by many local residents (Houghton, 2016; Patterson & Swain, 2016).

The Intergovernmental Panel for Climate Change (IPCC) proposes two active responses to climate change: mitigation of greenhouse gas emissions to slow or stabilise the warming trajectory, and adaptation to address the effects of a changing climate (IPCC, 2007). Some see mitigation and adaptation as two distinctly separate options, but developing and adopting both mitigation and adaptation strategies will be necessary to ensure safe human habitation along the NSW coast in the coming years (ACECRC, 2008; Thomsen *et al*., 2012; Pelling 2011; Maiback *et al.,* 2008). While mitigation measures are highly unlikely to significantly reduce the risks of sea-level rise and extreme events in the short to medium-term, efforts to adapt sustainably to coastal hazards driven by climate change (such as erosion and inundation) are already the primary policy option for many coastal planners and coastal council decision-makers (Smith *et al*., 2016; Leitch & Inman, 2012; ACECRC, 2008).

As of December 2015, NSW's coastal resident population (residents within 50 km of the coast) numbered 7.5 million people (NSW DPE 2016). Under the latest projections, the state of NSW is anticipated to grow to 9.23 million in 2031(NSW DPE, 2016). Almost 80% of the state's population is projected to live within the Wollongong – Sydney - Newcastle conurbation by 2031. However, Gurran *et al*. (2005) report that significant numbers of internal migrants are already moving to coastal local government areas (LGA's; the Sea Change phenomenon) which, combined with seasonal influxes of tourists, also places uneven pressures on these regions. Highlighting these pressures, the Australian Greenhouse Office (AGO, 2007) published a report that

outlines the potential impacts of climate change in six areas of local government (council) responsibility: infrastructure and property services; health services; planning and development approvals; natural resource management; water and sewage services; and recreational facilities. It was noted that where coastal development is permitted in areas vulnerable to sea-level rise, the coastal council is likely to have to cover costs, legal liability and possible compensation for previous 'legacy' decisions that allowed developments to go ahead (ACECRC, 2008; AGO, 2007). Legacies of inappropriate coastal development pose a significant problem for NSW coastal councils, and closely align with the State's 15 identified coastal erosion "hotspot" areas.

In an effort to accommodate for both demographic pressures and a changing coastal environment, the NSW Government recently passed the *Coastal Management Act 2016.* This replaces the *Coastal Protection Act 1979* and seeks to make more effective linkages between land use planning, environmental considerations and coastal council decision-making. The new legislation has incorporated objectives to conserve and enhance the scenic, social and cultural values of the NSW coastal zone while supporting sustainable coastal economies and ecologically sustainable development (OEH, 2017). The NSW coastal zone is divided into four coastal management areas each with a specific focus: (1) coastal wetlands and littoral rainforest area (2) coastal vulnerbaility area (3) coastal use area (4) coastal environment area. The new Act establishes management objectives for each coastal management area to ensure coastal councils apply appropriate management tools and development controls (OEH, 2017). Of particular note, is the focus on social and cultural values, maintaining access to amenities and considering potential climate change induced impacts in land use planning. Also under the new act, the Coastal Management State Environmental Planning Policy (the Coastal SEPP) notes the dynamic nature of coastal environments and requires this to be taken into consideration in any future planning within the coastal zone. The new legislation provides a framework for reflecting the needs and values of NSW coastal communities and allows for public involvement in decision-making (OEH, 2017). As with existing policy, this is achieved by undertaking 'community engagement' activities, the concept of which is widely accepted as underpinning successful climate change adaptation efforts (Smith *et al.*, 2016; Barnett *et al.*, 2013; Leitch & Inman, 2012; Morgan, 1997), land use planning and acceptable natural resource management decisions the world over.

Engagement with the coastal community

Many NSW coastal councils undertake a variety of community engagement practices. However, often the public they engage with are either people directly exposed to coastal hazards or members of the community who are actively concerned about the future of their coast (Leitch, 2017; Barnett *et al.*, 2016). As a result, a consistent problem has arisen in coastal management; 'how to engage the wider community?' (Thomsen *et al.*, 2009). It must be noted that one, homogenous 'wider community' does not exist. Rather, multiple communities that overlap and are constantly changing make up specific groups, tribes or what we will call 'coastal communities'.

Two umbrella categories are commonly used to describe communities: *communities of place* (e.g. residents) and *communities of interest* (e.g. tourists, SLS clubs, shareholders of companies etc.) (Thomsen *et al.*, 2009). However, the real challenge in defining coastal communities is considering how each type of community impacts and interacts with the coastal environment and how this may change both temporally and spatially (Thomsen *et al.* 2009).

When coastal councils engage with the 'community', it is often assumed that directly affected local residents need to 'get on board' with adaptation efforts and change their mindset to align with current scientific findings (Thomsen *et al.*, 2009; Meppem, 2000). Underlying this is the presumption that physical coastal science trumps community

understanding, and the motivations, aspirations and perspectives of those exposed to coastal hazards (Moser & Dilling, 2011; Sterman, 2008; Morgan, 1997) and that experts know best.

However, engaging with a community defined as being only those that are directly affected or with an active concern about the coast produces significant difficulties for engagement. It may be that a considerable number of people with an interest in the coast (a community of interest) may reside outside that narrow area (or even that local government area), perhaps only having a short-term or passing interest in the area, such as holiday home owners, caravan park users, tourists etc. (Thomsen *et al.* 2009) – but still a valid interest. Also, there maybe members of a community that don't have an active concern in the present, but do in the future. Additionally, the person or entity framing the issue to be addressed often does not consider themselves to be part of the community, effectively externalising the issue and distancing themselves from the 'community' (NOAA, 2016b; Thomsen *et al.* 2009) This method perpetuates a top-down public engagement approach, and emphasises the hierarchy of knowledge with scientific understanding given pre-eminence.

Community engagement

Several studies have found that public support for government policies is critical for effective coastal adaptation (Buckley *et al.*, 2017; Smith *et al.* 2016; Buckeley, 2000; Slovic *et al.* 1979). In order to gain public support and drive individual behaviour change, a clear understanding of the hazards and issues must be provided to the public (Bulkeley, 2000). Barnett *et al.* (2013) discussed barriers to adaptation, as identified by a variety of stakeholders. Their findings highlighted that most of the barriers identified revolved around the inability to comprehend climate science and the relative risk of impacts, as well as feelings of fear and apathy through uncertainty, and the tendency for short-term thinking rather than long-term, strategic planning. This suggests that the initial confusion regarding the science of coastal hazards may lead to a skewed perception of the eventual risks.

As promoted in the Information Deficit Model (Bulkeley, 2000), ignorance is often seen as a barrier to effective public involvement in policy processes. However, studies by Eden (1996), Leiserowitz (2005) and Luis *et al.* (2015) point to socio-cultural factors as the key frames for risk perception. In light of this, there is a need to move from the idea of just providing people with information in order to create behavioural change, but rather recognise that public understanding is complex, fluid and often contradictory in nature and that it is buoyed by social relations and lived experience (Leitch & Inman, 2012), and founded upon lived values (Graham *et al.,* 2013). Public engagement needs to be a two-way exchange of information, between policy or decision makers, and the public (Leitch & Inman, 2012; Department of Environment and Conservation NSW, 2006; Eden, 1996;). However, in practice, evidence suggests that in many contexts engagement remains driven by external agencies, with pre-formulated agendas so that the results of a two-way communication engagement, representing a successful learning partnership, is the exception rather than the norm (Thompson *et al.* 2009; Smith *et al.*, 2005; Meppem, 2000). This line of reasoning strengthens the need to adequately understand how much different communities know about coastal hazards and associated risks and will provide critical insights into how risk communication efforts can be tailored appropriately.

The issues with community engagement and 'wicked problems'

As noted above, it is critical to the eventual success of an adaptation effort for Governments to effectively engage a broad range of stakeholders when making decisions that will affect the whole community, not just those directly affected. While

some stakeholders will come with a deep understanding of specific aspects of an issue, it is unlikely that anyone will have a thorough understanding of the overall issue, taking into consideration the needs and wants of all other stakeholders (NOAA, 2014b), including scientists. An *ambiguity* of knowledge among different stakeholders, underlying *complexity* around problem definition and *uncertainty* of impact make adapting to coastal risks a truly 'wicked problem' or risk conundrum (Kasperson *et al.* 2017).

A wicked problem, as described as Rittel and Webber (1973), is;

> *'…a complex, interacting issue that is not easy to define, has no clear solution and involves many stakeholders with conflicting interests and opinions. How a wicked problem is understood will frame any potential solution, which means that tackling a wicked problem is essentially a social process'*

As already stated, the complexities of sea level rise, its' influence on coastal hazards, the complexity of impacts, a wide array of perspectives and values, and an uncertain timeframe provides a prime example of a wicked problem. It is important to engage coastal communities in the initial scoping of the problem, to develop a shared understanding of the issue and in turn, find a solution that meets in expectations of the differing stakeholders (Smith *et al.*, 2016). To date, there have been no studies in NSW that seek to define coastal communities' understanding of coastal erosion and coastal inundation, and their interaction with storms and rising seas, which means that engagement efforts relating to these specific hazards may be flawed from the start.

Exploring public understanding

The typical method for identifying what the public knows and thinks about any given matter is via survey-based research (Smith *et al.*, 2016; Morgan, 1997). However, there are some serious issues with identifying what the public 'knows' in comparison to what they infer from the content of a question, especially in terms of measuring understanding of a complex issue such as coastal hazards (Sterman, 2008; Morgan *et al.,* 2002; Morgan, 1997). This is often an issue of question framing – it is important to be able to pose a question without prompting, or leading to a particular answer (Bostrom, 2017; Sterman, 2011; Morgan *et al.,* 2006; Morgan, 1997). It is considered a major challenge to produce questions that are in lay language, but are precise enough to elicit unambiguously correct answers, even when questioning a room full of experts (Morgan, 1997).

By seeking to elicit community views around coastal hazards and risk, this project is placed firmly within the field of risk communication. One method to improve risk communication, without influencing answers through indications in the question, is based on the 'mental model' approach. This approach takes into account what people might already know about an issue, prior to a formal communication strategy, and works this knowledge into the communications strategy (Bostrom, 2017; Morgan *et al.,* 2002). People generally have some kind of existing 'mental model', a knowledge structure relevant to the subject (Morgan, 1997) that helps make sense of the problem at hand. Because any new information imparted to them will pass through, and be filtered by this existing 'mental model', it is crucial to know what those mental models are before designing a communication campaign (Bostrom, 2017; Sterman, 2008; Morgan *et al.*, 2002; Morgan, 1997).

Project Design

This project aims to explore how different NSW coastal communities, with different values and connections with the coast, understand coastal hazards and perceive management options to adapt to these hazards. Coastal hazards are defined as 'a physical process or activity that affects a coastal asset or value'. Specifically the hazards of interest in this study are:

i) Coastal erosion and shoreline recession caused by wave action, tidal currents, littoral currents, or wind, which may be exacerbated by coastal storms or elevated water levels;
ii) Coastal inundation and flooding associated with sea level rise and/or elevated still water levels due to storm surge and/or wave run up.

For this study, the hypothesis being tested is;

Communities with varying levels of interaction with the beach will have different understandings of the coastal hazards of erosion and inundation, as well as different perceptions of management strategies.

Having completed a thorough literature review, which spanned a number of disciplines, an online, quantitative survey approach was identified as the best research method. With consideration of Thomsen *et al.* (2009)'s report, and with the logistical difficulties of surveying the entire NSW coastal demographic, we have selected five coastal communities, which are present NSW wide, based on their varying degrees of interaction with the coast and participation in engagement activities (see Table 1). These are;

i) surf lifesaving club members;
ii) primary and secondary school teachers;
iii) coastal holiday accommodation owners and managers;
iv) coastal holiday accommodation tourists and residents; and
v) coastal management decision makers.

In addition to the online survey distribution, face to face survey distribution for the coastal holiday accommodation owners and tourists will be conducted to maximise return rate for this community.

Table 1 Rationale for selected 5 target 'coastal' communities in New South Wales

Target Community	Rationale
Surf Life Saving Club members	• 129 NSW SLS clubs with approximately 74,690 members • Clubhouses located immediately adjacent to NSW beaches • Community with an active interest in the coastal environment • Members comprise diverse demographic group living varying distances from the coast • Ease of online survey promotion via SLS NSW email and social media networks
Teachers	• Over 2000 schools within NSW coastal LGA's • Community members may or may not be directly connected with the coast • Diverse demographic group living varying distances from the coast • A community (teachers) involved with educating future generations (students) • Direct connections with students may provide potential for insight into youth and educational perspectives • Ease of online survey promotion via NSW Teaching networks • Elements of this project (coastal hazards) are part of high school curriculum
Coastal accommodation tourists and residents (e.g. coastal caravan park tourists)	• Diverse demographic group varying in age, residential area and coastal usage • Individuals who choose to reside or vacation in close proximity to the coast • Ability to connect with a coastal community who use the coast sporadically over the year, but value the coast as a holiday destination 'transient tourist population'
Coastal	• Represents a significant and growing market across the State

accommodation businesses (e.g. coastal caravan park owners, hotel managers)	• Businesses often in close proximity to the coast; • Businesses who are involved with or have a vested interest in the coast; i.e. derive revenue due to their proximity to the coast
Coastal decision makers e.g. Local councillors, environmental managers	• Actively undertake activities to address coastal risks in NSW • Provide direct experience of present management strategies and public engagement • Live varying distances from the coast and have different valuations of the coast

Survey design

In order to specifically target the above coastal communities, we have developed five surveys that include identical questions regarding understanding of hazards and perceptions of management options (Table 2). However, each of the communities has additional tailored questions to enable the study to gain a broader understanding of each community's values and where they have previously gained information regarding coastal hazards.

Table 2 Generic survey questions by section, objectives and reference source used to design questions

Section	Questions	Objective	Reference
Your coast	Demographics Coastal value	Segmentation for analysis through - Age - Gender - Geographical variables - Value of coast - Coastal usage	Hine *et al* (2013) Graham *et al.* (2013)
Hazards and climate	Concern about various hazards; - SLR - Erosion - Storm surges - Nuisance flooding - Coastal storms	Assess understanding and perceptions of coastal hazards in terms of factors; - Temporal - Spatial - Magnitude - Frequency - Impact	Tofa & Gissing (2017) OEH (2017a) Church *et al.* (2016) Hine *et al.* (2013) Goidel *et al.* (2012)
Coastal Management	Management options - Hard options - Soft options - Retreat - Do nothing Perceptions of what is being done and future expectations	Gain understanding of public perceptions of; - Protect - Accommodate - Adapt - Acceptability Measure expectations	Hine *et al.* (2013) Goidel *et al* (2012)
Hazard and risk communication	- Previous sources of information - Level of participation in coastal management engagement activities - Level of trust of various sources - Information gaps - Politics	Defining accepted sources of info and level of trust	Hine *et al.* (2013) Goidel *et al* (2012)

The study commenced in April 2017 and is expected to run until April 2018. A primary goal of the study was developing a survey that would provide useful information for those partner organisations involved in the project: Sydney Coastal Councils Group (SCCG), NSW Office of Environment and Heritage (OEH), Surf Life Saving NSW (SLS NSW), and end users (e.g. coastal councils). As such, significant time was devoted to

research and consultation to develop a comprehensive literature review that would identify key existing knowledge gaps and guide the content of the survey(s). A critical element of this involved examining existing surveys that have been completed in NSW and other areas of Australia and internationally on related topics. The result was multiple surveys (Table 2) targeting the communities described in Table 1. Three of the five surveys (SLS members, teachers coastal accommodation businesses) will be launched online in October 2017. The groups will be targeted via social media and through email networks. This ensures that the survey reaches a large amount of appropriate responders in each community group. The survey targeting *Coastal Decision Makers* will initially be disseminated in hardcopy format, in person, during the NSW Coastal Conference in November 2017. It is hoped that administering the survey personally will increase the response rate for this comparatively smaller group. The final group, *coastal accommodation tourists and residents*, will be targeted over December 2017 and January 2018, through hardcopy face to face interaction at a number of pre-selected sites. In addition to this group, coastal accommodation businesses will also be targeted to bolster the response rate of this community.

Expected Outcomes

Once the data has been collated, cleaned and analysed, the findings will be compared to existing science regarding magnitude and frequency and impacts of East Coast Low coastal storms, sea level rise and associated coastal erosion and coastal inundation. On completion, this study aims to identify common 'understandings' about these topics, or 'mental models'. This will then be used to produce information guides to inform coastal council, decision makers or any other interested party on ways in which to best tailor communication of information to specific coastal communities. What differentiates this study from other similar studies is that it focuses on coastal usage and coastal values of communities, and not just their geographical location. This will allow for a greater connect with coastal users, encouraging a broader scope of participation for future community engagement.

Challenges

There were a number of challenges faced when designing this study, largely based around the fact that it spans a number of disciplines. In trying to identify public perceptions about storm induced coastal erosion and coastal inundation, the study touches upon concepts that are embedded in the psychology of risk perception, the economics of 'who should pay' for damage, and the social science of mental models and theories of communication, all under the twin umbrellas of climate change and coastal science. In order to gain meaningful insights into community understanding of these coastal hazards, it was not possible to separate the interdisciplinary aspects, but rather the focus was on finding ways to address each aspect without losing data integrity and to fulfil the objectives of the project. This is particularly difficult to do through the medium of online survey data collection, specifically in terms of the length and time it would take to complete the survey to ensure a suitable number of responses.

Another issue that arose during the survey design phase was the problem of engaging with coastal communities NSW-wide. With a 1600km long coastline NSW is a very large study area and for the data to be meaningful, the response rate would need to be exceptionally high. This led to the decision to focus on coastal usage and values of the five specific coastal communities (Table 1). By changing the focus from geographical to usage and values based factors, we will be able to maintain a NSW wide spread using discrete and representative samples. However, this did not address the issue of the vast geomorphological variation in the NSW coast. The different experiences of respondents based on which part of the NSW coastline they most frequently visit,

would ultimately influence the way they perceive threats to their coastal usage and the appropriateness of various coastal management strategies. For example, a respondent from Collaroy-Narrabeen may think implementing a seawall is the best way to reduce erosion based on their local experience, while a respondent from Batemans Bay may think beach nourishment is more effective. Both may be right, as these issues are often location specific and influenced by a range of factors. In order to address this issue, a number of open-ended questions in the survey allow respondents to provide a specific location or situation, in order to gauge their understanding of the hazards themselves and appropriate coastal management options.

Ultimately, the main challenge in designing the project and survey was maintaining a strict focus on what this study aimed to achieve. There are multiple avenues that could have been explored under the title of this project. However, with limited time and resources, it was deemed necessary to focus the scope of this project to one main aim; *community understanding of the hazards of coastal erosion and coastal inundation*. It is hoped the others engaging in future studies similar to ours may learn from the challenges faced in this study's process.

Summary

While many, if not all, coastal councils attempt to actively engage communities in coastal management plans and decision-making, there is often a lack of baseline knowledge of public understanding of the nature and character of coastal hazards. Critical information is missing such as when, where, why and how coastal hazards may manifest, and how they might affect community values. The benefits of broad public engagement for climate change adaptation at the coast can be vast, including mutual capacity building, generation of new knowledge, gaining novel insights, cross sectoral innovation, encouraging social learning (Reed *et al.*, 2010) and providing a platform for acceptance of sustainable coastal adaptation solutions.

By targeting different 'coastal communities' within NSW, this study hopes to provide a cross-section profile of community perceptions that enables a degree of insight State-wide. Attempting to tailor our communications with these sectors will prove a useful exercise as many authors and practitioners have identified the need to communicate risks in a manner that is appropriate for the particular audience being engaged ('fit for purpose'). In doing so we also effectively pilot methods of risk communication that can inform practitioners up and down the coast.

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