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Social Learning in Vulnerability Assessments: The role of double loop learning in helping communities adapt to Climate change

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ABSTRACT

A 'Vulnerability assessment' can be used to identify and assess people, regions and specific places that are at risk from the impacts of climate change. These assessments are increasingly being seen as a way to understand the nature of climate change impacts, whether action is required and begin discussions around what form this should take. Initial perceptions of assessments by stakeholders are often around a scientific assessment that will provide the 'answers'. However, increasingly the process triggers more questions than answers and evolves into an action learning process that brings together not only data around likely impacts, but also local knowledge and provides a platform for shared learning and collaborative decisions. This paper explores social learning occurring in four vulnerability assessments undertaken in south eastern Australia. Data was collected using qualitative interviews with stakeholders with analysis using a social learning.

In all four assessments, the level of detail in the data generated as part of the assessment fell short of initial expectations. However, this did not necessarily lead to dissatisfaction with the process, because assessments also provided a platform where information was shared, engagement between stakeholders catalysed, objectives negotiated and actions deliberated upon. In addition, individuals started to see things differently such as the need for not just individual assessments but a broader adaptation planning process that may start with a vulnerability assessments but carries it forward into the future.

The implications are that more research is needed into the potential for better facilitating social learning in vulnerability/ risk assessments through more careful consideration of diverse participants (experts, policy-makers, practitioners) and greater investment in the early stages of assessment design to recognise, facilitate and monitor learning activities.

Keywords (<6): Social learning, vulnerability assessment, risk assessment, climate change

I. INTRODUCTION

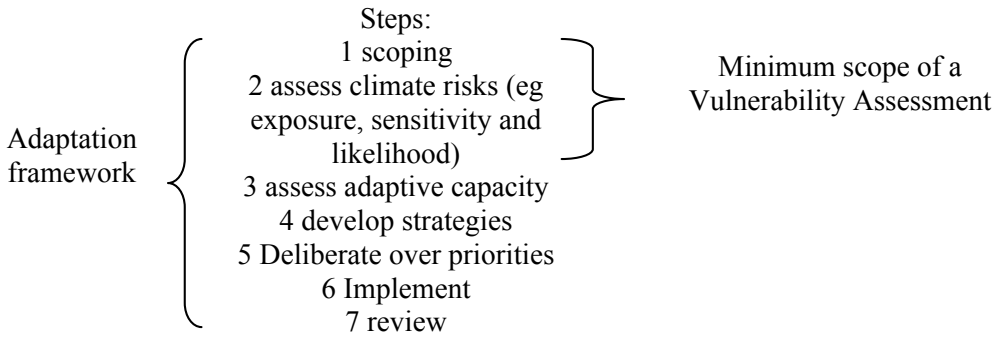
Vulnerability and risk assessment are methods for identifying and assessing people, regions and specific places that are at risk from threats. These assessments are increasingly being seen as a way to understand the nature of climate change impacts. Ideally they are part of a broader adaptation planning framework which takes assessment findings and translates them into concrete actions to communicate and

manage impacts, build capacity in local managers and where necessary undertake further research. However many are conducted independently from adaptation planning (Preston, 2010) and end up being a primarily academic exercise in vulnerability assessment methodology.

Various adaptation frameworks exist (Willows and Connell, 2003, UNDP – GEF, 2003) and they commonly contain a number of steps which are generalised in figure 1. The reality is far more complex (and less linear) than the simple listing of the steps implies and in fact often projects merge multiple steps, run them in parallel or skip others all together. The UKCIP framework (Willows and Connell, 2003) in particular acknowledges the circular and iterative nature of the reflexive process of adaptation. However, in order to facilitate understand at each of the stages this paper will conceptualise them linearly.

Figure 1. Steps or activities within an adaptation framework

In this paper, the term adaptation framework will be used to describe the entire group of steps along the adaptation pathway as illustrated. The framework is a conceptual model only and steps are undertaken



opportunistically in an adhoc basis depending on funding or organisational support and perceived urgency. The process may unfold over a long-time period with intense periods of activity (often triggered by a formal project) followed by periods of inaction or reflection and planning.

Vulnerability assessments and risk assessments are used to describe the process of identifying and assessing people, regions and specific places that are at risk from the impacts of climate change. Theoretical differences exist (Preston, 2010) whereby a vulnerability assessment (comprised of exposure, sensitivity and adaptive capacity) is only one sub-component of a risk assessment (which includes both vulnerability and likelihood). However, from a stakeholder perspective, both vulnerability and risk assessments represent pathways to learning about drivers of change, potential consequences and their relative importance.

Different types of vulnerability assessment undertake different activities in the adaptation framework. Some stop after a first-pass assessment (Sharples et al., 2008) that broadly identifies sensitivity to risks at a broad scale. Most assessments go on to prioritise risks and identify possible actions to deal with the risks. Some undertake a second pass assessment that characterises in more detail exposure at a regional level or a third pass assessment that delves deeper into risks at a localised scale (Sharples et al., 2008). They may also assess the ability of a community to adapt to these risks based on their adaptive capacity (Adger and Vincent, 2005) or develop detailed adaptation plans to deal with the risks.

The objective of the research was to analyse the social processes occurring in four vulnerability assessments in terms of how they contribute to collective action. Qualitative interviews were undertaken with practitioners and stakeholders of assessments and the data was analysed using a social learning framework. In using this framework it makes explicit how, why and what learning occurs, and what

preconditions can support collective actions. In understanding the nature of social learning it is hoped that collective action and ongoing adaptation planning can be better facilitated in subsequent assessments.

II. SOCIAL LEARNING

'Social learning', also commonly referred to as 'collective learning', is a concept with divergent theoretical roots and has been used in widely different contexts. In environmental management fields, social learning is used as both an analytical and facilitative framework to support collective decision making and action to address complex natural resource management problems (Pahl-Wostl and Hare, 2004, Keen and Mahanty, 2005). Conscious and active learning among multiple stakeholders across scales have been shown to be critical for identifying and implementing solutions to complex, large-scale problems where uncertainty is high (Walters and Holling, 1990). Sharing experiences, ideas and values with others, combined with iterative experimentation and reflection, is argued to enhance common understanding and collective action (Ruitenbeek and Cartier, 2001). Social learning is an ongoing, adaptive and iterative process that typically involves scoping, analysing, negotiating, organizing, implementing, reflection and back to scoping again (Keen and Mahanty, 2005).

One of the most useful conceptualisations of social learning is that of different cycles or 'loops' of learning (Groot and Maarleveld, 2000). Single-loop learning can be identified in terms of a change in skills, practices, and actions to meet existing goals and expectations. As such, there is only an adjustment or correction of errors. By contrast, second-loop learning is an examination of the assumptions that underlie action and it involves a transformation in thinking. Triple-loop learning involves a more deep-seated questioning and changing of the values and norms that underlie operating assumptions and actions.

III. MATERIALS AND METHODS

A. Case studies

Four vulnerability assessments undertaken at the scale of local council in south Eastern Australia were used. Council Groups undertook two of the case studies, one was conducted by a large metropolitan council and the final case study was undertaken by a research institute in a rural local council. Case studies were selected on the basis of being finalised as either a first or second pass assessment so as to provide a comparison of different methods. The assessments were selected to provide variations in: levels of community participation (e.g. some were top down and one was bottom up) and community engagement; lead organisation (e.g. Some were partnerships between council groups and researchers, one was researcher driven and in another the council engaged a consulting company); and scope (eg a narrow risk assessment for specific hazards facing organisation(s) versus a vulnerability assessment for a broader group of stakeholders).

Australia has three levels of government (federal, state and local) and the assessments were undertaken at the scale of either local government or through a group of local governments (ie regional organisation). However, there were also resources provided by both state and federal levels in the form of funding or expertise. The assessments were for the Sydney Coastal Council Group, Western Port Greenhouse Alliance, Alpine Shire and City of Melbourne located as illustrated in Figure 2 below.

The Sydney and Western Port assessments were undertaken through regional organisations and covered the largest geographical area with 15 and 5 (now 8) councils respectively. Both cost in the order of $500,000 with additional in kind support from agencies. However, there were also many differences in that they were in different state jurisdictions, had a different focus (one was a greenhouse alliance initially formed to promote greenhouse gas mitigation measures, the other a regional organisation group focussed on broader interests) and they had a slightly different methodologies and stakeholder engagement processes.

The Melbourne assessment covered an urban council with a population around 100,000 and cost in the order of $100,000. It was an organisational based risk assessment undertaken to a strict timeline and budget by consultants.

The Alpine assessment was funded through the PhD program and covered an area geographically large but with a population just over 10,000. It used a participatory process implemented by researchers for community determined objectives.

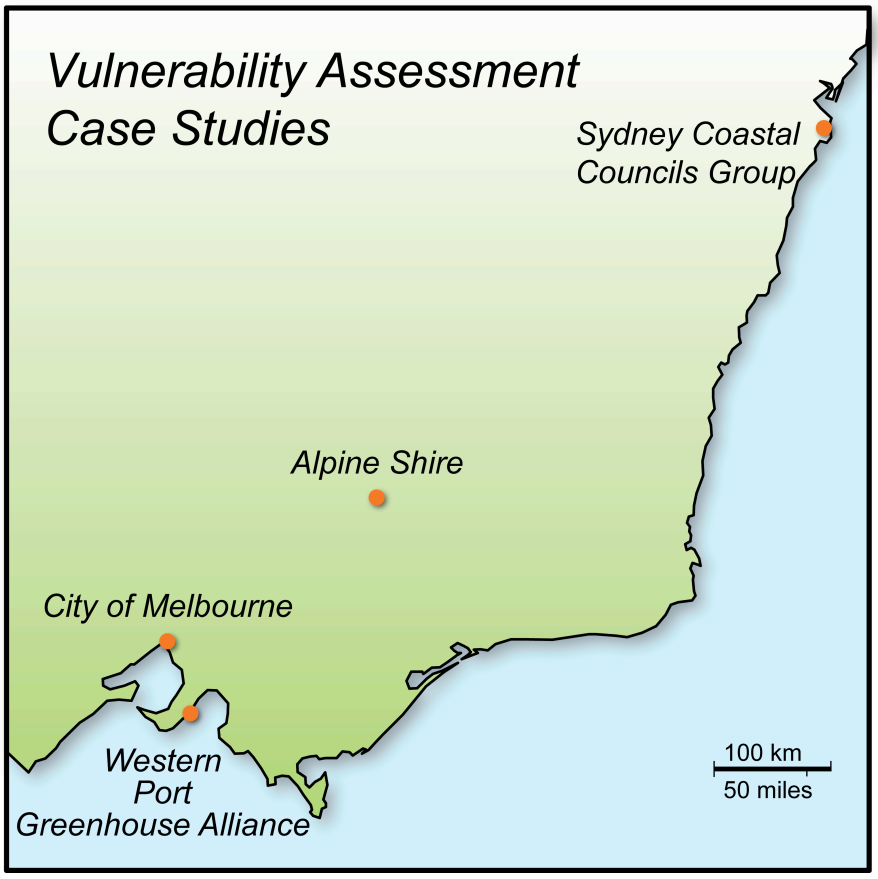


Figure 2. Case Study Assessment locations

B. *Participants and data collection*

In order to explore social learning at the various stages within a vulnerability assessment, interviews were held with 33 participants with some involvement around one of four case studies. The key informants were invited to participate in interviews on the basis of meeting at least one of the three criteria:

- employed in an organisation in a role responsible for contributing to the vulnerability assessment;
- employed by an organisation who was a stakeholder in the assessment who either provided information into the assessment or was impacted by recommendations of the assessment;
- community members with some familiarity of the assessment and who are ultimately impacted by climate change.

A first cut list of potential key informants was obtained from project managers with snowball sampling used to obtain additional names to help identify interviewees from a range of technical and non technical backgrounds with both favourable and unfavourable opinions on the case study. Participants were contacted by telephone and told about the full nature of the study, the other case studies involved, and

expected outcomes from the research. Their consent was obtained to be interviewed and directly quoted. All core project team members were interviewed although the large number of stakeholders in some assessments prohibited interviewing every stakeholder in every assessment.

This inductive and exploratory study was aimed at developing hypothesis and as such it was not necessary or possible to use random sampling.

The interviews used open-ended questions as an interview guide pertaining to what worked, what didn't and what was the outcome and why. These interviews were between 0.5 and 2.5 hours in length.

C. *Data analysis*

Questions were asked of stakeholders in the four vulnerability assessments around:

- What assisted or could have been improved as part of the vulnerability assessment process?
- What new knowledge or actions resulted from the vulnerability assessment?

Questions did not directly pertain to social learning but rather social learning was used as an analytical framework for analysis of the interviews. This data was used to determine who, what, how and why learning occurred based on a framework developed by Maarleveld and Dangbégnon (1999).

Double and triple loop learning within the steps of the assessments was explored through questions on whether the processes made participants re evaluate initial assumptions or underlying values and included questions:

- Were the outcomes for your organisation what you expected at the beginning of the project?
- Did any of the stakeholders try to change the outcomes?
- What could have helped you achieve these outcomes?
- What was the ultimate goal you wanted to achieve? And how important was your project in helping to achieve this goal?

Adaptation planning is a new activity and at the time of the research there were no assessments in Australia that had been undertaken right through to the policy implementation stage.

IV. RESULTS

A. *General findings across the case studies*

1) *Who was learning?*

In the four case studies, there was the opportunity for social learning to occur in groups ranging from researchers to policy makers to those ultimately impacted by the decisions made. Some studies brought in a broad range of stakeholders from state agencies (Western Port) and local residents (Alpine) while others focussed on the council(s) and their employees (Sydney and Melbourne). State agencies often came into the assessments (Western Port, Melbourne, Sydney) with beliefs that their role was to share their knowledge with the group rather than taking back recommendations to their agencies. However in some assessments, media coverage (Sydney) and concern over controversial findings (Melbourne) meant that they were brought in more closely at the end and become more active as a stakeholder. The Federal Government supported funding in two 'pilot' assessments (Sydney and Western Port) and as such had a keen interest in the outcomes although had limited involvement in the process beyond funding.

One project (Alpine) targeted knowledge held by local residents outside of government circles although generally the assessments (Western Port, Sydney and Melbourne) limited community engagement to after the risks had been assessed. In these 3 assessments, communications were around what was at risk and what is being undertaken to address the issue.

2) *How was learning facilitated?*

The four case studies used different methods of developing, sharing and deliberating over information with different stakeholder groups through different events.

The Western Port Assessment entailed using modelled climate variables to assess the impact on the built environment as well as the social and economic implications. This was shared at various workshops and meetings with not only the project team but also the reference group. Local governments and other stakeholders were invited to risk assessment workshops where risks from these impacts were identified and collectively prioritised for each council. A report was released publically and a number of new research projects were initiated in response to the assessment. In addition, some councils set up project teams or taskforces to facilitate adaptation activities. In some councils (eg Mornington Peninsular in Western Port) community consultation also occurred. This project undertook a detailed evaluation and the funding agency also conducted its own evaluation.

The Sydney Assessment combined a vulnerability mapping, systems analysis and qualitative interviews with local governments about barriers. The systems analysis and work on barriers were relatively new and innovative methodologies over which there was some debate over their complexity and usefulness for local government. The project steering committee was actively involved in all three stages while the full group in the Sydney Coastal Councils Group was updated at meetings. State government and other stakeholders were not closely involved in this assessment process and although efforts were made to engage them. Evaluation surveys were distributed at the end while the funding agency also conducted an evaluation.

The Alpine Shire assessments were two individual but related assessments both starting with a collective process for problem definition. The Integrated assessment of flooding in Myrtleford undertook qualitative interviews and followed the flood mitigation decision-making process. Community meetings were held to provide feedback and reports were provided to the local library and council. The tourism in alpine shire study also used qualitative interviews but combined it with council workshops to develop timelines of climate related events and these were displayed at local stores and other community centres. Both recorded stories of past impacts and responses through the interviews.

In the Melbourne Assessment the council steering group oversaw the work undertaken by consultants who identified first and second order risks and presented these back to the council and their stakeholders. The role of participants at these workshops was to confirm the findings of the consultants and contribute to

the rating of the risks. The risk assessment report was released and published on the website in 2008 after which processes were set in place to develop the adaptation plan within council.

In the two regional assessments (Sydney and Western Port) found learning was facilitated by a regional scale for climate risk assessments. The council group had legitimacy amongst member councils as well as synergies in being able to pool resources, put pressure on the councils who were slow to act and assisted with translation of information and objectives between researchers and councils.

3) What was learnt?

"fantastic getting the social planners sitting next to the … engineer and saying 'well I'm doing this' 'well I'm doing this' and 'this is affecting me oh yeah' and sitting together and working out their jobs are impacting or alleviating some of those issues. It was just getting people to think differently" (SCCG GW)

In three of the communities (Sydney, Western Port and Melbourne) researchers and the steering committees shared knowledge around impacts and possible responses. Interestingly in one assessment (Western Port) this negotiation process actually lead to more investment in infrastructure despite the scientific assessment rating bushfires a higher priority. At the end these core project teams ended up with a better idea of what the vulnerability assessment process is, should be and what can be done to improve it next time.

Stakeholders involved in reference groups and within individual councils also shared knowledge around impacts, possible responses and were involved in prioritising risks.

Frequently the process galvanised employees within councils who were often meeting for the first time. These employees came to understand the need for adaptation, what their role is in the bigger picture whilst simultaneously generating interest and commitment for actions across council.

Meanwhile the community commonly learnt what government was doing to address the impacts although this was not necessarily a social activity because it might have been learning on an individual basis.

Unlike the other assessments the goal of the Alpine case study was not to facilitate council activities but to explore community perspectives of climate related issues. This process increased awareness in the community but participants were not clear at the end what a vulnerability assessment actually is or how climate change can be addressed. It did however provide an opportunity for the community the frame the problem from their perspective. It also demonstrated to the research community that local knowledge can be a complementary knowledge source for integrated assessments.

In addition to these single loop learning there was also double loop learning where stakeholders re-evaluated some of the initial assumptions underlying the assessment of risks. Some of the assessments (Melbourne) had a structure that was less conducive to double loop learning because it required consultants to submit a proposal, undertake the work in relative isolation compared to the regional assessments (Sydney and Western Port) and inform/ verify their findings with council. This left neither the flexibility to deviate from the original proposal nor for council's members to re-evaluate the assumptions. Others (Alpine Shire) were based on participatory action research principles and were free to adapt.

One assessment (Western Port) found that future priority actions were not just around better science on the impacts but rather how to address barriers to adaptation. Another of the assessments (Sydney) specifically targeted understanding the social and political barriers to implementing adaptation strategies. Although it undertook this process, one participant commented that the assessment of these barriers was more useful to state and federal levels of government and not for the local government target audience.

One or more participants in each assessment shared the belief that the most valuable parts of the process was bringing people together to debate and negotiate ways forward. Often the data provided the impetus for this gathering but it was the deliberation over responses that lead on to collective action.

Observed actions were in the form of changed infrastructure investments (Western Port, Sydney, Melbourne) or new research activities (Western Port, Sydney, Melbourne and Alpine).

The Western Port assessments was particularly successful in leading to funded research projects in areas of heatwave strategies, strategic planning processes, impacts on the Phillip Island penguin parade, food access and community engagement. It is unclear exactly what facilitated social learning in this situation although further research could explore engagement processes, the complexity of information shared and local politics. Firstly the Western Port study included a broader group of stakeholders but combined this with informal one-on-one briefings with council managers by a full time coordinator. On the other hand despite the Sydney assessment actually having a more in depth formal engagement processes with council employees, the project team was geographically spread out over the country and coordination was undertaken by a technical committee. Secondly, Western Port had a simpler more familiar (risk assessment) methodology as well as undertaking a separate scoping stage giving time for participants to reflect on what was being undertaken. Finally, Sydney and Western Port are in different states where the political environments are very different.

Researchers in two assessments (Western Port and Alpine) shared with other stakeholders their beliefs around the value of local knowledge systems to complement specialist scientific data, which may or may not have been apparent before the project started. However this understanding is yet to be reflected in action through new locally based research methodologies in the case study areas.

The Melbourne risk assessment revealed tensions between council priorities (eg financial liabilities) and external stakeholder interests (eg land development) and community objectives (eg vibrant and resilient community). Alpine shire also experience tensions between research goals (academic understanding and community empowerment) and council goals (something that can easily be taken forward and is aligned with council). It is important to understand the nature of competing interests, and set in place collective processes that can facilitate decision-making that accommodates multiple interests.

All of the assessments noted how important it was to design for longevity via an ongoing process that is able to continue the adaptation planning process either through an ongoing program or opportunistically taking advantage of funding, as it is available. In two assessments (Western Port, Alpine Shire) the loss of core staff was noted as a potential problem for this.

4) Why did learning occur?

Funding of assessments promoted learning by providing the platform on which information around strategies could be shared and a collective vision and process negotiated amongst those responsible for action. The circulation of project documents and reports also assisted in this process.

In one case study (Sydney) the media also helped facilitate learning by not just the broader community but also state government. In this assessment state government were not specifically targeted, but in response to the media coverage, and collective learning in the community about the issue, the State government released a new sea level rise policy.

This assessments were usually driven by interested and individuals within the organisations. The Sydney assessment was driven by a relationship between the Executive Officer and an academic research. In Alpine shire the assessment was driven by two interested PhD students. Western Port was driven by the Greenhouse alliance who widened their agenda to include adaptation. Finally, the Melbourne assessment was driven by a wilful individual working in the environmental planning area.

V. DISCUSSION

The case studies illustrate various ways single loop learning has helped stakeholders share understanding around the nature of climate impacts and negotiate actions to deal with them. They also identified situations where the original goals and assumptions of any particular step in the vulnerability

assessment were questioned (double loop learning). Understanding these single and double loop-learning processes has implications for long term outcomes from assessments.

Vulnerability assessments provide social arenas or 'platforms' where ideas can be shared and deliberated over. Platforms have a specific set of characteristics such as location, and purpose and can be formal or informal. Examples include meetings (project team, committees, taskforces etc), workshops (stakeholder or community) but can also include groups collaborating over draft reports. Other arenas include the media, community consultation processes and even informal conversations between colleagues. Social learning is both an outcome but also a process for achieving outcomes within the adaptation process. In understanding how and why social learning occurs in these 'platforms' the design of future assessments can incorporate ways to better facilitate learning and opportunities for collective action. The case studies identified a number of factors potentially influencing social learning in vulnerability assessments:

- the types and diversity of stakeholders;
- initial beliefs held by stakeholders about what they expect out of the process (eg detailed data or an ongoing process) and what is their role (eg one way or two way learning);
- the ability to frame and reframe goals and hence redesign processes;
- complementary knowledge systems (eg local, experiential);
- concepts and information that are readily understood and easy to apply in day to day activities;
- designing for longevity of the adaptation process, beyond the first vulnerability assessment;
- multiple opportunities for shared learning, deliberation and time for reflection;
- scale at which an assessment is undertaken which is large enough for synergies but not so large that it is too difficult to coordinate across groups (eg regional organisations).

Consideration of these factors in the design can help facilitate social learning and lead to collective decision making. A critical part of this is for there to be formative evaluation processes that reflects on progress as the assessments progress and is able to result in the assessment and adaptation planning process being adaptive to changing conditions and new understanding. While stakeholders need to have some idea of what assessments will, and will not, achieve from the start, they also need to be open to changing their expectations through double loop learning. In this way desirable outcomes, many of which are unstated or recognized at the outset, can be facilitated.

VI. CONCLUSIONS

Vulnerability assessments can be of value in providing a 'platform' (shared social spaces where interaction, reflection and negotiation occurs) and for generating 'objects' (eg new knowledge) for social learning. This provides the space for relationships to develop; actions to be deliberated and planned; and also a space to rethink what and how communities should adapt to climate change. Considering the social processes within and following vulnerability assessment is important when planning assessments so that collective action is best facilitated. This involves considering diverse participants (experts, policy-makers, practitioners, community) and diverse types of knowledge (e.g. climate science, 'citizen' science, and institutional and policy sciences) in the early stages of assessment design. It also requires monitoring and feedback on the process so that adaptation can reflect new knowledge, dynamic environments and adapt to changing goals as they emerge.

Further research is needed into monitoring the social processes in future vulnerability assessments. Research into: the selection of and processes for engaging stakeholders and project teams; the way people

interact with different sorts of information and expert knowledge; the communications of this information or knowledge; and how the social context influences assessment outcomes. This research will help design effective assessment processes to ensure findings are not only understood but implemented to achieve long term outcomes.

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