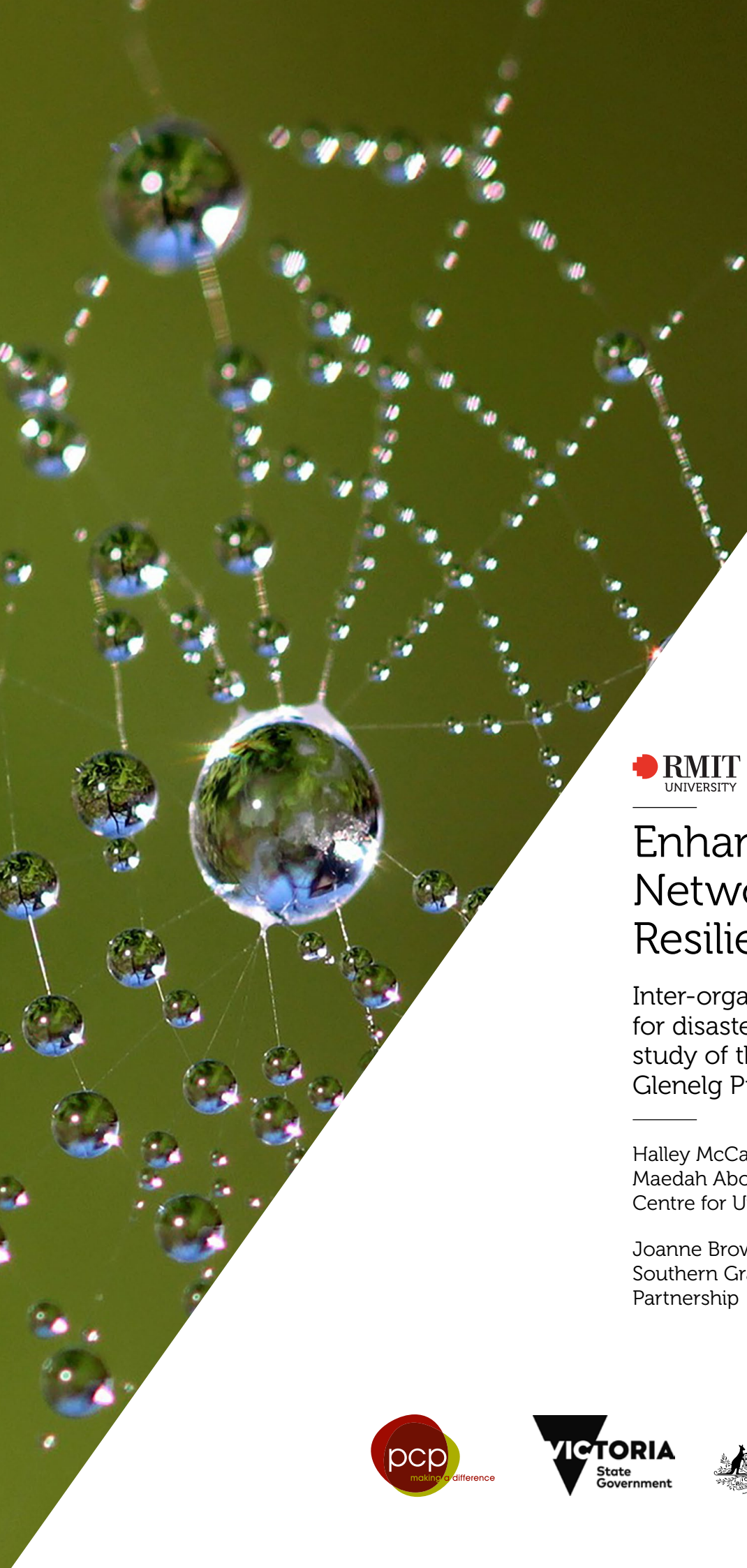

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Enhancing Networks for Resilience

Inter-organisational collaboration for disaster resilience: A case study of the Southern Grampians Glenelg Primary Care Partnership

Halley McCann, Hartmut Fünfgeld, Maedah Aboutalebi Karkavandi
Centre for Urban Research, RMIT University

Joanne Brown, Rowena Wylie
Southern Grampians Glenelg Primary Care Partnership

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Contact:
Halley McCann
Primary Researcher
Centre for Urban Research
RMIT University
halley.mccann@rmit.edu.au
+61 3 9925 9057

Assoc. Prof. Hartmut Fünfgeld
Chief Investigator
Centre for Urban Research
RMIT University
hartmut.fuenfgeld@rmit.edu.au

Maedah Aboutalebi Karkavandi
Research Assistant
Centre for Urban Research
RMIT University
maedeh.aboutalebikarkavandi@rmit.edu.au

Jo Brown
Manager Health and Wellbeing
Southern Grampians Glenelg Primary Care Partnership
joanne.brown@wdhs.net
+61 3 5551 8563

Rowena Wylie
Project Officer
Southern Grampians Glenelg Primary Care Partnership
rowena.wylie@wdhs.net

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Disclaimer
The views expressed herein do not represent those of the Australian Government, or any of the organisations that participated in the study. They are the views and interpretations of the report authors.

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AGENCY ACRONYMS

Southern Grampians Glenelg Primary Care Partnership – Partner Agencies	
BFYS	Brophy Family and Youth Services
BNC	Balmoral Bush Nursing Centre
CCC	Casterton Old Courthouse Community Centre
CMH	Casterton Memorial Hospital
DBNC	Dartmoor Bush Nursing Centre
DWHS	Dhauwurd-Wurrung Elderly and Community Health Centre
GSC	Glenelg Shire Council
HCH	Hamilton Community House Inc
HRH	Heywood Rural Health
KY	Kyeema
MCHC	Merino Community Health Centre
MIF	MI Fellowship
MULL	Mullerateronq Centre Inc
OZC	OzChild
PCP	Southern Grampians Glenelg Primary Care Partnership (SGGPCP) team
PDH	Portland District Health
PWS	Portland Workskills Inc
SGSC	Southern Grampians Shire Council
SWS	South West Healthcare – Mental Health Services
WDHS	Western District Health Service
WMAC	Winda Mara Aboriginal Corporation Inc
Non SGGPCP Partner Agencies	
BFC	Bethany Financial Counselling
CC	Centacare
DET	Department of Education and Training
DHHS	Department of Health and Human Services
DJR	Department of Justice and Regulation
DU	Deakin University
KAR	Karingal
MP	Mpower Inc
PNET	Western Victoria Primary Health Network
RMIT	RMIT University
STV	St Vincent De Paul
SW	Southern Way
VPOL	Victoria Police
WCC	Warrnambool City Council
WDEA	Western District Employment Access

Executive Summary

Introduction

Disaster resilience and climate change adaptation are often characterised as "wicked" or complex, due to the interconnection of unpredictable variables in complex social-ecological systems. Governance approaches that move away from linear, siloed and command and control processes are said to be better able to deal with such complexity. Such approaches require collaborative, iterative, multi-institutional arrangements that consider various temporal and spatial scales.

Adaptive co-management and network governance have been positioned to be able to accommodate such arrangements.

Although adaptive co-management and network governance are recognised as suitable approaches to facilitate disaster risk management and climate change adaptation, understanding the conditions under which these can emerge and investigating the drivers that enable networked forms of governance and management remains a challenge for research. This includes gaining a better understanding of the formal and informal processes that create networks between individuals and organisations, how organisations collaborate on disaster resilience and climate change adaptation, and the types of outcomes of such network collaboration.

Background

This report investigates the presence of particular adaptive co-management and network governance components in an inter-organisational network, the Southern Grampians Glenelg Primary Care Partnership (SGGPCP) in South West Victoria. Primary Care Partnerships (PCPs) are networks of local health and human service providers that work together on improving community access to services and continuity of care. PCPs and similar types of networks can play a key role in disaster risk management at community level, as they have access to a diverse range of community-level actors, who themselves play critical roles in disaster preparedness, response and recovery. The SGGPCP is one of 28 PCPs in Victoria and includes 20 member agencies across the Southern Grampians and Glenelg Shires in South West Victoria. Partner agencies include local government, large and small rural health services, community service organisations, disability providers, mental health services, neighbourhood houses, bush nursing centres, and aboriginal health services.

Methodology

To investigate the characteristics of the SGGPCP network, the project used a mixed method approach, with social network analysis (SNA) at the centre of the research design. SNA is a quantitative methodology, which investigates the structure and characteristics of networks by examining the relationships between actors. Key informant interviews were also undertaken.

Results of the SNA reveal which SGGPCP partner agencies are collaborating; what disaster management activities they are collaborating on; and how they collaborate. The findings also show which organisations are important bridgers or brokers for a range of important disaster risk management activities.

Exponential random graph models (ERGMs), an innovative statistical approach, were applied to provide a deeper understanding of the multiple factors that contribute to the formation of networks.

Key findings

The ERGM results support characteristics of network governance and adaptive co-management that are described in theoretical frameworks and the academic literature. The ERGM found that those with informal relationships, and those that apply inter-organisational learning in their work, were more likely to collaborate on disaster preparedness. The modelling also revealed that informal relationships were a precursor of trust.

More complex findings emerged in relation to inter-organisational learning. Interviewees expressed appreciation of learning-type benefits from collaboration, such as innovation and breaking down silos; however, the perceived importance of these benefits did not correlate with SNA results. Applied learning was a sparse network, highlighting the difficulty of employing new knowledge in practice. Investigation into the enablers to learning revealed no statistically significant links with trust, informal, and formal relationships, therefore raising more questions about enabling conditions and challenging existing understanding of social learning processes.

Sharing organisational goals and understanding each other's organisation and its leadership were stated by participants as the most significant enablers of collaboration, while time, distance, resourcing, and lack of shared goals or understandings were considered key barriers to collaboration.

The social network and interview data supported the notion of a network administrative organisation to achieve network effectiveness. The SGGPCP support team were shown to be important brokers and bridgers in disaster preparedness activities, through informal relationships and formalised activities like working groups. They were also viewed by participants as providing essential administrative and coordination support.

Conclusions

SNA brings a range of unique insights and methods to a research project. However, the strengths and limits of SNA as a method must be thought through early in the research design and the research must anticipate how the results can meaningfully contribute to the understanding of an issue.

To date, SNA in disasters risk management and climate change adaptation has focused on better understanding the flow of information and resources through networks, linking them to notions of adaptive capacity and resilience. In disaster risk management, such research has concentrated on networks enacted during disaster response and recovery stages. Investigations of adaptive capacity and resilience need to move towards prevention and preparedness activities and be based on relationships that go beyond information flows, such as processes of applied learning and shared decision making.

Our research provides an approach for how this shift in analytical perspective can be catalysed. Future research will need to focus on furthering understanding the enablers of applied learning through collaboration as well as the network governance characteristics of shared decision making, shared responsibilities and leadership within SGGPCP or similar networks.

The SGGPCP is well placed to continue brokering relationships amongst diverse actors within and beyond the SGGPCP, to help agencies develop innovative solutions to complex issues, like natural and human-induced disasters and climate change.

1. Introduction

The National Disaster Resilience Strategy (NDRS) acknowledges that non-government and community organisations are at the forefront of strengthening disaster resilience in Australia. The work of these organisations is critical to helping communities to cope with and recover from a disaster. Priorities of the Strategy emphasise the role of partnerships and networks based on shared responsibility, coordinated planning and response.

In support of these priorities the NDRS funded Southern Grampians Glenelg Primary Care Partnership (SGGPCP), in collaboration with RMIT University, to examine how partnerships and networks contribute to disaster resilience outcomes in the Enhancing Networks for Resilience Project (EN4R). Specifically the project examined:

- Types of relationships between SGGPCP partner agencies
- Enablers and barriers to relationships and collaboration in the SGGPCP
- Disaster resilience benefits from collaboration to partner agencies , the SGGPCP, and the community
- Future aspirations for the SGGPCP network.

The project had a remit to broadly investigate existing networks with relevance to disaster resilience in the Southern Grampians and Glenelg Shires. The first phase of the project, which is covered in this report, focused on the role of inter-organisational networks. Subsequent phases may investigate the interaction of inter-organisational networks with the community. Future directions for this work are further discussed in Section 8. The first phase of the EN4R project began in October 2015 with extensive scoping activities in collaboration with SGGPCP partner agencies. An action research, mixed methods approach was undertaken where each research activity informed the focus and scope of the next.

This is the final project report and output of the first phase of the project, which covers the following content:

- Rationale
- Background and context
- An introduction to Social Network Analysis (SNA)
- Methodology
- Results
- Discussion
- Conclusions and future directions

2. Rationale

Disaster resilience and climate change adaptation are often characterised as "wicked" or complex, due to the interconnection of unpredictable variables in complex social-ecological systems[1]. Governance approaches that move away from linear, market based or command and control processes are said to be better able to deal with such complexity[2]. Such approaches require collaborative, iterative, multi-institutional arrangements that consider various temporal and spatial scales[3].

Adaptive co-management and network governance have been positioned to be able to accommodate such arrangements. Adaptive co-management is typified by learning, knowledge, networks, shared power, and inter-organisational interactions[4]. Comparatively, network governance is characterised by processes of networked and decentralised decision making, enabled by predominantly informal mechanisms (such as trust, shared understandings and accountabilities).

1 (Australian Public Service Commission, 2012)
2 (Bodin & Prell, 2011; Folke, Hahn, Olsson, & Norberg, 2005)
3 (Plummer et al., 2012)
4 (Plummer et al., 2012)

EN4R investigates the presence of adaptive co-management and network governance components in the SGGPCP to support partner agencies in disaster resilience activities. The project takes a mixed method approach, with SNA at the centre of the research design. SNA is a quantitative methodology, which investigates the processes, structure and characteristics of networks. In relation to disaster resilience and inter-organisational networks, SNA helps investigate if and how the characteristics of network governance and adaptive co-management are occurring, such as: what type of actors are collaborating and what are they collaborating on; are there shared goals and how do collaborations contribute to them; is there trust and are actors learning from each other? SNA can also be used to illuminate important brokers and governance approaches that bring together diverse actors in support of learning and the application of different "frames" required for climate change adaptation and disaster resilience.

The figure below illustrates the key relationships between the issues and concepts discussed above.

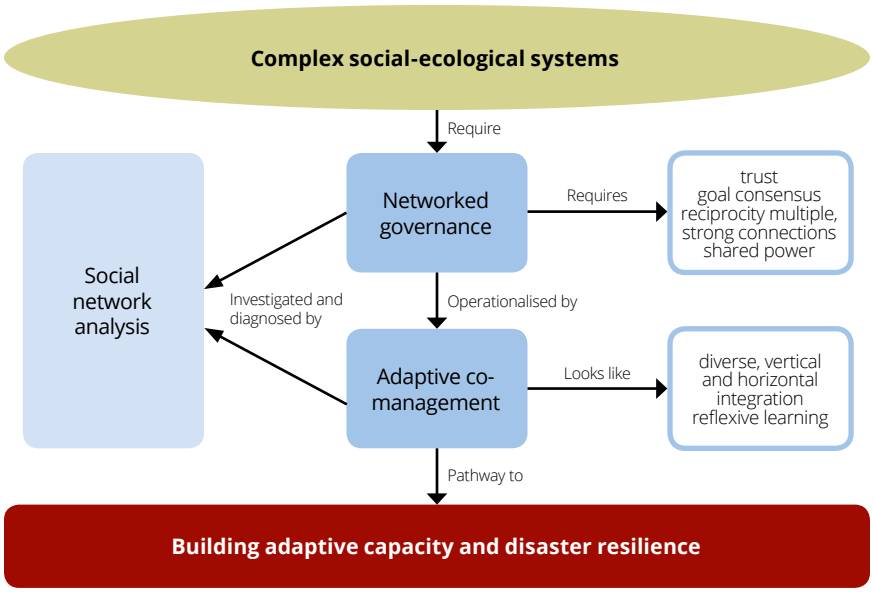


Figure 1 Disaster resilience, governance and social network analysis

3. Background and context

3.1 Primary Care Partnerships

Primary Care Partnerships are funded through the Victorian Department of Health and Human Services. They bring together local health and human service providers to work together on improving access to services and continuity of care for the community. PCP partner agencies focus on better coordination among services, management of chronic disease, integrated prevention and strong partnerships.

As one of 28 Victorian PCPs, SGGPCP works with 20 partner agencies across the Southern Grampians and Glenelg Shires in South West Victoria. The partnership includes local government, large and small rural health services, community service organisations, disability providers, mental health services, neighbourhood houses, bush nursing centres, and aboriginal health services. The core business of each agency ranges from acute health service provision through to prevention and wellbeing (see Appendix 1 for table of SGGPCP partner agencies). SGGPCP facilitates and supports the partnership to work effectively in an integrated and innovative way to address the shared priorities of the partnership. The three prevention priorities as documented in the SGGPCP

2014 – 2017 strategic plan are: healthy food and active living, community culture of responsible drinking, and community resilience through climate change adaptation.

SGGPCP recognised the impacts of climate change on the health and wellbeing of the community as a priority in 2008 and published *Policy Signpost #3 Climate Change Adaptation: A Framework for Local Action* [5] to identify the role of the partnership in climate change adaptation. Beginning with a focus on the everyday impacts of climate change, SGGPCP initiated projects centred on improving household energy efficiency and food security as well as ongoing work around heatwave and drought. SGGPCP also participated in the project *Implementing tools to increase adaptive capacity in the community and natural resource management sectors*, funded by the Victorian Centre for Climate Change Adaptation Research.

The subsequent *Rural People; Resilient Futures* Project (carried out in 2014-15) engaged SGGPCP partner agencies to understand community vulnerability to extreme weather events and to integrate action to enhance resilience. This project found that identifying opportunities for embedding disaster resilience and climate change adaptation actions can pose a considerable challenge for service delivery agencies. Among the SGGPCP, many agencies cited limited capacity and knowledge and conflicting priorities as major barriers. SGGPCP had the ability to take on a leadership role, connecting partner agencies with emergency management agencies, government and the research sector to increase organisational capacity to enhance agency and community resilience. Significant project findings included the importance of understanding and fostering agency connections for collaboration, learning and capacity development.

3.2 Southern Grampians and Glenelg Shires

The Southern Grampians and Glenelg Shires are characterised by dynamic social, environment and economic conditions. As one of the largest agricultural regions in Australia, changing average temperatures and rainfall patterns are generating challenging circumstances for farmers and the communities they live in. These environmental and economic challenges occur in parallel with demographic shifts, as the Southern Grampians Shire ages faster than the Victorian average, with the median age being 44, compared to 37 in Victoria and Australia. The predicted increase in frequency and intensity of heatwaves will further exacerbate the vulnerability of seniors in the region. Heatwave mortality is already significant in Victoria: the Department of Health Heatwave Assessment (2009)[6] cited 374 excess deaths across the state in the five days of the 2009 Victorian heatwave.

The natural assets of the region are also vulnerable to extreme events. With a number of national parks, coastal vegetation and open grasslands, South West Victoria has experienced significant bushfires. River and creek systems entwine the southwest, increasing the risk of localised flash flooding under climate change, while more frequent and more intense storm events are increasingly placing those relying on road travel at significant risk. Built assets and infrastructure, such as a deep water port at Portland and other natural assets along the region's coast, are at risk from sea level rise, coastal erosion and inundation.

Combined with projected climate change, the demographic and economic challenges in the region create a complex set of flow-on impacts for local and regional health and wellbeing services. These include: increased demand for mental health services; accessing vulnerable and remote clients during extreme weather events; damage to critical service infrastructure; completing vulnerable persons procedures; and ensuring the safety of service delivery staff and volunteers. Innovative and collaborative partnerships are increasingly required to address the complex and interacting drivers of health and wellbeing issues in the region.

5 (Rowe & Thomas, 2008)
6 (Victoria. Parliament. Legislative Council. Standing Committee on Finance and Public Administration, 2010)

4. An introduction to social network analysis

The project used social network analysis (SNA) to better understand the role of relationships and networks among SGGPCP partner agencies and in the region. SNA is a way of looking at a social system by focusing on the *relationships* within a system. It differs from social research that emphasises other factors, such as attributes or external factors. In this research, the member organisations of a formal network, the SGGPCP, are the actors studied. However individuals, countries, teams, species, cities or businesses can also be the focus of a network study.

Actors in a network are characterised by their **attributes**. Relevant attributes of people may include gender, age, or income, while for an organisation they may include type of core business, location, or number of staff. The basic units of analysis are the **ties** between two actors. Ties between actors vary based on the type of network and the research question. Ties may be the relationships between two people such as members of a family, friends or colleagues, and they can be connections based on shared feelings or thoughts, such as like or dislike for particular activities. One of the most common types of ties is the interaction or flows of materials, such as the flow of information, money, goods, or services.

Ties are also considered in terms of their *strength* and *direction*. Strength can be a qualitative measure, such as friendship being considered stronger than an acquaintance, or a quantitative one, like the number of ties, or regularity of interaction between two actors. The direction of a tie, indicated by an arrow, indicates whether the exchange is one way, or both ways. A single arrow could indicate one person perceives someone as a friend but the other perceives that person as an acquaintance, or that organisation A provides resources to organisation B, but B does not to A. When ties go both ways the relationship is described as reciprocal, and reciprocity is often measured in network analysis.

Social networks can be visually displayed as maps, which are derived from an adjacency matrix (Figure 2)[7]. Adjacency matrices are analysed using methods from graph theory and statistics. Ties are categorised into binary, nominal or ordinal data and the visualisations derived from a matrix are known as social network maps. The example below is a matrix where each row represents what each person has stated about the presence of a tie with each other person. The right part of Figure 2 illustrates how this is transformed into a social network map.

	Bob	Carol	Ted	Alice
Bob	---	1	1	0
Carol	0	---	1	0
Ted	1	1	---	1
Alice	0	0	1	---

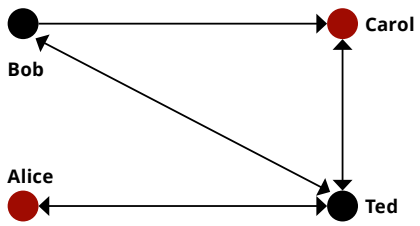


Figure 2 Adjacency Matrix and social network map

In Figure 2, the actors are people, where they are colour coded according to gender; all relationships are reciprocal except the relationship between Carol and Bob.

The start of SNA occurs when statistical analysis is applied to the adjacency matrix rather than when the social network maps are generated. Algorithms help researchers understand whether a certain structure, process and configuration of actors is statistically significant and, subsequently, to decide what visualisation or social network map to produce to communicate these characteristics.

7 (Hanneman & Riddle, 2005)

4.1 Key concepts in social network analysis

A number of measures are examined in SNA to help characterise the network in terms of structure and function. The measures most commonly investigated are *density* and *centrality*. Density and centrality measures are explained below and are applied to the result data in Section 6.2.4.

Density is the most commonly analysed feature in a network. A network's density is the ratio of the number of ties in the network to the total number of possible ties between all pairs of actors in a network. It measures how well connected a network is. A well connected network can have various benefits, such as easy and efficient information flow; it may indicate high levels of trust and thus suggest a network that is able to effectively collaborate. However it may also present challenges. High network density can lead to network closure, preventing the introduction of new ideas and consequently leading to a network which is homogenised in its knowledge and experiences. It may also point to the need for higher levels of coordination (for example where a client accesses multiple well connected services but there is no coordinating administrator leading to duplication or other efficiency issues).

Centrality is the other most commonly considered network feature. It can reveal who the most important actors are in a network. There are various types of centrality measures, each serving a different purpose. The most basic type, ***degree centrality*** refers to how many ties an actor has. A high degree of centrality means an individual actor has more ties comparative to others in the network. ***Betweenness centrality*** is the degree to which an actor connects other actors who would not otherwise be connected, and ***closeness centrality*** is the distance of one actor to all others in the network[8]. In a directed social network map, which shows whether ties are reciprocal, the *in-degree centrality* is the number of ties directed towards a particular actor. The *out-degree* in a directed map is the number of ties directed away from a particular actor.

Centrality measures can help determine which actors are the most popular and influential, including which actor is the most accessed for funding (in-degree) or who shares the most information (out-degree). Closeness centrality is useful when looking at the efficiency of resources or information getting from one place or actor to another. It may also highlight an important actor that is being underutilised or is isolated compared to others in the network. Betweenness centrality can become important when wanting to link different groups together, known as **clusters or cliques**. Actors with high betweenness centrality can become important bridges between cliques with specialised knowledge, enabling the introduction of new ideas and innovation and preventing network fragmentation or network closure[9]. Betweenness centrality is closely linked to the concept of bridging social capital. Bridging social capital can be an important component of building adaptive capacity and resilience as it brings diverse knowledge, organisations, values, and localities together. This diversity is often required in responding to complex governance challenges, like climate change and disaster.

Network research acknowledges that activities between actors in a network may be interdependent, and these activities can in turn affect the whole network. Similarly, the outcome of interest and independent variables may vary. For example, the analysis may consider the outcomes for an individual actor; outcomes for the relationship between two actors; or the outcomes for the whole network. Variables that could affect the outcomes may include the attributes of actors, the type and strength of relationships, or patterns or structures in the whole network[10].

These varied points of analysis complicate the examination of outcomes, as what might be good for an individual actor may not be good for network level or system outcomes. Subsequently interrogating multiple causal relationships between network variables (actors, relationships and network structures) is important (albeit complex) in providing insights into network dynamics.

8 (Robins, 2015)
9 (Borgatti, Everett, & Johnson, 2013)
10 (Borgatti et al., 2013)

5. Methodology

The EN4R project undertook an action research, mixed methods approach that included desktop reviews of recent academic and grey literature, qualitative interviews, and an online survey to identify and analyse inter-agency relationships of the SGGPCP. Qualitative and quantitative data was collected and analysed over multiple research activities and each activity informed the scope of the next. The diagram below outlines each activity and their key interactions.

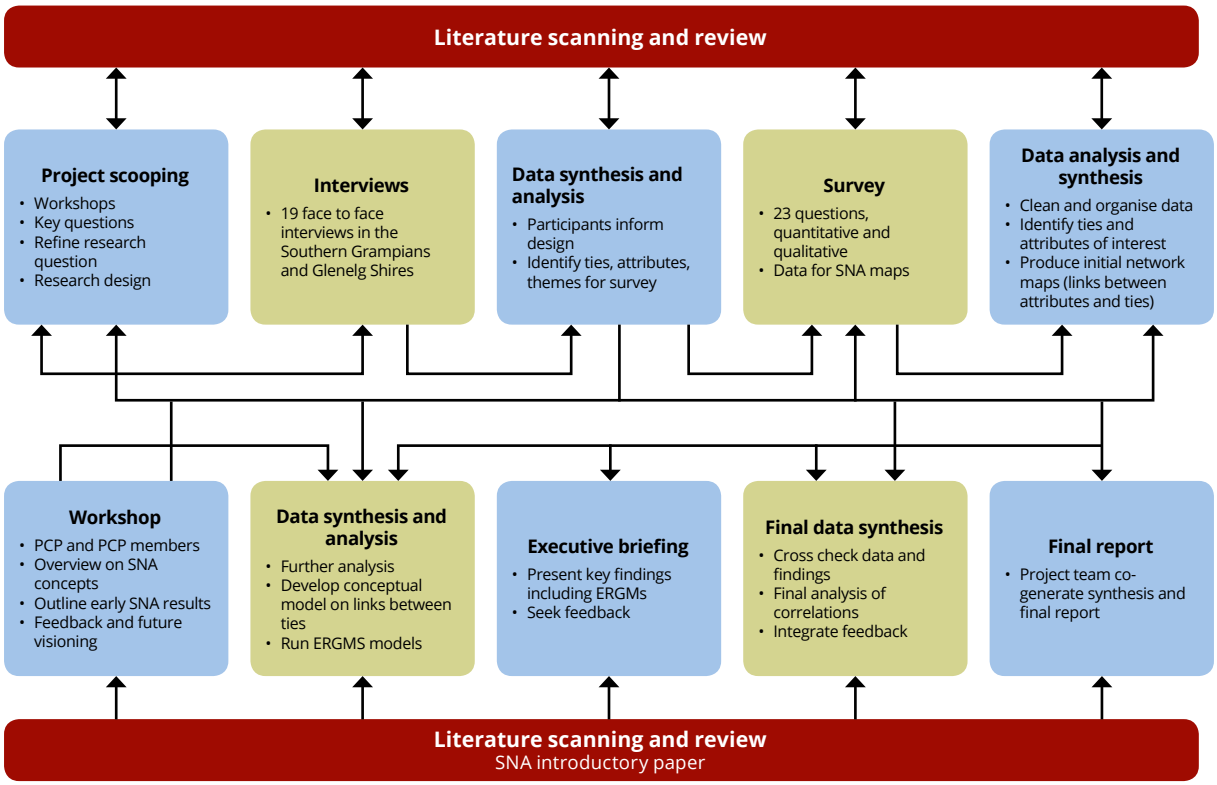


Figure 3 EN4R research methodology

5.1 Project scoping

The project was designed to investigate the following research questions:

1. How can the effectiveness of social networks in rural Australian communities for building community resilience be defined and evaluated in the context of disaster resilience?
2. How can these social networks be enhanced to better support communities in building resilience?

The project team spent significant time clarifying and refining these questions to enable the application of SNA to the research. This scoping process was critical for ensuring the project investigated relationships and actor attributes that were relevant to the SGGPCP, meaningful in relation to disaster resilience, and focused on those actors and organisations for which data could be collected within the timeframe and resources available.

During the scoping process, sub-research questions were developed and discussed in detail, to operationalise the broad research questions. They were:

- Whose resilience are we focusing on? What do they want to be resilient to?
- Why are we using SNA? How does it help answer the research question/s?

- What relationships (or ties) are we wishing to explore? Why are we investigating these relationships? How do these relationships relate to the literature on SNA, disaster resilience and climate change adaptation? Are these relationships present in SGGPCP?
- Are we focused on outcomes for individual SGGPCP members, the network as a collective or the community?
- What is the boundary of the network we wish to study? Are we doing a whole network study or an ego network study? Why are we doing it and how does it relate to the research question and theoretical dimensions of the project?
- What is realistic in garnering participation for the research? How might this impact the results and analysis?
- How might participants inform the research design to ensure user driven outputs? What would be the process for engagement, and are there work program implications?
- In responding to all of the above - what are the time, skill and resourcing constraints?

Discussing these questions in detail and exploring various options for addressing the issues raised were critical steps in ensuring the project remained on track towards achieving its objectives. The project team undertook a number of collaborative workshops to address the questions, which were regularly revisited in the first half of the project. Interrogating these questions deepened the rationale for the approach (Section 2 and 3) and refined the scope of each data collection phase.

5.2 Literature review

Recent academic and grey literature was reviewed throughout the life of the project to inform research design, methodology and analysis. Early considerations of developing a comprehensive critical literature review were replaced by a short summary paper as the project team realised that a comprehensive written review would have been of limited use to end users. The introductory paper on SNA expanded the project team's understanding of this methodology and its relevance to the project. It outlines key SNA terms and concepts and discusses their relationship to inter-organisational networks, disaster resilience and climate change adaptation. It also provides a selection of case studies to demonstrate various applications of SNA research, and the potential challenges and benefits. The paper enabled SGGPCP partner agencies to develop their understanding of SNA, draw meaning from project results, and consider how SNA may be applicable in various contexts in the future.[11]

5.3 Semi-structured interviews

Data collection for the project commenced with semi-structured interviews. The objectives for the semi-structured interview phase were to:

- Provide context for the overall research to SGGPCP member organisations
- Ensure the project research activities were reflective of the needs and dynamics of the SGGPCP members
- Further inform the ties and relationship attributes that were investigated in the quantitative SNA component

11 (McCann, Fünfgeld, Brown, & Wylie 2016)

- Enrich quantitative information with individual and collective narratives of disaster events and resilience
- Build rapport and trust with participants and enable them to be part of the research design process
- Support the SGGPCP to continue their understanding of their members' network.

The interviews followed a schedule of questions (see Appendix 2) that sought to characterise the inter-organisational relationships of each organisation, specifically, who they work with, how, and why. The interviews also sought to uncover any benefits arising from inter-organisational relationships, challenges with maintaining these relationships and the enablers and barriers of building collaborative relationships. The role of formal and informal mechanisms for collaboration (e.g. contracts versus ad hoc catch ups or verbal agreements) were discussed in the interviews, as well as the dynamic and changing nature of relationships. The end of each interview focused on how climate change and extreme events affect each organisation and other key planning or service delivery challenges.

Face-to-face interviews with 19 participants took place between December 2015 and January 2016. 16 participants were SGGPCP members and 3 were other stakeholders engaged in health and wellbeing, disaster resilience or climate change, including the Country Fire Authority, Department of Health and Human Services, and Emergency Management Coordinators.

5.4 Online survey

The objectives of the online survey were to provide quantitative data for the SNA. The relationship ties investigated in the survey were derived from an analysis of the interviews, SGGPCP knowledge of member activities, and with consideration to the characteristics of adaptive co-management and network governance.

SGGPCP agency representatives who participated in the interviews were invited to complete the survey. Participants had four weeks to complete a 23 question online survey. It was developed using the software Qualtrix and included a combination of multiple choice, single answer, and open ended questions. Following extensive reminders via email and phone, the survey had a response rate of 100%.

Four questions (questions 9, 11, 13 and 19) in the survey generated quantitative data for the SNA (see Appendix 3). In addition to these four questions, participants were asked multiple-choice and opened ended questions on a number of themes including: barriers and enablers for collaboration; dissemination of collaborative learnings through networks; understanding of and contributions to collective goals; and honouring inter-organisational agreements, (see Section 6 for results and Appendix 3 for full survey).

5.5 Workshop

A participatory workshop with SGGPCP partner agencies was designed to achieve the following objectives:

1. Provide a shared and base level understanding of what SNA is and how it can be applied
2. Support an understanding of why networks and the analysis of networks are relevant to organisations, disaster resilience and climate change adaptation
3. Present the early findings of the EN4R research to participants
4. Obtain feedback from participants through interactive exercises on the research findings to inform the final report and other research outputs
5. Help the SGGPCP identify opportunities to enhance the network for resilience outcomes.

Attendance was targeted to two types of participants: SGGPCP members to achieve objectives three to five; and local non-SGGPCP organisations that were interested in learning about SNA and its applications, to achieve objectives one and two.

The workshop agenda is included in Appendix 4. The first half of the day introduced participants to the basic concepts, methods and applications of SNA, including its relevance to network governance, resilience and climate change adaptation. The second half of the workshop was targeted to SGGPCP partners. Workshop participants broke into three small groups to develop collective visions for three different types of networks:

- SGGPCP agencies that collaborate in preparing for a disaster
- SGGPCP agencies that learn from each other and apply this learning in their work practice
- SGGPCP agencies that network, share information, or seek advice from another organisation more than once a month.

The exercise sought to examine collective views of the network, and compare networks drawn by participants with the networks developed via the online survey data. The last group exercise asked participants to reflect on what was working well in the network, what could be improved, and what actions might support these functions or improvements.

5.6 Data synthesis

Each data collection phase was followed by synthesis and analysis to inform subsequent data collection activities. Following the semi structured interviews, a high level thematic analysis was performed to support design of the Qualtrix online survey.

Following a 100% response rate the Qualtrix survey data was exported to an Excel file. The raw data was separated into a matrix for each tie and an ID was created for each participant. Attribute data was collated from Qualtrix and SGGPCP agency annual reports and coded into categories. Questions 13 and 19 (see Appendix 3) were de-identified, as outlined to participants in the survey's participant information and consent form. Data was then transformed into a UCINET format to create preliminarily maps and descriptive statistics related to the networks data, using the UCINET software.

Following the workshop, and further analysis of literature and data, the team developed a conceptual model, which was subsequently tested by applying exponential random graph models (ERGMs) to tie and attribute data. Specifically the ERGM sought to investigate:

- Do learning and networking, information exchange and advice predict disaster preparedness collaborations?
- Do networking, information exchange and advice and understanding others' organisational needs, predict learning?
- Is understanding each other's organisational needs enabled by networking, information exchange and advice?
- Is networking, information exchange and advice affected by organisational attributes (like core business, location and size) and whether organisations work together on projects, referrals, coordination?

Figure 4 below illustrates the interrelationship between ties and attributes investigated by applying the conceptual model:

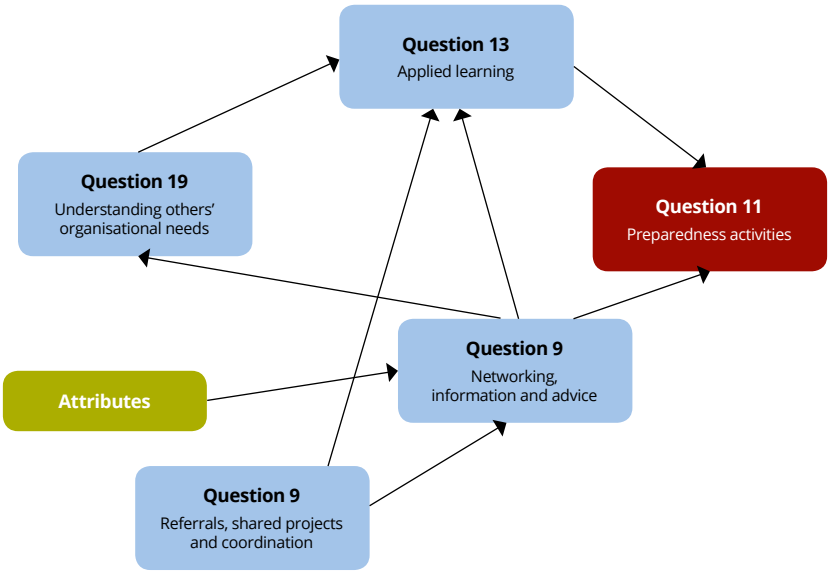


Figure 4 Conceptual Model - ERGM

Exponential random graph models (ERGMs) are used to better understand the complex and multiple factors that lead to the formation of networks. ERGMs enable the testing of a hypothesis about which factors may contribute most significantly to the structure of a network. A key strength of an ERGM is that it examines multiple contributors to tie formation, including other ties in the network and the attributes of actors. It can also uncover characteristics about the network by making comparisons with other simulated networks. Without the application of ERGMs it is difficult to compare or benchmark network characteristics or make inferences about predictors of tie formation.

6. Results

This section outlines the key results from the semi-structured interviews, online survey and workshop. The results represent the perspectives of a diverse range of project participants. The project team acknowledges that social networks and relationships are dynamic and the results are therefore only a snapshot in time and the perspective of a single agency representative. Opportunities to explore the changing nature of relationships and methodological limitations are further discussed in Section 8.

6.1 Semi-structured interview findings

Participants in the semi-structured interviews held a range of positions, from CEO, Director, to health care practitioner; however, most worked in senior managerial roles. Employees of 14 out of the 20 SGGPCP member agencies were interviewed. Each interview went from thirty to sixty minutes, depending on the depth of exploration. Interviews were conducted face-to-face and held in the offices of the partner agencies or the SGGPCP office. The interview schedule is included in Appendix 2.

The NVivo analysis of the interviews was clustered around the following key themes derived from the project scope and research questions:

- Benefits from relationships and collaboration

- Enablers of relationships and collaborations
- Barriers to collaboration
- Opportunities to improve collaboration
- Intersect between professional and personal networks
- Relevant climatic events.

6.1.1 Benefits from relationships and collaboration

Respondents were asked on a scale of 1 to 10, with 10 being the most important, how they would rate the importance of relationships in helping achieve their organisational outcomes. The average response was 9.4. The most commonly discussed benefit was being better able to achieve individual and collective goals. Linked to this overarching theme, a number of additional benefits were highlighted amongst participants, including:

"Because I would have to say that I've never done any decent networking that has not resulted in some interesting possibility and sometimes you can pursue it and sometimes you can't. But if you don't do the networking in the first place you'll never find out what other people are interested in, where you might align your interests, and it sometimes almost creates a spark where you have a conversation with someone or you hear them saying something that they're about to do, and you go "Oh my God, that's exactly what I've been thinking we should do" and then you develop those relationships."

- Sharing of assets and systems, for example information technology
- Learning from others to drive innovation and change
- Avoid becoming stagnant, isolated or lacking in evidence
- Pooling of resources, efficiency in delivery, and a "bigger bang for your buck"
- "Two brains are better than one"
- Benefits for the client, for example, enabling them to access more services
- Avoid reinventing the wheel and duplication
- Increase in referrals to own services.

There's always something you're going to learn from others. So if you want to sit in your own little silo, , that can be some of the frustrating thing when you're in a larger organisation, there's so much to do, yet you need to get out and free yourself up to go and have a look around. So that's really important, that networking and learning from others.

6.1.2 Enablers of collaboration

Participants were asked about the critical factors that make relationships and collaboration effective. The top three responses were personal relationships, understanding each other and having similar goals. Leadership also repeatedly emerged as a theme throughout the interviews. Memorandums of Understanding (MOUs) were highlighted as an important, but not the most critical, component of successful relationships. A number of participants highlighted that MOUs are most useful when preceded by strong personal relationships built on trust and when such trust is maintained throughout the life of a MOU. The other key themes were:

- Skilled engagers
- Relationships of mutual benefit
- Delivering on commitments
- Regular meetings, communication, relationship maintenance
- Time

I go down there (the bakery) and, when the coffee's being made I go and sit with the ladies and talk to them, and numerous issues come up about health and wellbeing that we discuss... So those informal conversations from that table go out to their networks. And then it comes back to me to say "I heard you were down at the Bakery and I heard that you mentioned that you were having such and such, and what a great idea". So it's amazing in a small community how that goes on.

- Trust and information sharing.

6.1.3 Barriers and challenges to collaboration

Time, resources and distance were the most frequently mentioned barriers to collaboration. Lack of shared goals or understanding was also a strong reoccurring barrier that emerged in the interviews. In addition to these predominant barriers the others mentioned were:

- Staff turnover
- Reporting systems
- Inter-organisational politics
- Not delivering on commitments
- Lack of will, interest or curiosity
- Change in policy or funding.

6.1.4 Relationship changes and improvements

Many interviewees talked broadly about the want to strengthen existing organisational relationships and explore new ones. Two participants discussed a need to reinforce SGGPCP's role in influencing government and connecting directly with communities. Opportunities to develop a culture in support of women leaders were discussed as well as how such leadership could advance collaborative relationships. Similar themes emerged to the discussion on barriers and challenges. For example, increasing understanding of each other's business, building inter-organisational trust, and encouraging collaborative leadership were highlighted as opportunities for improvement.

6.1.5 Intersection between professional and personal networks

I bore my family stupid about what's going on in the workplace. There are people who will just call me like journalists and carers and I'll have one-on-one, sit down for a cuppa with carers, and there are people who keep in touch with me even though their loved one isn't with our service anymore.

"Oh we've already called the triple 0, will you just come and be with us until it arrives?" And later on they turned around and said, "We consider you a friend with knowledge."

Seven interviewees raised the intersection between their professional and personal networks. One respondent highlighted the partnership and information dissemination benefits of staff active in community activities from Men's Sheds, Meals on Wheels to the CFA. However, also acknowledged was the potential for burn out, as the same proactive individuals often play the outwardly "connecting" role in both the work place and in community organisations. Another interviewee mentioned phone calls they would receive at home from local community members seeking health advice. Their status as a friend and a local resident, combined with their professional role, afforded them trusted knowledge. Others relayed how they shared work-related activities at their local bakery or tennis club, sometimes instigated by themselves, other times at the request of local community members. These conversations were noted to provide important links between activities and organisations. One SGGPCP partner agency discussed how voluntary contributions in the community were a key part of the work culture and that staff were expected to share and learn with the community. Others spread information to the leaders in their personal networks, potentially in support of information dissemination, and a couple of respondents mentioned that they saw themselves as advocates of the area they worked in, even outside of work and when not on duty.

6.1.6 Impacts of extreme events

Respondents discussed a range of climatic events they knew about or had experienced themselves. Most common were heatwave, fire and drought. A couple of respondents mentioned storms and floods. A number of population groups were considered to be particularly vulnerable to extreme events: farmers, seniors, those living in isolated areas, people with disabilities, the homeless, those with complex health issues, and people experiencing financial strain. The mental health impacts of prolonged drought were highlighted by a number of respondents, as were the compounding issues of alcohol, family violence, and gambling. Many extreme events increased demand for services, in conjunction with resourcing diversions to implement the requirements of the vulnerable person's registers. Many organisations noted the resource intensive nature of this activity. Respondents from several agencies talked about the significant risks to clients and service disruption caused by the impacts of fires and storms on communication services.

Our staff are another big concern in terms of sending people out. We have significant outreach services to remote areas, to areas that are in the bush, so we have very strong emergency bushfire protocols, home visiting protocols, tracking devices to know where people are (and provide) appropriate warnings.

Impacts of extreme events on agency staff were particularly prevalent when travelling on high bushfire risk days, through storms and on icy roads. Broader health and wellbeing impacts on staff were also noted as local environments changed and were unable to provide their usual recreational functions (e.g. sportsgrounds and lakes). Also mentioned were clients struggling to heat their homes in winter due to increasing energy costs.

..you certainly do get an increased incidence of use of mental health services, alcohol or drug – that's for sure because it becomes a very difficult and stressful time for those on the land.

We take on a key responsibility for vulnerable clients in our community... from a service delivery perspective it increases demand, and uses a lot of our resources... Those heat health alert days create lots of paperwork and lots of driving around.

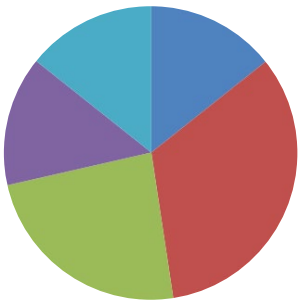
We've had fires on ships, we've had the chemical spill, fires, Casterton's had floods, and so we have the whole lot.

6.2 Online survey results

6.2.1 Attribute data

The survey collected attribute data from participants and the organisations they worked for. Participant data included position in the organisation, postcode of residence and participant's length of tenure. The only organisational data collected was their postcode. Business plans were also used to classify organisations according to core business and staff numbers.

Organisations' core business was classified into five categories: small health organisation; large health organisation; community service organisation; local government or partnership agency; neighbourhood house or employment service. The distribution of SGGPCP partners across these five core business categories was as follows:



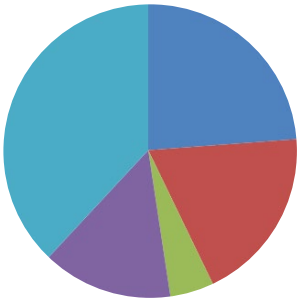
Organisation	No	%
LGA/ Partnerships	3	14.25
Community Service Organisation	7	33.25
Small Health Service	5	24.00
Neighbourhood House / Employment Service	3	14.25
Large Health Service	3	14.25

Figure 5 SGGPCP Partner agencies - core business

The SNA showed that core business was one of two attributes that had statistically significant associations with ties. Core business had influence over organisations that network, shared information and seek advice from one another, (see Figure 11 and Section 7).

6.2.2 Organisational location

Organisational location was clustered via postcodes to help analyse how distance affects inter-organisational relationships. It was the other attribute which had the most significant influence over ties, specifically whether organisations, network, share information and seek advice from one another. It also had influence on whether organisations worked together on disaster preparedness, further discussed in Section 6 and 7.



Postcode	No	%
3300	5	23.81
3280	4	10.05
3407	1	4.76
3310 & 3311	3	14.29
3304 & 3305	8	38.10

Figure 6 SGGPCP Partner agencies geographic office location

6.2.3 Tenure

The majority of survey participants had been employed by their organisation for more than five years (Figure 7 below). Preliminary statistical modelling suggested a link between tenure and applied learning, however, given most participants had similar lengths of tenure, this association was disregarded in further analysis.

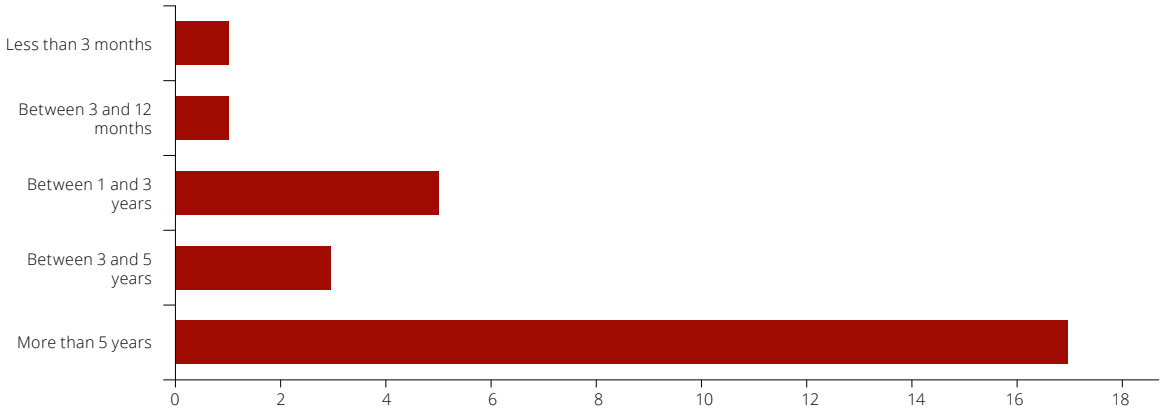


Figure 7 Length of tenure

6.2.4 Social network statistics and maps

The table below is a summary of key network structures and actor roles in 15 networks (rows 1-15). Columns A, B, C show the network level structural characteristics of centralisation, reciprocity and density, and column D and E show which actors have the highest in-degree (i.e. popularity, see Section 4.1) and betweenness (i.e. play key broker roles, see Section 4.1). Each network is based on a particular tie (or relationship type) and correlates to a question in the online survey in Attachment 3. A selection of network maps based on their statistical relevance and connection to other qualitative findings are provided further below. Interpretation of these results are discussed in more depth in Section 7. Information presented in this table represents descriptive network characteristics. Statistically significant network patterns were tested with exponential random graph models (ERGMs) in Section 6.4.

Table 1 Social Network Statistics

	Networks, tie type and survey question	Network level			Actor level	
		A	B	C	D	E
	Types of ties that occur once a month or more (Question 9)	**Centrality**	**Reciprocity**	**Density**	**In-degree**	**Betweenness**
1	Referrals, coordination and shared projects	0.13	0.13	0.1	PWS, DBNC, MCHC, CCC, KY (followed by MIF, MULL and BNC)	OZC highest betweenness
2	Committees and working groups	0.13	0.25	0.06	GSC, PDH, and WDHS highest in-degree	PCP highest betweenness
3	Networking, information sharing and advice	0.19	0.18	0.06	GSC highest in-degree	PCP highest betweenness
4	Advocacy and funding	0.1	0.04	0.03	GSC, PNET, and WDHS highest in-degree	WMAC highest betweenness
5	Other	0.07	0	0.01	WDHS highest in-degree	WDHS highest betweenness
	Disaster management activity (Question 11)					
6	Prevention	0.28	0.13	0.04	GSC highest in-degree	WMAC highest betweenness
7	Preparedness	0.46	0.15	0.04	GSC and PCP highest in-degree	PCP highest betweenness
8	Response	0.39	0.11	0.05	GSC highest in-degree	HRH highest betweenness
9	Recovery	0.58	0.07	0.04	GSC highest in-degree	WMAC higest betweenness
	Learning from collaboration (Question 13)					
10	Interactions have decreased understanding	0.05	0	0.02		
11	Understandings and work practice remain unchanged	0.15	0.13	0.1		
12	Understanding has increased but work practice has remained unchanged	0.11	0.08	0.03		
13	Understanding has increased and work practice has changed	0.45	0.15	0.03		
	Consideration of others organisational needs (Question 19)					
14	Needs are considered	0.28	0.22	0.04		
15	Needs are not considered	0.38	.04	0.03		

Actor level in-degree and betweenness

Glenelg Shire Council (GSC) were the most popular (i.e. had the highest in-degree; see Section 4.1) on a number of ties. Other agencies turned to them the most for networking, information and advice; disaster prevention; disaster response and disaster recovery (cells 3D, 6D, 8D, 9D in Table 1 above). GSC shared the highest in-degree with PDH, and WDHS (2D) when it came to committee and working group activities, and they also shared the highest popularity with PNET and WDHS on funding and advocacy ties (4D) and with the PCP team on disaster preparedness activities (7D).

Glenelg Shire Council's popularity in the network may reflect the Shire's focus over a number of years on two strategic areas of the SGGPCP, obesity and alcohol prevention. This is in contrast to the Southern Grampians Shire Council (SGSC), which has only recently engaged in these health and wellbeing areas. Conversely, WDHS' popularity may result from the lower activity in the SGSC and the WDHS' coverage of the whole shire with respect to these health and wellbeing issues, including formal governance activities, such as committee and working groups.

GSC's popularity in disaster management activities may reflect that extensive natural and industrial assets in the shire are at risk from extreme events, as well as the council's extensive accountabilities related to the Municipal Emergency Management Plan. The council is also experienced in a diversity of incidents, including a significant chemical spill and flooding. PDH's ongoing dedication to health and wellbeing activities may explain its visibility and popularity in more formal governance activities.

Many agencies had a high in-degree for referrals, coordination and shared project ties; eight agencies held the top two spots in popularity (1D). This accords with the network being one of the two densest, and with the fact that these ties most represent day to day business activities of partner agencies.

The SGGPCP team had the highest betweenness in committee meetings and working groups, networking, information sharing and advice, and disaster preparedness (2E, 3E), suggesting them as a key connector between members on these activities. The SGGPCP team play a major role in partnership development and facilitating key working groups, committees and networks in support of collaborative health and wellbeing activities. Over the past eight years, SGGPCP has taken a leadership role in community resilience and climate change adaptation to increase the capacity of members and the collective network in this area.

WMAC has the highest betweenness in prevention, recovery and funding and advocacy (6E, 9E, 4E), indicating a key brokering role in disaster management activities. This correlates with WMAC's role in fire incident management, identification of sacred sites and other land management strategies, as well as their key advocacy role in aboriginal health and wellbeing. Heywood Rural Health is also suggested to play a key role connecting agencies during disaster response (8E), given the high fire risk of their region and their connection to community.

Network density, centrality and reciprocity

The second network with the highest density was the network connecting members that did not learn from each other when collaborating (11C). Reasons for this density were not highlighted in any other research activity. The need to further understand the drivers for learning are discussed in Section 8. Conversely, the network with the least amount of ties was the network where members indicated their understanding of an issue decreased from collaborating (10C).

The network with the highest level of reciprocity was committee and working groups (2B) and the lowest reciprocity was with those who connected on funding and advocacy (4B). This is explained by participants' marking of key external stakeholders, such as government agencies, who did not participate in the survey and funding ties are typically not reciprocated in nature as those that allocate funds to others do not receive funds from the same organisations.

The most centralised network was the disaster recovery network (9A), aligning with the fact that GSC was the sole most popular actor in this network.

Figures 8 to 13 are six social network maps highlighted in the statistical analysis above. Attachment 5 includes additional social network maps generated for the project.

Social network maps

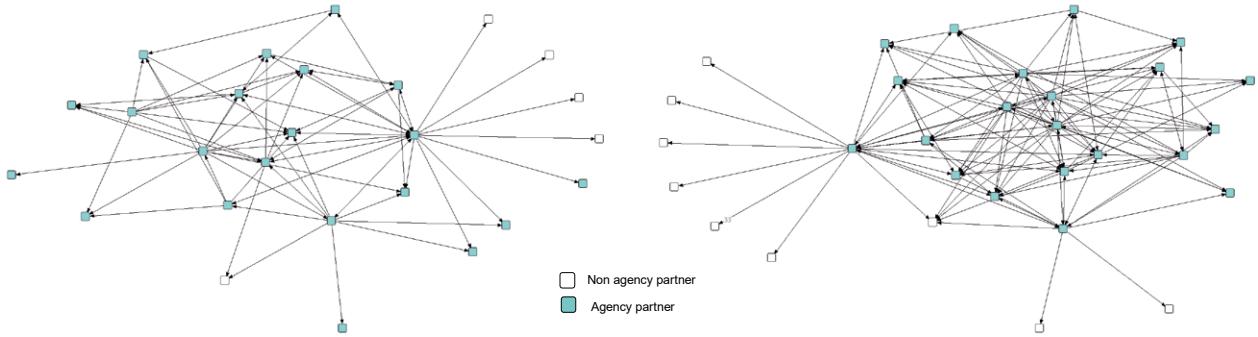


Figure 8: Collaborations that resulted in applied learning

Partner agencies were asked: *how has working with other organisations on disaster resilience, climate change or related services impacted your work?* This network represents the response: *My understanding of an issue has increased and work practice has changed.*

Figure 9: Collaborations that did not result in learning

Partner agencies were asked: ***how has working with other organisations on disaster resilience, climate change or related services impacted your work?*** This network represents the response: ***My understanding of an issue and work practice has remained unchanged.***

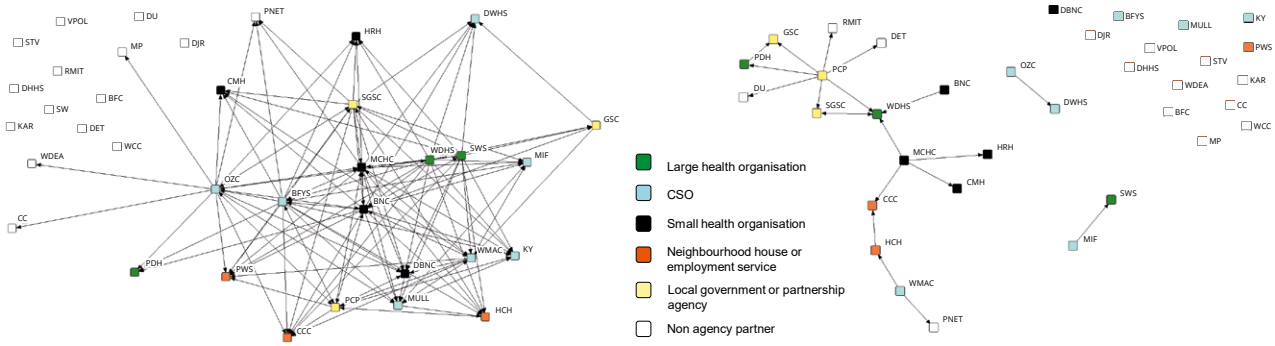


Figure 10: Referrals, shared projects or coordination

Network of SGGPCP organisations that connect once a month or more on referrals, shared projects or coordination. The colour of the actors represent the core business type of each agency.

Figure 11: Networking, share information or seek advice

Network of SGGPCP organisations that network, share information or seek advice from each other once a month or more. The colour of the actors represent the core business type of each agency.

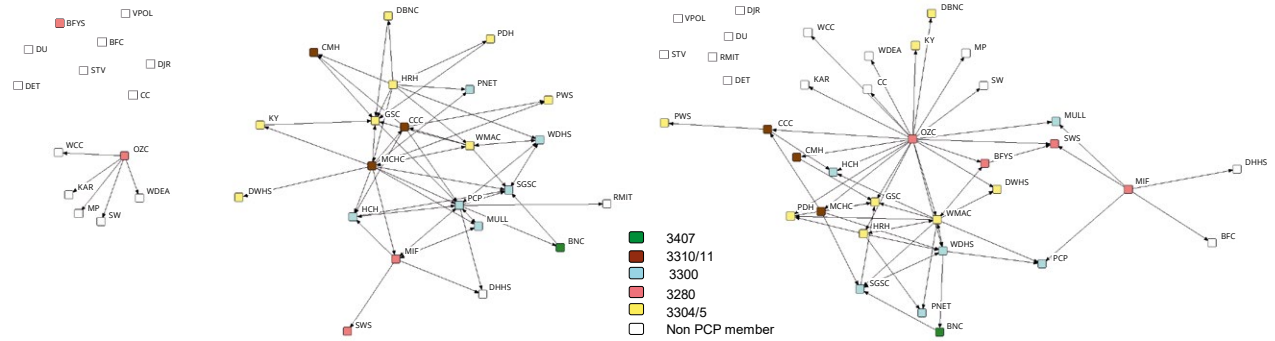


Figure 12: Disaster preparedness

Network of SGGPCP organisations that work together on disaster preparedness. The colours represent the office postcode of each agency.

Figure 13: Disaster recovery

Network of SGGPCP organisations that work together on disaster recovery. The colours represent the office postcode of each agency.

6.2.5 Survey responses about enablers and barriers to collaboration

Figure 14: Barriers to collaboration

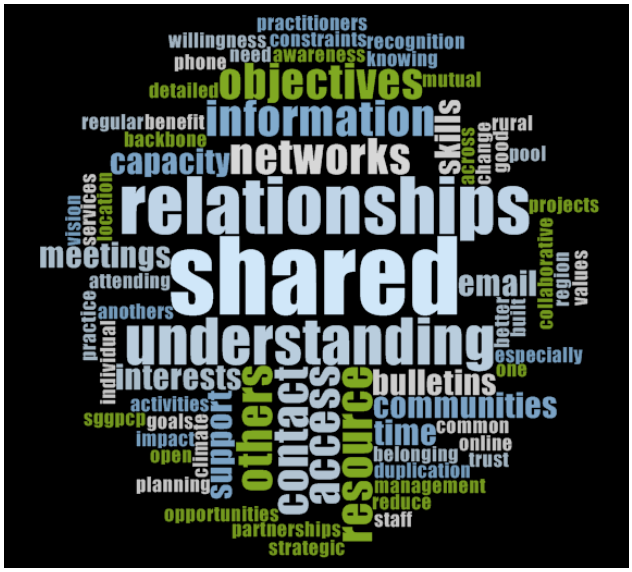
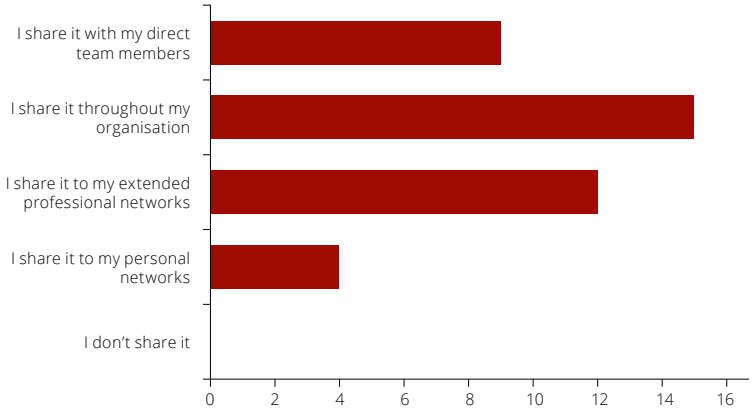


Figure 15: Enablers for collaboration

Participants were asked about the barriers to collaboration (Figure 14 and 15). The top two barriers reported were lack of time and access issues due to location. Other most commonly noted barriers were resource constraints, capacity limitations, and having differing organisational objectives. Similar themes emerged in response to questions about enablers for collaboration. Awareness of each other's work or shared objectives and existing relationships or networks were the two most frequently stated enablers. Other key factors supporting cross organisational collaboration included time and capacity. These themes are consistent with the results from the interviews (Section 6.1).

6.2.6 Knowledge transfer

To understand how inter-agency learning is disseminated between and within professional and personal networks, participants were asked how they shared their learning when collaborating on disaster resilience. Respondents were able to select more than one answer. Almost 70% of participants shared learning throughout their organisations and extended networks, while just over half shared it with their extended professional networks. 18% shared learning with their personal networks.

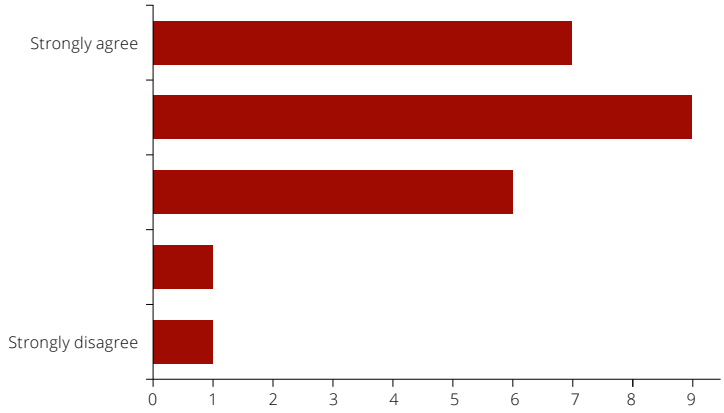


Answer	No	%
I share it with my direct team members	9	40.91
I share it throughout my organisation	15	68.18
I share it to my extended professional networks	12	54.55
I share it to my personal networks	4	18.18
I don't share it	0	0

Figure 16 Knowledge transfer

6.2.7 Honouring agreements

Members were asked if SGGPCP agencies live up to the agreements they make with their organisation, 67% strongly agreed or agreed, 25% neither agreed nor disagreed and 8% disagreed.



Answer	No	%
Strongly agree	7	29.17%
Agree	9	37.50%
Neither agree or disagree	6	25.00%
Disagree	1	4.17%
Strongly disagree	1	4.17%
Total	24	100%

Figure 17 Honouring agreements

6.2.8 Understanding SGGPCP goals

Participants were asked to select which of the statements below best represented their understanding of the SGGPCP goals.

75% knew and understood some or all of the SGGPCP goals whilst 25% - six respondents - did not know or understand SGGPCP goals.

Answer	%	No
I know and understand the SGGPCP goals	45.83%	11
I know the SGGPCP goals but I don't really understand them	0.00%	0
I know and understand some of the SGGPCP goals	29.17%	7
I don't really know or understand the SGGPCP goals	25.00%	6
Total	100%	24

Table 2: Knowledge and understanding of the SGGPCP goals

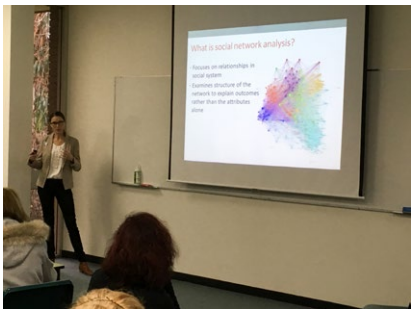
6.2.9 Contribution to SGGPCP goals

Respondents were asked how they thought their collaborations contributed to the shared goals of the SGGPCP. Key themes that emerged from responses included: input into strategic planning, projects and research; providing information and advocacy on local context and issues; implementation of projects across the SGGPCP priority areas; and by sharing information across the network.

6.2.10 Support for collaboration

The last question gave participants an opportunity to make any other comments. Most of the comments provided were about enthusiasm and the need for collaboration but acknowledged constraints, such as resourcing.

6.3 Capacity development and validation workshop



Workshop participants were asked to consider interagency connections related to disaster preparedness, learning and networking. Participants drew very dense networks, denser than the networks revealed from the survey results. Reflections from participants on the SGGPCP network included overall network density, the diversity of connections, the importance of maintaining connections and opportunities for learning. Also noted was the challenge in knowing all connections and opportunities in relationship building in the network. The role of all network members in creating links and effective relationships was also highlighted.

6.4 Conceptual model and exponential random graph modelling

Figure 18 shows the summary results after applying ERGMs to eight possible tie inter-relationships. Four significant and positive relationships were discovered, one significant and negative relationship and three non-significant relationships.

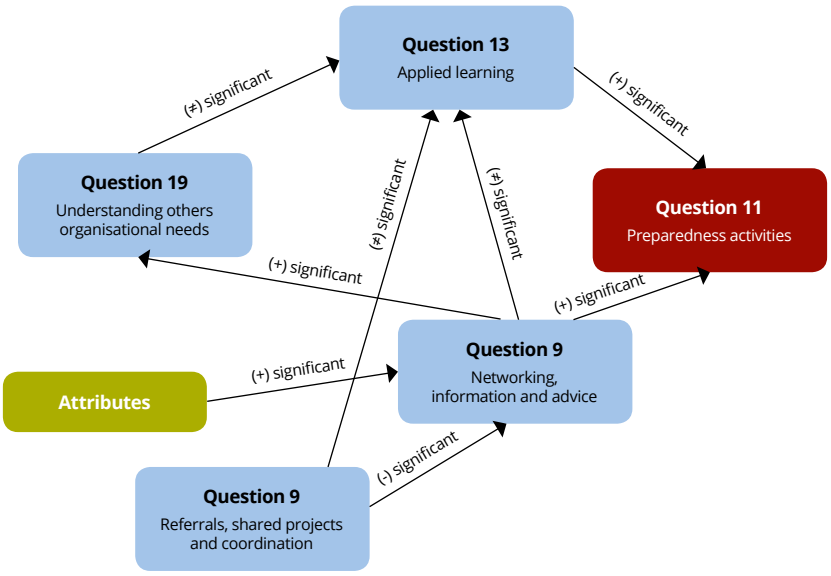


Figure 18 Conceptual model: summary ERGM results

Each tie association is described in more detail below. Referral, coordination, shared project delivery ties are abbreviated to shared project ties and information sharing, networking and advice ties abbreviated to networking ties. Analysis is contained in Section 7.

6.4.1 Association between shared projects and networking ties

Interestingly, agencies that work on projects together were less likely to have more informal relationships associated with networking, information sharing and advice. This may be explained by those agencies that share projects having different core businesses, or because networking already occurs during shared project activities. Core business and location were two significant predictors of networking tie such that organisations with the same core business and same location tend to form networking ties. Number of staff and tenure were not significant predictors of networking ties.

6.4.2 Association between networking ties and preparedness ties

Those that network together are more likely to work together on disaster preparedness. No organisational attributes predicted preparedness ties (see Figure 19).

6.4.3 Association between applied learning ties and preparedness ties

Applied learning ties proved to be a significant predictor of preparedness ties, such that when organisations learn from each other and apply that learning, there is a higher chance that they also collaborate on preparing for disaster. There was the significant effect for location homophily, in that organisations from the same area tended to work together on preparedness (see Figure 20).

6.4.4 Association between networking ties and perceptions of understanding each other's ties

Networking ties again had influence over other ties, as those agencies that networked together were more likely to perceive the other to understand their organisational needs. Actor level outcomes are not indicated in Table 1, as the question was anonymous; however, the de-identified social network map can be found in Appendix 5 (see Figure 21).

6.4.5 Ties with no associations

All three ERGMs that investigated predictors of applied learning found no significant results. Networking, perceptions of understanding organisational needs and shared projects were not shown to be precursors for applied learning between member agencies.

6.4.6 Maps of ERGMs

The following three maps illustrate the associations between networking and organisational needs, networking and preparedness and learning and preparedness. The purple ties in all three maps represent the predictor tie, networking in the Figure 19, learning in Figure 20 and networking in Figure 21. The grey ties represent preparedness and consideration of organisational needs.

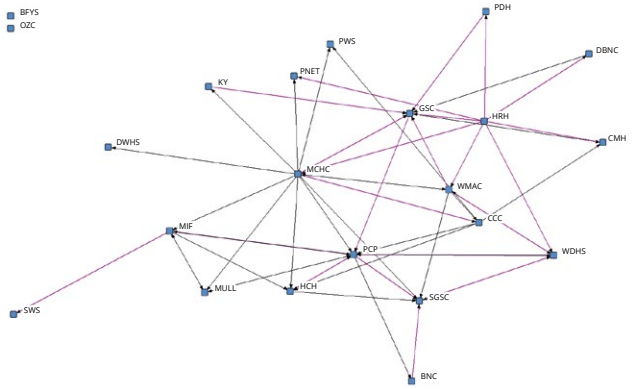


Figure 19: Networking predicting preparedness

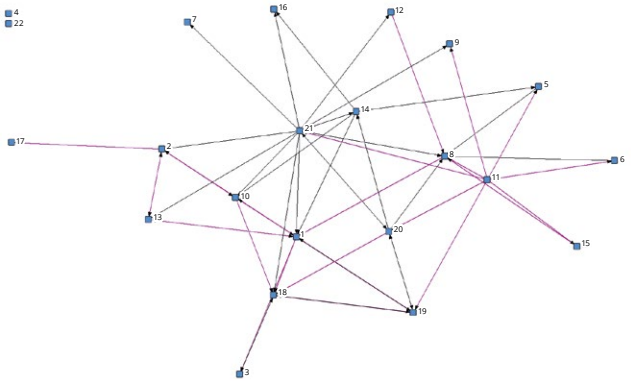


Figure 20: Learning predicting preparedness

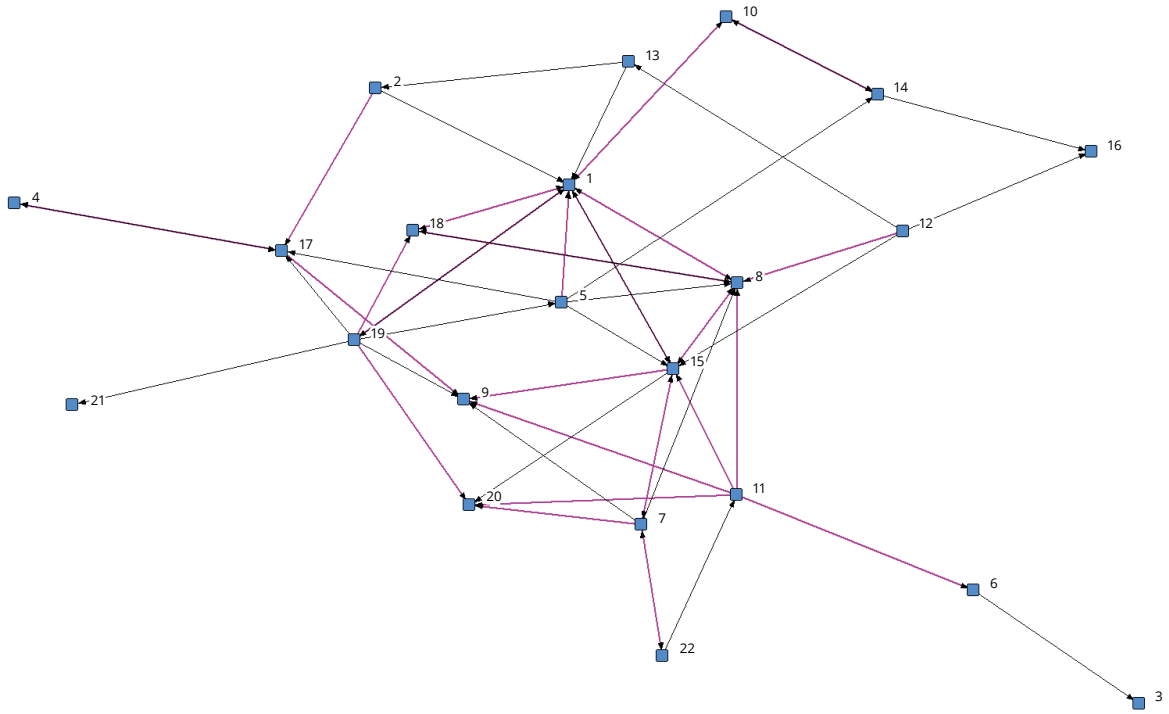


Figure 21: Networking predicting inter-agency understanding

7. Discussion

7.1 Adaptive co-management, disaster preparedness and applied learning

Project data reveals interesting findings about how adaptive co-management and network governance is operationalised and perceived within the SGGPCP. This is particularly evident when considering the role of applied learning. The ERGM model results support theoretical concepts of network governance and adaptive management by highlighting the importance of applied learning and informal activities, such as information sharing and networking to disaster preparedness. This is consistent with the academic literature[12] which emphases the role of reflexive and social learning in disaster resilience and climate change adaptation. Interviewees presented innovation, "doing things differently", and moving beyond silos as benefits arising from collaboration. The extent that SGGPCP partner agencies evidently transfer lessons learnt within and beyond their organisation also implies the value of information sharing and knowledge exchange within the SGGPCP.

However, the theoretical and perceived importance of applied learning by agencies does not correlate with other results in the research. One of the densest networks was those agencies that stated that they did not learn from each other when collaborating. Accordingly, although important to agencies in the interviews, applied learning was not as easily realised in practice.

To better understand enablers of applied learning, the ERGM investigated the role of networking and information sharing, and more formal activities like shared projects and referrals. Neither were precursors to applied learning. Perceptions of understanding each other's organisational needs were also tested, and these also weren't found to be precursors for applied learning. These findings are in contrast to social learning and governance theories that would consider markers of trust and informal networks as key ingredients for enabling learning. The findings also suggest that in order to optimise collaboration on disaster preparedness, a greater understanding is required of how and why agencies learn from each other, and apply this learning in their work practice.

7.2 Adaptive co-management, informal relationships and diverse connections

The networking and information sharing network was one of the sparsest networks, however the research demonstrated its importance to perceptions of inter-agency understanding (and potentially trust) and disaster preparedness collaboration. Therefore future work of the SGGPCP would benefit from seeking a greater understanding of what provides an enabling environment for informal relationship building activities. The ERGM also showed that agencies with the same core business and location were more likely to network and share information than those with a different core business and location. Seeking information or networking with organisations with the same core business is not uncommon and has many practical and necessary benefits. However, adaptive co-management highlights how complex socio-ecological issues are best addressed by relationships that integrate horizontal and vertical actors. This diversity helps understand the interactive and root drivers for vulnerability, whether environmental, economic and social.

12 (Boyd, Richerson, & Henrich, 2011; Pelling, High, Dearing, & Smith, 2008)

7.3 Network governance, relationship enablers, and formal partnerships

Barriers and enablers of collaboration discussed in the interviews and in the survey point to key themes in the network governance literature. Understanding each other or sharing goals, developing personal relationships of mutual benefit, and trust, all emerged as important components of relationship building. Although many partner agencies acknowledged the importance of shared understandings and goals, the survey indicated only 46% of partners knew and understood all of SGGPCP's goals. Another 29% knew and understood some of the PCP's goals. The interviews, survey and workshop indicated members' deep appreciation of the benefits of collaboration, as well as key ingredients like trust, time and personal relationships. Yet the densest and most reciprocal networks were those typical of formal relationships – committee and working groups were the most reciprocal and shared projects, referrals and coordination were the densest (Appendix 5 and Figure 24). Again, this is in comparison to the sparse and more informal network of networking and information sharing. Participants acknowledge the balance required between formal and informal mechanisms. MOU's were stated by a number of agencies to be important, but best utilised when accompanied by strong trusting personal relationships. When investigating trust via (only) two survey questions, interesting structural patterns were revealed. The SNA on survey question 19, (Appendix 5, Figure 27) indicated that trust was not uniform in the network but resided in small hubs and that these hubs had high levels of reciprocity. This network also revealed a small number of key popular actors were perceived to understand other agency needs when collaborating the most. In addition 67% of survey participants also stated that they agreed or strongly agreed that partner agencies honoured the agreements made with their agency, indicating a medium to high perception of trust within the network. Future work could characterise and detail the nature of trust to support improvements via informal processes highlighted in the ERGM.

7.4 Partner agency roles

When examining the in-degree and betweenness of various actors in the social network maps, foreseeable results emerged. Smaller agencies like WMAC and HRH, with strong connection to community and based in high fire risk areas, play a key connecting role in liaising between agencies during disaster preventions, response and recovery. Glenelg Shire Council, the council with the most recent emergency management experience and like all local governments, which has a legislated mandate in emergency management activities, is very popular in a range of related activities. The SGGPCP team itself is a critical connector between agencies on networking information sharing, disaster preparedness and committees and working groups, correlating with their mandate in integration of health and wellbeing activities and their recent focus on climate change adaptation and resilience. Particularly important is their brokering role in networking and information sharing, given the important role these activities play in shaping understanding between agencies and disaster preparedness relationships.

8. Conclusions and future directions

The research on the SGGPCP network confirms existing understandings about how networks function and their potential benefits, while the results also raise further questions. All partners acknowledged how beneficial inter-agency relationships were to achieving their own agency goals. The most commonly mentioned enablers of relationships were: understanding each other, having similar goals, and leadership. The main challenges mentioned were time, distance, resourcing, and the lack of shared goals and understanding. The SGGPCP team are well positioned to address these issues in part. They can continue to help agencies understand each other and establishing shared interests and goals, which notably is critical for disaster preparedness and enabled by informal relationships. Increasing this focus may have flow-on benefits for how individual agencies prioritise time and resources for collaboration. Such ongoing focus may also require individual agencies to examine why these barriers may exist within their own organisational contexts. The SGGPCP team is also well placed to continue brokering relationships amongst diverse actors within and beyond the SGGPCP, to help agencies develop innovative solutions to complex issues, like natural disasters and climate change.

Future research should focus on further understanding the enablers of applied learning through collaboration. Along with a diversity of actors, social and reflexive learning is a vital element of adaptive co-management. Adaptive co-management also highlights shared decision making, shared responsibilities and leadership; characteristics not investigated in this research. Follow-up research could focus on these areas within the SGGPCP or other networks with a similar governance focus and approach.

The intersection between personal and professional networks was not fully investigated within this project. However, agency interviews revealed that it is not uncommon for health and wellbeing professionals in rural areas to share professional information with their personal networks. There is potential benefit in understanding if and how these networks intersect and what strategic opportunities may exist for disaster resilience outcomes. However, this type of ego network analysis may be resource intensive and requires committed participation of relevant actors.

The literature scan for this project revealed that SNA in disasters and climate change adaptation has focused to date on the flow of information and resources, linking them to notions of adaptive capacity and resilience. In disaster resilience, such research has concentrated on networks enacted in response and recovery. Investigations of adaptive capacity and resilience need to move to prevention and preparedness activities and be based on relationships that go beyond information flow, such as applied learning and shared decision making.

Additional empirical work would support frameworks and theories (such as adaptive co-management and network governance), asserting collaborative approaches in pursuit of effective adaptive capacity building activities.

Finally, SNA brings a range of unique insights and methods into a research project. However, the strengths and limits of SNA as a method must be thought through early in the research design and the research must anticipate how the results will meaningfully contribute to the understanding of an issue. Often, SNA is selected to present existing understandings in a quantitative and visual format, rather than to create new meaning. The high levels of participation required in network studies must also be considered, as without appropriate participation, the statistical analysis and social network maps may misrepresent a social system. Furthermore, given SNA is rooted in mathematical and graphs theory it requires specific skill sets to synthesise and analyse data. However alongside these challenges SNA has a lot to offer researchers and practitioners trying to untangle some of the governance challenges within complex socio ecological systems. With the right blend of skills, time, and research design SNA can help explore how adaptive co-management can be operationalized to support collaboration, learning and capacity development for disaster resilience.

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10. Appendices

Appendix 1 SGGPCP partner agencies - core business overview

SGG Partner Agency	Core Business
Brophy Family and Youth Services	Youth and family services, accommodation, education, training and employment
Balmoral Bush Nursing Centre	Community health services, nursing services, equipment hire, childcare
Casterton Old Courthouse Community Centre	Community centre, adult education, social support
Casterton Memorial Hospital	Hospital services, chronic and complex care and health promotion
Dartmoor and District Bush Nursing Centre	Community health services, nursing services, equipment hire
Dhauwurd-Wurrung Elderly and Community Health Service	Aboriginal health and community services
Glenelg Shire Council	Local government services
Hamilton Community House Inc	Community centre, adult education, social support
Heywood Rural Health	Hospital services, chronic and complex care and health promotion
Kyeema	Disability Support Services
Merino Community Health Centre	Community health and district nursing services
MI Fellowship	Mental health and wellbeing services
Mullerateronq Centre Inc	Disability Support Services
OzChild	Children and family services
SGGPCP team	Partnership facilitation and integration to improve health and wellbeing
Portland District Health	Hospital services, chronic and complex care and health promotion
Portland Workskills Inc	Training and employment services
Southern Grampian Shire Council	Local government services
South West Healthcare Mental Health Services	Mental health and wellbeing services
Western District Health Service	Hospital services, chronic and complex care, aged care and health promotion
Winda Mara Aboriginal Corporation Inc	Aboriginal health and community services

Appendix 2 – Semi-structured interview schedule

1. What are the current priorities for your organisation?
2. What other organisations do you work with on these priorities?
3. What is good about these relationships? What is challenging? What could be improved?
4. What do you think are the critical factors that enable your relationships?
5. How have the relationships changed over time? Why do you think these changes have happened? Are there any that you would like to change?
6. Are there others you would like to form a relationship with?
7. On a scale of 1-10 (10 being the most important), how would you rate the importance of relationships in helping achieve your organisational outcomes?
8. How does climate change or extreme events affect your organisation? What affects your organisation and the community you live in the most (in the context or climate change or extreme events)
9. Do you discuss work related matters in your personal networks? If so how does this come about?

Appendix 3 – Online survey

Enhancing Networks for Resilience Survey

Thank you for participating in the Enhancing Networks for Resilience (EN4R) Project. EN4R is exploring how relationships in the Southern Grampians Glenelg Primary Care Partnership (SGGPCP) contribute to disaster resilience outcomes in your community, in your organisation and the SGGPCP.

The project started by undertaking semi structured interviews with SGGPCP organisations from December 2015 to February 2016. The interviews informed the content of this survey and will contribute to analysis in the final report. Although this survey covers similar content, the purpose of this survey is to collect quantitative information for the development of social network maps.

The interviews and social network maps will then be used to draw conclusions about the characteristics of the SGGPCP and will be further validated with SGGPCP organisations via interviews or workshops. The social network maps will provide unique insights into the specific roles of relationships among SGGPCP in building disaster resilience.

Public documents and journal publications resulting from this research will not identify organisations or individuals. Internal non-public documents for the SGGPCP (including participants) will identify the organisation you are representing for responses 1 – 10. Responses from 11 - 21 are completely anonymous and the research will be coded and de-identified prior to the generation of material for SGGPCP. These questions are marked as anonymous.

You have until 23 May 2016 to complete the survey. You may save partial completions of the survey and move back and forward within the survey to amend responses. This survey takes approximately 30 minutes to complete. The research is being led by Dr Hartmut Fünfgeld from RMIT University in partnership with the SGGPCP as a result of funding received Natural Disaster Resilience Grants Scheme. The project has been approved by the RMIT Human Research Ethics Committee. Please read the information below about the research process and your rights as a participant.

Thank you for taking the time to complete the survey.

Halley McCann Primary Researcher, RMIT University Email: halley.mccann @rmit.edu.au

Ph: (03) 9925 9057

Dr Hartmut Fünfgeld Associate Professor, RMIT University, Email hartmut.fuenfgeld@rmit.edu.au

If you have any concerns about your participation in this project, which you do not wish to discuss with the researchers, then you can contact the Ethics Officer, Research Integrity, Governance and Systems, RMIT University, GPO Box 2476V VIC 3001. Tel: (03) 9925 2251 or email human.ethics@rmit.edu.au

PART A Part A will ask a little bit about you, your organisation and your work with the SGGPCP team.

1) What is the name of the organisation you work for?

2) What is your job title?

3) What department do you work in? (Write N/A if department if is not applicable to your organisation)

4) What postcode is your office in?

5) How long have you worked in this role?

- ❍ Less than 3 months (1)
- ❍ Between 3 and 12 months (2)
- ❍ Between 1 and 3 years (3)
- ❍ Between 3 and 5 years (4)
- ❍ More than 5 years (5)

6) How long have you worked for this organisation?

- ❍ Less than 3 months (1)
- ❍ Between 3 and 12 months (2)
- ❍ Between 1 and 3 years (3)
- ❍ Between 3 and 5 years (4)
- ❍ More than 5 years (5)

7) What postcode do you live in?

8) What activities or areas do you work with the SGGPCP on? Select as many as relevant.

- ❍ Integrated chronic disease management and service coordination. (1)
- ❍ Healthy food and active living (GenR8 Change and SEA Change Portland) (2)
- ❍ Community culture of responsible drinking (Glenelg Alcohol Health Promotion and Planning Committee) (3)
- ❍ Community resilience through climate change adaptation (Glenelg SAVES, Rural People; Resilient Futures, Enhancing Networks 4 Resilience) (4)
- ❍ Other (please describe) (5) _____

Part B This next section focuses on your relationships with the SGGPCP team, other SGGPCP organisations, and other non SGGPCP organisations you may work with. If you have key collaborations with organisations not listed, there are six additional spaces for you to enter these organisations. These entries will be carried forward into the questions following.

9) What activities do you engage on with the organisations below?

Please indicate the regularity of your engagements by entering a 1,2,3,4 or 5 in line with the time frames below.

1	Constantly	= once a week or more
2	Very regularly	= once month
3	Regularly	= once a quarter
4	Not very regularly	= once every six months
5	Hardly at all	= once a year or less

Select as many activities relevant next to each organisation. Leave blank the organisations or activities you don't engage with.

	Referrals, coordination, or shared project delivery (1)	Participation on committees or working groups (2)	Networking, information exchange and advice (3)	Shared advocacy or funding opportunity (4)	Other (5)
SGGPCP team (1)					
MI Fellowship (2)					
Balmoral Bush Nursing Centre Inc (3)					
Brophy Family and Youth Services (4)					
Casterton Memorial Hospital (5)					
Dartmoor and District Bush Nursing Centre Inc (6)					
Dhaurwurd-Wurrung Portland & District Elderly Citizen's Association (7)					
Glenelg Shire Council (8)					
Primary Health Network (9)					
Hamilton Community House Inc (10)					
Heywood Rural Health (11)					
Kyeema Centre Inc (12)					
Mulleraterong Centre Inc (13)					

Old Courthouse Community Centre Inc (14)					
Portland District Health (15)					
Portland Neighbourhood House Inc (16)					
South West Healthcare – Psychiatric Services (17)					
Southern Grampians Shire Council (18)					
Western District Health Service (19)					
Winda Mara Aboriginal Corporation (20)					
Merino Community Health Centre (21)					
OzChild (22)					
Other (23)					
Other (24)					
Other (25)					
Other (26)					
Other (27)					
Other (28)					

11 This next question asks about your collaborations more specifically as they relate to disaster resilience.

The National Disaster Resilience Strategy notes four phases to building resilience:

Prevention: measures to eliminate or reduce the incidence or severity of emergencies.

Preparedness: measures to ensure that, should an emergency occur, communities, resources and services are capable of coping with the effects; the state of being prepared.

Prevention and Preparedness may include a range of activities to reduce a client's vulnerability - such as reducing a client's vulnerability to heat stress, increasing financial literacy to minimise the impact of drought, or providing transport to isolated clients during high risk conditions. It may also include activities to help your organisation operate differently in response to high risk periods.

Response: actions taken in anticipation of, during, and immediately after an emergency to ensure that its effects are minimized, and that people affected are given immediate relief and support.

Recovery: the coordinated process of supporting emergency-affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical well-being**.**

Which organisations have you interacted with on each of these activities? Tick more than one activity if relevant. Leave blank if you have not interacted with any other organisations on the activities below. (Organisations indicated in question 9 are listed for recipients to respond against)

Organisation	Prevention	Preparedness	Response	Recovery

13) How has working with other organisations on disaster resilience, climate change or related services, impacted your work? Select the response that best describes what you have learnt from interacting with organisations. Please note this response is anonymous.

14) If your interactions with other organisations on climate change or disaster resilience have generated a new understanding or practice, select how you share these learnings with others. Please note this response is anonymous.

- ❍ I share it with my direct team members (1)
- ❍ I share it throughout my organisation (2)
- ❍ I share it to my extended professional networks (3)
- ❍ I share it to my personal networks (4)
- ❍ I don't share it (5)

PART C The last section explores your insights and experiences when collaborating with others in the SGGPCP. Please note all response in Part C will be anonymous.

15) Based on your experience, please describe the top three enablers of collaboration with SGGPCP organisations. If you have not experienced three enablers, please enter N/A in the remaining boxes.

- ❍ (1)
- ❍ (2)
- ❍ (3)

16) Based on your experience, please describe the top three barriers or challenges to collaboration with SGGPCP organisations. If you have not experienced three barriers please enter N/A in the remaining boxes.

- ❍ (1)
- ❍ (2)
- ❍ (3)

17) If they are different, and based on your experience, please describe the top three enablers of collaboration with non SGGPCP organisations. If you have less that one enabler, please enter N/A into the other boxes.

- ❍ (1)
- ❍ (2)
- ❍ (3)

18) If they are different, and based on your experience, please describe the top three barriers or challenges to collaboration with non SGGPCP organisations.

- ❍ (1)
- ❍ (2)
- ❍ (3)

19) Select the option that most accurately describes your organisation's relationship with each SGGPCP organisation and non SGGPCP organisation. Leave blank if you do not have a relationship with an organisation. "The organisation keeps in mind the needs of my organisation when working together".

- ❍ Strongly agree (1)
- ❍ (2)
- ❍ (3)
- ❍ (4)
- ❍ (5)
- ❍ Strongly disagree (6)

20) Select the option that most accurately describes your engagements with SGGPCP organisations. "SGGPCP organisations I work with live up to the agreements they make with my organisation"

- Strongly agree (1)
- (2)
- (3)
- (4)
- Strongly disagree (5)

21) Select which most accurately describes your understanding of the SGGPCP goals

- I know and understand the SGGPCP goals (1)
- I know the SGGPCP goals but I don't really understand them (2)
- I know and understand some of the SGGPCP goals (3)
- I don't really know or understand the SGGPCP goals (4)

21) Describe how you think your professional collaborations contribute to the SGGPCP goals.

22) Is there anything else you would like to add about your collaborations with others and or disaster resilience activities?

Appendix 4 – Workshop agenda

Enhancing Networks for Resilience Workshop Agenda – 20 July 2016

Objectives:

Part A

1. Provide a shared and base level understanding of what SNA is and how it can be applied

Part B

1. Support an understanding of why networks and the analysis of networks are relevant to organisations, disaster resilience and climate change adaptation.
2. Present the findings of the EN4R research to participants including the semi structured interviews, social network maps, and qualitative analysis from the online survey.
3. Obtain feedback from participants through interactive exercises on the research findings to inform the final report and other research outputs.
4. Help the SGGPCP identify opportunities to enhance the network for resilience outcomes.

Section	Start time
1. Registration	9.50
2. Introduction to the project, project team, overview of the day *(very high level as more detailed item in second session)*	10.00
3. Introduction to participants	10.15
4. Introduction to social networks – types of networks, basic terms and examples	10.30
5. Questions and discussion	10.35
6. Analysing social networks – key concepts and methods	10.45
7. Questions and discussion	10.55
8. Conclusion and more information	11.00
9. Break	11.00
10. Overview of the afternoon and recap on who is in the room	11.05
11. Detailed project objectives and rationale – Including relevance to network governance, resilience and climate change adaptation.	11.15
12. Questions	11.25
13. Overview of method – Semi structured interviews, survey, and this workshop. – Outputs intended	11.30
14. Questions	11.35
15. Group work – What do you think the SGGPCP network looks like? (3 types of ties – 10 minutes each	11.40

16. Report back (three groups 5 minutes each)	12.05
17. Lunch	12.20
18. Presentation - the findings Social network maps, interview themes, analysis and conclusions.	12.45
19. Comments and questions	1.05
20. Group work *With consideration to types and numbers of ties, structure of network, outcomes for individual organisations, and outcomes for the network as a whole:* *a. What is productive about the way the network looks now and we should we keep doing?* *b. What could be improved in the network? What actions can be put in place to help the network look and operate like this? (with consideration to enablers and barriers)*	1.10
21. Report back	1.40
22. Summary and next steps	1.55
23. Close	2.00

Appendix 5 – Additional Social Network Maps

Figure 22 Combined ties for agencies that interact once a month or more on:

- referrals, coordination, or shared project delivery
- participation on committees or working groups
- networking, information exchange and advice
- shared advocacy or funding opportunity - other

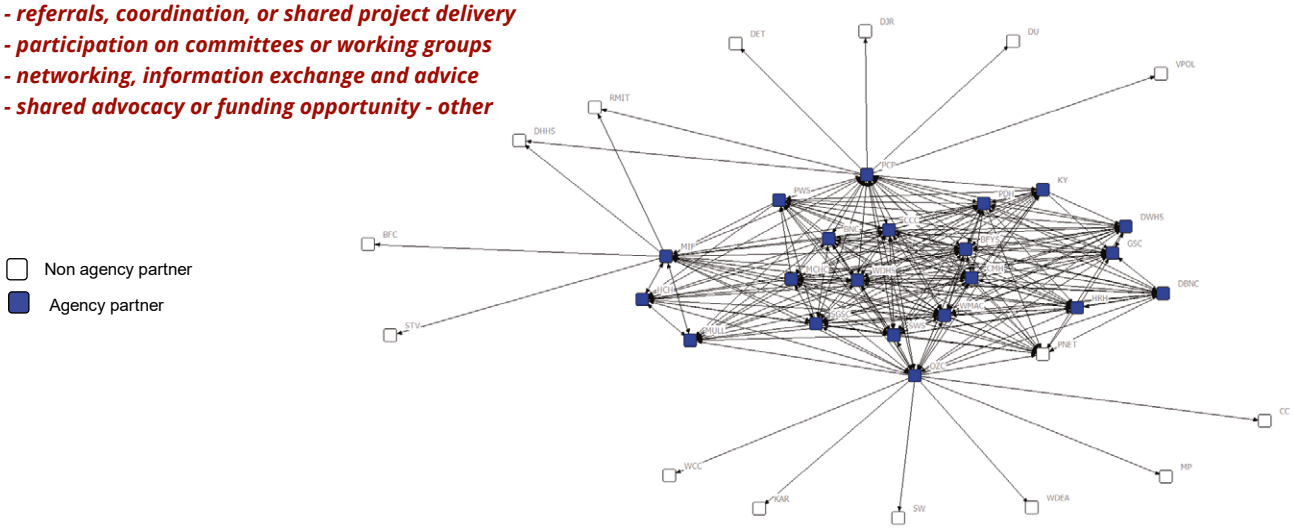


Figure 23 Agencies that connect on disaster prevention according to core business and number of staff

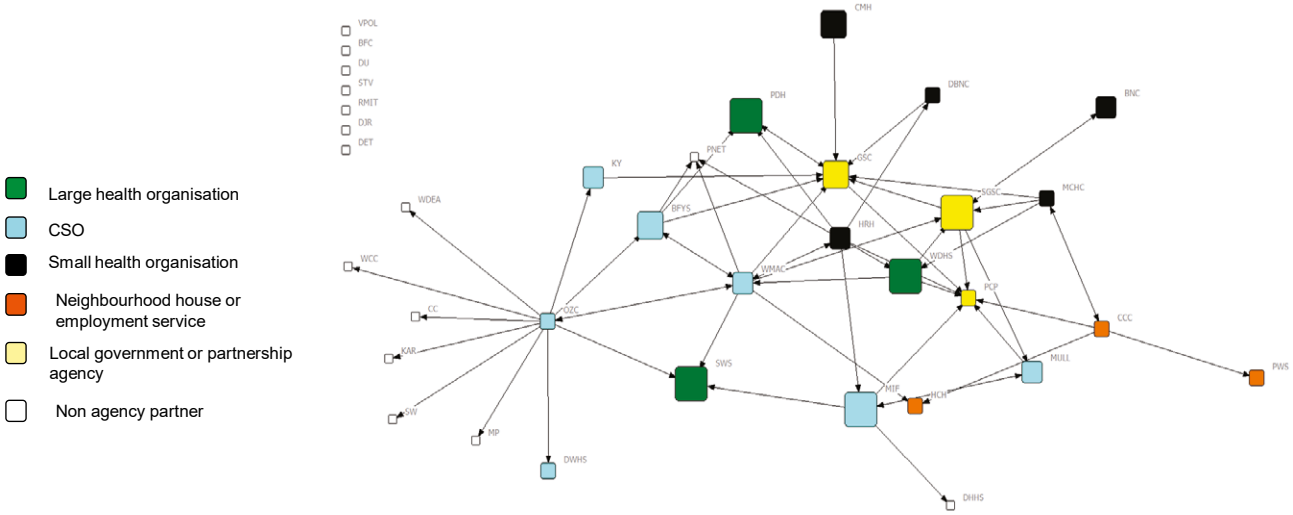


Figure 24 Committee and working groups interactions that occur more than once a month according to core business

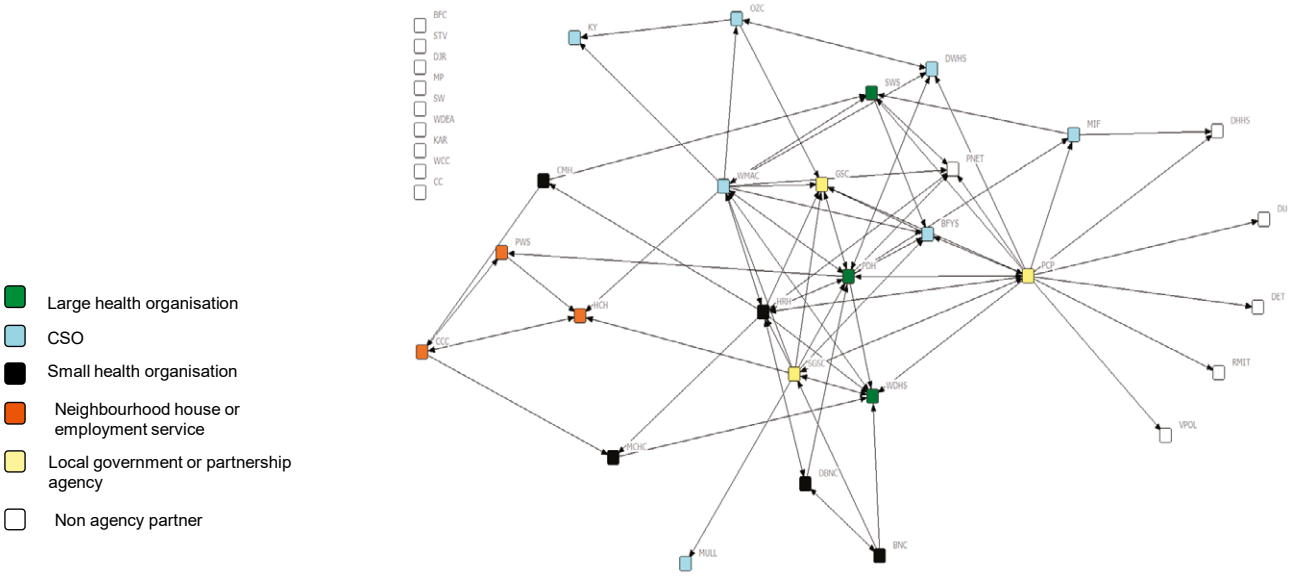


Figure 25 Agencies that interact on funding and advocacy more than once a month by number of staff

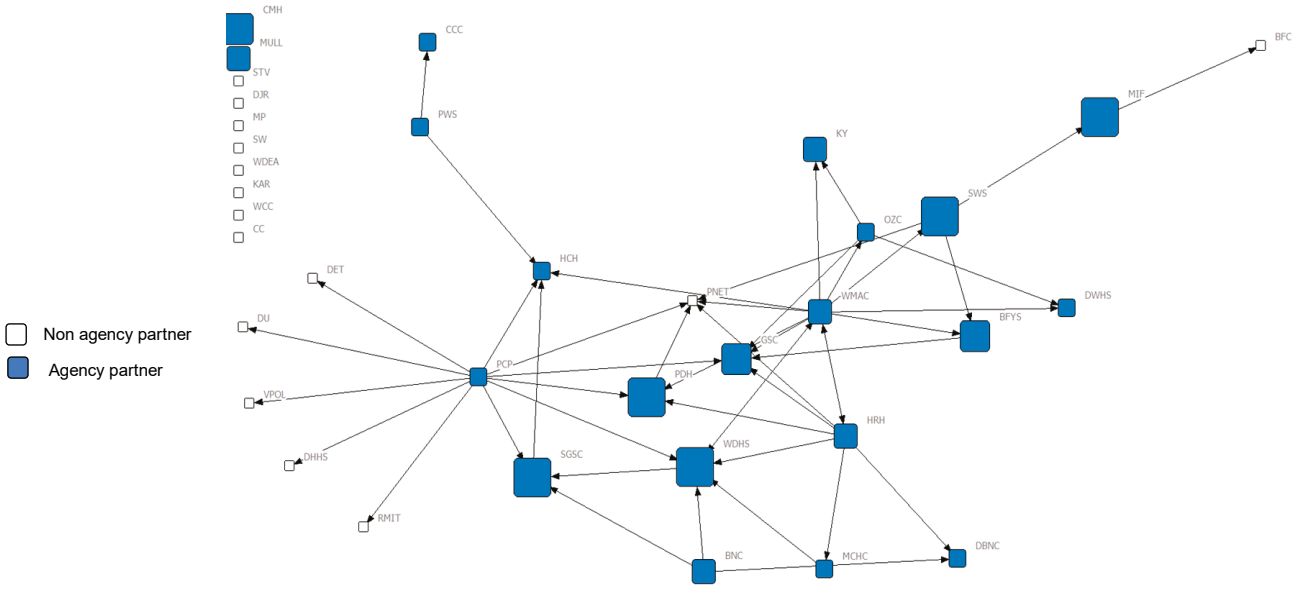


Figure 26 Agencies that connect on responding to disasters, coded by location and number of staff

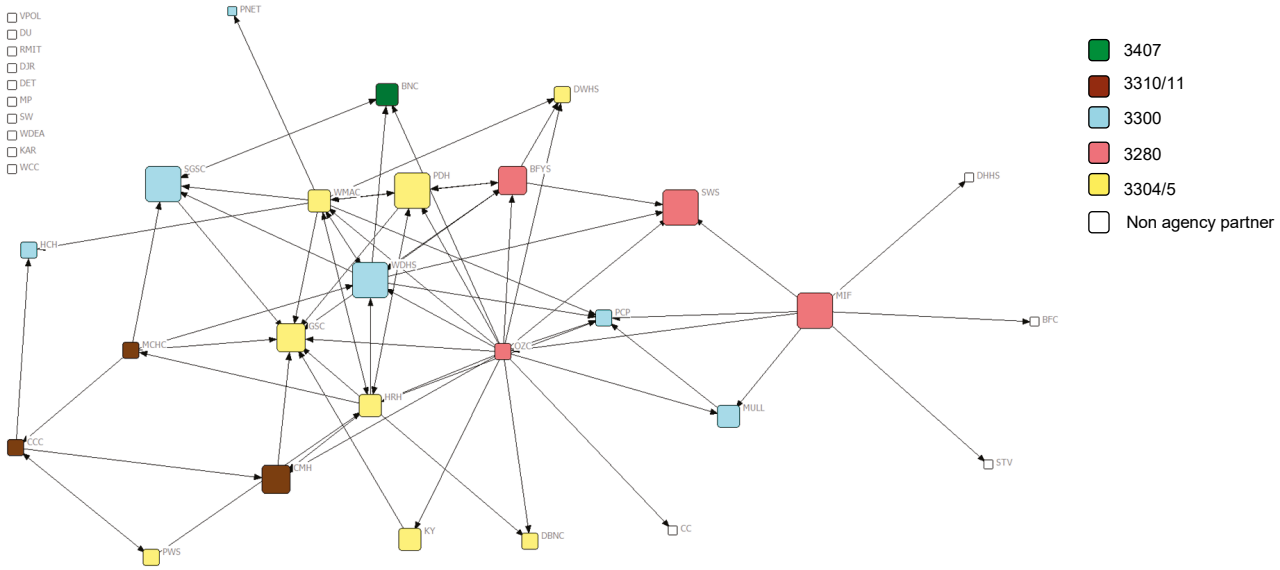
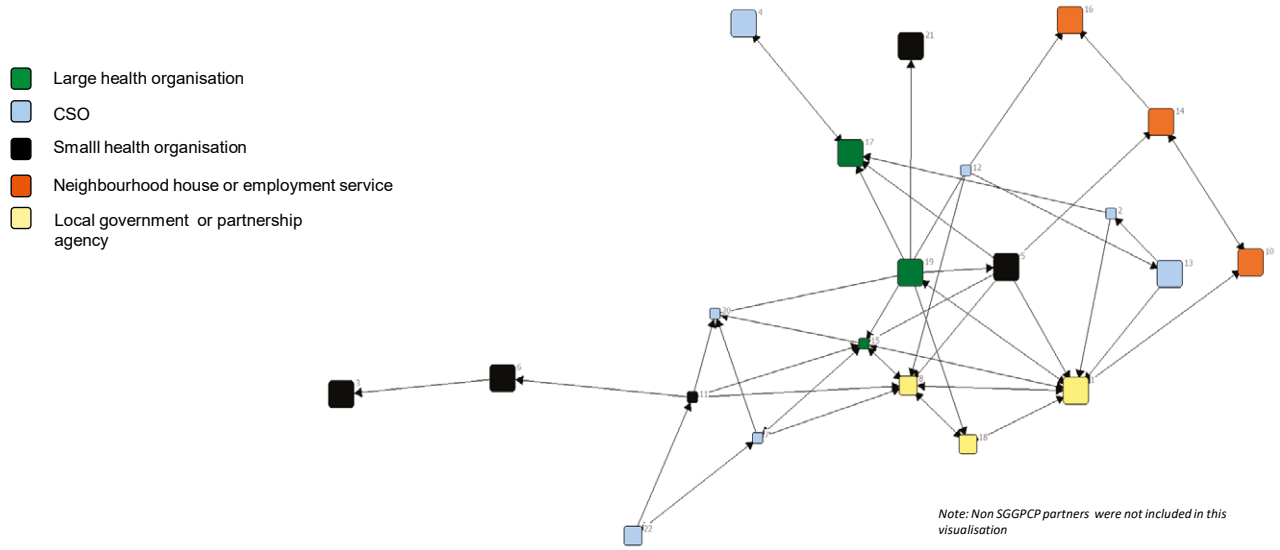


Figure 27 Agencies that perceive others consider their agency's needs (strongly agree or agree) according to core business and tenure



Note: Non SGGPCP partners were not included in this visualisation

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