

## Aberystwyth University

### *Social dynamics of community resilience building in the face of climate change*

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## **Supplementary Material (S1): Four-tiered process used for community resilience building**

The community resilience-building process in the action-oriented research project was designed and implemented as part of the Scottish Borders Climate Resilient Communities Project in the UK between May 2016 and September 2017. The SBCRC project aimed to enhance the resilience of three communities to shocks and stressors of climate change by operationalising ten aspects of resilience-building (Table 1). This supplementary material outlines the eight main features conceptualised as four interacting tiers, with each tier below supporting each of the tiers above (Figure 1). Each of these tiers is outlined below.

### **Tier 1: Relationship and trust building**

The first tier recognised that resilience building is predominantly a social process. As such, a primary focus of the project sought to build relationships and trust, which was considered essential for helping enable collaborative action. While relationships and trust are often advocated as important (Hahn et al. 2006), how such aspects should and can be developed in resilience building are rarely made explicit. This project therefore involved explicitly bringing into the process different activities, such as convening dialogue, creating safe spaces for exploring ideas, brokering, mediating, iteratively providing support then standing back to encourage autonomy, encouraging and making connections, having the project officer working independently from the local government to emphasize a degree of independence and ability to be perceived as an ‘honest broker’, and working with different actors to find common ground. The active process of helping to build relationships was also supported by an explicit engagement strategy that brought participants together. This involved: (a) using a ‘hook’ of flooding to provide focus for wider conversations and activities for community resilience to climate change; (b) working with existing engagement routes of the Scottish Borders Council, such as with flood resilience groups, to access diverse actors (Figure 2); and (c) ensuring the process was transparent and open, such as through continuously sharing emerging information (e.g. by providing workshop reports).

In the Scottish Borders formal relationships between the local council and community councils generally provide the primary mechanism for community consultation and engagement. Similarly, other departments within the council have also established more informal relationships with specific local and community-based organisations to help shape outcomes. This includes informal arrangements that have established local resilience groups in collaboration with the Scottish Borders Council (Lyon 2015). These groups are often an extension of community councils which formally provide a mechanism for civic engagement at the community level, although in practice community participation more widely, and capacity to represent community interests, greatly varies (Jun 2013). The local government has also engaged with community planning partnerships, which encompass a number of communities, and which is being strengthened by the Scottish Borders Council by piloting a ‘localities approach’ which seeks to bring communities into local decision-making to improve local facilities and services (Audit Scotland 2013, Matthews 2014). This is partly in response to the Scottish Community Empowerment Act 2015 and to the challenges of austerity, where new ways of working with limited resources are required (Pugh and Connolly 2016). As such, existing relationships between local government and communities are changing and developing.

Table 1. Principles for resilience building (Fazey et al. 2018) and how they were incorporated into the SBCRC project design.

Principle	How this the essential approached in the SBCRC project
1. Enhance adaptability and flexibility	<ul style="list-style-type: none"> <li>• Focusing on linking and working with local issues;</li> <li>• Developing and supporting new community groups to organise and develop community focused projects;</li> <li>• Providing opportunities for some participants to learn about participation and facilitation;</li> <li>• Encouraging ownership of learning and decision-making and enhancing learning about complex issues through system and futures oriented workshops;</li> <li>• Enhancing and building relationships and bridging social capital across actors and organisations</li> </ul>
2. Enhance resilience to specified and issues, shocks and stressors	<ul style="list-style-type: none"> <li>• Focused discussions in first stage workshops to identify key shocks and stresses and their relationships, including issues such as impacts of potential food price rises, higher frequency and intensity of extreme weather events, and potential policy changes.</li> <li>• Development of understanding of systems dynamics of community resilience and disadvantage;</li> <li>• Taking a systemic approach to understanding climate disadvantage and resilience and how to work with this. This included developing qualitative systems models of community dynamics and how these affected community needs and aspirations and exploring both mitigation and adaption to climate change</li> <li>• Taking a systemic approach to understanding climate disadvantage and resilience and how to work with this. This included developing qualitative systems models of community dynamics and exploring key feedbacks affecting communities and exploring both mitigation and adaptation in integrated ways</li> </ul>
3. Enhance horizontal working across sectors and issues	<ul style="list-style-type: none"> <li>• Examining linkages across different sectors (e.g. food, poverty, water, environment) in the first workshop;</li> <li>• Developing relations across organisations representing different sectors and with communities through encouraging diverse involvement of different actors in the project;</li> <li>• Bringing together diverse stakeholders in workshops to highlight and work with cross-sectoral issues (e.g. land use change, community development, flood risk and emergency management, and renewable energy)</li> </ul>
4. Enhance vertical working across social scales	<ul style="list-style-type: none"> <li>• Examining and working with linkages between family level issues and community level dynamics;</li> <li>• Examining challenges in communities as a systemic issue and using this to develop thinking about national policy environments to support community resilience;</li> <li>• Working with national policy actors to identify key opportunities for creating a more enabling policy landscape and environment conducive to resilience at community levels.</li> </ul>
5. Reduce carbon emissions through systemic approaches	<ul style="list-style-type: none"> <li>• Developing and supporting carbon reduction projects (e.g. energy renewable schemes in Hawick) as part of the action oriented work in the project;</li> <li>• Focusing on climate change as a wide and systemic issue.</li> </ul>
6. Build climate literacy	<ul style="list-style-type: none"> <li>• Direct and explicit focus on climate change in workshops that encouraged wide conversations about climate change, but in ways that drew out its relevance to local issues.</li> </ul>
7. Engage directly with futures	<ul style="list-style-type: none"> <li>• Use of the Three Horizons approach in the second (and sometimes third) workshops to frame current challenges in relation to future desired possibilities and to identify intermediate steps to help get there.</li> </ul>
8. Focus on climate disadvantage and reducing inequalities	<ul style="list-style-type: none"> <li>• Explicit and direct focus on identifying those most disadvantaged by climate change. This included, for example, building understanding of the systemic nature of resilience at community levels from the perspective of climate disadvantage.</li> <li>• Development and discussions of disadvantage and resilience at group, community and national policy levels;</li> </ul>
9. Encourage participation, learning and empowerment	<ul style="list-style-type: none"> <li>• The entire project was focused on delivering a process of engagement and community activities;</li> <li>• Use of expert facilitation and process design and implementation was built around flexibility and participation;</li> <li>• Emphasis on dialogue, relationship building and on community ownership and participation through application of a strategy of community engagement;</li> <li>• Reflexive and iterative process of learning embedded in the process.</li> </ul>
10. Focus on transformative and systemic change	<ul style="list-style-type: none"> <li>• The project continually sought to encourage collaborative thinking and work focused on interconnections. While there were limited opportunities to genuinely work towards deep and significant forms of change, the project sought to gradually build relations, trust, capacities for collaborative working through its focus on the nine other essentials to lay foundations for deeper conversations and work to occur</li> </ul>

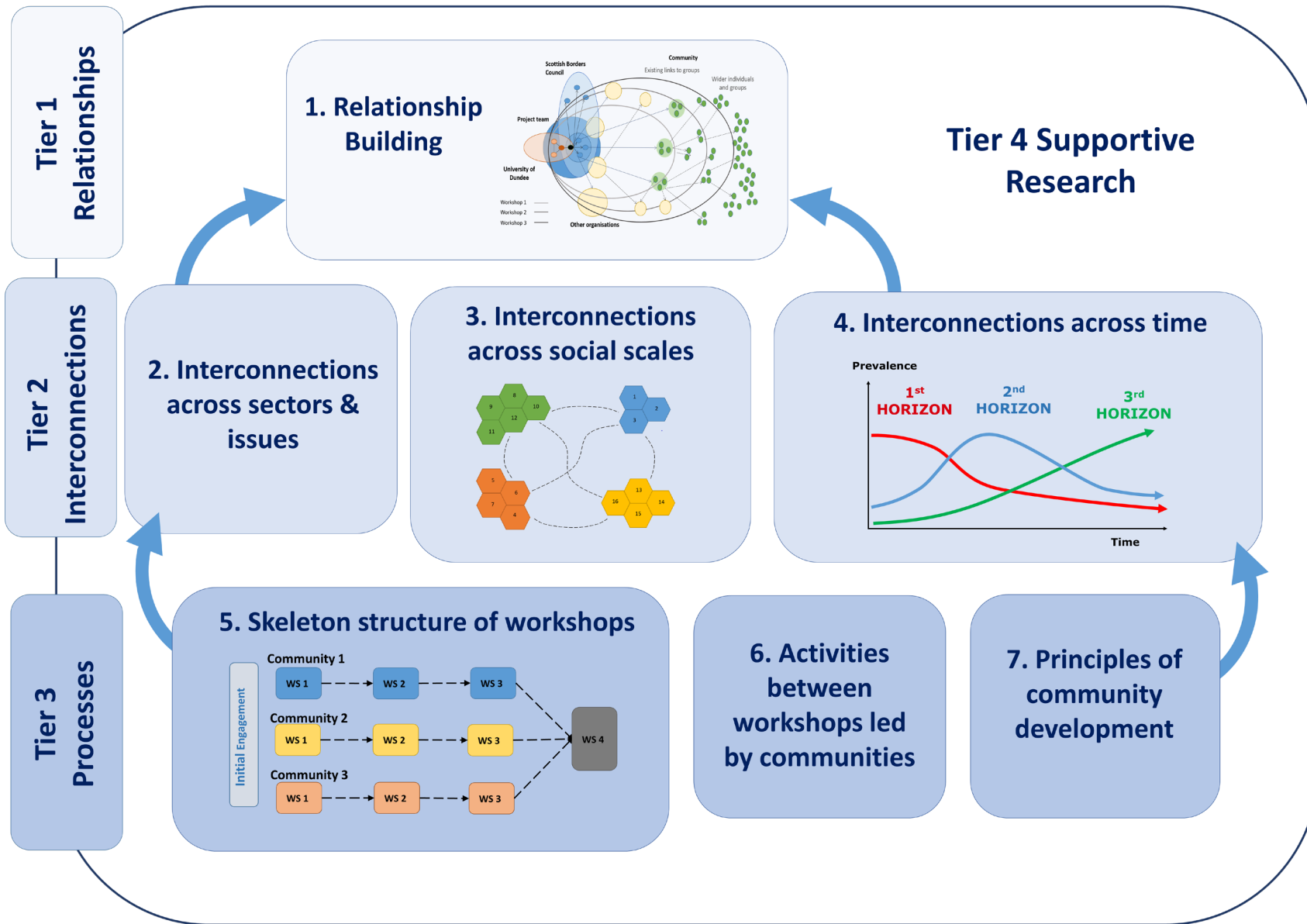


Figure 1: The four-tiered community resilience building process implemented in the SBCRC project.

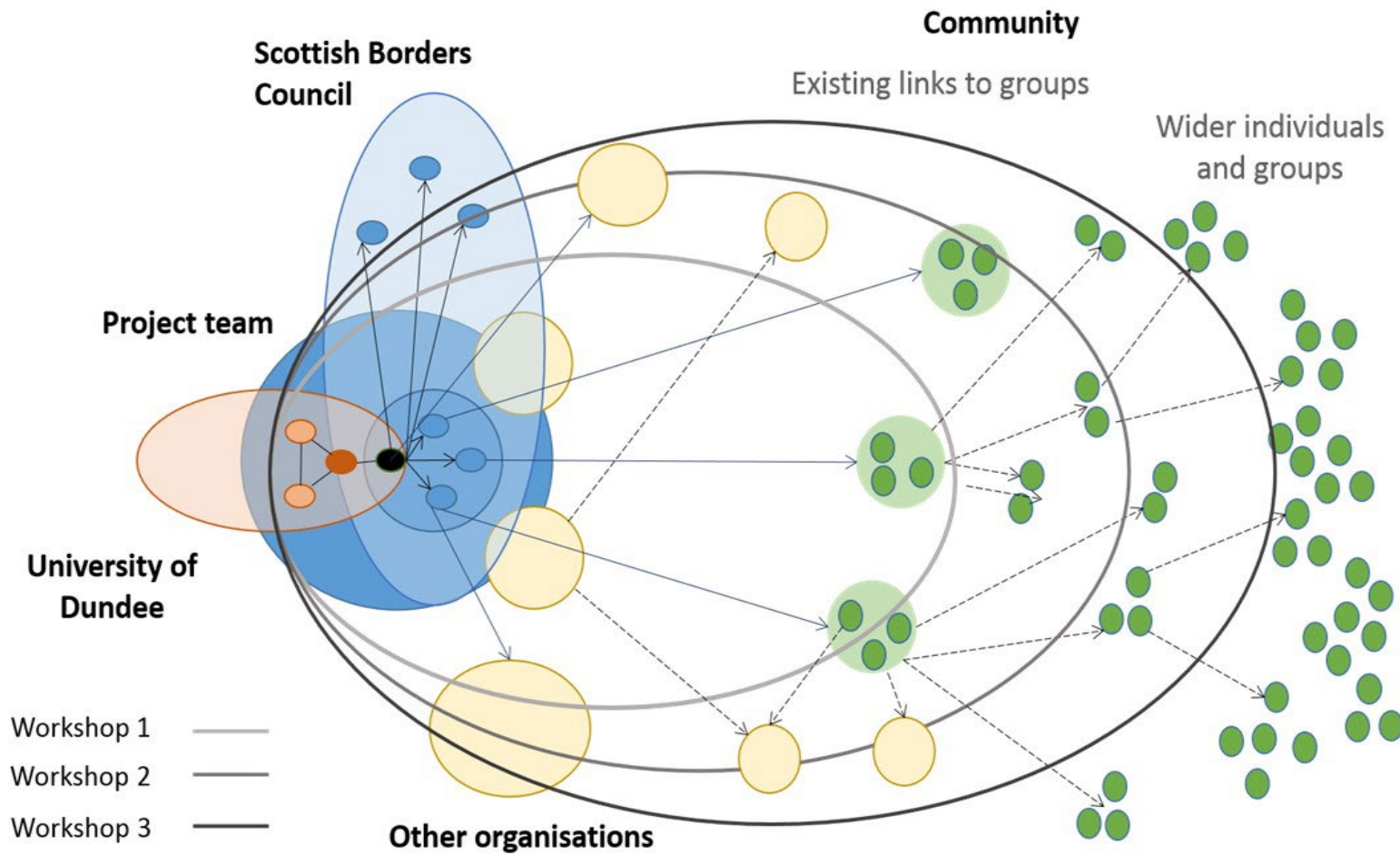


Figure 2: Processes used to enhance and engage with different stakeholders and community based participants.

## **Tier 2: Interconnections**

In line with many studies which highlight the importance of considering interconnections and system dynamics in resilience (Allison and Hobbs 2004, Gallopin 2006, Berkes and Ross 2013, Wilson 2014), the second tier focussed on exploring, learning and developing collaborative action that considered interactions across: (i) issues/sectors, (ii) social scales and (iii) time (Figure 1), ultimately with the goal of reducing vulnerability of those most disadvantaged by climate change.

While holistic thinking, where all things are considered to be interconnected and interrelated, is a fundamental basis of the theory of resilience (Helfgott 2018), this framing is often not applied in practice (Wenger 2017). The SBCRC project therefore encouraged participants to continually expand the notion of the system boundary to help participants move beyond silo-based perspectives and develop systemic oriented solutions. While it is not possible to be fully comprehensive (Helfgott 2008), relationships across sectors and issues were explored in workshops with participants in depth to help them develop systemic understanding of about the nature of problems and solutions and help change how decisions about what actions to take forward and how to achieve them were framed.

The second tier also worked with interconnections across social scales (Wilson 2013, Chandler 2014, Wilson 2014, O'Donnell et al. 2018). This included relations at family, community, and wider national scale policy environments. To understand relations between community and national levels, 24 participants from national level government and non-government organisations examined findings about community dynamics to identify what a synergistic policy landscape would look like that could more effectively support community resilience. Participants in this process had diverse expertise, including about poverty and disadvantage, community development, climate change, flooding, emergency planning, rural development and environmental management.

Systemic change requires creative approaches that attend to the interconnections across time between actions in the present and the emergence of an aspirational future (Tschakert et al. 2014, Sharpe et al. 2016, Tschakert et al. 2016). The SBCRC project therefore also focused on mapping possibilities for transformational change using the participatory Three Horizons method (Sharpe et al. 2016). This was underpinned by a strength based approach (Helfgott 2008) which, rather than focusing on identifying problems, sought to empower participants by asking what actions would generate success and what resources existed that could help achieve it. The strength based futures method then resulted in a set of actions for resilience building that took into account the complexities of community life, the different needs and desires of those involved, and the need for systemic change (Figure 2).

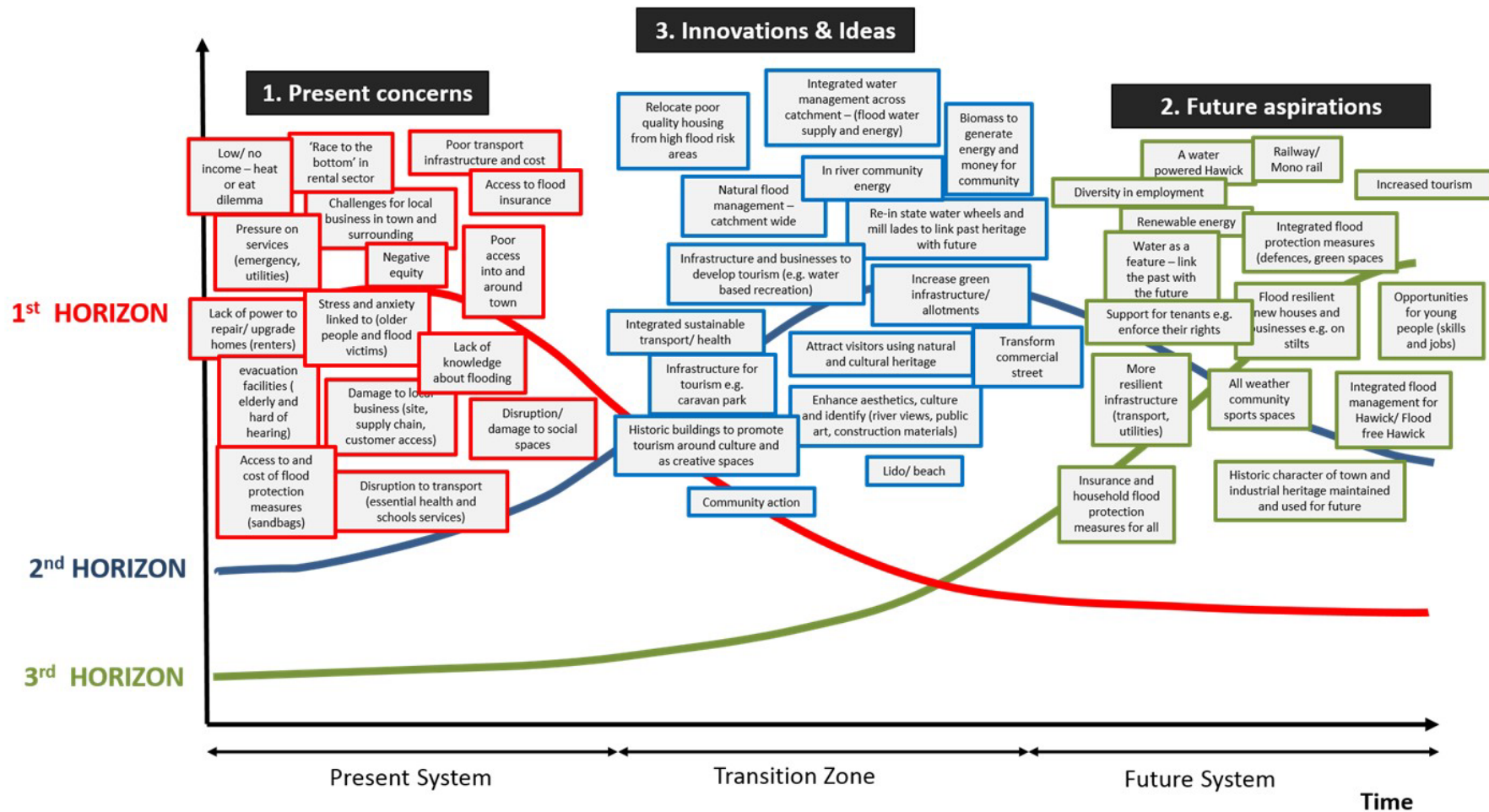


Figure 2: Example of a futures oriented map from one of the communities (Hawick) about how to achieve systemic pattern shifts through modifying flood defence designs. The primary shift in this case was from immediate concerns about flooding (red boxes) towards much more holistic perspectives of what development and resilience should focus on, such as more broadly towards community regeneration (green boxes)

### **Tier 3: Process design and implementation**

The third tier supported tiers one and two by guiding how the project was implemented. This included supporting learning through exposing participants to the diverse perspectives and expertise of others. The design included applying: (a) a flexible structure of engagement and interaction between stakeholders (Figure 3); (b) collaborative actions; and (c) principles of participatory community development.

First, resilience building requires a balance between providing sufficient direction and flexibility to local interests and needs (Mog 2006). A skeleton structure of three professionally facilitated workshops were thus held in each community with different actors and organisational representatives which provided more formalised spaces to convene dialogue and share perspectives (Figure 3). The first workshop (repeated in each community) worked with participants to explore shocks, stressors, complexities, uncertainties, and climate disadvantage, developed a sense of direction for action, and identified key community dynamics and leverage points (Meadows 2000, Abson et al. 2017). The second workshop mapped potential future visions, aspirations, and began to co-create actions and plans (Figure 2), and the third provided a facilitated space to examine how to take agreed actions further forward to address context specific needs framed within a wider systemic level understanding.

Second, the project involved actions led by community members with support from the project officer, which included further relationship building, support for community members to undertake research in their own community, mediation between actors by the project officer; support for project planning; regular reflexive meetings and specific actions to enhance resilience.

Finally, the process involved balancing diverse needs, such as provision of direction and community ownership, and meeting both funders and community's needs and expectations (Parfitt 2004, Mog 2006). As such, principles of community development to enhance participation and project implementation were applied (Table 2) to enhance collaborative and cross sectoral action and to support the first two tiers.

### **Tier 4: Action oriented research, learning and reflexivity**

Resilience-building is enhanced when supported by an active and iterative learning process, where information about issues and the process are continually fed into projects and where underlying assumptions can be challenged and considered (Ashley et al. 2012). A supportive research process was therefore embedded within the SBCRC project to help guide decisions and to stimulate reflexivity, action and change. This involved a skilled project officer who acted as both implementer and researcher and continued reflection by the project team as new information and ideas emerged.

The research aimed to achieve two outcomes: (1) Support the project by iteratively feeding in new insights as they emerged and (2) providing new information about resilience-building as a social and dynamic process. For the latter aspect, four different kinds of data were used (reflective diary, interviews, evaluation of community based workshops, and reflective workshops with team members). This data was analysed using three main iterations. In the first iteration open and axial coding identified activities, learning outcomes, tangible and capacity building outcomes, different types of influencing factors, and opportunities. This was then used to construct detailed timelines for each community, enabling contribution analysis (Mayne 2011) to be used to assess relative influence of different factors on how each of the community projects unfolded. In the second iteration, timelines and contributing factors were critiqued and refined by the whole of the project team in a reflexive workshop. This provided deeper insights about the commonalities and differences between the community projects and emergence of an initial grounded theory about the social dynamics involved, which was then tested and refined in relation to the more formalised data sources. The third iteration



involved further refinement by the project’s advisory board and further triangulation. The final grounded theory was represented as a causal loop diagram (CLD)(Sterman 2000) to show key influences and feedbacks and establish insights about the overall dynamics involved.

A critical aspects of the research process was ensuring the work was reflexive. This enhanced ability of those involved to continuously reflect on how the embeddedness of researcher-participants influenced how they were understanding what was happening and why and to help inform the project as it progressed. Reflexivity was enabled in five main ways:: (i) iterative collection and analysis of data; (ii) active critical reflection through diary writing to surface implicit assumptions; (iii) reflexive monitoring where assumptions were challenged through regular, but separate, meetings between the project officer and with the project lead, the evaluator and the local authority lead; (iv) reflexive meetings and workshop with the project team as a whole that were professionally facilitated to probe perceptions and findings; and (v) through interviews with team members by the external evaluator, which helped members reflect on their role and project progress.

Figure 3: Structure of the process, based around three workshops in each community with activities conducted inbetween each workshop.

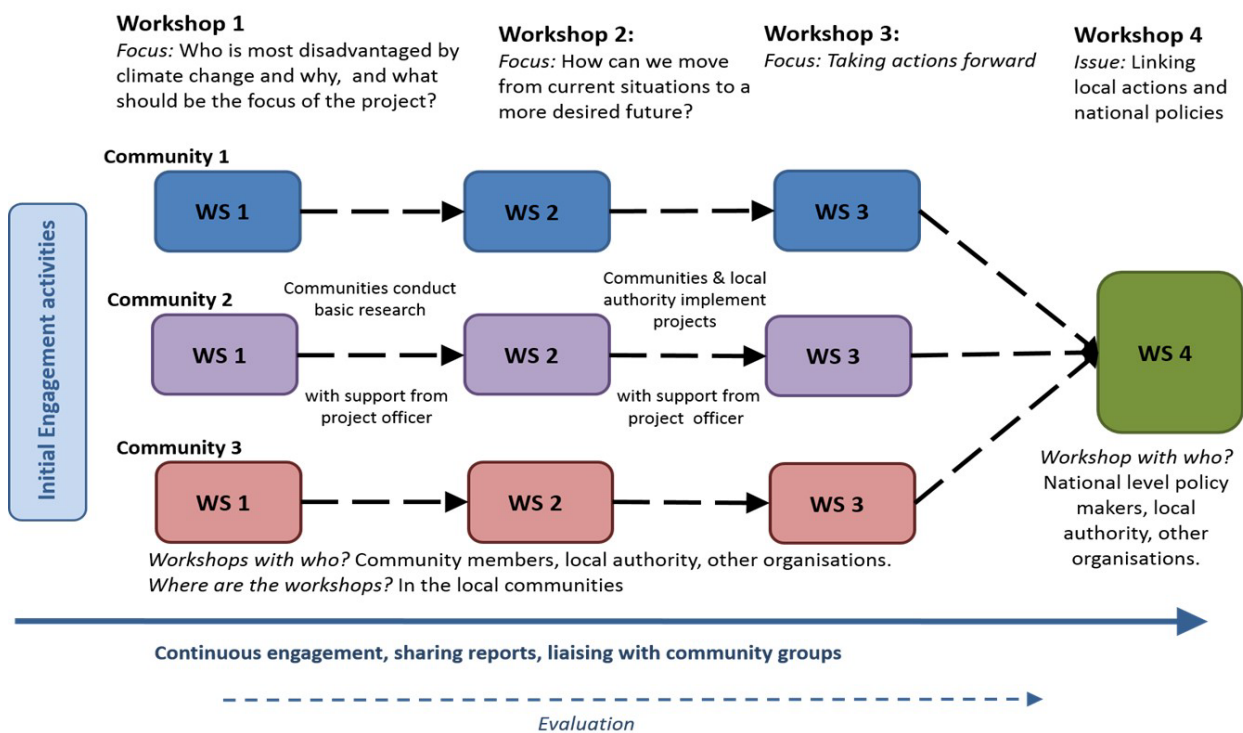


Table 2: Principles from participatory community development operationalised in the project (Chambers 1997, Parfitt 2004, Mog 2006).

Principle	How the principle was operationalised
1. Maintain local focus	The project officer was immersed within the social setting to enhance understanding of the challenges and concerns of the council and local communities.
2. Strengthen collaborations	Engagement routes through the project team organisations were used and team members' involved in workshops as participants.
3. Provide spaces for dialogue with flatter hierarchies	While the project was led by organisations external to the communities, significant attempts were made to build relations and provide spaces for dialogue that could encourage participation and collaboration. This included workshops being primarily facilitated by researchers and/or professional facilitators whereas other team members (e.g. project officer, Council Staff, other organisations) engaged in the workshops as participants alongside community members. This sought to help provide spaces which reduced the top down nature of the project and which could encourage meaningful dialogue.
4. Flexibility in objectives	Identifying common objectives and shaping the project to increase the perceived added value to local communities and the Scottish Borders Council. For example, in Peebles the final workshop was shaped around the development of a Community Resilience group. This aligned with the goal of some local people following severe flooding in December 2015 and with the pre-existing goal of the council's Emergency planning team.
5. Flexibility in focus	Adapting the project to focus on locally relevant issues, which differed across the three communities and emerged as the project progressed.
6. Flexibility of the process	Allowing the overall process to be adapted as understanding of the local and council needs developed. For example, the project involved interviewing participants about the process and feeding this back to the project team to encourage reflection and learning. This led, for example, to significantly altering Stage 3 workshops.
7. Flexibility in workshop design and facilitation	Adapting the design of workshops depending on changing needs of the project. For example, the Three Horizons method was used in the second workshop in all communities but was modified depending on specific issues emerging from the communities.
8. Be clear about what was possible	While the project aimed to provide meaningful opportunities for people to shape outcomes it was important to be clear about what was possible to avoid raising expectations. For example, discussions to engage people were undertaken with a wide range of organisations and individuals to explain the project, the process and outcomes. Emphasis was placed more on action than research. Involvement in the project was linked to an ability to help shape outcomes through the process.
9. Be iterative and reflexive	Listening feedback, applying learning to adapt practices and ensure flexibility. This included regularly 'stepping back' from the process to critically examine the implications of the behaviours and activities of the project officer. For example, following each community workshop a well-structured report was written which outlines the process, the discussions in the workshop and the agreed next steps. These reports were emailed or posted to participants who were asked for feedback. Bi weekly discussions were also held between the project officer and the project manager to discuss progress, challenges, ideas and next steps. A core element of these discussions was critical reflection.
10. Strive for credibility and relevance	Ensuring the project process was perceived as adequate to deliver the stated aims and objectives. This is an essential aspect of working with communities and other stakeholders in a participatory way. For example, the skills of the funders and the different project partners was explained by the project officer to those engaged and these were then modified in a flexible manner to meet community needs. An advisory board was also used gain the views of external experts to help increase the degree to which findings could be made meaningful to other policy and more generic contexts.
11. Take a systemic approach	Recognise and embrace the complexity of the challenges and inter-relationships of issues and people. For example, to initiate discussions a range of known climate change challenges were used in the first workshop to examine the local impacts of climate change.
12. Be legacy oriented	Seek to contribute to a wider, on-going process of engagement and action and support key people to develop future initiatives. For example, much of the process focused around relationship building. In Hawick, the project officer also supported the community based renewable energy group to include more local people and to take steps to develop closer collaborative working with the river culture thematic groups and create a renewable energy initiative alongside the flood scheme.
13. View project as longer term learning journey	Overall, the project was viewed as being part of a longer term learning journey. This meant 'learning' became as a key focus in the project as well as achieving specific actions and outcomes. This maintained emphasis on: (a) Recognising that not all aspects were important but that learning how to do change was critical; (b) orienting workshop design and targeting engagement activities; (c) reflexion - i.e. continual consideration of local and council needs, how well the project was working and balancing needs for considering systemic and holistic aspects of the project while also providing focus.

Table 3: Ten essentials for second order climate research and how they were operationalised

Essential	How it was applied in the SBCRC project
1. Focus on transformational change	Second order climate change research requires a focus transformational responses, such as understanding or generating impact on systemic, structural, cultural and normative change. For this project, enhancing resilience was approached as a process of change involving both mitigation of carbon emissions and adapting to the impacts of climate change, which in turn requires analysing and working with the systemic aspects of communities and climate change. The whole project therefore revolved around addressing and working with systemic aspects and finding ways to work with or challenge these.
2. Focus less on problems and more on solutions	The project focused on action rather than being primarily focused on producing knowledge, from which action is often implicitly assumed by researchers to emerge. The action then gave opportunities for learning both about the systemic issues involved and developing wider lessons about delivering resilience as a practice (this paper).
3. Develop practical as well as epistemic knowledge	In addition to learning about the systemic nature of community resilience, such as through eliciting expertise through workshops and interviews, the project sought to develop know-how knowledge about implementation. This emerged as two main forms: First, development of the embodied knowledge of project team members and participants, such as better know-how knowledge relating to skills in facilitation, participation and community engagement, relationship building and system change. Second, the work produced know-how knowledge presented in epistemic form, such as that in reports and this paper.
4. Approach science as occurring from within the system being intervened	The project officer was directly embedded in local government and worked directly with community groups to provide them with support for taking actions forward. All project members were also embedded in the project, playing different roles in shaping the project outcomes which enabled them to have a more intricate understanding (albeit from different perspectives) about what was happening and how action and change was unfolding and could be stimulated.
5. Work with normative aspects	Working with contemporary challenges like climate change requires researchers to be aware of their own values and assumptions driving the research and finding ways to work a plurality of values of others that affect both the knowledge produced and the action-oriented outcomes achieved. This was achieved through delivery of a highly flexible co-creation process with diverse stakeholders and in participatory ways. Different values and thinking often surfaced in workshops, meetings and interviews, which were also designed to provide spaces for dialogue and debate. This included engaging with different mindsets held about the relationship between present actions and future, aspirational change.
6. Take a multi-faceted approach to understanding and shaping change	Different ways of understanding were explored and developed through the project. While the project largely focused on understanding social complexity (e.g. relationships, social capital), it also sought to integrate this with more physical aspects of complexity, through developing qualitative system models. Use was also made of different ways of knowing, such as through local expertise, professional expertise, as well as codified forms of knowledge, such as reports.
7. Acknowledge the value of alternative roles to accelerate learning	To enhance learning, it is sometimes necessary for researchers to take on different roles other than through being an observer. In this case, all researchers were involved in some way in helping to create action, such as by being facilitators, mediators, connectors. Those on the project team who were not form a research background also often engaged in research, including collection of data or interpretation of results. The mixing of roles was recognised as being both essential for delivery of action and to enhance development of different forms of practical and epistemic knowledge.
8. Embrace and encourage second order experimentation and change	The project was itself an experiment in implementing resilience in practice. The experimentation involved: (i) Integration, where external knowledge was incorporated to inform interventions and actions (e.g. about design and during implementation); (ii) trial and error, where new actions (e.g. for community engagement) were improved and developed when working within different communities; (iii) repetition of activities, such as across different communities.
9. Seek new ways to challenge and generate new insights	The project was focused around developing different ways of thinking using different tools and approaches. For example, the futures method helped participants develop new ways of looking at the future and how change emerges, while the systems approach that was used with participants helped them develop more creative and effective solutions. In many cases this challenged the thinking of the participants, as highlighted through interviews conducted with them about their learning journeys.
10. Be reflexive	Reflexivity in the research process is essential to consider how those involved in the research are affecting perceptions and learning about the knowledge being produced. To address this, reflexive activities were directly embedded into the research process in two main ways. First, given the key role of the project officer in the project, attention was given to ensuring there were regular spaces and mechanisms for reflection, such as: directly with the project lead or project team members; through keeping a reflective diary; and through analysis of emerging data and trends that then informed her activities. Second, reflective spaces were provided for the team as a whole, including in pre-determined meetings and small workshops where data from interviews and workshops fed into the reflexive process.

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## **S2 Lessons about the practical aspects needed for resilience-building**

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### **Design and implementation**

Design and implement for participation and engagement  
Focus on identifying strategic relationship-building and partnership needs  
Play a mediator role in developing trust and relationships  
Have a direct focus on climate change and enhance climate literacy  
Pay close attention to different expectations of team members  
Take a holistic and systemic approach to embrace complexity and interconnectivity  
Focus on climate disadvantage, with appropriate methods for inclusion  
Orient conversations that situate the present in relation to the future  
Partner with local organisations  
Ensure project officers are locally embedded and immersed within the social setting  
Strive for credibility (high quality) and relevance (usefulness)  
Ensure senior support in partner organisations  
Ensure time for developing shared understanding and desired outcomes in core team  
Use existing engagement routes to strengthen multi-stakeholder collaboration  
Focus on relationship building with stakeholders  
Ensure clarity of project team roles  
Pay attention to different forms of power in relationships, and how these are strategically used by partners to retain control, ensure different interests are achieved, and needs are met

Ensure objectives are flexible to increase the perceived added value for partner organisations  
Link activities across different issues and with local interests, initiatives and expertise  
Identify and work with change oriented leaders  
Be clear about what is possible  
Work with and enhance existing resources and capacities  
Provide spaces for dialogue that reduce hierarchies and encourage participation  
Be flexible in workshop design and facilitation to respond to local needs  
Work with and link climate change to local issues  
Ensure time is available to explore complexities  
Find simple language to convey complex issues  
Provide support to develop new collaborations and relationships between stakeholders  
Ensure the process is flexible to enable diverse outcomes to emerge  
Design for learning and knowledge exchange to maximise potential for future capacities  
Make learning explicit so that changes emerging in project are more visible  
Iteratively feedback learning to adaptively shape a project  
Build in legacy planning to enable continuation beyond projects  
Engage communities in early stages of project design rather than assuming they will participate

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### **Skills, expertise and capacities for project teams**

Knowledge brokering,  
Diversity of participation and facilitation expertise  
Systemic capacities that enable working with inter-related issues  
Local expertise about context, relationships and networks  
Diverse expertise in core team (e.g. systems and specific technical expertise)  
Ability to bring in additional specific expertise where necessary  
Strategic oversight to balance flexibility with focus  
Capacities for relationship building and collaborative working

### **Creating and capitalising on opportunities**

Turn crises into opportunities  
Develop basic plans to capitalise on both known and unanticipated opportunities  
Work with local interests of community members  
Work with existing community drive  
Collaborate with other projects/ initiatives within communities  
Feed up local issues, actions and outcomes into regional or national scale policy  
Be legacy oriented, viewing projects as part of a longer journey within a wider social setting

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