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Published in:
Sustainability Science

DOI:
[10.1007/s11625-021-00950-x](https://doi.org/10.1007/s11625-021-00950-x)

Publication date:
2021

Citation for published version (APA):

Fazey, I., Carmen, E., Ross, H., Rao-Williams, J., Hodgson, A., Searle, B. A., AlWaer, H., Kenter, J. O., Knox, K., Butler, J. R. A., Murray, K., Smith, F. M., Stringer, L. C., & Thankappan, S. (2021). Social dynamics of community resilience building in the face of climate change: The case of three Scottish communities. *Sustainability Science*, 16(5), 1731-1747. <https://doi.org/10.1007/s11625-021-00950-x>

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Social dynamics of community resilience building in the face of climate change: the case of three Scottish communities

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Received: 30 September 2020 / Accepted: 29 March 2021 / Published online: 9 June 2021
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Abstract

Meeting global targets that maintain temperatures at 1.5 °C above pre-industrial levels while adapting to the growing impacts of climate change requires significant and rapid societal change. Within this context, there has been growing interest in building community resilience to shocks and stressors and as a forward-looking process. Yet while there has been extensive attention to conceptual aspects, there has been much less on how this can be achieved in practice. This research worked with three communities in Scotland (UK) regularly exposed to flooding and other integrated challenges to learn from action about community resilience building. A carefully developed four-tiered transdisciplinary approach was applied that included: relationship-building; enhancing capacities to work with interconnections; enabling processes; and supportive action-oriented research. The findings of the analysis of the system dynamics that were occurring during the resilience-building process highlight that it is a complex and messy social process. Yet, it also shows that if quality and sufficient quantity of support and time to help surface and deliberate on underlying assumptions about communities and change is provided, it can be possible to stimulate emergence of beneficial reinforcing social dynamics that begin to support collaborative and systemic action. To further advance know how about resilience building, much greater focus will be needed on the ‘how’ of resilience. This, in turn, will require new framings of, and approaches for, community resilience and new framings of research, knowledge and knowing.

Keywords Regenerative cultures · Community development · Action research · Resilience building · Capacity · Vulnerability · Systems · Social dynamics

Introduction

Meeting global targets that maintain temperatures at 1.5 °C above preindustrial levels while adapting to the growing impacts of climate change requires significant and rapid changes in technological and behavioural domains, energy systems and structures, governance, and in the worldviews, cultures, norms and beliefs underpinning high carbon societies (IPCC 2018). Within this context, there has been growing attention to building community resilience to shocks and stressors and as a forward looking process to addresses underlying challenges associated with climate change (Pelling 2011; Pelling and Manuel-Navarrete 2011; Bassett and Fogelman 2013; Revi et al. 2014). Community resilience is relevant to many fields including community development, disaster risk reduction, fuel poverty, vulnerability, health, education and sustainability (Magis 2010; Wilson 2013; Aldrich and Meyer 2015; Berkes and Ross 2016; Mulligan

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et al. 2016; O'Donnell et al. 2018). Although there has been extensive research on conceptual aspects (Chandler 2014; Cretny 2014; Choudhury and Haque 2016), there has been much less on understanding how to build community resilience in practice (Fazey et al. 2018a).

Communities are groups and individuals connected by common values, norms and/or interests, and sometimes a geographic place, that shape a shared sense of identity (Kenter et al. 2015; Barrett 2015). In a context of climate change, the issues facing communities are diverse. They include direct impacts to lives and livelihoods, such as from floods, droughts or shifting markets (Jacob et al. 2010; Fazey et al. 2016; Rahman et al. 2018; Currenti et al. 2019; Doloisio and Vanderlinden 2020). Many of these climate impacts intersect with, or are exacerbated by, other issues such as poverty, ill-health, food insecurity, obesity, gender inequalities (Friend and Moench 2013; Jordan 2018; Currenti et al. 2019; Doherty et al. 2019), or with continually evolving stressors that affect everyday life (Câmpeanu and Fazey 2014; Rahman et al. 2018). The pathways through which these challenges are experienced as a community also depend on interplays between different ethnic, cultural or socioeconomic groups (Fazey et al. 2016); through relationships with local and regional governments and other actors (Woodruff et al. 2018; Revell and Dinnie 2020); and through differing contexts of social power (Ramcilovic-Suominen and Kotilainen 2020; Revell and Dinnie 2020; Haverkamp 2021). Some communities face existential threats from climate change, ranging from challenging communities sense of culture, value or identity (Jacob et al. 2010; Jaakkola et al. 2018; Doloisio and Vanderlinden 2020; Espeso-Molinero and Pastor-Alfonso 2020) to threats to actual existence, such as experienced by those having to relocate in the face of major coastal land loss and sea level rise (Connell 2016; Bisschop et al. 2018).

Community resilience can thus be considered to be the ability of a community to adapt to different kinds of interconnected social, environmental and economic change and in ways that promote further change towards healthy community functioning (Magis 2010; Wilson 2013; Fazey et al. 2018a). Recent reviews highlight there are diverse approaches to building or enhancing community resilience (Ross and Berkes 2014), including: capturing stories about place to inspire change; building intangible social assets to reduce vulnerability (Burnell 2013); and using community participation, assessment or planning (Pfefferbaum et al. 2015). Resilience building is, however, predominantly a social process involving different actors working and learning collaboratively (Hahn et al. 2006; Sitas et al. 2016; O'Donnell et al. 2018). It requires, for example, building relationships and trust, creating organizational linkages, boosting social supports, developing decision-making capacities and trusted sources of information (Norris et al.

2008; Cavaye and Ross 2019). Many resilience initiatives require customised approaches for each unique community (Pfefferbaum et al. 2015) and support from a proactive local government as well as shifts at wider regulatory and political levels (Revell and Dinnie 2020; Schneider et al. 2020). To be effective, resilience building tends to require going beyond working with symptoms to also addressing underlying drivers of risks and vulnerabilities, such as particular socioeconomic trends and inequalities (Bassett and Fogelman 2013; Choudhury and Haque 2016). Given the rapidity of social, environmental, economic and other change, building community resilience is thus likely to require transformational thinking and approaches (Cutter 2020).

Resilience building is complementary to community development (Zautra et al. 2008; Ross and Berkes 2014; Henfrey and Giangrande 2017; Cavaye and Ross 2019). Community development provides important insights about how to achieve endogenous or sympathetically facilitated 'bottom-up' iterative processes and enhance confidence and capacities for collective working towards practical needs and to learn from successes and set backs (Bhattacharyya 2004; Matarrita-Cascante and Brennan 2012). This includes insights about empowerment, improving well-being of the more disadvantaged, and challenging structural relationships that keep such people disempowered (Brown 2016; AlWaer and Cooper 2020; AlWaer et al. 2021). Such work emphasizes the need for building capacities for self-reliance while also enhancing linkages, support and partnerships at higher social scales (Chapin et al. 2016; Ayal et al. 2017; Henfrey and Giangrande 2017). Social-ecological strands of resilience, on the other hand, highlight the need to work in integrated ways with systemic and interconnected issues, such as across sectors (e.g. adaptation and mitigation, water and food), social scales (e.g. from families, communities to governments), and time (past, present, future) (Berkes and Ross 2013; Wilson 2013, 2014; Chandler 2014). Community development and resilience both highlight the need for capacities for effective navigation of diverse norms, values, perspectives and interests (Voß et al. 2007; Fazey et al. 2011; Kenter et al. 2011; Brown 2016). Yet, despite important insights from both social-ecological strands of resilience and community development, there still has been limited cross fertilization of ideas (Matarrita-Cascante and Brennan 2012; Berkes and Ross 2013).

This research aims to understand the social dynamics involved in resilience building to inform how it can be improved in practice. The work analyses the dynamics of the Scottish Borders Climate Resilient Communities (SBCRC) project in the UK, which applied an action-oriented, participatory, systemic, and relationship building approach and combined insights from resilience and community development. Our research assumes that developing knowledge about resilience building requires learning from trying to

do it in practice. Rather than providing an evaluation of the project's outcomes, the focus is to understand how resilience-building unfolded, and the implications this has for enhancing future efforts. The paper first explains the context and change process applied, followed by methods used to understand the social dynamics, the findings and discussion. The paper is important because it: focuses on the 'how' of community resilience building rather than the 'what' of concepts and problems; includes a novel process for resilience building; and presents a new grounded theory of the social dynamics involved.

Materials and methods

The focal project

Aims and context

The SBCRC project, which brought together insights from resilience and community development, aimed to enhance resilience of three communities to shocks and stressors of climate change by working with interconnected issues and

challenges. This involved operationalising ten essentials of resilience (Fazey et al. 2018a), such as working with interconnections across issues like housing, land use, inequalities, flooding, adaptation and mitigation; working vertically across governance scales; working with different normative goals, envisioning and enacting new futures and by encouraging learning and capacities for adaptability.

The 15-month project (May 2015–September 2016) worked with three communities (Peebles, Hawick and Newcastleton) in the Scottish Borders, a region south of Edinburgh on the east coast of Scotland (Table 1). The region includes a network of small market towns that historically developed along the rivers, with the water used to drive mills for a once thriving textile industry (McLean 2016). The region has an ageing demographic and is known for rural recreation (game fishing, mountain biking, tourism), large-scale farming and commercial forestry. Its most immediate climate related challenge is flooding, with eight areas being acutely disadvantaged in terms of flooding, including some of the larger towns and rural villages (Kazmierczak et al. 2015). Flooding is increasing (Werritty and Sugden 2013) and is combining with other issues, such as potential rising food prices and low employment, thereby increasing

Table 1 The three communities involved in the resilience building project

Town	Character and issues
Peebles	Originally an important market town with a population of around 8000 River Tweed and its tributaries run through the town. Some areas of the town located close to these watercourses have a history of flooding Close proximity to Edinburgh with good transport infrastructure. Many residents travel to Edinburgh for work. Educational qualifications are generally high A high number of elderly people with many young adults moving away to access a wider range of work opportunities Numerous community groups, such as those focusing on local food, youth development. A Community Resilience Group works to address flooding in the Tweed Green area A key challenge was managing issues with Peebles being a commuter town (e.g. many people being absent during the day reducing cohesion, high house prices making it difficult for local people to remain)
Hawick	Industrial town centrally located and one of the largest in the region with a population of around 15,000 The town grew around an internationally renowned textile industry with mills powered by the waterways that run through the town Industrial decline has led to job losses and a reduced population, especially younger, more economically active people Many industrial buildings remain and there is a history of flooding across large parts of the town There is an active, self-initiated local flood action group and a recent Community Resilience Group established by the Community Council and the Scottish Borders Council The primary challenge facing Hawick is how to enhance urban regeneration of the town
Newcastleton	The remote, rural community is in the far south west of the Scottish Borders region with around 800 people Newcastleton was a planned settlement, built on the flood plain by a local landowner in 1793 Main sources of employment are forestry, agriculture, and tourism, with main conurbations being 22 miles away on roads that are often single lane Over the last few decades, the village has lost a number of key services (e.g. petrol station, railway) There is a relatively high number of elderly people in the community and young people often move away for employment The community council and the community development trust are key groups, with much of the focus on strengthening physical connectivity e.g. IT and transport The community is well organized, and despite not having a formalised resilience group, it provides support in emergency situations The village is exposed to flooding on a regular basis The primary issue facing Newcastleton are the challenges of rural development

stress in communities. The sector most involved in working with climate change has been the emergency services and local government, such as through establishing local community resilience groups. This work has primarily focused on enhancing capacities to respond to shocks rather than being framed as working with climate change.

The three communities were chosen because they had a history of growing impacts of climate change (mostly flooding), but also provide different contexts and challenges (urban regeneration, commuter town, rural development) (Table 1). The project was implemented on a small budget (£100,000) with funds provided by the Joseph Rowntree Foundation's Climate Justice programme. The team included the University of Dundee, the Scottish Borders Council, Tweed Forum, Southern Uplands Partnership, the International Futures Forum and the Scottish Association for Marine Science. A dedicated project officer was embedded in the Scottish Borders Council. In total 284 individuals participated in the project. 219 attended workshops with 166 being community-based participants and 53 coming from established organisations, such as public bodies (e.g. Scottish Environmental Protection Agency, the Forestry Commission, and Scottish Borders Council); local organisations

(e.g. Housing Associations and a large local Estate); and from other NGOs with a focus on rural development, energy, and environmental management.

Four-tiered process for community resilience building

A community resilience-building process was implemented that included eight main features, conceptualised as four interacting tiers (Figs. 1, S1). The first tier focused on developing relationships and trust between the project team, community members and representatives from different organisations (e.g. statutory agencies, local government and nongovernmental organisations). This was then supported by the second tier that focused on enhancing capacities to work with interconnections across issues, social scales and time and to enhance agency for more holistic approaches to resilience. The third tier then supported the first two by guiding how the project was implemented. This included: three workshops in each community and a policy synergy workshop; actions implemented in collaboration with different stakeholders in each community between the workshops; and implementation of principles of community development. These aspects helped ensure the process enhanced

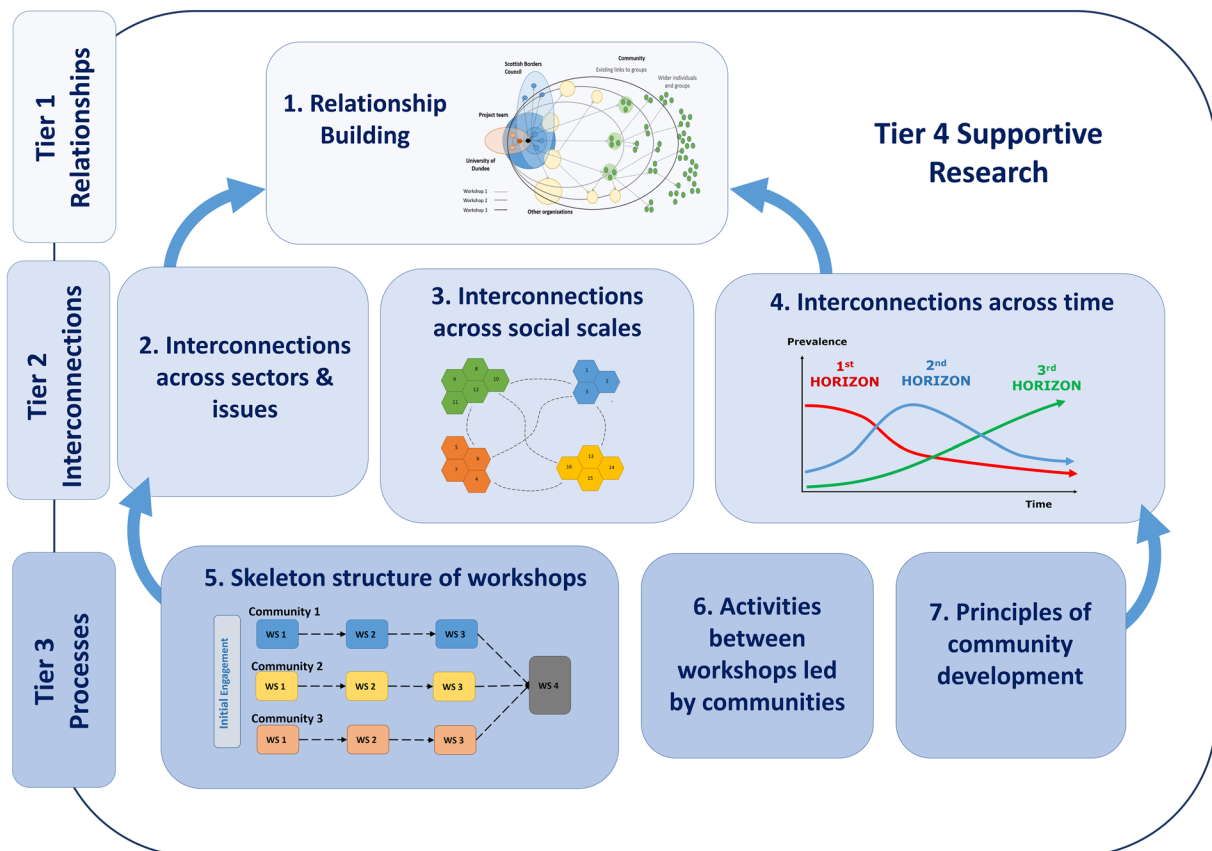


Fig. 1 The four-tiered community resilience building process (See also S1)

participation, co-learning and capacities for collaborative action. The fourth tier provided action-oriented research to iteratively support the project as it unfolded and to elicit insights for future initiatives (this paper). The ‘research’ was delivered in a participatory way to complement other tiers, including co-learning and relationship building. Full details of the resilience–building process are outlined in S1.

Importantly, while it was recognised from the outset that the way resilience was conceptualised mattered, the project deliberately did not seek to directly draw out interpretations and framings of the concept of resilience. This was to ensure the main focus was on building trust and relationships with different actors and ensure the project was immediately relevant to them, which would have been hampered by too much focus on such a contested term and to which any consensus was unlikely to be achieved. Instead, underlying aspects of what was already known as being key to resilience were explored, such as drawing out understandings of the interconnections between many facets of climate change, exploring how these related to the dynamic and localised nature of each community, and then how this connected to those disadvantaged within them. This then provided opportunities to support learning and gradually build collective understandings of the complex nature of climate change, helping avoid superficial responses and actions. As such, it was through gradual exploration and attempts at building resilience that participants developed and shared their understandings of community-based change, and thus a deeper understanding of both the nature of community resilience and how it comes about.

Research methods

Approach

The research aimed to develop ‘how to’ knowledge for resilience building. ‘How to’ knowledge has generally received limited attention compared to problem analysis in academia. Doing so requires different approaches that can elicit and develop practice-oriented knowledge, such as embodied *techné* and *phronesis*, as well as more abstract *epistémé* (Rolfe 1998; Flyvberg 2001; Fazey et al. 2018b). To advance ‘how to’ knowledge, this study was thus framed as second order research (Umpleby 2016). This rejects the often implicitly held assumption that researchers can and should be independent of what they observe. Instead, second order scientists actively work ‘as if from within’ the system being studied (Umpleby 2016; Fazey et al. 2018b) with knowledge generation and action viewed as being closely intertwined and being more aligned to issues of community importance (Greenwood and Levin 2007; Umpleby 2016).

A second order approach enabled a co-creative process where different actors played diverse and complementary

roles. For example, ‘researchers’ acted as facilitators, project managers, and knowledge brokers and ‘practitioners’ acted as researchers, such as by helping collect and make sense of data and by being critical observers. It included a primary ‘pracademic’ (E. Carmen)—an embedded researcher and practitioner—who was the central actor and meaning-maker in the project. Validity was then assumed to have been enhanced because participant researchers were closely aligned to the messy real-world of action, enabling them to learn from it rather than being divorced from its practice. This work was, however, also supported by systematic processes that encouraged reflexive monitoring about how being embedded influenced insights as they emerged (Arkesteijn et al. 2015) (S1).

Data collection and analysis

While researchers were embedded in action, to understand the social dynamics of resilience building, four explicit data sources were collected:

1. A reflexive diary kept by the primary pracademic: This provided detailed reflections on discussions, workshops, meetings, local policies, practices and initiatives, how the project was unfolding and why, emerging storylines and narratives, and critical learning and observations about the social dynamics involved. Diary entries were made throughout the project, such as after significant meetings and workshops or when faced with obstacles or challenges.

2. Formal interviews conducted by an evaluator (J. Rao-Williams): This included 47 face-to-face or telephone interviews of 20–30 min, mostly with the same participants at different project stages (27 different participants, with 9 from the project team, 9 from participating organisations: and 3 from each community). Interviews focussed on project progress, what was or was not being achieved, challenges and opportunities, and assessed tangible, capacity building and learning outcomes. Findings were fed back into the project as well as being used in later analysis.

3. Surveys to evaluate the ten workshops to understand participants’ perceptions of project progress and their learning.

4. Three formal reflective meetings and a final reflective workshop with the project team: This helped surface new insights, confirm or challenge emergent thinking, and consider why particular outcomes and findings were occurring.

The data were triangulated and analysed to develop a grounded theory of the social dynamics of resilience–building through three iterations (Fig. 2a). This included: coding and development of project timelines and the different

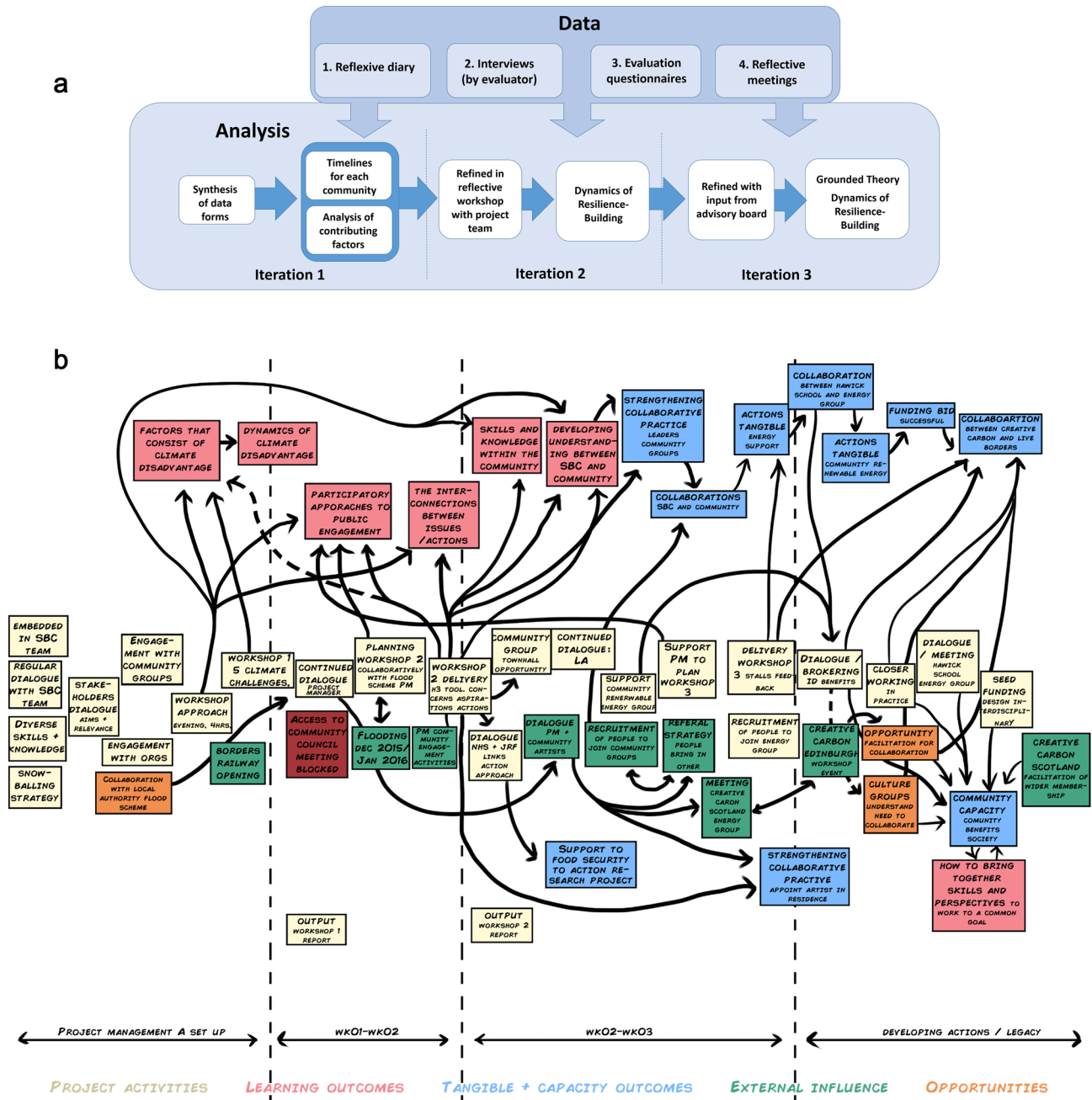


Fig. 2 Analysis: **a** The iterative process of data analysis and **b** an example of a timeline produced for each community during analysis. Yellow: Project activities; Pink = Learning outcomes; Blue = Tangible and capacity outcomes; Green = External influence; Orange = Opportunities

influences on emerging outcomes (Fig. 2b); refining timelines with team members; further refinement and development of a causal loop diagram (CLD) (Sterman 2000) to show key influences and feedbacks and enable wider systemic insights to be derived (see full details in S1). Ethical clearance was obtained through the University of Dundee.

Results

The resilience–building unfolded in different ways in each community (Table 2, Fig. 3). In Hawick, the project capitalised on the existing work of the local government and engineers who were designing a new flood scheme to bring in community members to re-shape designs so the scheme contributed to wider systemic issues. In Peebles,

Table 2 How projects unfolded in each community

Town	Storylines and outcomes
Hawick	<p><i>Storyline</i></p> <p>Collaboration quickly established in early phases between the project team and the team developing the Hawick flood scheme</p> <p>First workshop explored climate change disadvantage and further consolidated collaborative working</p> <p>Series of flood events hit the town (1 in 55 year event), occurring five days before, and enhancing interest in the second workshop</p> <p>Second workshop used diverse participatory methods to explore local impacts from the recent flooding, followed by visioning and then considering how an alternative future for Hawick could be developed using community action to generate multiple solutions through changing the design of the Hawick flood scheme</p> <p>An extensive programme of community action including different work streams led by community members (e.g. renewable energy, art, education, business, regeneration) developed ideas</p> <p>Ideas fed into a large community exhibition (third workshop) about how the proposed flood scheme could create potential synergistic ideas for wider community benefits, such as implementing community water powered renewable energy</p> <p>Continued support was provided to develop the community renewable energy actions, including work to strengthen links with other work stream groups</p> <p><i>Outcomes</i></p> <p>New studies and funding to continue community engagement and progress specific actions, e.g. external funding for an in river renewable energy feasibility study</p> <p>New partnerships to continue to progress actions grouped around specific issues, such as cultural identity, renewable energy and supporting the local economy</p> <p>Increased capacity for collective action to build community resilience to climate change through joining work on climate adaptation, climate mitigation</p>
Peebles	<p><i>Storyline</i></p> <p>Bringing together wide range of community orientated groups</p> <p>Examining climate disadvantage, with community research team to explore this further, including from local housing associations</p> <p>Using Three Horizons to explore alternative futures and actions. The latter included focus on adapting to flooding, youth employment and climate change mitigation</p> <p>Series of flood events (1 in 50 year events), resulting in change in focus towards expanding a community resilience group to include the whole of the town</p> <p>Third workshop builds on the new momentum following floods to explore how to fully establish and sustain the community resilience group</p> <p><i>Outcomes</i></p> <p>Learning outcomes, such as about systemic issues, community participation tools, and disadvantage were high</p> <p>New, more collaborative relationships between the Scottish Borders Council and community members were formed and enhance</p> <p>The community-based resilience group continues to be active, with major contributions to other crises and challenges affecting the town</p>
Newcastleton	<p><i>Storyline</i></p> <p>Climate disadvantage was explored in first workshop</p> <p>High river flows resulted in precautionary evacuation of households</p> <p>Second workshop explored alternative futures for the community and identified actions to help bring this about</p> <p>Activities between the workshops focused on building relationships and understanding between the project team and key community members, for example those involved in the community council and the community development trust</p> <p>The third workshop was co-designed with key community members. It examined four issues for collaborative working: local flood risk management; establishing a community resilience group; improving energy efficiency; and mobile phone and broadband coverage. The workshop included discussion with different local and national level government and non-government organisations (e.g. Forestry Commission, Broadband Scotland, Home Energy Scotland and Rural Housing Scotland)</p> <p><i>Outcomes</i></p> <p>Action plan co-developed between the Scottish Borders Council Emergency Management team and key community members for a collaborative community resilience group</p> <p>Inclusion of the community in an initiative examining broadband coverage in the wider area being led by one of the project partners (Southern Uplands Partnership)</p> <p>Capacity for collective action between the community and local organisations</p>

effort focused on building relationships between diverse actors, which eventually led to establishing a community-based resilience group to work collaboratively with local emergency services. Finally, in Newcastleton, new relationships between the community and local authority were

formed, leading to new collaborative working groups and community-based initiatives (Table 2, Fig. 3).

From a critical stance the tangible outcomes may seem limited. Yet, while we do not seek to over-claim success, in a short period the project also laid important foundations and capacity for collective working across different sectors

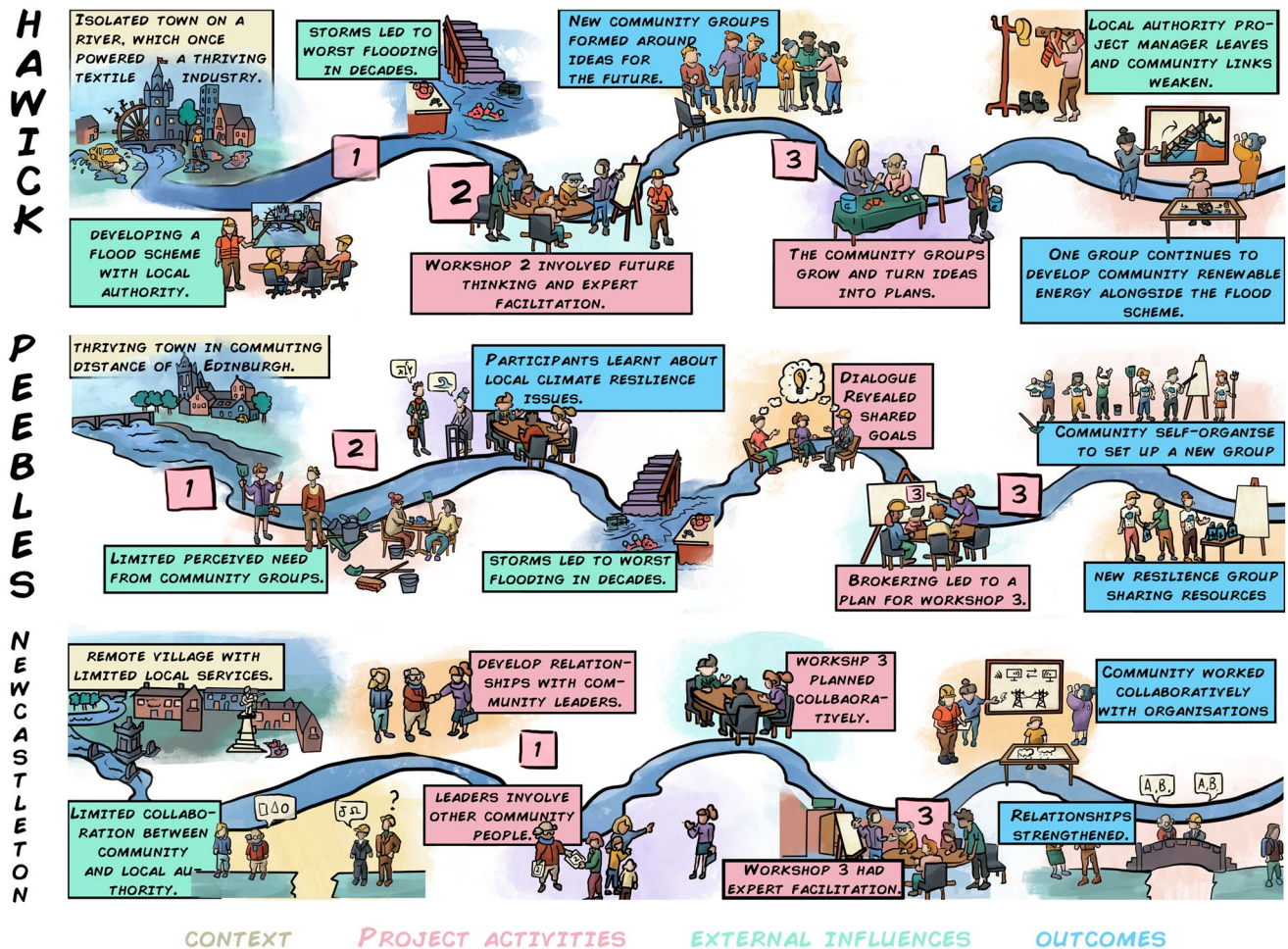


Fig. 3 Visual overview of how projects unfolded in each community. Yellow boxes are the issues around context of each community; pink boxes the project activities; green boxes external influences and blue

boxes key outcomes. Numbers refer to the workshops, which provided structure around which other activities occurred

and governance scales from which long-term systemic interventions were beginning to become possible. Had the project received long-term support, more transformative and holistic outcomes and action are likely to have emerged. The grounded theory emerging from the analysis explains how the different aspects of the social dynamics led to these important foundations (Fig. 4). These dynamics included five main reinforcing loops (R1–R5) and four key influencing factors.

Reinforcing loop 1: strengthening relationships enhanced collaborative action

The first reinforcing loop, relationships and collaborative action (R1, Fig. 4) represents how enhanced *strength of relationships and trust* from relationship-building efforts (e.g. enhancing connections between actors, convening dialogue, mediation between groups) led to greater *willingness and ability to wield power collaboratively*. Social power

had been expressed in the project in different ways, such as how participants: shared or withheld information; enabled or allowed meetings; chose to be absent or present; held on to, or chose to apply scarce human, monetary or physical resources; or in the way they made different decisions with or without certain people. Power was thus not simply wielded by those in local government because they could make decisions across wider geographical scales and provide support over a large number of communities with limited resources. Instead, the need for local government and wider actors to provide equitable support across a large geographic area and for many people meant that these actors were highly dependent on cooperation by community members who also wielded their own kinds of convening power, such as in choosing who and when they engaged. As greater willingness to collectively wield power emerged, however, this then increased *likelihood of effective collaborative, systemic action*.

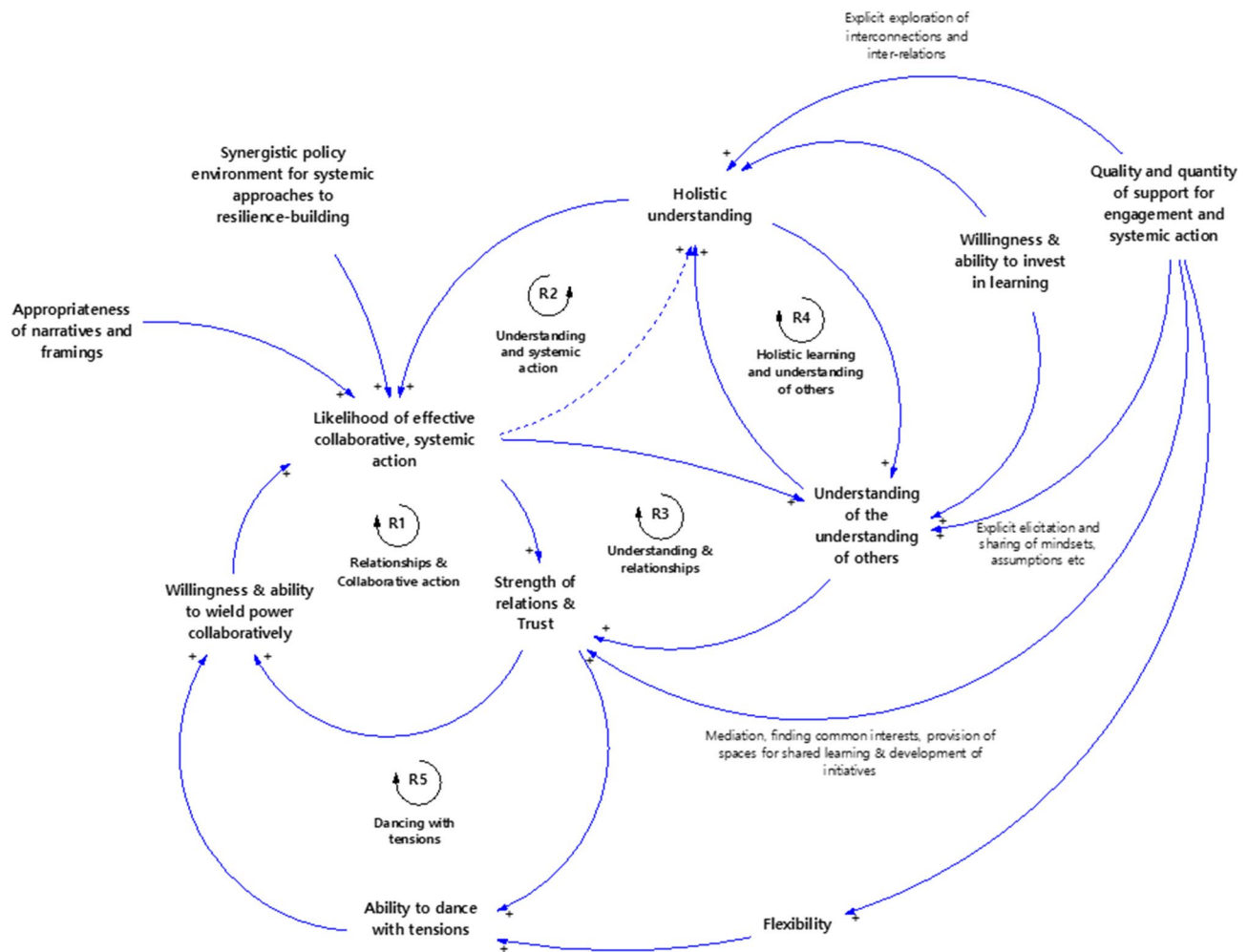


Fig. 4 A grounded theory of the social dynamics of resilience-building represented as a causal loop diagram (Sterman 2000). Arrows indicate a causal relationship between variables with the direction of the arrow indicating the influence of one variable on another. Polarities explain the nature of that relationship. Positive polarities indicate that when an initial variable increases or decreases, the variable it influences changes in the same direction. ‘R’ labels indicate rein-

forcing feedback loops. That is, the direction of change (increase or decrease) in one variable affects other variables so as to reinforce the direction of change in the initial variable. Solid arrows are influences supported by empirical research findings. Dashed arrows appear to be occurring, but the precise evidence has not been able to be fully substantiated

An example was in Newcastleton, where community members already had extensive motivation and considerable capacity for action, but were initially deeply concerned about loss of autonomy if they worked more closely with the local authority, in which the community had limited trust. Extensive effort was then made in the project to enhance working relationships, with the project officer and those from a third-party organisation often acting as mediators. Once initial levels of trust had been developed, multiple actions rapidly flowed (Table 2, Fig. 3). For example, as collaborative working increased, then so did relationships and trust, closing the feedback loop (Fig. 4, R1). In all cases collaborative working continued for at least two years after the project ended. In Newcastleton dialogue continued through partnerships to examine land use (Table 2) and in

Hawick a community group established in the project had made significant progress in developing a renewable energy scheme. Enhanced collaborative action between communities and local government also directly enhanced effectiveness of responses to flooding and extreme weather events of winters 2016/17 and 2017/18. Thus, the extensive focus on relationship and trust building proved critical for long term, novel and collaborative outcomes.

Reinforcing loop 2: learning about systemic aspects enhanced likelihood of collaborative systemic action

The interviews with participants highlighted the process stimulated greater learning about what constitutes

disadvantage, the systemic nature of climate change, processes and skills in facilitation and community engagement, and the diverse expertise of others (e.g. about flood risk, renewable energy, community development, poverty initiatives) (Fazey et al. 2017). This learning enhanced the way participants understood interconnectivities between issues, with the enhanced *holistic understanding* increasing *likelihood of collaborative and systemic action* (R2, Fig. 4). In Hawick, for example, as the flood scheme began to be viewed more widely and in holistic ways, other working groups emerged that focused on the arts, education, economic development, and recreation, enhancing possibilities for systemic action. Further, while not fully evidenced, there were also suggestions that engaging in more systemic-oriented aspects reinforced holistic understanding (R2, Fig. 4). Future initiatives seeking to enhance ability to work with interconnections between issues therefore need to provide the right conditions, and increase the opportunities, for doing so.

Reinforcing loop 3: learning to understand the understanding of others enhanced relationships and collaborative action

The extensive work on engagement exposed participants to diverse perspectives, mindsets, values and expectations of others. Many of those involved expressed how this helped them develop *understanding of the understanding of others*, which in turn increased *strength of relationships and trust*, leading to more *collaborative action*, closing the feedback loop (R3, Fig. 4). In the project, the loop was enhanced by actively surfacing and working with different mindsets, assumptions and action logics. For example, there were different perceptions of how change was expected to come about and who had power in decision making. In many cases, the different perspectives stemmed from adherence to traditional notions of governance and control. For example, those from local government often implicitly assumed a more top-down approach because they could not see how devolving decision making would enable them to retain sufficient control to ensure statutory obligations were met, such as ensuring public safety in relation to floods where quick and decisive action is needed. While many such issues were difficult to surface and challenge, when it did occur, substantial breakthroughs occurred. For example, in Newcastleton mediation between opposing perspectives unleashed possibilities for a new kind of relationship, unlocking possibilities for a number of different initiatives to emerge. (Fig. 4, R3). Overall, ability to enhance understanding of the understanding of others and work with this in constructive ways proved important for systemic and collaborative outcomes to occur.

Reinforcing loop 4: Holistic learning and understanding of others

Enhancing *understanding of the understanding of others* also enhanced *holistic understanding* and appreciation of the interconnected nature of climate resilience (R4, Fig. 4). For example, in Hawick participants' different orientations to the future were explored in a workshop to shape the design of a new flood scheme. The workshop, by chance, occurred five days after a major flood that caused significant damage, with some residents losing homes. While tensions in the workshop were extremely high, the futures approach helped participants to work simultaneously with different future-oriented mindsets (managerial, entrepreneurial and visionary). Surfacing and legitimising all three mindsets completely changed the atmosphere from one of anger and fear to one of hope, motivation and greater trust, and ultimately to formation of highly motivated working groups. This opened up space for greater appreciation of the holistic nature of the challenge, increasing *understanding of the understanding of others*, thereby closing the feedback loop (Fig. 4, R4). The key lesson here was that enhancing understanding of the understanding of others through surfacing and working constructively with different orientations to the future enhanced willingness and capacity to work with interconnected issues in more holistic ways.

Reinforcing loop 5: Dancing with tensions

Enhanced *strength of relationships and trust* also enhanced *ability to work with tensions*, which led to greater *likelihood of collaborative action*, reinforcing *relationships and trust* (R5, Fig. 4). Tensions are dilemmas that cannot easily be reconciled and for which there is no single right way to approach them (Höijer et al. 2006). Instead, continuous reflection and re-orientation is needed to 'dance' within an accepted bandwidth between the extremes of the different dimensions involved (Sharpe et al. 2016).

In this project, many tensions were experienced (Table 3). This included tensions between perceived need for achieving quick outcomes versus long-term goals and between the extent to which participation versus direction was needed, with some community members wanting more involvement in decisions and action while local government members struggled to see how this could be achieved. In some cases tensions were able to be managed through balancing others. For example, participation versus direction was partially foreseen and managed by balancing structure versus flexibility, where a skeleton of community workshops provided a degree of direction (Fig. 1) but which was then used flexibly depending on shifting and emerging needs stemming from participants. Achieving balance between participation and direction was further supported by balancing provision

Table 3 Tensions experienced in community resilience building

Tension	Explanation
1. Climate change focus vs Local interest	Focusing directly on addressing climate change issues may not be directly aligned with immediate interests or perceived needs. There is a key challenge about how to maintain interest while also moving towards a genuine focus on climate change
2. Holism vs Focus	Integrating issues and connecting agendas is important to enhance community resilience, but too broad an approach can limit focus and direction
3. Generalised vs Specified resilience	Enhancing generalised resilience is important for developing capacities to respond to unanticipated shocks and stressors while specified resilience is needed for specific issues (e.g. floods or droughts). While both are important, they require different approaches and emphasis. Decisions are needed about where to allocate effort and resources
4. Learning vs Tangible action	Encouraging learning about complexities and inter-related issues is important but with limited time and resources this can detract from achieving more tangible outcomes ('getting things done')
5. Relationships vs Tangible action	Building relationships and trust is critical for collaborative and long-term outcomes but takes time and extensive effort. In some cases, too much focus on this aspect may detract from achieving more immediate outcomes
6. Quick wins vs Longer term outcomes	Achieving immediate outcomes is important to maintain interest, but this can be at the expense of achieving a sustained legacy from a project. Most resilience builders will be under extensive pressure to deliver day to day activities and may have limited resources to focus on integration across sectors and time, which will be important in the long term
7. Depth vs Breadth	Considerable attention to working with a small number of communities may not be sustainable for larger scale impacts. Thus, while relationship-building and in-depth learning is important, it may be difficult to know how to take work forward once a project has been completed
8. Innovations to support status quo vs Innovations for change	Innovations are likely to be needed to address immediate concerns, but these also tend to support existing ways of doing things. Innovations are also needed that disrupt the status quo and lead to more transformational kinds of change. This tension often manifests as different perceptions of stakeholders and team members about what is most important or urgent, and can stem from different demands placed upon them
9. Participation vs Direction	Genuine participation and engagement takes time to form new, or strengthen existing, relationships and requires perceptual changes in the relative roles of the individuals or groups involved. Yet being highly participatory can sometimes detract from achieving goals, which can sometimes be better achieved through greater control and direction
10. Structure vs Flexibility	Sufficient structure is needed to ensure a degree of focus of a project and maintain motivation for participant engagement. However, a high degree of flexibility is also needed to meet different stakeholder needs and to work with challenges and opportunities as they arise
11. Providing support vs Encouraging autonomy	In many communities, support is needed to manage and work with the complexities associated with climate change. However, provision of too much support can create dependency. Thus there is a tension between how much support should be provided and how to encourage greater autonomy. Facilitators need to balance stepping back and handing over ownership with the possibility of an action failing, while also being able to step forward to provide support when capacity may be lacking
12. Independence vs Vested interests	Independence is needed for effective facilitation, but this is not always easy to achieve given that it is rare fully independent facilitators will be available. Project team members are likely to have vested interests such as needing to deliver what is needed from their respective organisations

Table 3 (continued)

Tension	Explanation
13. Participation as empowerment vs Participation as a means to an end	Tensions are likely between having projects that aim to be genuinely empowering, with participation viewed as an end in itself and ideas generated being community owned and developed, or whether the projects and participation are mostly viewed as a means to an end, with the 'ends' being predetermined and participation used to help achieve those ends. The former places a strong emphasis on capacity, learning, and relationship building and the latter is more focused on achieving more immediate or tangible outcomes
14. Embedded vs Independent researchers	Research is critical for informing projects as they progress. While having researchers embedded within projects and involved in action can enhance learning about the process because they are closer to action and develop know how knowledge there are also sometimes advantages in having a more independent perspective
15. Data collection vs Action	Resilience-building is primarily an action, but which can be supported by research. Tensions may then arise around the extent to which engagement with diverse participants is designed for dialogue or whether it is designed for the elicitation of data which, when analysed, can enhance learning about how to improve the process

of support versus encouraging autonomy, where there was a continuous dance between assisting community activities and then stepping back to encourage ownership and autonomy. This, however, was complicated by independence versus vested interests of project team members, where the project team needed to be independent to provide genuine facilitation and participation but who also were accountable to their own institutions and project funders.

Overall, as relationships and trust were enhanced, those involved developed greater willingness to work with tensions in more constructive ways, leading to greater likelihood of collaborative and effective systemic action, and eventually closing the feedback loop (R5, Fig. 4). This was enhanced by anticipating tensions, which suggests that future projects could be enhanced by surfacing tensions at the outset and finding ways to work flexibly with them.

Additional influence 1: willingness or ability to engage in radical learning affected potential for transformational outcomes

In addition to reinforcing loops, there were four critical influences affecting how projects unfolded (Fig. 4). The first was *willingness and ability of participants to invest in learning*, which was key to exploring and breaking out of particular mindsets and assumptions (Fig. 4). Many participants, for example, missed critical opportunities for learning because, at short notice, they were required to respond to urgent duties elsewhere. New approaches that can quickly draw out implicit thinking, work with underlying assumptions, and enhance willingness of those involved to engage with uncomfortable and messy learning processes are therefore

needed. Finding ways to do this was a significant challenge in the SBCRC project.

Additional influence 2: quality and quantity of support affected opportunities for relationship building, learning and working flexibly with complexity and tensions

Quality and quantity of support was critical to achieving collaborative and systemic action (Fig. 4). This support included high level skills in facilitation, participation, and working with systems and futures. While such skills are often highlighted as important (Hagmann et al. 2002; Sitas et al. 2016), they are also often overlooked, not sufficiently resourced, or available. In the SBCRC project the dedicated project officer was essential to support community-based projects while facilitation and futures methods and skills were key for working with tensions, encouraging holistic understanding, understanding others, and in strengthening relationships and trust (Fig. 4). Quality support also enabled flexible working. An example was when major floods struck each community, providing opportunities to galvanise action and form new resilience groups in two of the towns: Peebles and Newcastleton. Flexibility was also greatly enhanced by having an adaptable funder and a project focused on 'softer' process related goals of learning and relationship building as well as more tangible fixed outcomes. Overall, the quality and quantity of skilled support proved to be a necessity rather than a luxury.

Additional influence 3: framings of resilience shaped community resilience building

The *appropriateness of narratives and framings of resilience* affected *likelihood of collaborative working and potential for systemic action* (Fig. 4). As outlined in the methods, given the highly contested nature of resilience, the project did not initially open up conversations about the concept. Instead, it assumed that both resilience building and shifts in understanding about the concept had to be part of a wider learning journey, developed over time and shifting with experience and exposure to the perspectives of others. Nevertheless, different framings of resilience clearly had an influence on how different parts of the project unfolded. For example, in Newcastleton, resilience was framed by the community as coming from building capacities to work with longer term stressors such as employment and limited access to infrastructure. This was in contrast to those from the local government who framed resilience as enhancing efficiencies and ability to respond to more immediate shocks. Lack of alignment of framings slowed collaborative efforts and detracted from working towards longer term challenges, such as those associated with climate change. Thus, while levels of trust were not sufficient at the outset to tackle contested framings of resilience, opening up conversations about the differences as part of a follow-on stage of the project is likely to have been helpful. This would, for example, have allowed for further exploration of deeper implicitly held assumptions about social power, such as who needed to wield power and when to enable change to happen. In Newcastleton, this would have been helpful in establishing how they could be further empowered to take action for the longer term while also ensuring the local authority also retained control so they could meet statutory obligations, such as ensuring safety of people when they were at immediate risk from flooding.

Additional influence 4: the policy landscape influenced community resilience initiatives

A key influence on community resilience building was the *policy environment*, including wider political, legal and decision-making contexts in which communities and local governments were embedded (Fig. 4). Four key aspects were identified by policy professionals that limited effectiveness of community resilience building: (1) tendencies to favour economic growth over longer term climate resilience in cost–benefit decisions; (2) limited community capacity to work with climate challenges; (3) poor coordination across policy domains that limited opportunities for multiple gains; and (4) limited approaches for working with highly interconnected challenges. These policy environments tended to be outside of the control of both communities and the local authority, but had an important influence on what was deemed possible.

Overall dynamics

The combined ‘system’ of the social dynamics of resilience building (Fig. 4) has important implications. First, all of the components described were important for resilience building, and together provide ten lessons to guide future initiatives (Table 4). Importantly, however, when these aspects were enacted together and efforts were put in to help make connections between them, they began to stimulate a beneficial reinforcing process. That is, once critical thresholds in relationship building and trust had been achieved, and with support from working with other elements in the system, a more regenerative process began to emerge. In effect, rather than just enhancing what existed, a new systemic structure had been created, allowing a new set of dynamics to occur. This suggests

Table 4 Ten requirements for emergence of a self-reinforcing process of community resilience building

Lesson

1. Enhance relationships and trust to enhance collaborative action and reinforce relationships
2. Enhance learning about systemic aspects to stimulate collaborative and synergistic action
3. Enhance understandings of the understanding of others to build relations and support systemic action
4. Surface, and find ways to work with, different values, mindsets and assumptions to develop more holistic understandings
5. Surface and work flexibly with tensions
6. Invest time and effort in, and enhance willingness to, engage in deep and systemic learning
7. Provide appropriate quality and quantities of support for engagement, participation and systemic action
8. Build in, and ensure support for, high levels of flexibility
9. Make wider narratives and framings of resilience, governance, and change explicit, and explore how these affect approaches to resilience building
10. Develop a deep understanding of how current policy environments support or hinder community–resilience building and strategically develop alliances, navigate governance at wider scales, and make locally based decisions

that, at least theoretically, major change may be possible in the long term if there is an appropriate focus on systemic forms of change, the capacity to work with it, and sufficient attention to capitalise on the reinforcing nature of the social dynamics involved. Thus, while wider sociopolitical scales are important, and achieving deeper transformational change is difficult, communities in this project did at least begin to appear to be developing agency and capacity for change, helping them to become the drivers of change. It did, however, require extensive work and specialised support, and it was not clear how much and for how long support would have been needed for longer term outcomes to be realised.

Discussion and conclusions

This research sought to help meet growing demand for knowledge about how to do community resilience–building in practice by learning through action. The findings highlight the complexities of resilience–building, requiring those involved to work with the messy and often intangible world of mindsets, assumptions, desires, relationships, power and trust. They show that this, in turn, requires a complex array of resources and capacities and being ready to capitalise on different opportunities as they emerge (summarised in S2). In particular, it involved being able to hold ‘spaces’ where contestation could be surfaced and worked through while also making sure those involved felt the process was of relevance, while also bringing long-term issues to the fore. Such resilience building is a ‘practice’ which, like the subconscious and embodied action of driving a car, requires learning by doing, and not just focusing on the development of abstracted epistemic knowledge.

Much of the challenges in the project related to inability of those operating at a single community scale to influence wider social contexts, including sociopolitical conditions, governance, fiscal and legal structures, framings and narratives. It also emerged from different needs and different framings of resilience. Some framed resilience through a narrow yet important lens of needing to uphold their statutory obligations to save lives in response to rapid events like floods, and across a large number of communities. This led to a more specified form of resilience, and attention to enhancing efficiencies. For others, it was viewed more in relation to empowerment and enhancing autonomy, but then the same individuals also at other times felt it came from external provision of support. In many ways, resilience was thus a contestation that revolved around who had power, for what and when, with the notion of resilience also changing for different issues. The contestation often limited possibilities for more collective

endeavours, including limiting possibilities for a focus on deeper underlying systemic challenges facing communities or long-term issues associated with climate change.

Importantly, however, the results highlight that as deeper understandings of others, trust, relationships and appreciation of the systemic nature of challenges increased, then so did possibilities for collaborative and systemic action. This suggests significant potential for resilience building efforts to begin to shape social dynamics so they began to reinforce themselves in beneficial ways (Fig. 4). Had the project been able to continue, it would probably have been possible to take it to another level, including tackling deeper contested issues as trust and thus openness to explore differences increased. Importantly, while difficult to disentangle, it also appeared that a new system dynamic had been created, with new connections that led to new beneficial feedback loops. If this is indeed what happened, then the outcome was in line with the kinds of transformational approaches and outcomes that will be needed to work with extensive change (Cutter 2020).

A goal for future resilience–building would thus be to work with the ten key lessons (Table 4) to build self-reinforcing systems in line with emerging ideas of regenerative systems in other domains (Wahl 2016). This would involve reframing resilience building from being primarily about harm reduction (e.g. resilience to prevent loss and damage) to viewing it as a process of creating new system dynamics that reinforce restoration of critical community functioning, health and viability. This is a goal that should not be taken at face value as it would require significant effort to help create the pattern shifts needed for such outcomes and processes to be realised. Much of the insights arising from this project, for example, place a strong emphasis on learning, trust, relationship building, and working with highly contested issues and needs (Table 4). All of these are difficult to navigate at the best of times, let alone for major challenges such as those associated with climate change. Yet, this study suggests that positive outcomes are possible if the right kind of support over the right kind of timeframe is provided.

In terms of the practice of resilience–building, there is relatively little we would change with hindsight given the resources available and context of the project. However, in future projects we would place a much stronger emphasis on two aspects. First, we would seek to find new ways to work with underlying assumptions, particularly among the project team. This could, for example, be enhanced by using the tensions identified (Table 3) to focus dialogue around underlying assumptions that were held about how change was expected to come about. Second, we would seek to find better ways to engage with those more directly disadvantaged. In this project there was extensive engagement which, in many cases, went beyond the usual suspects. This was

achieved because of the way the project built and encouraged a degree of ownership by those involved and ensured relevance to participants. This engagement, however, rarely included those from the most severely disadvantaged backgrounds, and the project failed in this regard. Doing so would require a different skill set and approach, including long-term engagement with disadvantaged individuals and tackling much more deeply rooted issues. For this project, such work was beyond the level of resourcing available.

In addition to practice, the project also had important lessons for research. Having researchers embedded in the action provided greater opportunities to develop ‘how to’ knowledge for resilience. This only worked, however, because it was accompanied by mechanisms that forced critical reflection on how embeddedness influenced meaning-making and provision of opportunities for stepping out of action, as highlighted as being important when a more critical stance is required (Arkesteijn et al. 2015). Further, the insights in the project were also made possible because of a subtle shift in emphasis in the analysis. The conceptual model specifically focused on the social dynamics of the resilience *building* not on the dynamics of the *problem* (e.g. of the existing relationships or dynamics between actors). This important shift enabled the work to go beyond critiquing problems or solutions to actively developing epistemic insights about resilience building as a practice.

Finally, development of ‘how to’ knowledge was ultimately only made possible by approaching the research as if from within the system being studied. This included starting from the premise that the primary goal was to stimulate action not to produce knowledge. This was important in helping shift towards the creation of a different kind of knowledge through action, allowing the development of a new kind of understanding about how such action can emerge. Contemporary knowledge production systems have been heavily criticised because they focus on producing knowledge about the world rather than production of wisdom about how to act within it (Maxwell 2007; Kläy et al. 2015). Shifting to an emphasis on the production of wisdom requires attending not just to empirical truths about the world but also to working with the personal truths people hold about what they feel is important or wish to see emerge. As experienced in this project this involves working with the messy world of emotions, values, and contestations around knowledge, from which most people, if given the opportunity, usually run a mile. Thus, in addition to new framings of resilience, if research is to help develop relevant ‘how to’ knowledge to support resilience building, then new kinds of research and capacities will be required.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11625-021-00950-x>.

Acknowledgements We express thanks to the many different and often inspiring participants involved in the SBCRC project who made this work possible. The project was funded by the Joseph Rowntree Foundation Climate Justice programme. We thank two generous reviewers who helped improve this manuscript.

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