



WHEN DOES RESPOND END AND RECOVERY BEGIN?

Exploring preparation and planning to support
community's resilient recovery.

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List of Acronyms

ERs	emergency responders
RPs	resilience practitioners
NHE	natural hazard emergency
SCCAP	Scottish climate change adaptation program

Section 1: Introduction

When does response end and recovery begin? Exploring preparation and planning to support community's resilient recovery.

The focus of this short research project is the influence that resilience practitioners¹ (RPs) and emergency responders² (ERs) can have upon a community's process of recovery in the aftermath of a natural hazard emergency (NHE).

This is important because a community's ability to effectively recover from impacts of an NHE have implications for that community's future resilience and thus its ability to adapt to the effects of climate change and cope with future emergencies events.

What happens during an NHE can have a profound impact upon every part of a community. There may be physical damage to buildings and vital infrastructure, local businesses may be unable to function, people may be hurt and profoundly shocked by events, trees may have fallen and rivers burst their banks, families may have had to leave their homes, strangers may have turned to one another for help and support, communities may have come together to clear roads and help their neighbours.

ERs and RPs are central to what happens in a community during an NHE. It is the role of ERs and RPs to come into communities when they are hit by an NHE, or any other emergency event, to protect the community and minimise negative impacts (the duties and responsibilities of ERs and RPs are given in section 2, objective one, of this report).

The impacts of the NHE that on a community needs to be dealt with, damage repaired, businesses working, people's physical and mental well-being restored. This is the process of recovery.

The condition of the community, what needs to be achieved so that the community can recover depends upon; what happened during the event, how resilient the community was, and the severity and extent of the NHE. This piece of research explored the influence of ERs and RPs in creating the conditions for community recovery.

Scottish Government Definitions:

Community Resilience

"Communities and individuals harnessing resources and expertise to help themselves prepare for, respond to and recover from emergencies, in a way that complements the work of the emergency responders." (P2, Scottish Government, 2019a)

Resilience

"the capacity of an individual, community or system to adapt in order to sustain an acceptable level of function, structure and identity" (Scottish Government, 2019c)

Box 1 Scottish Government definition (P2, Scottish Government, 2019a) (Scottish Government, 2019c)

¹ resilience practitioners here refers to groups or individuals who are part of an organization (voluntary or professional) involved in preparing for, responding to, and or recovering from emergency events.

² emergency responders here refers to category 1 responders which are defined as the police, ambulance, fire and rescue services, local authorities, NHS Health Boards, the Scottish Environment Protection Agency and the Maritime and Coastguard Agency <https://www.gov.scot/publications/preparing-scotland-scottish-guidance-resilience/pages/8/>

This research project focused upon investigating which aspects of a community are influenced by ERs and RPs during the response to an NHE, and what they can do both during the response to an NHE, and during their preparation and planning, to create the conditions for recovery. Specifically, conditions which support A) community resilience to NHEs, and B) the Scottish Climate Change Adaptation Programme (SCCAP).

This research will be of use to those with an interest in community resilience, including policymakers and resilience practitioners involved in community resilience and emergency response.

The purpose of this piece of research is to aid RPs and ERs to identify potential strategies, that they can use during a response to an NHE and incorporate into their planning and preparation for NHEs which will support community's recovery process. This report suggests approaches to help ERs, and RPs identify strategies without compromising their own core duties which influence a community's capacity to become more resilient to future events and adapt to the impacts of climate change, in the aftermath of an NHE. This will be of benefit to RPs and ERs because, more resilient communities support more effective responses, and adapting to the impacts of climate change mean that the impacts of NHEs will have less effect on these communities (Revell and Dinnie, 2018; Scottish Government, 2019a; Scottish Government, 2019b).

Report structure

The following three sections of the report answers each research objective in-turn, explaining the findings and their implications.

Objective 1: To identify categories of resources and assets which have the potential to be affected by resilience practitioners and emergency responders during a natural hazard emergency.

In this section of the report the features of the community which resilience practitioners and emergency responders directly effect during a natural hazard emergency are identified. The process through which these features are influenced has been explored and what drives this process identified.

Objective two: To identify strategies from pre-existing research which affect a community's recovery which also contribute to A) community resilience to NHEs and B) the Scottish climate change adaptation programme.

In this section examples are given of successful strategies used in communities to recover from NHEs. These strategies are evaluated to determine how they contribute to a community's future resilience to NHEs and its ability to adapt to climate change.

Objective three: To identify strategies which RPs and ERs can incorporate into their own response to NHEs and their preparation and planning which have the potential to support a community's recovery process to be A) resilient to NHEs and B) in accordance with the SCCAP.

In this section how RPs and ERs could support strategies is outlined. The process involved in identifying strategies is shown. A decision support tree has been created as a potential approach which RPs and ERs involved in community resilience could apply to identify individual strategies or use to coordinate multiple strategies across RPs and ERs sectors or organisations.

The final section summarises the key findings from this research project.

Section 2: Objective one: Identify Categories of Resources and Assets Which Have the Potential to Be Affected by Resilience Practitioners and Emergency Responders during a Natural Hazard Emergency.

Introduction

The purpose of this part of the report is to identify the features of a community which resilience practitioners (RPs) and emergency responders (ERs) can directly affect during a natural hazard emergency (NHE). The reason for doing this is to differentiate between the impacts of the NHE on a community, and the effects of the actions of ERs and RPs on the community.

This is so that RPs and ERs can identify the influence their actions have upon a community and assess whether they could change their actions or decisions during the response to an NHE to improve the recovery outcome for that community.

In this section of the report the context of the research is explained, including a diagram which illustrates a generic overview of the typical community and the areas that an NHE would impact, Figure 1. The following sections each go onto explain a diagram, Figure 3 shows two cycles which are triggered by NHE. The outer cycle shows what happens during an NHE, while the inner “reaction cycle” is concerned with the community’s and individuals’ reactions to the NHE. Figure 4, Figure 5, and Figure 6 form a series which show in depth what is driving each stage of the inner reaction cycle shown in Figure 3. This will enable the identification of strategies which can be used by RPs and ERs to positively influence the reaction cycle. Finally, a summary of the findings of this section of the report is given.

Context:

A significant risk in Scotland are natural hazard emergencies, such as floods, extreme storm events and landslides which can have serious consequences for communities. Identifying the risks to communities is an ongoing process which is constantly being reviewed, through the UK national risk assessment and the Scottish Government risk assessment (Cabinet Office, 2017). The Scottish Government guidance on resilience recommends “adopting an all risks approach to developing our response to emergencies ” Page 11 (Scottish Government, 2019c).

Risk assessment is a statutory duty of Category One ERs which in Scotland is undertaken by the Scottish Fire and Rescue Service (West of Scotland Regional Resilience Partnership, 2018; North of Scotland Regional Resilience Partnership, 2018; East of Scotland Community Resilience Partnership, 2018). These assessments identify the dominant risks to a community’s assets and resources. Other category one and two responders³ and resilience practitioners may also conduct risk assessments targeted at their own areas of concern and relevant to their specific context, which they are required to share with one another, as laid out by the Civil Contingencies Act Scotland (Amended) (*The Civil Contingencies Act 2004 (Contingency Planning) (Scotland) Amendment Regulations 2013*, 2013). This

³ <https://www.gov.scot/publications/preparing-scotland-scottish-guidance-resilience/pages/3/>

Category 1 Responders - Local Authorities - Police - Fire - Ambulance - Health Boards - Scottish Environment Protection Agency - Maritime and Coastguard Agency

Category 2 Responders- Electricity Operators - Gas Suppliers - Scottish Water - Communications Providers - Railway Operators - Airport Operators - Harbour Authorities - NHS National Services Scotland - Health and Safety Executive.

is a complex challenge, the first stage of which is to identify which of a community's assets and resources are at risk.

Figure 1, illustrates a simplified generic overview of the areas of a community affected by a NHE, the arrow's direction denotes the dominant direction of impact flow, double ended arrows show where the impact flows in both directions (functionality or availability of the asset or resource impacts upon other assets and/or resources) with the potential to set up negative or positive feedback cycles.

The resources and assets which are affected by resilience practitioners and emergency responders during an NHE are similar to those that are affected by the NHE itself. What is affected by the RPs and ERs in the response phase will depend upon, the nature and extent of the NHE, the specific context and circumstances, and the level of preparation and planning that the community itself has undertaken. For example, is there a community resilience plan in place, how engaged is the community, what are the demographics of the community, are there any other emergency events taking place? As well as a variety of other factors, identifying these individual factors in depth is beyond the scope of this research project but should form part of any cohesive community resilience plan (Scottish Government, 2019a).

In very simplistic terms the duty of RPs and ERs during an NHE is to protect the community from and deal with the consequences of the NHE. Specifically category one and two responders are collectively tasked with achieving the following five objectives, (P6, Ready Scotland, 2017).

- Protecting human life, property and the environment
- Minimising the harmful effects of the emergency
- Managing and supporting an effective and coordinated joint response
- Maintaining normal services as far as is possible
- Supporting the local community and its part in recovery

The actions and decisions taken by ERs and PR's during a response to an NHE have an impact on the following areas (as shown in Figure 1):

- civic infrastructure
- physical infrastructure
- individual's safety
- natural environment
- the community's (and businesses') capacity to function
- individual (and collective community) well-being

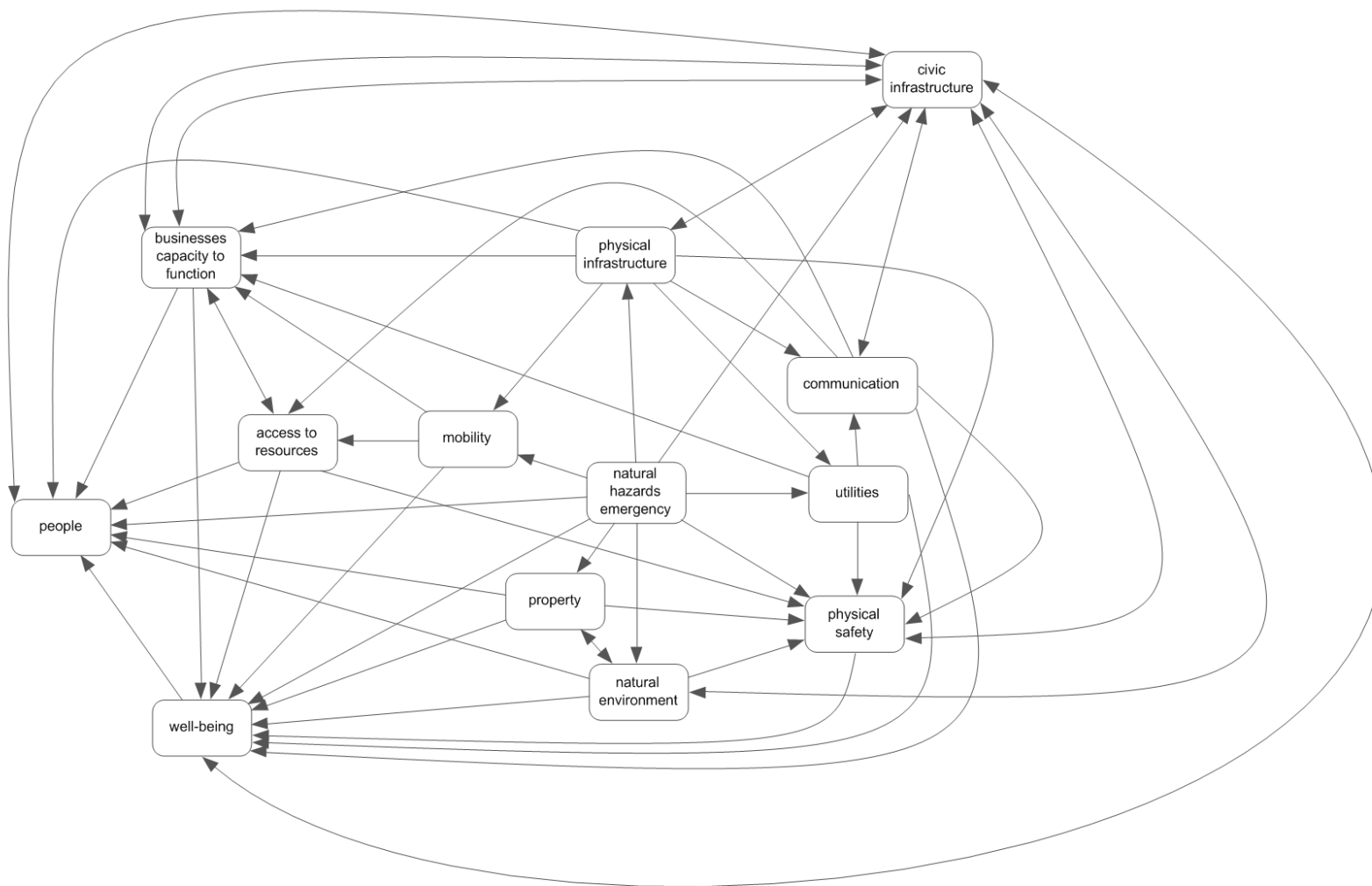


Figure 1 Generic influence diagram illustrating areas impacted by a natural hazard emergency.

These areas are comprised of a range of assets and resources needed for the community to function and they can be categorised as: social, economic, and environmental, some of which may fall within more than one category.

During an NHE, the Scottish government resilience guidance (2019a) recommends integrated emergency management which has three distinct levels: strategic, tactical and operational. These different types of decisions and actions have the potential to be taken at any level within the Scottish resilience structure, as illustrated in Figure 2, depending upon the extent and severity of the NHE. Following a command control and coordination structure as outlined in Scottish Government guidance documents (Scottish Government, 2017b; Ready Scotland, 2017). The purpose of these actions and decisions is to meet the five objectives involved in protecting a community from, and dealing with, the consequences of the NHE.

The coordination between strategic, tactical, and operational actions and decisions is a vital component of any NHE response and will have a material impact upon the outcomes and potential long-term recovery of communities. The level of involvement in operational, tactical and strategic actions and decisions will vary between the different form levels of the Scottish Government resilience structure, and not all levels will be brought into every NHE. This will depend upon the severity, context, and extent of the NHE in progress. The local resilience partnerships can request that a regional resilience partnership become involved in the response. Any member of the regional partnership can request that a national response to an NHE is made and this information will be sent up to Scottish Government structures and appropriate decisions taken about whether or not the Scottish resilience room be brought into operation.

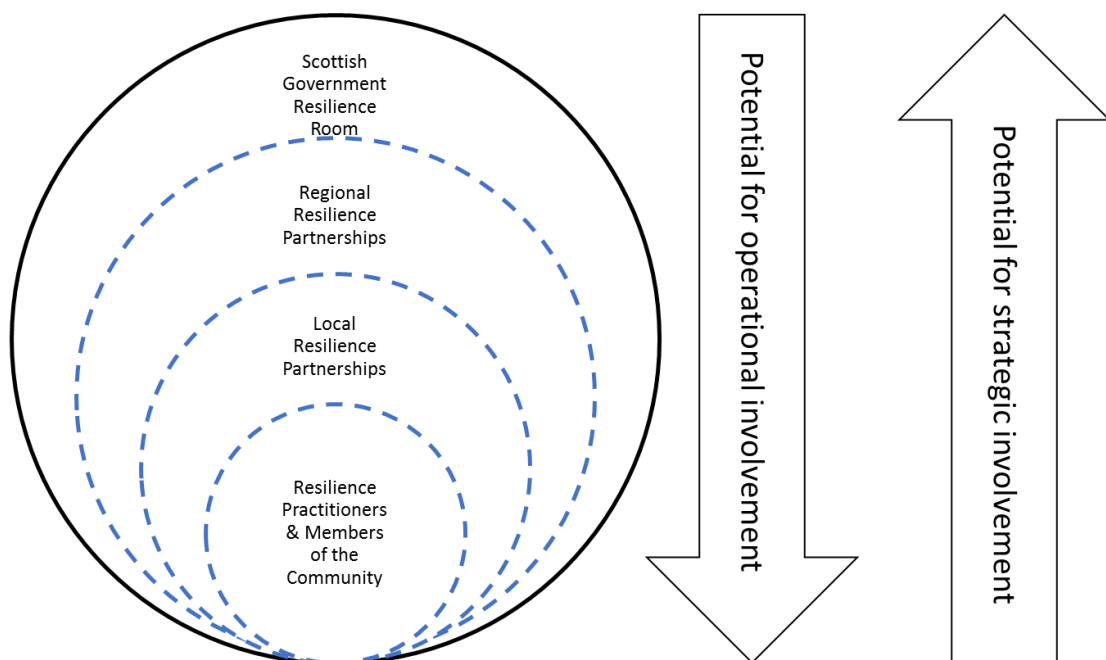


Figure 2 Overview of the Scotland civil contingency structure as laid out in the Civil Contingencies Act 2004 (Contingency Planning)(Scotland) Amendment Regulations 2013. The arrows indicate the levels of operational or strategic involvement of each of level of the resilience structure in Scotland. Tactical involvement has not been included as all levels are likely to have equal involvement in tactical decisions.

These, strategic, tactical and operational decisions and actions influence communities' and individuals' assets and resources. All levels of the structure shown in Figure 2 can be involved in any type of action or decision and not every NHE will result in all levels being activated.

Areas affected by resilience practitioners and emergency responders during a natural hazard emergency

From Figure 1's simplified view of a community's features, the most influential areas are communication, well-being, and civic infrastructure. These areas also are strongly linked to social capital, which can be characterised as the willingness of people to help each other (Kawamoto and Kim, 2019). These areas are the focus of this piece of work because they present the most opportunities for resilience practitioners to affect them during a NHE. This also fits well with the strategy of the Scottish Government's resilience division approach to community resilience, of an engaged public, empowered community, enabling collaboration between stakeholders, promoting education and learning, to support evaluation and improvement (Resilient Communities Team, 2017). The potential strategies need to be those which can be quickly adopted in the preparation and planning phase, which can be deployed by RPs and ERs without the need to tackle underlying physical, structural, or demographic issues.

Well-being is influenced by all other aspects of a community system (Figure 1). Well-being is strongly influenced by both the community experience and an individual's experience of an NHE, as shown in Figure 5. This makes well-being, physical and mental, very sensitive to the strategic, tactical, and operational decisions taken during the response to an NHE by RPs and ERs.

Well-being is strongly linked with community capital (Pfefferbaum, Van Horn and Pfefferbaum, 2017)). Therefore, if RPs and ERs can incorporate strategies to actively increase community capital during the response phase into resilience planning and preparation this has the potential to be a powerful tool to contribute to the future resilience of communities and thus their long-term recovery.

What happens during an NHE does influence the effectiveness of the actions and decisions of the RPs and ERs during the response to the NHE, and has implications for the future resilience of communities. How this may manifest itself is controlled by the process shown in Figure 3. These two cycles represent these stages of the processes which the community and individuals within that community can experience. The outer cycle has been informed by community resilience research (Baxter, 2019) and the inner cycle has been informed by research into behaviour, and social resilience research (Azevedo and Shane, 2019; Boylan and Lawrence, 2020; Goidel *et al.*, 2019).

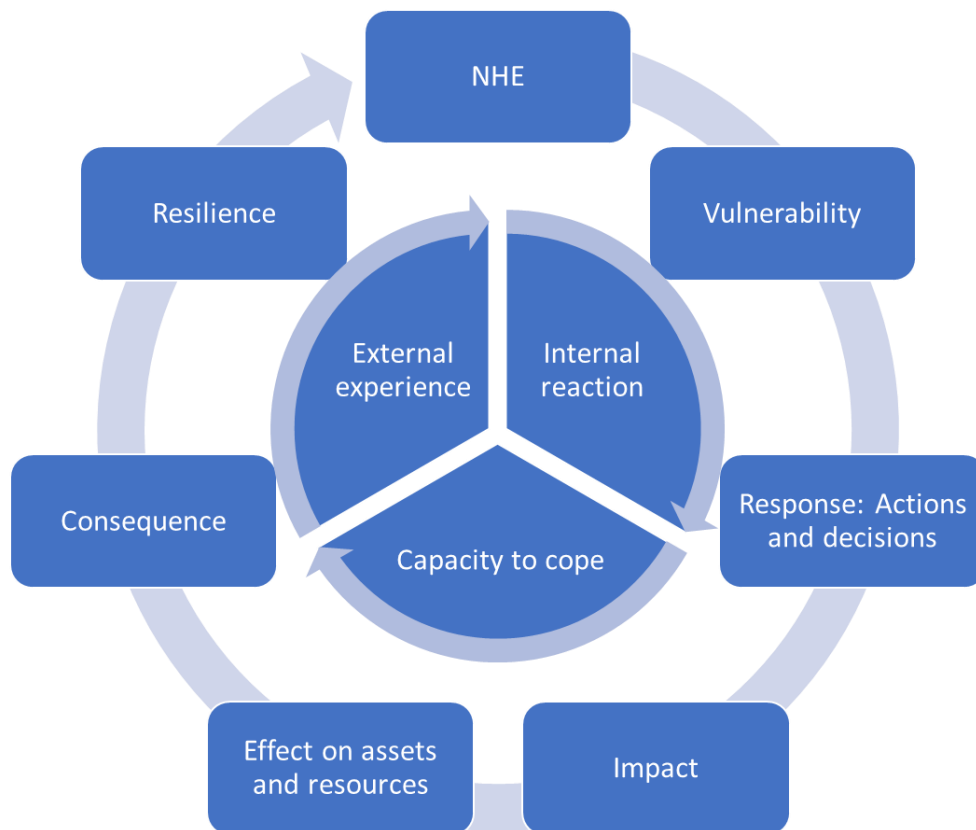


Figure 3 Generic illustration of processes undergone during a natural hazard emergency response. Outer cycle illustrates the stages experienced by a community during a natural hazard and the inner cycle (coping capacity feedback cycle) represents the community's and individuals' responses to natural hazard emergency. Authors own work.

The outer cycle comprises of:

- The NHE which is the external events and an objective reality.
- Vulnerability which refers to external areas such as the state of physical infrastructure, population demographics, the state of the natural environment, access to resources et cetera.
- Response: actions and decisions, this is the vicinity in which the ERs and RPs operate and is the area of focus for this research.
- Impact is the consequence of the NHE as filtered by the community's vulnerability and the Response.
- Effect on assets and resources is what happens to these features of a community.
- Consequences are the results.
- Resilience refers to how well the community dealt with the NHE and its subsequent state of resilience.

Following the outer cycle shown in Figure 3, during the NHE available assets and resources are being depleted which is a necessary and planned for part of response. For example, equipment used will need to be replaced or repaired, PR's and ERs become tired and stressed, which depletes available assets and resources thus impacting upon the community's resilience. There is a notable exception

to this, a community's social capital, which has been observed to increase during an NHE (Baxter, 2019; Cui and Li, 2020).

The coping capacity feedback cycle (inner cycle) comprises of:

- The internal reaction representing the emotions and thought processes and can only be interpreted through the lens of how that individual or community behaves because of that internal reaction.
- External experience representing lived experience of the individual or community which is also subjective as how this is experienced is mediated through their own internal reactions.
- Capacity to cope is how the internal reactions and external experiences manifest themselves. For example, the individual may feel more empowered or may become stressed which reduces their ability to make decisions or evaluate situations.

Following the inner cycle of Figure 3 for example an individual may be uncertain about what they are supposed to do during the NHE, if there is a clear consistent information put out by RPs and ERs across media types which the individual receives, they know what to do and can cope better with the situation.

These two cycles represent, A) what happens to the community as a result of the NHE, and B) the responses to the NHE. The two cycles are interrelated, the key stage for RPs and ERs is "response: actions and decisions", and the relationship between this stage and the inner cycle. This is the focus of this piece work and is explored in more depth in the rest of this report.

Internal reactions

The different types of actions and decisions, strategic, tactical and operational all have the potential to affect multiple assets and resources in different ways and very much depend upon the context and the nature of the NHE. These actions and decisions result in a reaction which is experienced internally by a community, individuals, and other groups, these internal reactions and the relationships between them and their impact on the future resilience of the community are shown in Figure 4. Internal reactions have implications for the effectiveness of the response to the NHE, the transition to recovery, and the success of a community's long-term recovery.

Figure 4 shows a range of reactions to an NHE which are likely to be experienced by individuals and communities. All the reactions will influence a community's future resilience and there is an interrelationship between each of them. Social capital is included as a reaction because it is related to emotional responses and could be viewed as a type of collective emotion. The central box of future resilience (outlined in green) shows how all these emotions are linked to a community's future resilience, thus the recovery process. ERs and RPs cannot control these reactions, which result from the coping capacity feedback cycle shown in Figure 3.

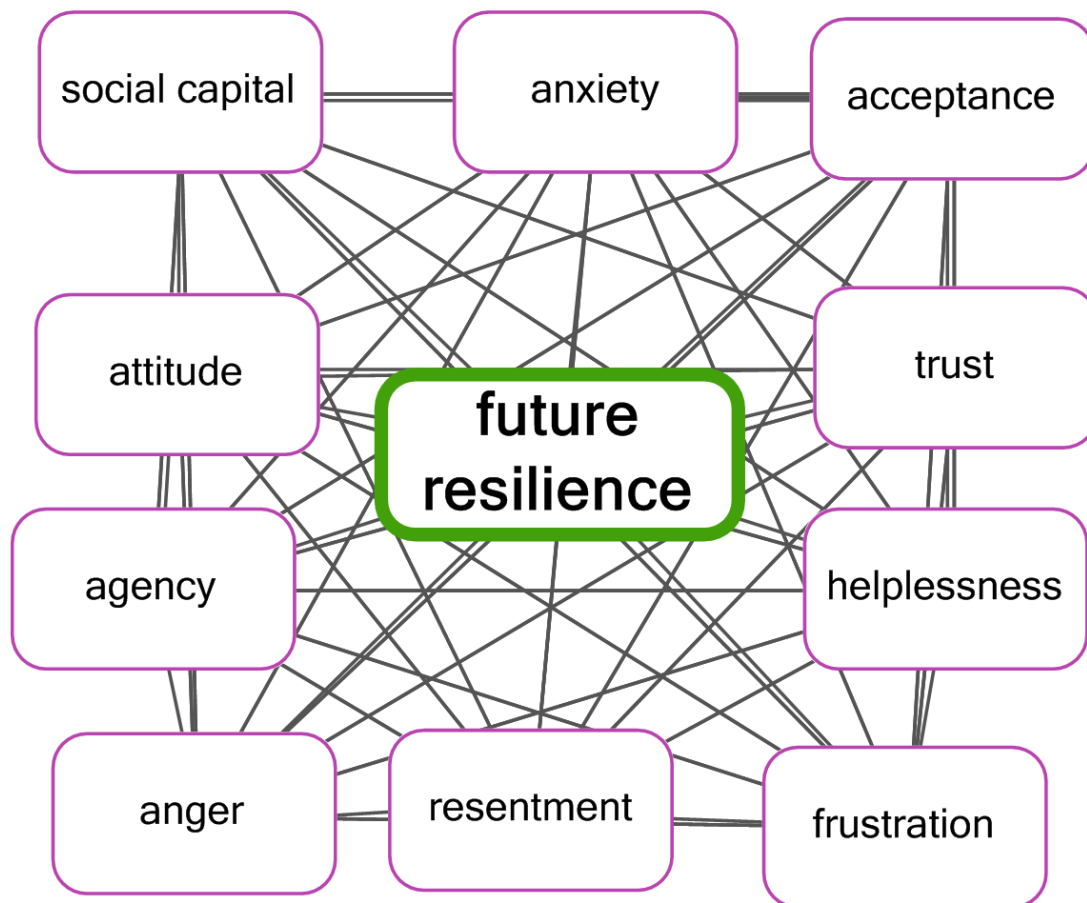


Figure 4 Spontaneous reactions to NHE (Individual and community)

The internal reactions of individuals and communities during an NHE are important for the recovery of a community. This is because of the impact they (reactions during the response) have on the process of recovery which in turn will affect future resilience (Cretney, 2016). RPs and ERs can influence reactions through a range of mechanisms⁴ which are illustrated in Figure 5.

External Experiences

The mechanisms which drive the external experiences of communities and individuals are shown in Figure 5. This demonstrates the complex web of relationships between mechanisms, which are shown in the coloured boxes, and internal reactions experienced⁵. Mechanisms with the most connections are the most influential during the response to a NHE. Looking at the density of connections shown in Figure 5 the competence of those involved in the response is the most important mechanism because it has an impact upon all the other mechanisms and impact upon reactions. All the mechanisms are important, because of the interrelationships of these mechanisms, effectively deploying one mechanism has the potential to promote others. For example, efficacy, being effective in the response, is likely to trigger more engagement make people feel more

⁴ a specific way of getting something done within a system

⁵ Examining the complexities of these multiple relationships is beyond the scope of this research, these relationships will be explored in-depth in a subsequent in-depth research project which has been funded by the NCR

altruistic towards others, be more willing to be involved, their observations of the event will be more positive, making them more willing to engage with RPs and ERs during the NHE and during the subsequent recovery.

The mechanisms shown in Figure 5 are affected by the actions and decisions of ERs and RPs. They present opportunities to develop strategies that RPs and ERs can utilise during the response to an NHE, and during planning and preparation for NHEs. Examples of how these mechanisms can be affected by RPs and ERs in the preparation and planning and response to an NHE are shown Table 1.

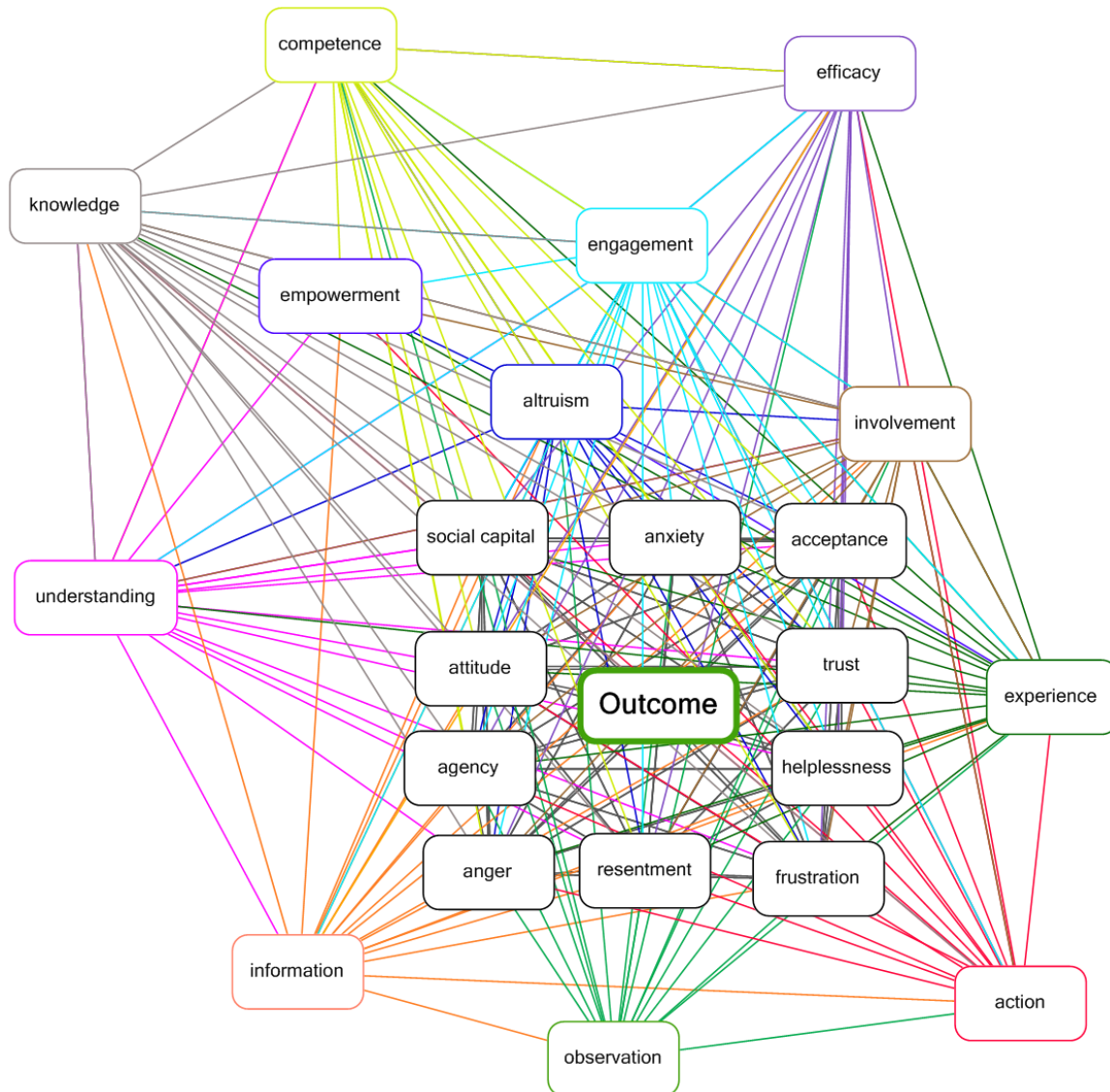


Figure 5 Illustration of the mechanisms involved in influencing the spontaneous reactions of communities and individuals (mechanisms are represented by boxes with coloured outlines and spontaneous reactions are represented by boxes with black outlines). The central box outlined in green containing outcome represents the combined impacts of the NHE on the features of the community (what is the level of damage the community has sustained, socially, economically, to its physical infrastructure and natural environment).

There is an opportunity to identify strategies to stimulate these mechanisms, to moderate the inevitable negative reactions of communities and individuals in a highly stressful situation. Which have the potential to improve:

- the effectiveness the response to the NHE

- the outcome for the community from the impacts of the NHE
- the process of recovery

Table 1 Mechanisms which influence the spontaneous reactions of communities and individuals to NHE and examples of how they can be affected by the actions and decisions of resilience practitioners and emergency responders during preparation and planning, examples based upon Scottish government guidance on community resilience (Scottish Government, 2019a) and response phase examples based upon workshops authors previous work with resilience practitioners and emergency responders

MECHANISM	PREPARATION AND PLANNING PHASE	RESPONSE PHASE
Competency	Training, building skills, knowledge, and expertise	Using available skills, knowledge, and expertise
Efficacy	Training, building skills and knowledge and expertise	Effectiveness of actions and decisions taken
Engagement	Working with communities, outreach et cetera	Behaviour and actions during NHE
Involvement	Working with communities	Behaviour and actions during NHE
Empowerment	Working with communities	Behaviour and actions during NHE
Altruism	Building confidence of individuals and communities	Behaviour and actions during NHE
Action	Planning and preparation work	What is done during NHE
Observation	What communities are aware	What people see and experience
Knowledge	Training, skills, working with communities et cetera	Situational awareness
Information	Outreach and engagement communication strategy	Communication strategy
Understanding	Education what they are aware of exposure to information	Exposure to experience creates empathy and understanding
Experience	Training, building skills, observation, and awareness	Builds during response

Capacity to cope

The features of the community are the characteristics of a community that combine to enable it to function, giving it the capacity to cope. Features of the community “includes the infrastructure, networks and processes that sustain society” P3, Scottish Government (Scottish Government, 2017b). Features are ostensibly the same as the community’s assets and resources, which create and support the community’s and individual’s capacity to cope. All the community’s features are interconnected and necessary for the community to function. During an NHE these features come under strain thus their condition or state is relevant to the outcome of the NHE. Their condition cannot be improved during the NHE, but they can be protected by RPs and ERs from the impacts. The state and condition of these features are very important for a community’s resilience and recovery, and some characteristics of these features can be affected by RPs and ERs during preparation and planning for NHE. Figure 5 shows the direct relationships between the features (shown in the densely outlined coloured boxes) of the community, mechanisms and internal reactions. All the features of the community have a direct relationship to the outcome from NHE, however they do not all have direct relationships with every mechanism or internal reaction.

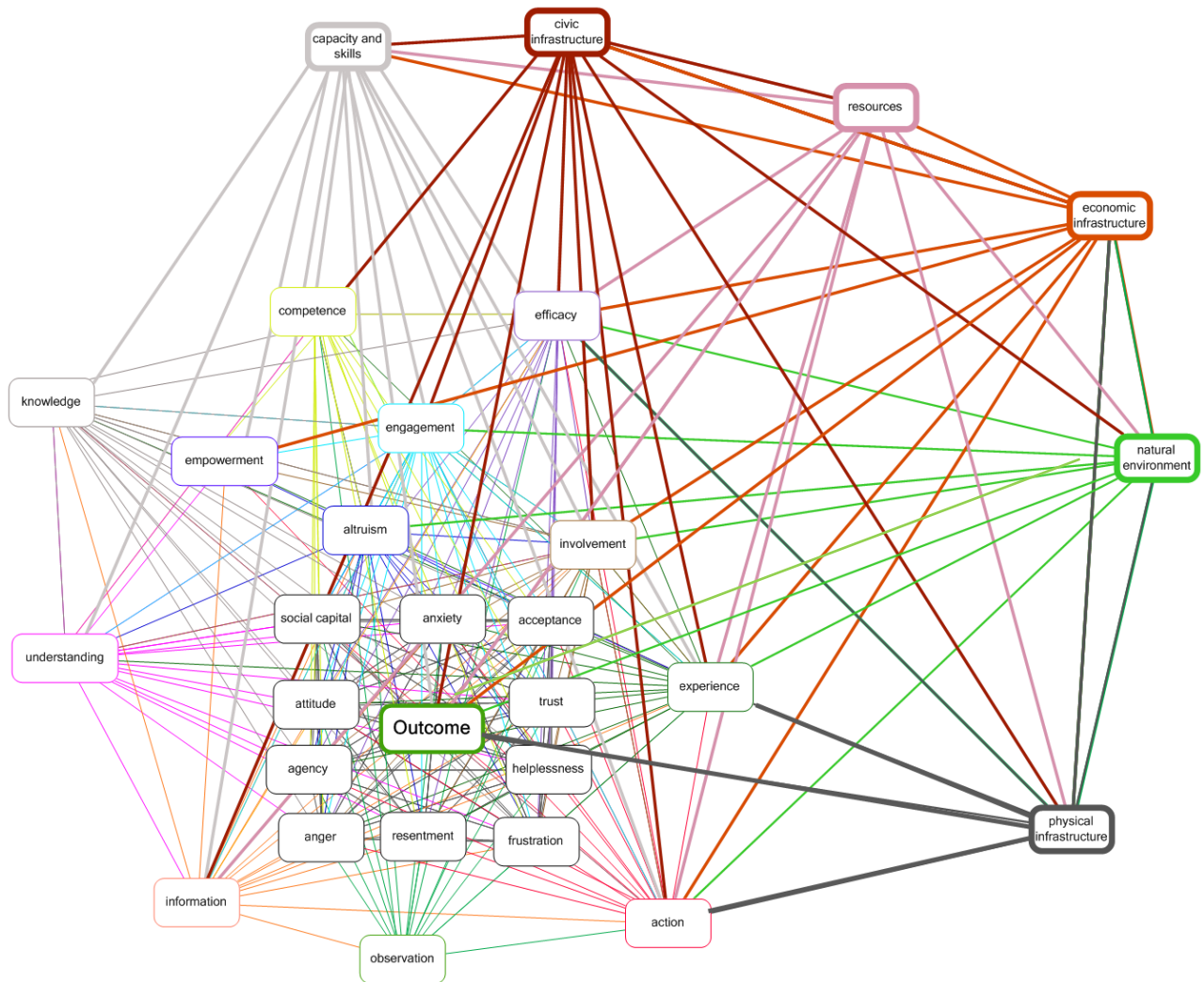


Figure 6 Illustration of the relationships between, features, mechanisms, and spontaneous reactions, which contribute to the outcome of a NHE for a community (features are represented by boxes with thick coloured outlines, mechanisms are represented by boxes with coloured outlines and spontaneous reactions are represented by boxes with black outlines). The central box outlined in green containing outcome represents the combined impacts of the NHE on the features of the community.

From the mapping of the relationships in Figure 6 , the features with the strongest density connections to the mechanisms are, capacity and skills, and civic infrastructure. Both of which present many opportunities to be directly affected by RPs and ERs, because they form part of the civic infrastructure and are directly involved in increasing their own and community's capacity and skills.

Social, economic, and environmental, assets and resources.

The outer cycle depicted in Figure 3, which shows the process of an NHE experienced, contains "assets and resources" which are affected by "response: actions and decisions". The assets and

resources create the features of a community, as previously stated, which support individuals' and community's capacity to cope with an NHE.

Table 2 classifies community features according to category and the dominant category that ERs and PRS are most able to influence in, A) the response phase and B) the recovery phase according to feature. The focus of this research is the response phase and as can be clearly seen, the two categories that can be influenced by RPs and ERs during the response phase are, social and environment.

In terms of preparation and planning the category of environment captures the physical features of the community (Economic Infrastructure, Natural Environment, and Physical Infrastructure). The ability to affect these areas is restricted to organizations whose specific role and responsibility is to manage these features of a community, for example the Scottish Environmental Protection Agency (SEPA), utility companies and local authorities. There is some scope for local communities to be involved in these features of the community, but larger infrastructure type changes are beyond the scope of this research project which is focusing upon actions which can be taken within the given context and situation. Therefore, this category will not be further explored in this project however there is scope for further investigation⁶. The category with the greatest scope for ERs and PRS to affect during the NHE response is the social category which encompasses the features; capacity and skills, civic infrastructure, resources, and economic infrastructure. As can be seen in Figure 6, the two areas showing the densest connections and therefore the greatest potential to be affected during the response are, A) capacity and skills, and B) civic infrastructure. To affect these features of a community during the NHE response RPs and ERs will rely upon,

- competence
- communication
- coordination
- cooperation
- access to resources
- efficacy

All of which can be improved during preparation and planning for an emergency response. This illustrates how during the immediate response to an NHE, ERs and RPs, have limited ability to affect the features of a community. They must focus upon the consequences of the NHE. How they do this will affect the efficacy of the response and will impact on the community's capacity to recover and future resilience.

⁶ will be explored in follow-up research project, funded by the NCR

Table 2 Features and category allocation (social, economic, environment), with examples of how which category of feature can be affected in the response and recovery phases of NHE by RPs and ERs.

FEATURE	CATEGORY OF FEATURE	RESPONSE		RECOVERY	
		CONSEQUENCE	CATEGORY AFFECTED BY ERS AND RPS	RESILIENCE	CATEGORY AFFECTED BY ERS AND PRS
Capacity and skills	Social and economic	People, tired stress potentially experience impact on well-being also gain experience and embed learning/skills	Limited ability to affect SOCIAL category predominantly in communications with one another and community.	Support people Training Debriefing Will require economic and social resources Opportunity SCCAP	Extensive ability to affect SOCIAL category, some ability to influence economic aspects (lobbying government for resources)
Civic infrastructure	Social and economic	As above	SOCIAL as above	As above	SOCIAL as above
Resources	Social and economic	These are depleted	SOCIAL as above	Will need repairing, replacing et cetera	SOCIAL as above
Economic infrastructure	Social, economic, and environment	Physical damage to business et cetera depleting economic resources, put under strain	SOCIAL as above, protection of physical infrastructure and natural ENVIRONMENT	Will need repairing, replacing and replenishing	Limited ability ⁷ for some RPs to affect all, SOCIAL , ECONOMIC and ENVIRONMENT dependent

⁷ Specific role for local authorities who can affect all categories during the recovery there are opportunities for local community resilience groups to affect all categories during the recovery stage to improve economic infrastructure

FEATURE	CATEGORY OF FEATURE	RESPONSE		RECOVERY	
		CONSEQUENCE	CATEGORY AFFECTED BY ERS AND RPS	RESILIENCE	CATEGORY AFFECTED BY ERS AND PRS
				Opportunity SCCAP	upon organization role and objectives.
Natural environment	Environment, social, and economic	Changed, damaged, impacted, put under strain	ENVIRONMENT , can protect during the NHE cannot affect social or economic aspects of this during the response	May naturally recover, may require economic and social input Opportunity SCCAP	Some categories of RPs and PRs can affect ENVIRONMENT and ECONOMIC aspects of this feature, dependent upon organization's role and objectives
Physical infrastructure	Environment, and economic	Put under strain, damaged	ENVIRONMENT , can protect during the NHE cannot affect the economic aspect during the NHE	Will need repairing, replacing and replenishing Opportunity SCCAP	ENVIRONMENT and ECONOMIC , as above

The social category is most directly affected during an NHE by the actions and decisions of PRs and ERs. This shows how the outer cycle illustrating the external response to the NHE and the inner cycle showing coping capacity are interrelated and influence one another, as shown below in Figure 7.

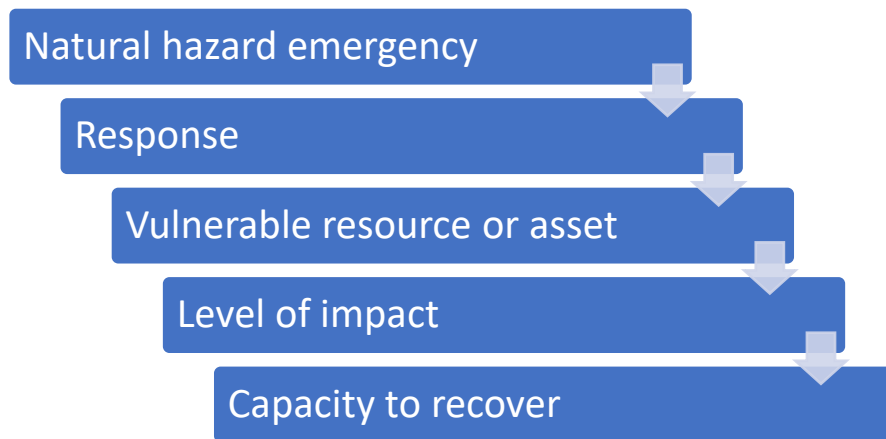


Figure 7 Simplified flow diagram, from Natural Hazard Emergency to a community's capacity to recover

The strategic, tactical and operational approach applied to natural hazards emergencies plays a key role in what actions and decisions are taken during the NHE. These different levels of actions and decisions all have the potential to trigger a negative or positive feedback loop within the coping capacity feedback cycle which can either increase or decrease a community's, or individual's resilience.

During response to natural hazard emergency different RPs and ERs have different roles, responsibilities and objectives which will affect what they are able to influence. During the response, the actions, and decisions taken by ERs and RPs will depend upon, the individual community's situation and context, extent of local preparation and planning, community resilience plans, and other emergency response plans and protocols. The different organisations that make up ERs and RPs work, plan, and train together in accordance with the Scottish Government's guidance on resilience which advocates an integrated management strategy (Scottish Government, 2019c). The Scottish Government provides extensive guidance on resilience including community resilience, preparation and planning, response, recovery, dealing with emergency situations, and mental and physical health during emergencies⁸.

While undertaking these different roles and using the Scottish Government strategic, tactical and operational structure there are different ways in which the mechanisms which drive the communities and individuals' external experiences can be utilised by different organisations and individuals who make up the ERs and RPs. In the next section, examples taken from the academic literature will be examined to identify strategies which have been successful in the response and recovery of communities devastated by past NHE.

⁸ <https://www.readyscotland.org/ready-government/preparing-scotland/>

Key Points

- The level of impact on the features of a community affects, the capacity to recover, and future resilience.
- The role of the PRS and ERs is to mitigate the impacts of the NHE on community.
- The features of a community are directly affected by NHE.
- The well-being of a community's during a response to an NHE is affected by ERs and RPs
- The well-being of the community during an NHE, and its future resilience, is strongly affected by and internal reactions of the community, and individuals.
- Community resilience to NHE is affected both by the A) response and B) reaction to events (Figure 3).
- Internal reactions of individuals and communities can be influenced during the response phase, both directly and indirectly by ERs and RPs
- ERs and PRs affect individual's and community's spontaneous reactions during a NHE (Figure 4)
- The social category is affected the most by RPs and ERs combined responses to an NHE.
- Internal reactions are affected by mechanisms (Figure 5).
- There is potential for ERs and RPs to learn from, and incorporate strategies which have used successfully in response to previous NHE to manage the spontaneous reactions of individuals and communities.

Section 3: Objective two: Identify Strategies from Pre-Existing Case Studies Which Affect the Replenishment of Community's Resources and Assets That Contribute to A) Community Resilience To Natural Hazards and B) The Scottish Climate Change Adaptation Program

Introduction

This section of the report gives examples of strategies used in the aftermath of an NHE that have been successful in assisting communities in their long-term recovery process. These strategies have been evaluated in the academic literature and have been shown to support community recovery. The purpose is to identify strategies which can be supported by RPs and ERs in the pre-existing context and circumstances of a community which experiences an NHE.

As illustrated in the preceding section, an area which resilience practitioners and emergency responders have a significant impact during the response to a natural hazard emergency is the social category. RPs and ERs cannot change the inherent conditions of the community during the response itself but are able to influence the reactions of individuals and the community through the actions and decisions that they take. The internal reactions of the community and individuals can either undermine or support; A) the community's future resilience, and B) the Scottish Climate Change Adaptation Program, of particular relevance is outcome one (Box 2).

This occurs because of how well-being is influenced, for example it can be undermined (Figure 8) which reduces the capacity to cope and recover (Walker-Springett, Butler and Adger, 2017). This can make it harder to engage with members of the community in the subsequent recovery phase. Which will have a knock-on effect on engagement and consultation, and potentially create barriers to recovery (Cretney, 2016). These reactions can be influenced positively by RPs and ERs during the response by using the mechanisms previously identified

Box 2 Outcome One of the Scottish Government's Climate Change Adaptation Program, 2019-2024

"Outcome 1: Our communities are inclusive, empowered, resilient and safe in response to the changing climate. This outcome utilises 'placemaking' as a theme, the idea that each place should be planned, designed, and managed to suit the needs and aspirations of the people who live there. There are two main elements that make up a place: social aspects, and physical aspects. The first Communities Sub-Outcome relates to the social aspects of community and includes the ways in which communities can be equipped with the knowledge and tools to adapt to climate change, while empowering them to do so." Page 10 (Scottish Government, 2019b)

((see Figure 5) to increase community capital which can aid the recovery process (Kawamoto and Kim, 2019).

Community capital is the cornerstone of the social category, which is vital in recovering, rebuilding, and the replenishment of a community's resources and assets and thus future resilience. For a community to successfully recover in the aftermath of a NHE, local authorities and government at all levels should work with the local community and engage with them, this supports the process of recovery and the future resilience of the community (Bakema, Parra and McCann, 2019; Chan *et al.*, 2019; McDonnell *et al.*, 2019).

This is strongly reflected in the Scottish Government guidance on resilience which emphasises the

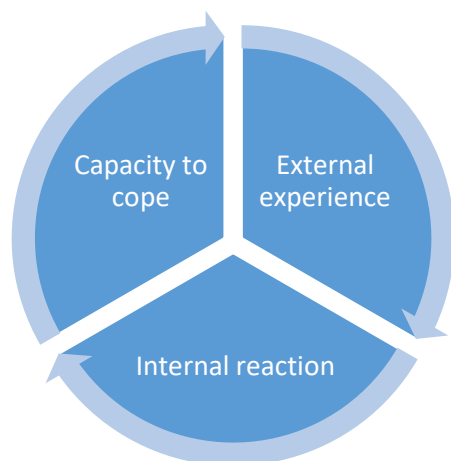


Figure 8 Internal process associated with the generation of the spontaneous reactions of individuals and communities

role of “communities and individuals harnessing resources and expertise to help themselves prepare for respond to and recover from emergencies in a way that complements the work of the emergency responders” (Resilient Communities Team, 2017).

A community’s ability to recover in the aftermath of a NHE is also dependent upon the community’s ability to access external resources and assets (Vallance and Carlton, 2015). As shown in figure 3, the impacts on a community have a cumulative effect upon the community’s capacity to recovery. To mitigate the effects of the NHE the recovery process needs to be actively engaged with and managed (Blackman, Nakanishi and Benson, 2017).

The recovery process is not automatic and a community’s resilience can be undermined by a lack of an active strategy to replenish a communities assets and resources (Jerolleman, 2019; O’Hare, 2019).

The condition and functioning of a community’s civic infrastructure in the aftermath of an NHE will play a vital role in the replenishment of the community’s assets and resources. What will be of critical importance is the relationship between, individuals and the community and the institutions and organizations which form a community’s civic infrastructure (Cretney, 2018). ERs and RPs are part of the civic infrastructure and can have an influence in the way this complex dynamic works.

The strategies given here are from pre-existing case studies, they have been selected because they focus upon the actions and decisions which fall within the social category. The Internal reactions of individuals and communities are strongly influenced by the social category, as previously stated, they can influence, the recovery process, engagement with resilience practitioners, and potentially the willingness to engage with climate change adaptation programmes. The purpose of focusing on social strategies is to identify ways in which ERs and RPs can trigger a positive feedback cycle (Figure 8) to increase individuals’ and the community’s capacity to cope, without the need to address the underlying systemic conditions.

Strategies which support recovery during the NHE response

The recovery process is like the immediate response to an NHE because recovery is the response to a set of problems created during the NHE which need resolving. These problems and their extent mirror the severity of the NHE and the impact that it has had on a community and its features. Addressing these problems presents a technological opportunity for communities to “build back better” and adapt to the challenges of climate change (Scottish Government, 2019a; (UNISDR), 2017; Scottish Government, 2019b). However these problems are also a complex set of interrelated policy challenges (Blackman, Nakanishi and Benson, 2017).

Figure 9 shows areas that can be directly and indirectly damaged during an NHE, each hexagon represents types of problem that will need solving during the recovery process and combine technological and policy challenges. RPs and ERs are key actors within the transition from response to recovery as well as the recovery process itself. As are the community’s own groups, organizations,

and individuals, so the relationship between all these different actors is fundamental to managing the transition from response to recovery.

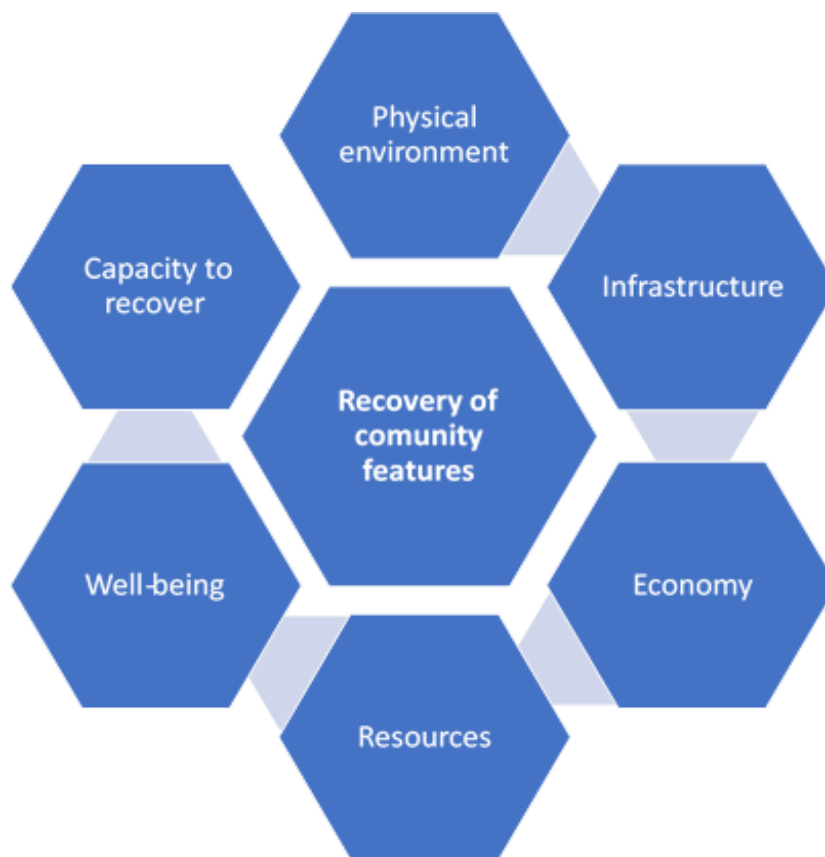


Figure 9 Simplified illustration of the impacts of natural hazard emergency cascade from the their physical impact on the environment through, infrastructure to the economy to the impact on resources, to social aspects including well-being and finally to a community's capacity to recover. Thus, creating a series of interrelated problems which need addressing during the recovery process

Within the academic literature on the recovery process the transition from response to recovery is limited and requires further research (Sellberg *et al.*, 2018). However, some common observations have emerged from the work that has been done.

- The recovery process does not automatically start once the immediate needs of the situation have been dealt with (Blackman, Nakanishi and Benson, 2017; 2016)
- Effective communication with the community is essential (Spialek and Houston, 2019; Thaler and Seebauer, 2019; Rollason *et al.*, 2018; Arneson *et al.*, 2017)
- There is a need to for inclusion of diverse actors during the transition to recovery (Cretney, 2018)
- The community needs to be willing to engage with the recovery of others involved in the recovery process (Okada *et al.*, 2018)
- The recovery process needs to be managed horizontally and vertically (Plein, 2019)
- New actors should be included as they emerge (Sou, 2019)

- The handover process should be coherent, and managed as different organizations and groups complete their roles and others assume responsibility (Finn, Chandrasekhar and Xiao, 2019)
- The community and its individual members should be recognised as autonomous and a valuable resource (Chan *et al.*, 2019)
- The decision-making process should be clear, transparent, accessible, and understandable (McDonnell *et al.*, 2019).

These observations suggest, the building of goodwill and positive relationships will support the subsequent difficult planning and decision-making process as the community's physical infrastructure, natural environment, economic and social features are being rebuilt. The internal reactions experienced by the individual and the community as a whole influence the way in which these relationships develop and the potential for goodwill between different actors. Using the findings from objective one (putting cross reference to appropriate figure) there are higher density of connections between some spontaneous reactions and some mechanisms, which drive internal reactions.

The following examples are taken from existing academic peer-reviewed papers on the recovery of communities, which describe and analyse the process of recovery. They have been selected on the following criteria A) the strategies and processes described have been successful⁹ in supporting the community's recovery B) the communities have physically recovered¹⁰ from the NHE C) the community's recovery process actively included future resilience and/or adaptation to climate change.

The analysis of the examples will draw out what aspect of the capacity to cope feedback cycle they address which mechanisms are used and how this enables the features of the community to be resilient to future events and whether this includes any measures to adapt to climate change.

Examples of strategies which support the replenishment of a community's resources and assets.

A Transition Phase

A defined transition phase, to take place between response activities (relief and rehabilitation) and long-term, recovery and rebuilding activities.

In their paper Blackman *et al.* (2017) examine two sets of case data; the Christchurch, New Zealand Earthquake February 2011, and the Great East Japan Earthquake and Tsunami February 2011. From these data they identify three system elements which successfully supported the recovery of communities

"long-term recovery needs to be shaped to increase future disaster resilience and preparedness. This will succeed or fail based on the willingness of those within the system to work together for an agreed outcome." Blackman *et al.* P95 (2017) .

⁹ that the strategies enabled the community's recovery objectives to be achieved

¹⁰ the physical infrastructure required for the community to function has been either repaired, replaced, or transformed

affected by these events: the actors¹¹ and their purpose, new forms of social capital, and a move to greater coproduction with community.

The transition phase Blackman *et al.* (2017) proposes is designed to allow the implementation of approaches, they observed in both of these communities which successfully overcame the issues and challenges that emerged as they navigated the process of rebuilding to increase their future resilience.

This transition they argue will allow time for the emergence of new actors from inside and outside the community. They observed that these emerging new actors were able to, listen, understand, and present the needs and visions of the community to government level officials who may not have direct access to the community. These emergent actors took time to work with community members enabling them to recognise what recovery meant. Emergent actors: were a catalyst for action, worked with local governments to disseminate ideas for recovery, and engage with community members and make them feel that they are also responsible for the recovery of their community.

New social enterprises and new businesses were created in both communities which their data suggested contributed to; creating bridging¹² social capital, individuals and groups empowering each other, and utilising limited available resources. These activities were also linked to coproduction with the community for its own recovery bringing together new actors and social capital. Their observations support the assertion that, the behaviour and interaction of individuals have a direct impact on the success of policy interventions (Head, 2008). They observed that activities which actively sought to increase social capital led to the community seeking more involvement in the recovery and rebuilding of their community.

The purpose of the transition phase is to reframe challenges of recovery and rebuilding the community, as distinct from those experienced during the response to NHE. To provide time for these challenges to be understood and to allow new emergent actors to establish their roles and purpose in the long-term recovery of that community, which will facilitate the long-term recovery and future resilience of communities. This approach also facilitates the potential for inclusion of climate change adaptation into the community's long-term resilience.

A transitional phase allows all aspects of the capacity to cope, the feedback cycle to be addressed and it also utilises the full range of mechanisms identified in Section 2: objective one.

¹¹ actor refers to those who have agency and take action

¹² bridging social capital links individuals and groups across vertical, powers and socio-economic, divides

Hurricane Sandy Rebuilding Strategy: Stronger Communities a Resilient Region was a federal strategy adopted in the USA, by the Obama administration in the aftermath of Super Storm Sandy (October 2012), designed to fund recovery to enable communities to become more resilient to the effects of climate change.

In their work Finn et al.(2019) analysed six planning responses in the New York city metropolitan region to illustrate an emergent model which they refer to as, Resilient Recovery Planning. They focus upon five cases which explicitly engage with the agenda of integrating recovery with the agenda of adapting to climate change and community resilience. The sixth case they examine uses a more traditional “business as usual” recovery model and is used as a comparator. They identify key elements that are of critical importance to a resilience focused recovery planning process; pre-existing planning capacity, strong political leadership, and non-governmental funding support. They argue that public sector planning activities are concerned with developing a “comprehensive vision of the future that maximise the health, safety, and economic well-being for all residents” Finn et al. (P 2, 2018). They argue that the planning profession well-positioned to help address recovery and rebuilding challenges holistically and should be key actors in the recovery process.

"when disasters strike, some kind of rebuilding will happen whether planned or not, so the post-disaster recovery, can paradoxically, create opportunities to actively and strategically address existing social, economic, and environmental challenges as citizens and policymakers recognise the unsustainability of pre-event conditions and show some willingness to consider changes, however briefly." Finn *et al.* (P 3, 2018)

The USA federal level, which administered the rebuilding fund, actively promoted a participatory recovery process which was built on “collaboration, coordination, technical assistance and resilience” Finn et al. (P 4, 2018). In their analysis Finn et al.(2019) observed that the communities that were actively engaged in resilience and adaptation as part of their recovery planning were most successful in accessing and utilising the available federal funds. Additionally they had pre-existing plans to adapt to some aspects of climate change and/or address pre-existing issues and needs within the local community (social/economic deprivation) which had been postponed often due to financial constraints or political difficulties. This allowed them to access the funds available quickly as they could quickly adopt their pre-existing plans and re-purpose and for the rebuilding to meet the objectives of the Disaster Relief Appropriation Act of 2013. They also found that an ability to navigate the processes of accessing federal funding was important and that this was linked to their ability to link their own recovery plans to environmental and resilience outcomes. The communities needed to have access to relevant expertise to put in process and complete recovery projects. A key element was to engage with the local community, this was achieved by linking the recovery process to resolving pre-existing issues within the community, demonstrating that the purpose was to improve people’s quality-of-life and well-being. These communities also accessed funding from additional diverse sources (Finn, Chandrasekhar and Xiao, 2019).

In an in-depth analysis of a “managed participatory approach” which was adopted by New York State in the aftermath of Super Storm Sandy, McDonnell et al. (2019) argue that this is an example of successfully incorporating community-based input into the post-disaster resilience process. This was achieved through vertical and horizontal integration. New York state utilised pre-existing climate change adaptation plans and adapted to create a top-down vision for the recovery process. For community they gave them a framework which comprised of a list of tasks and deliverables. Each

community then had to provide a list of suggested resilience projects. The state provided experts to each community from the private sectors to supply the expertise that the communities may be lacking. Fundamental to this was to take advantage of ground-level knowledge to allow for more effective use of federal funds towards feasible resilience projects. They facilitated local meetings and created local planning committees which had oversight of their local projects and were responsible for public engagement. This enabled local needs to be connected directly to funding streams and for external experts and local communities to work together and engage with one another. This participatory process was carefully documented creating a record to refer back to and compare with the agreed recovery and resilience projects. This encouraged horizontal integration because the programme facilitated the collective action and responsibility of the community, utilised and encouraged social ties, and developed relationships with multiple sectors of the community including emergency responders, schools and local businesses. It was also vertically managed because the state took leadership in directing federal level resources to local communities and provided them with assistance and their technical expertise that they may have been lacking. It was noted that some of the local planning groups transformed into new organisations which continue to advocate for local communities (McDonnell *et al.*, 2019). In conclusion both Finn *et al.* (2019) and McDonald *et al.* (2019) concluded that key to the success of this resilience rebuilding strategy was the existence of pre-existing plans which addressed local needs and climate change adaptation and resilience which the local communities were already to some extent willing to engage with.

These two mutually complementary strategies do address all three aspects of the capacity to cope feedback cycle with a focus upon the physical infrastructure, economic, natural environment, and civic infrastructure of the community. There is less focus upon capacities and skills and putting in place resources which can develop from within the community. Like the transition phase this strategy is very concerned with engaging with the community though in a much more directed way to achieve the aims of adapting to climate change and producing more resilient communities but without directly addressing the well-being of individuals and communities as part of this. This strategy aims to directly improve community's future resilience and ability to adapt to climate change as part of the recovery and rebuilding process. It relies heavily upon external resources, pre-existing plans, and strong leadership.

Machizukari "creating communities" balancing infrastructure recovery with local sociality

A Japanese approach uniting, physical, structural, and social aspects of the planning process which has been successfully used disaster recovery.

In a review of four poster disaster communities (two Australian communities, affected by the 2011 Queensland floods, and two Japanese communities, affected by the 2011 Tohoku earthquake and tsunami) the authors explore the way in which social capital and social networks were utilised by different agencies, government institutions, and community members during the recovery process (Okada *et al.*, 2018).

"recovery efforts must address renewal of wide-ranging of social, institutional, cultural and economic activities within the disaster affected locality and across the different disaster affected population to rebuild community.....These elements of community development are often overshadowed by the reliance on expertise in physical recovery. This risks leaving disaster affected groups vulnerable to externally imposed institutional and practitioner decisions." Okadra *et al.*, P 1031, (2018).

In the two Australian communities the authors observed that in both cases the local government deemed the recovery measures that they had led to be successful in terms of finance and flood mitigation, it should be noted that this was the local authorities' vision of recovery and not the local communities'. However, they observed that many community members felt excluded from the process which was reflected by which actors were communicated with and listened to, this affected the allocation of resources and decisions about which parts of the community were to be protected from future flood events. This reinforced pre-existing imbalances in power and hindered social and economic recovery. The local authorities in both communities focused upon physical infrastructure for mitigation and did not communicate "evenly" with all actors. This approach; excluded grassroots and spontaneous community-based recovery initiatives, created conflicting relationships between community members, and delayed the recovery of these communities (Okada *et al.*, 2018).

In the two Japanese communities, local governments involved in the recovery sought to link rebuilding the local sociality with the physical planning to rebuild the affected communities. The authors examine the use of pre-existing neighbourhood associations which were used to communicate with local people which they observed to be useful for local people to reinforce their pre-existing social bonds and feel part of a community. However it was found in Keizmui community, that power was not evenly allocated within these groups, "the desire to save the well progressing relocation project silenced many of the communities members" P 1038 2018, (Okada *et al.*). This resulted in contrasting outcomes for different sectors of the community. However overall this community was able to utilise these pre-existing social and community networks and bring in new actors to the process, and overall it was felt by the community, that it had recovered well. In Namie, whose entire population had to be evacuated, many groups emerged discussing their vision for maintaining and improving community life, and the town office was not involved in these consultations. As the national government further increased their power and dominated the recovery process, the levels of uncertainty and fear and factors beyond their control, impacted on local peoples' recovery, reducing their capacity to re-establish their social networks (Okada *et al.*, 2018).

The authors concluded that from these four different case studies where local sociality and recovery were balanced with one another, negative effects of power imbalance could be overcome. They also concluded that there needs to be an active focus on sociality, which needs to be worked at in order to create it by all actors involved. Additionally they noted that a citizen centred process supported all aspects of recovery enabling the integration of physical rebuilding, future planning and mitigation projects to be more effective (Okada *et al.*, 2018).

This strategy addresses all three aspects of the capacity to cope feedback cycle it focuses upon linking people's internal reactions to external experience, terms of maintaining sociology to enable communities to engage with rebuilding and infrastructure projects to avoid undermining the communities overall well-being, which can damage a community's resilience to future events and make them less willing to engage with climate change adaptation initiatives. This strategy highlights the importance of actively working to keep and develop a community's social networks and to engage and involve them in the recovery and reconstruction process.

Mental-health and well-being are key components of the recovery process and to improve individual and community outcomes strategies need to be in place to support this aspect of the recovery process.

In an in-depth analysis of the impacts of psychological well-being on the recovery process in communities affected by the Somerset levels floods of 2013/14, Butler et al. (2018) examined the consequences for people's mental well-being, of interventions from authorities, and other institutions on recovery outcomes. It was found that there were two aspects which were important for the extent of the impact on mental-health well-being, these were a) the actual interventions made by institutions and b) the perceived absence of support.

Butler et al. (2018) observed that both people's physical and mental-health deteriorated as a consequence of flooding, and was exacerbated by emotional distress which manifested as stress and anxiety which in some cases became chronic as the recovery process progressed. They observed that different groups of people had different perceptions of same event, depending upon their life experience, observations, and understanding of what interventions were being made by public agencies. They concluded that institutions and public agencies actions and interventions were vital, but what was important was that they were perceived as taking actions. An example which they cited as being particularly useful was a local village agent scheme. This is where community members were paid during the flood to signpost people to resources that they might need and to alert public bodies to needs within the community. This was important because it was a two-way process and was active and highly visible to the communities.

"The institutional challenges to provide appropriate support for a sufficient period, while also recognising the specificities of need associated with different people, places, and... Events.... It is not just the presence or the level of institutional support that affects recovery. Rather, the perceived performance of institutions, perceptions of their fairness in distributing assistance, and the support of agencies for community led process, also affect the overall outcome of recovery." Butler et al. (P 68, 2018)

It was noted that community capital and engagement, which was high in the active response phase of the flooding, does diminish over time as individuals try to re-establish normal life. So this form of support, while useful and important, cannot be relied upon moving forward into the recovery (Butler, Walker-Springett and Adger, 2018). It needs to be recognised that other organisations may need to fulfil this role for some individuals as this form of community capital diminishes. While it is widely recognised that enabling communities to take action and be responsible for their own recovery is important these actions still need support and resources from external agencies to be achieved and it is important for the community's perception that they have the support necessary to enable them to rebuild their own resilience. It was found that the future safety and building future resilience was fundamental in the recovery process to enable people to manage their anxiety and stress and this process needed the support of external interventions and agencies, for example putting in place flood defences and adapting to climate change (Butler, Walker-Springett and Adger, 2018).

When assessing well-being in the aftermath of the Boston 2013 and the Somerset 2013 floods Walker-Springett et al. (2017) identified four key processes in well-being improving outcomes for these communities. Firstly, that well-being develops and manifests over time, it was found that this

well-being would increase and decrease with the processes of action and recovery, for example it would increase if it was perceived that positive actions were being taken or that the community was receiving external support. Secondly the importance and role of social networks and social capital. This was seen to steadily decrease and change over time, it was observed that this capital could be maintained through facilitating the kinds of activities that were taking place, for example celebrating and commemorating events but also actively working to improve the community's future resilience. Thirdly perception and agency, this was strongly influenced by organisations and public authorities working with communities and supporting them for example facilitating flood resilience groups and providing them with resources, also consultation around flood defences. Finally, they observed the importance of people making sense of what they had experienced, the stories that the community told themselves about what happened and the narratives that they constructed strongly influenced well-being. If these stories could be constructed with a narrative of hope and a feeling of empowerment the flooding experience was more likely to manifest as post-traumatic growth (Walker-Springett, Butler and Adger, 2017).

Walker-Springett et al. (2017) argue that in terms of well-being and mental health outcomes it is the recovery and the perception of what is done and how that is important for long-term recovery outcomes, that a "recovery gap" should not be allowed to develop or be perceived to develop as the emergency response ends and the rebuilding process begins. This agrees with the findings of Butler et al. (2018) and their work upon mental-health and the need for agencies to be mindful of the effect of their actions on mental-health and well-being, and that perceptions are as important to well-being and mental-health.

This strategy is predominantly engaged with the internal reaction aspect of the capacity to cope feedback cycle. It focuses upon in people's reactions to their situations and how this can affect their perceptions and thus their external experience which has implications for the community's ability to recover due to the effect this has on communities and individuals capacity to cope. This strategy directly addresses the community's potential future resilience by enabling individuals to cope better with future events. However, without addressing the recovery of the features of the community directly, in terms of rebuilding projects and economic recovery, in parallel with this the community would not be sustainable moving forward and could reverse the gains made in well-being if these things were not done.

Creating space for groups to form, in response to disasters (building psychosocial¹³ capacity).

Ensuring that cultural, social, and pre-existing community norms are part of the recovery process to develop psychosocial capacity to improve resilience to cascading emergency events.

Drawing on data from disaster recovery literature a common theme emerges in communities that have successfully recovered from repeated exposure to emergency events and disasters, psychosocial capacity (Miller and Pescaroli, 2018). It was observed in communities where disasters lasted for significant periods of time where: social behaviour was affected,

"Every disaster is embedded in a unique context on the road to recovery is shaped by sociocultural factors, individuals, and public perceptions. Culture is central to what defines personhood and how people experience a disaster and what they need and expect in order to rebound from adversity." Miller and Pescaroli, P170, (2018).

¹³ the mind's ability to, consciously or unconsciously, adjust and relate one's physical and mental health the social environment so that the individual can function

and emergency services became less effective, those with psychosocial capacity were better able to respond to events and recover from them (Khalili, Harre and Morley, 2018).

Miller and Pescaroli (2018) argue that space should be provided for communities and individuals to form groups and allowing pre-existing groups to meet, providing informal and formal sources of support for cultural and social activities. They have observed that most types of groups are helpful in the aftermath of the disaster. These groups support the development of the necessary five elements of psychosocial capacity (Miller and Pescaroli, 2018):

- sense of safety
- ability to self-calm
- sense of collective efficacy and ability to achieve goals
- connections with an access to people and resources
- a sense of hope.

Creating space for these groups to meet and emerge supports psychosocial capacity, building elements which are an active part of any community's recovery process. These groups can integrate future resilience related activities and be used to engage the community in climate change adaptation measures in the rebuilding process.

This strategy addresses all three aspects of the capacity to cope feedback cycle. It does require external resources, planning, and direction for it to be effectively used. Relying on groups to spontaneously create and maintain the five necessary elements of psychosocial capacity without support from external actors would be challenging. However, this and enabling spaces to be available for these groups to develop and address the challenges that their communities have to, to allow them to recover, has the potential to greatly support future resilience of the community and as part of that adaptation to climate change.

Summary

Table 3 and Table 4 summarise the strategies discussed above and indicate which aspects of the community feature they are concerned with and the mechanisms which are used to support the strategy.

A common theme running throughout these strategies is engaging with and empowering the community. They strongly illustrate the need for preparation and planning in advance of emergency events for the recovery process. In terms of ERs and RPs these strategies and the successful deployment of them will be influenced by their actions during the response phase of the emergency as well as their planning and preparation for their emergency response.

In the next section the focus will be upon what ERs and RPs can do in their own individual and collective planning and preparation for natural hazard emergencies. It focuses upon how the actions and decisions taken by ERs and RPs can support strategies like those identified in objective and potential approaches available to them, which can be incorporated into their resilience planning and preparation. And whether these have the potential to support A) the community's future resilience and B) the Scottish climate change adaptation program.

Key points

- There needs to be an actively managed transition period between responding to natural hazards emergencies and recovering from them

- The well-being of the community, mental and physical, should be supported as part of effectively engaging with the community
- The perception of actions and decisions taken by ERs and RPs affects the community's capacity to cope and willingness to engage
- Pre-existing plans which have been created with the community in advance, facilitate long-term recovery
- A strategic shared concept of what the recovery process looks like is important
- Access to external resources including skills and equipment is an essential part of the recovery process
- A diverse range of actors, both emerging and established, support long-term recovery
- The community and its individual members should be recognised as autonomous and a valuable resource with the capacity to create its own solutions
- The decision-making process should be participatory, transparent, accessible, and understandable.

Table 3 Strategies successfully used by communities to recover from natural hazard emergencies and the community features which the strategy replenished (highlighted in blue).

Strategy	Features of the community which are replenished, rebuilt, adapted or transformed					
	Natural Environment	Economic infrastructure	Resources	Physical infrastructure	Capacity and skills	Civic infrastructure
Transition Phase						
Resilient Recovery Planning and Managed Participant for Community Resilience						
Machizukari “Creating Communities” Balancing Infrastructure Recovery With Local Sociality						
Well-Being and Mental-Health Interventions and Support to Enable Community Recovery						
Creating Space for Groups to Form in Response to Disasters (Building Psychosocial Capacity)						

Table 4 Examples of strategies used by communities to successfully recover from natural hazard emergencies, showing which mechanisms (highlighted in blue) were utilised and the strategies' potential to improve communities future resilience or/and adaptation to climate change. The prioritisation of the strategies for future resilience and climate change adaptation is also indicated, green squares show that this aspect is a high priority and amber squares show that there is potential to include this as part of the recovery process but it is not prioritised by the strategy.

Strategy	Potential		Dominant Mechanism											
	Future Resilience	Adaptation to Climate Change	Efficacy	Engagement	Involvement	Competency	Altruism	Action	Observation	Knowledge	Information	Understanding	Experience	Competency
Transition Phase														
Resilient Recovery Planning and Managed Participant for Community Resilience														
Machizukari "Creating Communities" Balancing Infrastructure Recovery With Local Sociality														
Well-Being and Mental-Health Interventions and Support to Enable Community Recovery														
Creating Space for Groups to Form in Response to Disasters (Building Psychosocial Capacity)														

Section 4: Objective three: Identification of Strategies Available to Resilience Practitioners Which Can Be Incorporated Into Resilience Planning. Identify Potential For A) The Community's Future Resilience And B) The Scottish Climate Change Adaptation Program.

Introduction

A community, which is a system (Scottish Government, 2019a), is influenced by each part of the inner coping capacity feedback cycle shown in Figure 3 objective one. This is important because to influence a community is the purpose of; A) what is done to plan and prepare for an NHE, and B) the actions and decisions taken in response to an NHE, which contributes towards creating the conditions under which the community's recovery takes place, laying the foundations for future resilience.

In this section of the report ways in which PRs and ERs can support different types of strategy for community's recovery from an NHE are proposed. These proposals are based upon the capacity to cope feedback cycle, the mechanisms which ERs and RPs can affect A) in their preparation and planning and B) the response, to an NHE, without compromising their core purpose of (Ready Scotland, 2017):

- protecting human life, property, and the environment
- minimising the harmful effects of the emergency
- managing and supporting an effective and coordinated joint response
- maintaining normal service as far as is possible
- supporting the local community and its part in recovery

The relationships between mechanisms, internal reactions, and features of the community are drawn out and how the actions and decisions during the NHE can potentially influence the sections of the capacity to cope feedback cycle, shown in the inner cycle of Figure 1. A summary of how mechanisms identified are utilised is given, to enable different sectors and organisations involved in community resilience to identify ways to identify strategies they could adopt. A decision support tree has been created to illustrate how to identify specific actions which support recovery strategies that improve the community's future resilience and contribute to the SCCAP. Finally, the requirements needed to exert influence on a system are illustrated and explained.

The relationship between mechanisms and internal reactions (spontaneous responses)

The focus of this research is what ERs and RPs can do to improve prospects for communities to recover from NHEs. As has been identified, in the preceding work on objective one and two, influencing individual's and community's internal reactions to what they experience can have a profound effect upon the community's recovery. These reactions affect every other aspect of community's recovery and are something which ERs and RPs affect directly using the mechanisms identified as shown in figure 5 and table 1 in objective one.

These reactions are driven by the community's and individual's external experiences, and their capacity to cope. It is in these two areas which RPs and ERs do play a role both in their preparation and planning and crucially in their response to NHEs. The focus of this next part of the report lays out how the mechanisms are likely to influence internal reactions identified in objective one.

Table 5 gives an overview of a simplistic relationship between the mechanisms and internal reactions. As previously shown in objective one Figure 4 and Figure 5, these relationships are much more complex and the network of relationships between individual mechanisms and individual reactions are interrelated and can exert an influence upon each other. The purpose of Table 5 is to show how effective use of the mechanisms listed (left-hand column) can increase the positive reactions while ineffectual use of the mechanisms can increase the positive reactions. All the reactions fluctuate over time and are influenced by one another as well as the mechanisms shown.

Table 5 Matrix of internal reactions and mechanisms. Purple squares indicate reactions which the objective is to decrease using the mechanisms, green squares indicate reactions which the objective is to increase using the mechanisms and yellow squares indicate where the aim is to positively influence using mechanisms.

Mechanisms which may influence internal reactions	Internal reactions levels of which fluctuate over time									
	Social capital	Agency	Acceptance	Trust	Attitude	Helplessness	Frustration	Resentment	Anger	Anxiety
Action										
Competency										
Efficacy										
Engagement										
Knowledge										
Understanding										
Information										
Observation										
Experience										
Empowerment										
Involvement										
Altruism										

Summary of mechanisms utilisation during response to NHE.

Action

Action here refers to the what is done during the NHE it encompasses the actions of all actors, individuals, groups, and organisations. ERs and RPs can only control their own actions and how well they can influence other actors' actions will depend upon multiple and complex interactions all aspects of the response system.

Competency

Competency here refers to how proficient the ERs and RPs are in doing their jobs, their professionalism, preparation, planning, and training. The Scottish Government's extensive resources and guidance documents as well as the Scottish Government's Resilience Learning Hub¹⁴ are all focused upon enabling ERs and RPs be highly effective when responding to NHEs to meet their core objectives.

Individual ERs' and RPs' organisations have very specific skill sets and their capabilities for developing and maintaining core skills to meet their organisational objectives are outside the scope of this research.

Efficacy

Efficacy is the most important mechanism (Meyer *et al.*, 2019) and here it specifically refers to the efficacy of the ERs and RPs actions and decisions during the response to an NHE. It is the effectiveness of what is done during the NHE which is key for every aspect of a response and the recovery. Like competence, efficacy relies upon training, preparation and planning, communication, situational awareness, and context. It relies upon ERs and RPs being able to access the resources they need when they need them. Efficacy of a response is improved by a community's own strategy preparation and planning for NHE, community resilience plans, flood management plans local authority plans (Lyon, 2015).

Efficacy is the linchpin of a response, in terms of how individuals and communities react to everything else. It has a tangible effect on the ground in terms of minimising the consequences and dealing with these consequences effectively. If ERs and RPS work together effectively do things well and are seen to do things well and have the confidence in their own capacities and abilities this will make the whole system more cohesive and responsive to dynamic situations (Flood *et al.*, 2019; Scottish Government, 2019a; Scottish Government, 2019c). For example it has been shown that highly skilled and competent individuals are better able to deal with members of the public and are more confident (Monachino *et al.*, 2019; Rosqvist, Lauritsalo and Paloneva, 2019), typically people who feel confident in their abilities can deal with situations better, communicate well with others have good attitudes, are less stressed, and can adapt and use their transferable skills in unforeseen situations.

Efficacy of strategic, tactical and operational, actions and decisions enables the response system to function well, is able to utilise and deploy its resources and capabilities where and when they are most needed, and take difficult decisions (Davies *et al.*, 2014; Scottish Government, 2019c).

¹⁴ <https://www.scords.gov.uk/>

Engagement

Engagement refers to connecting with local communities and involving them in their own resilience. Community engagement is a core aspect of the SCCAP and Scottish Government's approach to community resilience (Scottish Government, 2019b; Scottish Government, 2019a; *Scotland Climate Change Adaptation Program 2019-2024. Published Responses*, 2019; Scottish Government, 2019c; Scottish Government, 2018; Scottish Government, 2017a; Resilient Communities Team, 2017). Engagement with communities means that communities themselves work with different sectors and organisations, both inside and outside of government, enabling them to be actively involved in planning and preparation for NHEs and use their own knowledge and understanding of their communities to help RPs and ERs in the response to NHEs. In Scotland an example of this is the development of community resilience plans which are used by ERs and RPs for their own planning and preparation (Lyon, 2015).

Knowledge

Knowledge here refers to A) ERs' and RPs' and B) the community's and individuals' capacity to interpret and use information, it requires some level of education and in the ability to learn (Meyer *et al.*, 2019). Knowledge transfer can take place during, and in advance of any NHE. Knowledge transfer can be utilised at strategic, tactical and operational levels and used by multiple actors. Knowledge has the potential to enable communities and individuals to develop understanding of what is taking place.

Understanding

Here understanding refers to how well the community and individuals within the community comprehend what is happening during an NHE and their roles within it (what they can do which supports the response).

Understanding is important as it enables people to explain to themselves what is happening around them and why. If people have a good understanding of the issues and challenges of managing a NHE response this can help to manage people's expectations of what is achievable and what they can expect from ERs and RPs (Meyer *et al.*, 2019). It can help to defuse tension when people have a comprehension and empathy towards other roles and duties. Clear, comprehensible and logical explanation of what is going on and why e.g. transparent decision-making process, can support understanding during the response. Understanding can be created in advance of an NHE through community resilience groups, engagement activities undertaken by different ERs and RPs in fostering a connection with the general public.

Information

Information here refers to that which is communicated to individuals and communities by the RPs and ERs. Information is vitally important during a response to an NHE clearly linked to understanding. Having access to trusted and true information informs people's understanding of the situation and affects the explanations which they tell themselves (Mabon, 2020). It is important to acknowledge that there are multiple and contradictory sources of information which are all competing for the community's and individual's attention (Paton and Irons, 2016). During the response it is fundamentally important that what information is being given by official sources, is true and consistent with what people are observing and being told by other trusted sources. If there

appears to be an inconsistency this should be explained either saying it is not possible to give a full picture of the situation or the reason why people's experiences and observations may differ from what they are being told. If it is not possible to give people all the information, say this and if possible, give an explanation.

Information also includes giving people what they need to know in order to take the actions they need to so it is vitally important that they trust what is being told because they will base their decisions on multiple sources of information which will affect their actions, attitudes and behaviour. It is important to be mindful of how information is communicated in terms of tone, this can affect people's attitudes. This can have a very big influence upon people's willingness to engage with the recovery process and those involved with it (Spialek and Houston, 2019).

Information needs to be comprehensive as far as possible, consistent, accessible, trusted to combat misinformation. Working with communities in advance of NHEs has the potential to "inoculate communities" to fake news (van der Linden *et al.*, 2017).

Observation

Observation here refers to what community and individuals within that community "see" happening around them. It refers to all the multiple sources of information around them, coming from friends, family, what they see on around them, news reports, social media et cetera. What people observe happening influences their perceptions. If people's observations do not agree with the information that they are receiving this can lead to reduced levels of trust (Bambals, 2015). Equally if people observe positive things this can have a positive effect. The behaviours that people observe taking place around them influence their own behaviours and can normalise either positive or negative actions (Brown *et al.*, 2019). ERs and PRs cannot control what people observe happening around them but they are able to influence some aspects of what people observe.

Experience

This refers to what the experience of being involved in the response to an NHE is like for, A) ERs and RPs and B) the communities and individuals. It also refers their level of experience, if have they previously encountered or been involved in NHEs. ERs and RPs can influence their own and others experience of an NHE through their actions and their decisions during the response. Experience is subjective and most of what is experienced during an NHE is affected by things outside the control of ERs and RPs and the individuals themselves (Su and Tanyag, 2019). How people experience a NHE can be positive or negative and how in control of the situation they feel has implications for their future resilience and the capacity of individuals and the whole community to recover.

Empowerment

Empowerment here refers to enabling individuals and communities to have the autonomy, skills, capacity, resources and confidence to codevelop and be involved with their community's response to a natural hazard emergency and their community's subsequent recovery.

When communities are empowered this provides additional access to knowledge, information and understanding about that community which is useful to ERs and RPs because people know their own community (Kerstholt, Duijnhoven and Paton, 2017). This helps to build community confidence and increased engagement with ERs and RPs again empowerment like experience can help with future

well-being of the community and develop the capacity to recover quickly from the effects of NHEs (Markantoni *et al.*, 2018).

Involvement

Involvement here refers to how involved communities and individuals from within that community are in the response and the planning and preparation for NHEs. It specifically refers to the actions that they take. Involvement during a response to an NHE can increase skills, knowledge, empathy, understanding and have implications for future resilience as events offer an opportunity for on the job training (Thaler and Seebauer, 2019). Being involved in taking control of situations in large and small ways again contributes to mental and physical well-being. It can reduce levels of anxiety and help people express altruism which turn can defuse feelings of helplessness, anger and frustration. This process can increase the likelihood of people being willing to become involved in the recovery process and can positively influence perceptions of the overall response to an NHE (Haworth *et al.*, 2018).

Altruism

Altruism here refers to acts undertaken by individuals or groups from a community which demonstrate a selfless concern for the well-being of others. Altruism has been shown to improve individual well-being and resilience. Acts of altruism help communities to increase their levels of social capital and well-being and can support the recovery and rebuilding process (Monteil, Simmons and Hicks, 2020).

Table 6 gives examples of ways in which RPs and ERs can influence the internal reactions using mechanisms and identifies some of the dominant drivers involved in creating internal reactions. Organisations and sectors involved in community resilience have different objectives and priorities and what these are will affect which strategies are available to them and whether they decide to adopt a strategy.

When considering strategies and utilising mechanisms RPs and ERs also take into consideration the potential scenarios under which they will be deployed. For example, what may be appropriate in a severe but localised flood may not be appropriate for an extreme snow event which affects multiple regions, for example Beast from the East which affected the UK in 2018. Scenario planning¹⁵ is outside the scope of this piece of research but is part of the process for organisations when evaluating their planning and preparation for NHEs.

¹⁵ scenario planning forms part of a linked research project which is being funded by the NCR

Table 6 Examples of strategies available to RPs and ERs which influence internal reactions of individuals/and or communities with the dominant driving mechanism when identifiable, where the dominant driver is listed as multiple it is not possible to characterise a single driver as necessarily having a dominant influence upon potential internal reactions experienced. Spontaneous reactions experienced by individuals and the community during the response and recovery to a natural hazard emergency. The dominant driver column refers to the mechanism which has been identified as playing the most significant role in driving that reaction. In the case of some reactions there is no dominant driver the reaction is influenced combinations of different mechanisms and no single mechanism dominates.

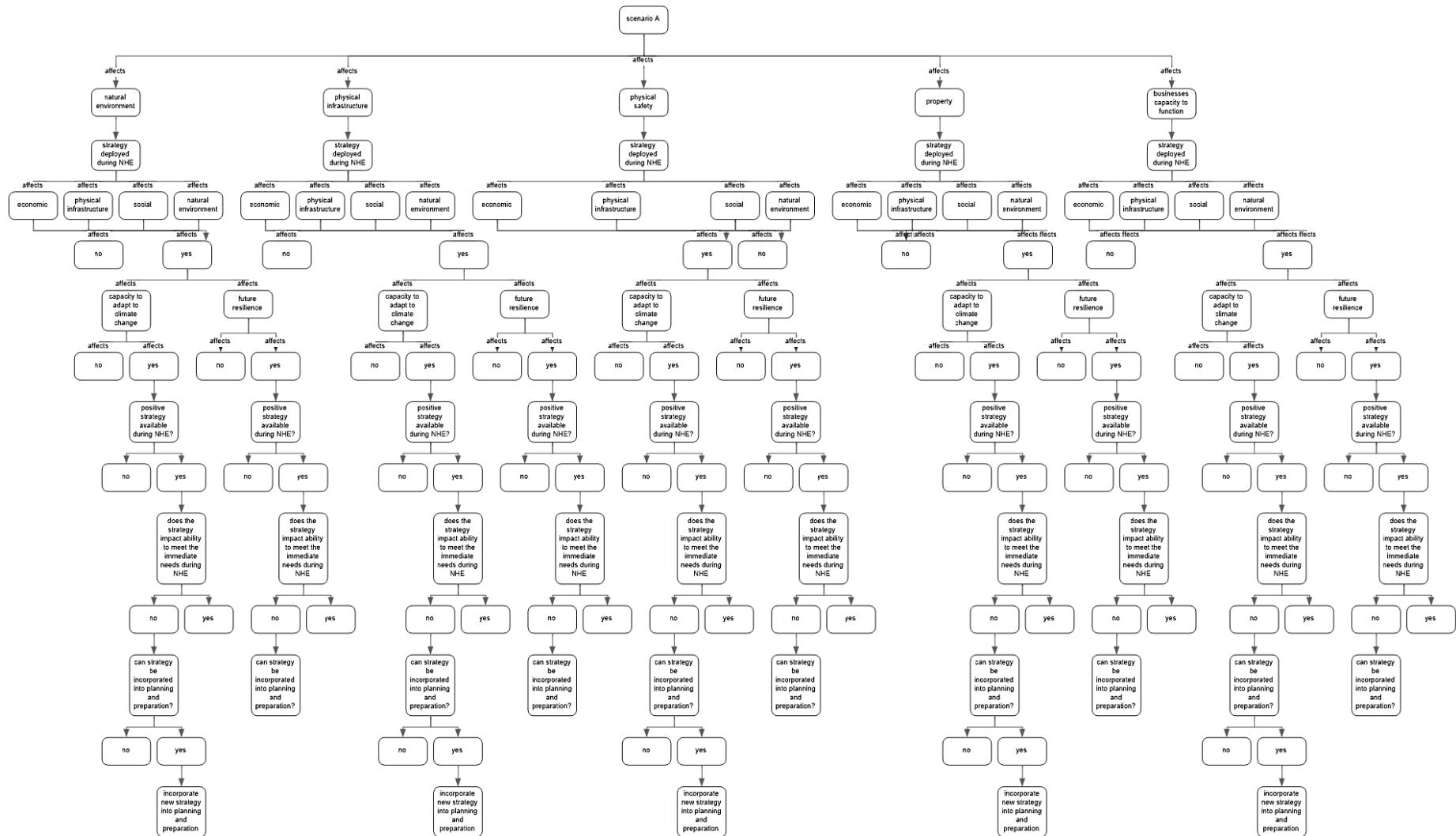
Internal REACTION	DOMINANT DRIVER	EXAMPLES OF STRATEGIES TO MITIGATE OR ENCOURAGE INDIVIDUAL AND/OR COMMUNITY REACTIONS	
		PREPARATION AND PLANNING	RESPONSE
Social Capital	Altruism	Community resilience groups, civic society, openness and social networks, prepare spontaneous volunteers management strategy	Communication strategy Manage and utilise spontaneous volunteers whenever possible
Anxiety	Uncertainty	Information, knowledge, expectations, familiarity, developing community capacities	Communication strategy Efficacy
Acceptance	Understanding	Managing expectations, listening to the community	Communication strategy
Trust	Multiple	Interaction between community, and RPs and ERs, familiarity, listening to the community, two-way process	Communication strategy Efficacy
Helplessness	Empowerment (Powerlessness)	Developing community capacities, information knowledge and skills	Communication strategy Efficacy
Anger	Multiple	Transparency, explanation, listening to the community and working with the community, use of language	Communication strategy Efficacy
Frustration	Multiple	Developing skills and capacities within the community, explanations, expectation management, transparency,	Communication strategy Efficacy

Internal REACTION	DOMINANT DRIVER	EXAMPLES OF STRATEGIES TO MITIGATE OR ENCOURAGE INDIVIDUAL AND/OR COMMUNITY REACTIONS	
		PREPARATION AND PLANNING	RESPONSE
Agency	Empowerment	Empowerment, developing skills and capacities, information and knowledge, two-way process	Communication strategy Utilise skills and capacity within community whenever possible
Attitude	Multiple	Language, engagement, inclusivity	Communication strategy Efficacy
Resentment	Multiple	Language, engagement, inclusivity, explanation	Communication strategy Efficacy

ERs and RPs require a consistent approach with strategies which enable them to support communities develop their future resilience, and the SCCAP as part of the recovery process, without compromising their core purpose or objectives. A decision support tree is one potential practical approach which could aid RPs and ERs in this process.

Decision support tree

Figure 10 is a partial illustration of the decision support tree which has been constructed as part of this research project. It shows the areas identified in objective one, Figure 1, how a strategy used to mitigate the impacts of scenario A (for example localised flood) on that area can be evaluated using the decision support tree.



The decision support tree shown in Figure 10 could be used by any organisation involved in community resilience and has been designed to be applied in parallel or in series. Organisations could prioritise individual areas or multiple areas, this would vary depending upon: A) objectives and duties, and B) the scenario being considered. This would streamline the process and organisations would use their own discretion and expertise to apply the decision support tree as required.

At a strategic level the following questions could be used to sift potential strategies and allocate them accordingly to buy sectors or organisations:

- 1) Can these strategies be prepared and planned for in advance?
- 2) Who would be able to plan and prepare these strategies?
- 3) Who could use these strategies?

These strategies could then be evaluated by those organisations using the decision support tree potentially working with the communities in which they may be deployed as part of this approach.

This approach has the potential to be adopted at a national, regional and local level. For example, at a national strategic level to develop an integrated resilience and climate change, framework. At a regional level to it could be used to integrate specific strategies across organisations and sectors for regional resilience. It could be utilised by local authorities to develop an integrated approach to community recovery from NHEs to build back better using the SCCAP outcomes to as a guide to the recovery process. It also has the potential to be applied at a community level to help inform their community resilience plans.

Figure 11 shows a single branch from the decision support tree which illustrates the process which would be followed for impacts on physical safety of a scenario using a strategy and the pathway to evaluate its effects on the social categories of a community's features.

This binary yes/no approach allows strategies to be consistently and quickly sifted and evaluated allowing a more detailed evaluation of those strategies which show the most promise of achieving the multiple objectives which would be required.

Creating the conditions for future community resilience

As shown below in Figure 12 there are three prerequisites for an individual or group to exert an influence or have an effect. These pre-requisites have been derived adapting principles established in behavioural economics (Laibson and List., 2015) with community resilience research (Kua, 2016). These three prerequisites are significant for two reasons; firstly for evaluating what strategies are available to RPs and ERs when they are preparing and planning, and what actions and decisions they take during the response to an NHE, and secondly for considering how different strategies influence conditions created in the immediate aftermath of an NHE.

The first prerequisite is, does the individual or organisation have the power to act? This is dependent upon it being influenced (the feature), what they can do to affect this feature (the mechanism), for example policymakers can change policy, and finally what they can draw upon (capacity to cope) what skills and resources are available to them to make this change.

The second is, do they have the capacity to act? This is also dependent upon the three stipulations above, but in addition to this the individual or organisation must want to change this (external experience). This is very important and complex because of: A) statutory obligations, B) economic, social, and political considerations, and C) the context of the NHE.

For individuals the capacity to act, may be driven by a desire to help rebuild their community, but they must be willing to work with others including official organisations. This willingness will be affected external experiences, ERs and RPs influence this both positively and negatively as a result of how well they utilise the mechanisms available to them (Table 6).

Finally, deciding to act. The desire to act (internal reaction) must be strong enough to overcome any barriers to action. This desire may be driven in part by advantages or disadvantages which they can expect to derive (Kua, 2016). However more important than this are the mechanisms identified in objective one, which have a fundamental role in creating the external experience and thus influence the internal reactions to an NHE and ultimately individuals' willingness to become involved in their community's recovery process.

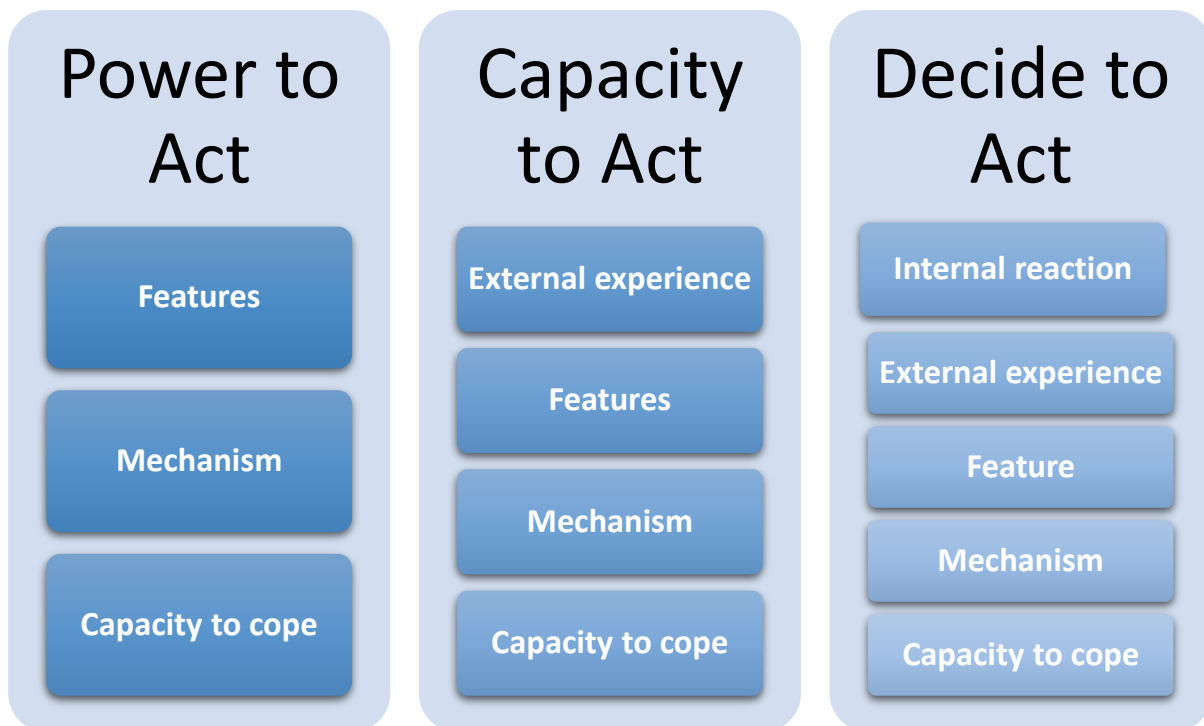


Figure 12 Prerequisites required for an individual or group to exert an influence.

The ability to meet these prerequisites depends upon the context of a situation and its conditions. The context of the situation, for example a community which has just experienced an NHE, is outside the control of ERs and RPs but they do have the ability to influence some aspects of the conditions of a community in the aftermath of an NHE. They can exert this influence in advance of an NHE as part of their preparation and planning, and during the NHE itself through their decisions and actions.

Key points

- Mechanisms need to be utilised appropriately and effectively to influence individuals' and communities' internal responses
- The strength or level of each internal response fluctuates over time
- The efficacy is the most important mechanism in any response to an NHE
- Strategies identified to support communities' long-term resilience and willingness to engage with SCCAP must not compromise ERs and PRs core objectives
- It is possible to identify which support multiple aspects of a community's future resilience and the SCCAP
- Strategies can be identified which can be utilised at a national, regional and local level
- A consistent decision-making process can help coordinate strategies across organisations and sectors to support the recovery process for a community's future resilience and the SCCAP.

Section 5: Summary of Research Findings

Discussion

Resilience practitioners (RPs) and emergency responders (ERs) are a fundamental part of any response to a natural hazard emergency (NHE). The actions and decisions which are taken during an NHE and when preparing and planning for an NHE can affect a community's recovery.

Communities' ability to recover from an NHE depends upon being able to access, physical assets and resources, and draw upon expertise and skills, that are needed to rebuild their communities. Recovery is also about community mental and physical well-being in particular the community's, and individuals', within a community, capacity to cope. This means not only capacity to cope with an NHE but also the capacity to cope with the process of recovery and the capacity to adapt to the impacts of climate change. Capacity to cope is bedrock of resilience and the foundation of building future resilience and being able to adapt to climate change.

As shown in figure 8 the capacity to cope feedback cycle involves internal reactions to something, as well as the external experience, both of which are equally important to a community's ability to recover from an NHE and ultimately that community's future resilience, as shown in figure 3, and thus the willingness to engage with the SCCAP.

ERs and RPs actions and decisions during an NHE are perceived by the community through the mechanisms identified in figure 5 and shown in table 1. ERs actions and decisions influence how well these mechanisms work and thus impact upon the community's internal reactions to what is happening around them and what they experience which then affects their capacity to cope.

The mechanisms, as discussed in section 4: objective three, and how effective they are is related to what RPs and ERs do during the NHE as well as what they do to plan and prepare for NHEs. As shown in table 1 and table 4. In the examples identified and analysed in section 3: objective three, for communities to successfully recover from the impacts of an NHE it is necessary that the community and the people of which it is comprised, are part of this process. It is not enough to rebuild the physical environment, as was illustrated in the strategy of Machizukairi, when parts of the community and their opinions were ignored physical reconstruction was not as effective as it might have been, also community (internal) reactions, as shown in figure 4 were negative. Applying the capacity to cope feedback cycle, figure 3, this undermined future resilience.

It has been shown that community capital and social capital increase during an NHE, ERs and RPs can contribute to this because they affect internal reactions, shown in figure 4. By effectively utilising the mechanisms ERs and RPs can increase the likelihood that communities will engage with them in the future as part of the recovery process and build future resilience.

The strategies evaluated in section 3: objective illustrate how important these internal reactions to ERs and RPs are in driving recovery. These internal reactions fluctuate over time, however what happens during the response to an NHE and what is done to prepare and plan for an NHE does have a direct impact on how successfully communities recover. These internal reactions affect all features of a community, figure 1, because communities are highly complex interrelated social-environmental-economic systems.

RPs and ERs influence the capacity to cope feedback cycle, figure 8 and figure 3, through effective use of mechanisms, examples of which are given in table 6. This process contributes to the condition

that the community finds itself in in the immediate aftermath of an NHE. If the positive internal reactions are more prevalent than the negative internal reactions (see table 5) and these levels can be nurtured as an integral part of the recovery process, then capacity to cope feedback cycle will be triggered in a positive feedback loop. If the negative reactions predominated, the process of recovery will be made more difficult as the community's well-being and capacity to cope will be undermined by their internal reactions and external experience.

Strategies to improve the effectiveness of the mechanisms needed for an effective response to NHE which also contributes to a community's future resilience and the SCCAP can be identified using a binary decision support tree, figure 10 and 11. Individual organisations and sectors involved in community resilience and emergency response can use this approach individually or collectively. Working together as recommended in by Scottish Government's guidance (Ready Scotland, 2016) on resilience means that using the Scottish Government resilience structure as shown in figure 2 supports this approach and could be used for the purpose of not only building resilient communities across Scotland but also as a way to incorporate the SCCAP into the recovery process.

For communities to be engaged in their recovery and thus future resilience and the SCCAP they need to have influence. To have an influence it is necessary to 1) possess the power to act, 2) have the capacity to act and 3) decide to act, as shown in figure 12.

ERs and RPs can support communities and through their actions and decisions which contribute to creating the conditions under which the recovery process takes place. If communities do not take the decision to contribute to their own recovery or have the capacity to contribute their own recovery, this process will be ineffective and undermine community's future resilience.

ERs and RPs have a positive effect on communities they are there to protect and mitigate the consequences of natural hazard emergencies, communities recognise this and appreciate it. By using strategies which support and improve the effective use of the mechanisms during the preparation and planning for NHEs and during the response to an NHE they can have a direct positive effect on community's ability to recover from a natural hazard emergency thus improving its future resilience and potentially its willingness to engage with the SCCAP.

Recommendations

- There should be a managed transition phase in between the immediate response to a natural hazard emergency and the recovery of a community.
- All ERs and RPs involved in the response to an NHE should prepare a withdrawal or handover plan in advance of an NHE as part of the transition to the recovery phase
- ERs and RPs should consider strategies which actively promote a community's future resilience and the SCCAP (provided they do not compromise their core objectives).
- ERs and RPs should consider themselves part of the what creates the conditions in which a community's recovery takes place both during A) the response to, and B) preparation and planning for an NHE.
- The relationships between, the mechanisms involved in a response to NHE, (action, competency, efficacy, engagement, knowledge, understanding, information, observation, experience, empowerment, involvement, and altruism) and the actions and decisions taken at a strategic, tactical, and operational level should be mapped out and prepared for using scenario planning to help predict and manage the internal reactions of communities and individuals.

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