Geo-Ed

Secondary school student perspectives on community resilience in Grey District

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Abstract: For a national competition supported by the New Zealand Board of Geography Teachers, secondary school students in years 10–13 were asked to identify and investigate factors that were building community resilience in their home areas, and the entries provided young people's perspectives on how well individuals, families and communities 'bounce back', adapt, change and become stronger following an adverse event. This article concerns the findings of students at Greymouth High School. Their entries showed that community resilience in Grey District depended on individual and collective capacity for action. The greater their involvement in community affairs and projects, the more likely individuals and families were to form networks and participate in communal activities. In Greymouth, as elsewhere in New Zealand, membership of voluntary organisations and participation in planning for, and responding to, catastrophic events has helped residents respond effectively in times of adversity and has enhanced community resilience.

Key words: community resilience, disaster preparedness, Grey District, secondary school students' findings.

Resilience

Resilience is the capacity of an individual, family, community or institution to cope with an adverse event, including the ability to recover from it and resume daily life and work. From the perspective of experience gained in natural disaster[1] management, Paton *et al.* (2013) described resilience as 'a process defined by the interdependent capability of people, communities and societies to use their resources and skills to anticipate, cope with, adapt to, recover and learn from the demands, challenges and changes encountered before, during and after hazard events'. The resilience of small, geographically isolated communities may also be challenged by economic shocks, such as after the collapse of a business that had employed many local people.

What enables a community to survive, retain its values and bounce back after adversity, and what can make a vulnerable community more resilient? On the assumption that shared capabilities and capacity-building skills allow individuals to work collaboratively and recover from natural disasters, what particular factors should be taken into account, and what particular skills are needed to enhance community resilience?

The international literature addresses those questions and suggests that the resilience of individuals, communities, businesses and institutions confronted with disaster involves

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(i) prompt adaption to the new physical and social environment and (ii) a speedy return to 'normality'. Researchers across the globe (Paton 2006, 2007; Becker *et al.* 2011; Paton *et al.* 2013; Thornley *et al.* 2015) have noted the importance of the following factors:

1 People are able to identify the hazards to which they, their families, communities and institutions are exposed.
2 People have access to resources – such as family and community plans for coping during an adverse event, emergency kits, up-to-date lists of go-to places, insurance cover and awareness of official policies for disaster relief and management – to ensure human safety and the continuation of core activities, while community members strive to resume normal economic and social activity.
3 Individuals have the competencies, knowledge, skills and training to locate and use those resources and have confidence in their own and others' ability to resolve economic, environmental and social problems as they arise.
4 People participate in community life and are members of networks that, *inter alia*, build local knowledge and trust, hone skills and capabilities for managing disasters, maintain resources useful in response and recovery and identify individuals who may require assistance.
5 Participation in marae, community and voluntary activities, along with formal business and disaster management training, will assist residents to prepare for, cope with and recover from a calamitous event. Engagement in community organisations or training facilitates:
   • building participants' skills in planning, strategising and problem solving
   • articulation of community views, attitudes and processes
   • exchanges of helpful information
   • identification, training and support of leaders
   • development of social environments that support collective action and grow and enhance residents' quality of life. Collective competence and cohesion are critical

for disaster management and post-disaster adaptation
6 People feel empowered and believe they can manage their affairs. This follows when residents know (i) they are listened to, (ii) their ideas will influence what happens in the community and (iii) they have access to resources that will facilitate justice, equity and respect for diversity.
7 People trust others in their community. Trust ensures the effectiveness of group processes, and people are more likely to adopt appropriate measures if they feel they are able to trust local sources of information and support.
8 Strategies are needed to ensure that key resources and competencies are sustained over time, irrespective of changing personnel, needs and goals.

In 2013, GNS Science was commissioned by the Ministry of Business, Innovation and Employment to investigate (i) how New Zealand communities respond to hazardous events and disasters and (ii) community attributes that foster resilience. Part of that project was an inquiry into young New Zealanders' understanding of resilience.

The students' task

A competition supported by the New Zealand Board of Geography Teachers and the New Zealand Geographical Society was designed to show if responses to significant natural and socioeconomic events that had affected individuals, families and institutions had enhanced community resilience. The students were asked to investigate resilience in the local community by interviewing older residents. If they wished, the students could use any of a set of twelve provided questions. Finally, the students were asked to summarise what they had discovered from that interview, their personal experience and any other inquiries they had made about resilience at the individual, family, institutional and community levels.

The largest cluster of research essays (hereafter 'RE') came from Grey District, where

residents had experienced numerous adverse economic and environmental events in recent years. In this article, we draw on information in the 11 essays submitted in 2013 and 2014 by Greymouth High School students. Their perspectives on community resilience in an economically and environmentally vulnerable part of New Zealand contributed to the larger project. For context and completeness, we added information from the 2013 census and other official sources as well as the references to the literature on resilience.

The meaning of resilience

Some of the students compared resilience in people to the responses of physical materials that 'spring back' to their original shapes after the relaxation of a deforming force (RE2, 7). They then probed meanings that relate to the context in which the term is used. Invoking the idea of recovery after perturbation, the students drew analogies with the effort required by an individual to attain a goal through 'working at something till you achieve it' and having the 'determination and courage' to overcome obstacles (RE11). One student's essay encapsulated the responses of several. It concluded that community resilience is the collective effort of being ready for, overcoming and adapting to disruption while basic functions are maintained, and people work collectively to foster economic and social recovery after a disruptive event (RE7).

The students did not restrict themselves to natural disasters. Some wrote about mental issues that may arise through misuse of recreational drugs and the support needed by households, institutions and the community when people face serious health problems (RE5, 9).

The students observed that the location, physical features and socioeconomic profile of Grey District have increased this area's vulnerability to environmental and economic disasters (Table 1). In explaining the geographic context, the students showed a mature understanding of the relationships between people and their environment[2] and how these influence community resilience.

Physical and social context

With a surface area of 3500 km^2, Grey District is one of three administrative units in the West Coast region (Fig. 1). Located on a long, narrow strip of land between the Tasman Sea and the Southern Alps, Grey District has been shaped by its geographical isolation from the rest of the South Island and physical processes stemming from the collision of two tectonic plates. The Southern Alps are being uplifted by about 20 mm/year (O'Loughlin & Owens 1987), but this is eroded by orographic rainfall generated by westerly winds crossing the Tasman Sea (NIWA 2014). Heavy rain triggers a range of adverse events, including accelerated soil erosion, landslides and flooding, but also supports two important industries: forestry and farming. The plate boundary is marked by active faults; chief among them is the Alpine fault that periodically generates earthquakes of a magnitude 7 or greater on the Richter scale.[3] All parts of Grey District lie within 30 km of the Alpine fault, making the area prone to the adverse effects of seismic activity, but it is also where uplifted seams of high-quality bituminous coal lie close to the surface. For more than a century, those deposits were the basis of a third important industry, coal mining.

Grey District's largest urban area, Greymouth, is built on alluvial mudflats at the mouth of the Grey (Māwheranui) River, and until the District Council invested in extensive flood control works, its central business district was subject to almost annual flooding (Benn 1990). The entrance to Greymouth's river port is partly obstructed by unstable sand bars between the two breakwaters (Fig. 2), making it one of the most dangerous ports in New Zealand. By 2013, some 45 boats had grounded on the Grey River bar, and the fatalities included crew members of commercial fishing boats (Mills & Logie 2013).

Demographics

Grey District had a 'usually resident' population of 13,370 at the 2013 census, having grown by 4% since 2001. The District is ethnically more homogeneous than the country as a whole (93% are 'European' in contrast to 74%), and 90% of its residents were born in New Zealand compared with 75% for the

Table 1 Major disasters and their impact: Greymouth and Grey District, 1869–2014

Date	Disasters
1869	A fire claimed 14 businesses
1872	70 buildings were washed out to sea during major floods
1887	Floods swamped Greymouth Central Business District (CBD) as high tides coincided with a flood in the river (100 people evacuated)
1896	Brunner mine explosion (65 deaths)
1905	Floods swamped Greymouth CBD (despite flood protection installed following 1887 flood)
1913	Greymouth CBD flooded
1926	Dobson mine explosion (9 deaths)
1929	Murchison earthquake (7.8 on Richter scale) 17 deaths – epicentre outside district but roads, buildings and bridges affected by tremors
1936	Lower Greymouth and Cobden flooded
1940	Kaye and Party mine at 10 Mile Creek, explosion (5 deaths)
1967	Strongman mine explosion (19 deaths)
1968	Inangahua earthquake (7.1 on the Richter scale), 3 deaths including one at Greymouth due to road subsidence – epicentre outside district, but two-thirds of Greymouth's chimneys were damaged
1970–1988	Greymouth CBD was flooded in 1970, 1977, 1980, 1983 and 1984. Work to construct flood protection walls began following the 1984 flood. Greymouth CBD experienced two major floods in 1988 prior to the floodwall's completion (the newly constructed Cobden stop-bank stopped direct flooding of 100 houses). The May 1988 flood caused $4 million worth of damage, the September 1988 flood $16 million (Benn 1990). 300 people were evacuated in the September flood. The 'floodwall' was completed in 1990 (cost $4.2 million) and raised higher in 2010 (cost $2.6 million)
1995	Cave Creek viewing platform collapse (17 students from the outdoor recreation course at Tai Poutini Polytechnic and a DOC officer caught in the collapse: 14 deaths, 4 injured)
1998	Mount Davy mine (2 deaths from gas inhalation)
2005	Tornado (6 people injured; 16 homes destroyed; 45 houses and 30 business damaged; community facilities, plus equipment and vehicles in Greymouth CBD destroyed or damaged: insurance claims cost $9.2 million, MacAskill 2005)
2006	Black Reef mine (1 death from flooded workings); Roa mine (1 death from mine shaft collapse)
2010	Pike River mine explosion (29 deaths)
2014	Tornado (10 buildings destroyed)

nation as a whole. Relatively few Māori now live in Grey District.

Greymouth, with a population of just over 8,000, comprises six area units (Fig. 1). The recent population increase of the town reflects growth in Karoro and South Beach-Camerons. These two area units, now home to one quarter of the town's population, are the wealthiest, have relatively few people without qualifications, lowest unemployment rates, fewest sole parents and relatively more people of working age (15–64 years). South Beach-Camerons has relatively more children and few elderly residents (Statistics NZ 2013).

Numbers of residents in the earliest settled parts of Greymouth have been declining for several years. Cobden, the oldest, has 20%

of the town's population. It has the fewest overseas-born residents, lowest median income, highest rate of unemployment, lowest rate of educational achievement, largest proportion of sole parents and the youngest age profile. In contrast, Greymouth Central, with 7% of the town's population, has relatively many retired people, the highest median age of residents in the six area units, fewer people under 15 years of age, low median income and the greatest proportion of overseas-born residents. It also has the second highest unemployment rate. Greymouth South has just over a third of Greymouth's population. Like Karoro, it has relatively few unqualified residents. Unlike the other area units, it has relatively few people of working age. It has a high proportion of people over 65 years of age. The
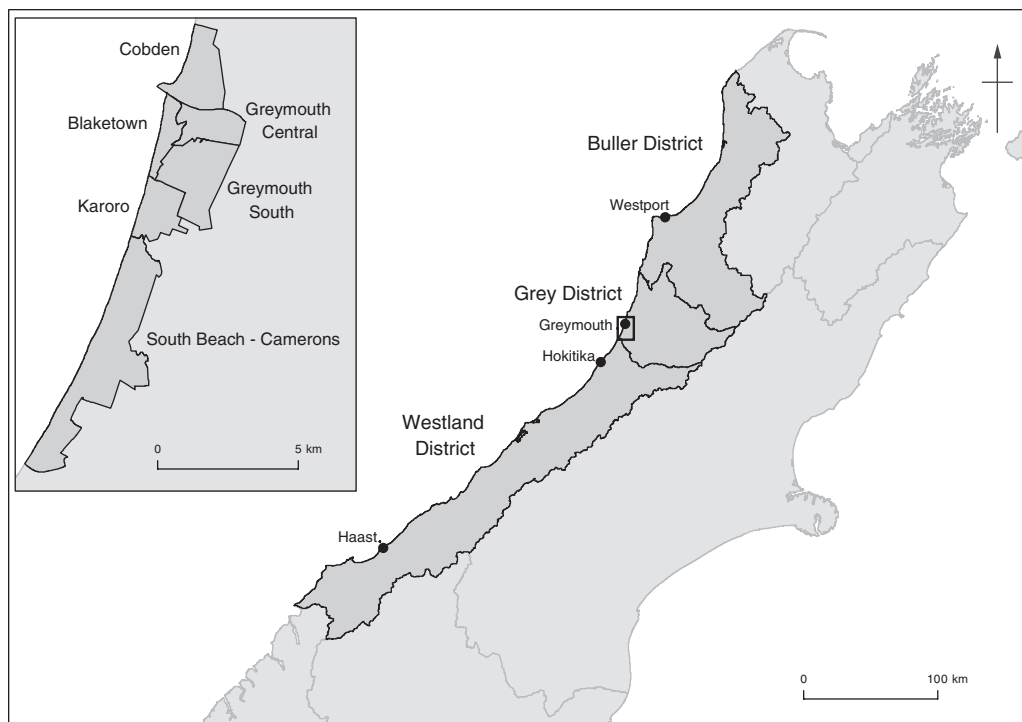
Figure 1 Residential areas of Greymouth and district boundaries of the West Coast.

remaining area unit, Blaketown, has a profile that is very similar to the district as a whole except for having a high proportion of people without qualifications and more sole-parent families (Statistics NZ 2013).

Employment and industry
The 2013 population census showed that most people in Greymouth and the Grey District were employed in the service sector (73% and 69%, respectively). The chief industries were 'health care/social services' followed by 'retail trade'. Secondary industry ('manufacturing' and 'construction') was the third largest employment category (21% and 19%, respectively). Although few residents were employed in primary industry, mining, forestry, fishing[4] and farming[5] along with ecotourism are important to the economic well-being of Grey District.

By 2010, Grey District's 130 mines had produced 44.5 million tonnes of coal (Christie *et al.* 2010), and by 2013, there had been 131 deaths (one-third of the West Coast's

mine fatalities, Fig. 3). While above-ground extraction continues, only two mines still use underground extraction methods: Spring Creek and Roa. In 2012, the State-owned company, *Solid Energy*, discharged 222 permanent staff and 130 contractors from Spring Creek Mine as commodity prices fell (Scanlon 2012). In 2013, it had a workforce of 200 and was mining 700,000 tonnes of coal annually. At the same time, the privately owned Roa Mine was operated by 35 employees who extracted 130,000 tonnes annually (Worksafe NZ 2013).[6] The 2013 Census recorded 255 people working in Grey District's mining industry. Gold mining is now limited to dredging on the Grey River.

Four-fifths of the region's native forests, which had previously formed the basis of the West Coast forestry industry, are part of the national conservation estate. The remaining area is administered by *Timberlands West Coast Limited* in accordance with the Forests Amendment Act 1986 and the West Coast Forestry Accord. Native forest logging ended

Figure 2 The changing functions of Port Greymouth are evident in the disused coal waggons and the newly laid boards on the wharf to make the facility safe for pedestrians. A line of breakers marks the sand bar at the mouth of the Grey River.

in 2000[7] (GDC 2014). There are 14,000 ha of planted forest across the region.

Almost half of those interviewed by the students had been made redundant by the cessation of logging or closures of coal mines and saw mills, but most of them had acquired new skills, found new sources of employment or established their own businesses. The students described them as 'resourceful'.

Official sources are vague about numbers, but Greymouth is a key transit point for tourists, and many of the estimated 1.9 million people who visit the region annually travel through Grey District. The tourism industry, seen by the District Council as a growth sector, is building on the district's natural scenery, food, hospitality, and environmental and social history. For example, the replica Chinese gold-mining settlement and Shantytown Heritage Park annually attract 90,000 visitors (RE7). The 136 km-long West Coast Wilderness cycle trail starts in Greymouth and 'will be a huge money-spinner in the future' (RE2).

Culture and community

Most of the residents interviewed by the students were members of families that had resided in Grey District for several generations, their predecessors having moved there from Britain and elsewhere for a better life. Others were from families that had recently moved from other parts of New Zealand in search of work and had been in the district for between 10 and 50 years. Some of the interviewees had left the Coast for a few years only to return, and some who had intended staying for a couple of years decided to remain permanently because they liked the community.

In their commentaries on Greymouth, the students reported how interviewees perceived their community:

I love living here, I know the area well, it has significance for me. My family and friends are all here. It's a small community so I know most of the people and always meet people I know when I go out (RE11).

What makes this a special place to live is the kindness and generosity of the people (RE4).

People are supportive; it's a good place to raise a family (RE1).

Figure 3 Memorial to miners who died in West Coast mines, Mawhera Quay, Greymouth.

The students concluded that the Greymouth community sees itself as friendly and caring, a place where people look after each other in times of need (RE1, 5, 7, 8, 9, 10).

While the community fosters the traditional values of respect and politeness, it is also conservative and a place where business and administration are 'strongly male dominated' (RE1). Women were seldom considered as candidates for jobs in the male-dominated industries of the area. While 'It is easier for the men to find paid work, and for the women to do the traditional chores of cooking and caring for children' (RE1), many women have acquired new or strengthened existing skills to cope with difficult economic and environmental conditions and participate effectively in community activities through their leadership, logistical and management skills.

Grey District coping with disaster

The distinctive physical features and geographical isolation of Grey District put the region and its residents at risk of major disruption by a range of natural hazards, notably, meteorological (heavy rain and flooding) and geological (landslip and earthquake). The impacts of these forces have been exacerbated by shortcomings in the health and safety measures of the district's coal mines (Macfie 2013) or errors made while navigating treacherous waters at the entrance to Port Greymouth.

Recognising hazards
The students recognised the importance of individuals' adaptive responses to their environment, their recognition of hazards and preparation for an anticipated disaster:

Being a resilient community or person is not just about getting back up on your feet, but taking that next step and planning ahead for whatever changes are likely to occur (RE2).

Despite its exposure to a wide range of natural hazards, Grey District's size, geographic isolation and its strong culture of collective, supportive action amongst residents have encouraged community members to develop ways to prepare for and cope with hazardous events and their impact. As one student commented, 'Each event has had a profound influence on the Grey District' (RE2). Natural disasters may be anticipated and prepared for, but aside from the closure of *Timberlands West Coast*, of which the company gave advance notice, the most recent economic shocks came without warning.

Grey Council maintains an up-to-date website with information about emergency centres around the district and town, the preparations people should make and how individuals can prepare for a catastrophic event (RE10; GDC 2015). With their experience of disasters and the knowledge that their community will experience further hazardous events, people in Grey District understand the need for preparation. They know about local hazards and participate in regular meetings on ways to prepare for adverse events, are keen to know what is going on and willingly share their plans for getting ready for, responding to and recovering from a major disruption (RE4).

Interviewees provided information about how they and their households had prepared for, coped with and recovered from disasters. Most had emergency kits, including canned food, torches, transistor radios and spare batteries, firewood or coal for cooking without electricity, and maintained current lists of neighbourhood emergency contacts. Their workplaces had emergency plans and procedures in place, including emergency contact lists, and many had received elementary or more advanced training in first aid (RE3, 6, 9). Interviewees spoke of participating in the training exercises[8] available several times each year in Greymouth (RE11), and at the town's schools, the students practice drills for different kinds of events (RE3). In addition, several individuals mentioned the importance of a

cash reserve and keeping up with insurance payments in the event of a disaster or redundancy (RE4, 10). Some members of the Greymouth community had their own stand-by electricity generators to keep food frozen in the event of power failure (RE5). People also knew that they could rely on local radio stations for useful information, such as broadcasts to parents on when and where to pick up their children in an emergency (RE3).

Response and recovery

A theme that emerged repeatedly – at the household, institutional and community levels – was the importance of co-operation and sharing, including knowing that people, even strangers, could be relied on to assist before, during and after an emergency (RE9, 10):

> We wouldn't have gotten through if it wasn't for each other; the support that everyone in the community was given was just extraordinary (RE4).

> Community resilience means coming together as one, and everyone being there for each other, including people that don't know each other and wouldn't normally interact, helping each other out (RE3).

Each interviewee spoke about the importance of people working together, such as sandbagging shop frontages prior to floods, assisting with cleaning-up after storms and helping neighbours who had lost jobs or loved ones in a mine or other disaster.

> There were lots of us just keeping in touch and talking to each other. I went down to the school and had a talk with the secretary down there just to try and help with the situation she was having, encountering all the mothers with their children who had lost their fathers, so we just all pulled together and supported each other. It just seems to be what small communities do (RE5}.

One parent became the caregiver for two families when her brother died in the Pike River Mine disaster. When asked how she coped, she said:

I coped with the generosity and love from my friends, family, community and all of New Zealand. It made it easier knowing I wasn't going through it alone, everyone was incredibly supportive … Also, because I now was the caregiver of six children, I had no option but to keep busy and focus on my children and my brother's children (RE9).

Another interviewee said:

Family and friends coped with the loss of jobs by sticking together, and were also employed by family and friends (RE8).

Through their inquiries, the students became aware of the importance of the voluntary activity and support available from community members in times of adversity, especially as most Greymouth residents are not well-off.

The whole town pitched in [after the tornado] and helped each other out, cleaning up the mess and restoring buildings so that they were safe to work in again, and fundraising occurred to help families that couldn't afford a lot of the repair work for their houses, so that everyone that had been affected was supported and not left out (RE3).

After the Pike River and Strongman Mine disasters and the 2005 tornado that damaged much of Greymouth, community support included provision of food vouchers through the local secondary school to families in need, food baskets being sent directly to families and various fund raisers (RE5, 6, 8): 'To offer a listening ear and a hot meal has become second nature' (RE1). While the community was supported by the efforts of organisations, including sports clubs beyond the West Coast, local people put in many months of work to rebuild, repair and restore damaged buildings. Similarly, local contractors and operators of heavy equipment often provided their services for free to support the community following an emergency (MacAskill 2005).

Community engagement, trust and empowerment

Most of the people interviewed by the students spoke about their participation in voluntary activities and organisations such as the local volunteer fire brigade, the ambulance service, search and rescue, their involvement in coaching school sports teams, participating in such one-off activities as building facilities for local schools, upgrading the swimming pool, fund raising for school events, working with local sports clubs and collecting for national causes like the Red Cross and cancer research (RE3, 5, 9, 10). The students also participated in community activities, learning a range of skills and building their own social networks with the declared objective of making their part of the world a better place to live (RE1, 6, 9).

The students discovered that when there is trust in a community, residents feel empowered to express their ideas in public in the expectation of a fair hearing. The comradeship and support one student received enabled that person to establish a West Coast LGBT[9] youth network, which connected like-minded teenagers in person and via Facebook. The latter meant that network members could connect and share concerns free from the constraints of time, travel or personal finances (RE6). Networks of this kind are invaluable for broadening the support base following a disaster, particularly in the short term.

The students also found that local people had attempted to influence what happens in their community at the political level. The entire community marched in protest against job losses from the Pike River Mine closure and layoffs at Spring Creek Mine, and a small contingent was funded by the community to travel to Wellington to try to change politicians' views (RE5, 8). Although not ultimately successful in retaining the mine, this action brought people together as a community.

Several interviewees had participated in civic activities, including local councils and boards (RE1, 6). In Greymouth, participation in community affairs has been essential in building a local skill base and enhancing the capacity for residents to deal with adverse events. It has also improved local knowledge about what to do and where to obtain resources. Leadership and trust were seen as significant in both preparing for and coping with the aftermath of disasters as well as in everyday life, and several students wrote

about the positive attitudes of the district's leaders, their tireless energy, guidance and role modelling of helpful, supportive, honest and respectful behaviour (RE1, 3, 6, 8, 10, 11). Such people provided leadership by setting aside their own concerns while working for the common good (RE8).

Not all the community leaders were elected representatives. Local business people, government employees and church people played significant roles in supporting the Greymouth community as it responded to and recovered from adverse events.

Features of a resilient community

The students found that Greymouth residents' familiarity with disaster, like the grief and economic issues they had dealt with in recent years, had alerted them to factors known to build community resilience. Many of the interviewees had first-hand experience of the Inangahua earthquake and the destruction it wrought on family property, and most had experienced floods and the consequent loss of income and costly repairs. The following quotation summarises the conclusions reached by the students.

> [Resilience] is imbedded in the Grey District culture after years of suffering from all sorts of environmental and economic disasters, but generation after generation and time after time the district has stood up and tackled the issues head on; this is what I believe [is] the best show of resilience a community can show (RE10).

In addition to fatalities from natural disasters arising from the district's geology, topography and meteorology, there have been deaths in the industries that underpin the Greymouth economy, and memories of the recent mine disaster are still raw for many of the town's residents. The students stressed the importance of taking a view of resilience that includes caring for the environment, managing it in a sustainable way and increasing the diversity of environmental resources from which income is derived. When its environment is managed sustainably, a community becomes more economically, socially and environmentally resilient. New technologies and procedures are supporting this diversification as well as providing new sources of income for Greymouth and the West Coast region (RE2).

The widely held beliefs that people should care for each other and that 'people are not bystanders when disaster strikes' (RE5) stimulated individual, family, community and institutional action to identify and gather resources useful in an emergency, build skills and networks essential for disaster management and develop the kind of social environment that supports shared action as a way to improve residents' quality of life.

The students demonstrated understanding of those social and physical attributes of Greymouth that have made it vulnerable and fostered resilience, and their findings were consistent with those of Paton (2006, 2007), Becker *et al.* (2011) and Paton *et al.* (2013). They particularly showed that geographical isolation, familiarity with local hazards, active engagement in community activities and an ethos of participating in adverse event preparation and restoration have together enhanced the personal and collective capacity of Greymouth residents to respond effectively to a catastrophic event.

In its turn, the Grey District Council is responding to perceptions of gaps in its preparation for disasters by encouraging people to acquire first aid skills and households to join with emergency services, utility providers, government and other local partner agencies in emergency training exercises. The students also advocated that official planning for disasters should take tourists into account because they may be less experienced in recognising and responding to emergencies like those known on the West Coast. Most importantly, the students concluded that local knowledge and well-established human relationships are essential and that residents need to remain involved with community activities.

By taking a social inquiry approach to their investigation of community resilience in Grey District, the 11 students became 'active makers (rather than receivers) of knowledge' (Taylor & Richards 2015, p. 2). They did so by investigating abstract features of their town and the district (building informational

understanding), matching this with interviews intended to deepen their understanding of social action, decision making and values in the Greymouth community (transformational outcomes from human activity and social processes). In that fashion, the students were able to enhance 'their prior knowledge by building personal meaning of newly introduced concepts and information' (Taylor & Richards 2015, p. 2).

Acknowledgements

Endnotes

1 These include fires, floods, earthquakes, tornados, tsunami, volcanic eruptions, snow storms and drought.

2 The competition followed NCEA curriculum achievements objectives for the social sciences at all levels [Cited 12 Apr 2013.] http://nzcurriculum.tki.org.nz/Curriculum-documents/The-New-Zealand-Curriculum.

3 There have been four earthquakes over a magnitude of 8 on the Alpine fault in the past millennium, dated around 1100, 1450, 1620 and 1717. Two earthquakes over a magnitude of 7 were experienced north of the district last century: Murchison 1929 and Inangahua in 1968. Seismologists predict a 30% chance of another large quake within the next 50 years [Cited 17 Nov 2015.] https://en.wikipedia.org/wiki/List_of_earthquakes_in_New_Zealand; Mortimer and Campbell (2014).

4 A fleet of 35 trawlers and longliners operates year-round from Port Greymouth to exploit inshore and deepwater fishing grounds, including Cook Canyon and the Challenger Plateau. About 8,000 tonnes of fish are landed annually.

5 More than 80% of farms in Grey District are livestock properties: 44% are dairy farms, 25% specialise in raising beef cattle, 7% are sheep or sheep and beef properties and 5% are deer farms (Statistics NZ 2012). The remainder includes market gardens, cropping farms (2% each) and forestry lots (15%). Dairying is the main agricultural employer.

6 Roa Mine was closed at the end of January 2016 with the loss of 20 jobs according to reporter Joanne Carroll [opened 29 Jan 2015.] http://www.stuff.co.nz/business/76213543/last-underground-west-coast-mine-closes-20-jobs-lost.

7 The West Coast Forestry Accord was an agreement made in 1986 to cease native timber milling on the West Coast in a staggered process, which, theoretically, would allow the community to absorb the impact. The Accord was cancelled in 2000 at which time native forest in the region was reclassified for conservation. The government provided a $120 million fund to create new jobs in, for example, ecotourism.

8 Grey District's Civil Defence and Emergency Management plans are tested using scenarios like an Alpine fault earthquake to ensure 'lifelines' (power, telecommunications, emergency services, pipes, roads and bridges) continue functioning (GDC 2007; McCahon *et al.* 2012).

9 Lesbian, Gay, Bi-sexual and Transgender.

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