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Social impact of the 2004 Manawatu floods and the 'hollowing out' of rural New Zealand

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The Manawatu floods of 2004 have had significant, long-lasting social consequences. This paper draws on findings from a series of detailed surveys of 39 farm households directly affected by the floods and 17 individuals directly involved in managing the flood recovery programme. The nature of the impact on rural families highlights how the 'hollowing out' of rural New Zealand has changed the capacity of rural communities to respond to natural hazards and increased their sense of isolation. In addition, the floods exposed the vulnerability of rural communities. This is shown to have implications for policies designed to build resilience and improve responses to adverse events, including the need to support local, community initiatives on self-reliance and mutual support. Approaches to manage better long-term flood risks should be designed within a context of ongoing rural decline that has compromised the health of both individuals and communities.

Keywords: floods, hollowing out, New Zealand, resilience, social impact

Introduction

The massive wind and rain storm that hit New Zealand in February 2004 had the greatest impact on the Manawatu–Wanganui region (see Figure 1). A number of different river catchments were concurrently affected, causing floods and landslips and resulting in widespread damage and disruption, especially to rural communities. In the aftermath of the floods there were a number of different investigations into what was officially recognised as a once in a 100-year storm (Environmental Management Services Limited, 2004; Ministry of Civil Defence and Emergency Management, 2004). These investigations built on knowledge gained from previous recovery programmes, including after Hurricane Bola on the east coast in 1988 and a major storm event in the Manawatu region in February 1994.

Given the emerging consensus that global warming may increase the frequency and magnitude of climate extremes, at least in the short-to-medium term (Easterling et al., 2007), the need to understand better community response and to integrate such understanding into policy is urgent. Moreover, a crisis such as an adverse climate event, as experienced in the Manawatu–Wanganui region in 2004, may expose points of strength and weakness in environmental and social systems, and so provide indicators of long-term policy needs.

In recent decades the structure and coherence of rural communities in modern industrial economies have been transformed by a multiplicity of factors. These include

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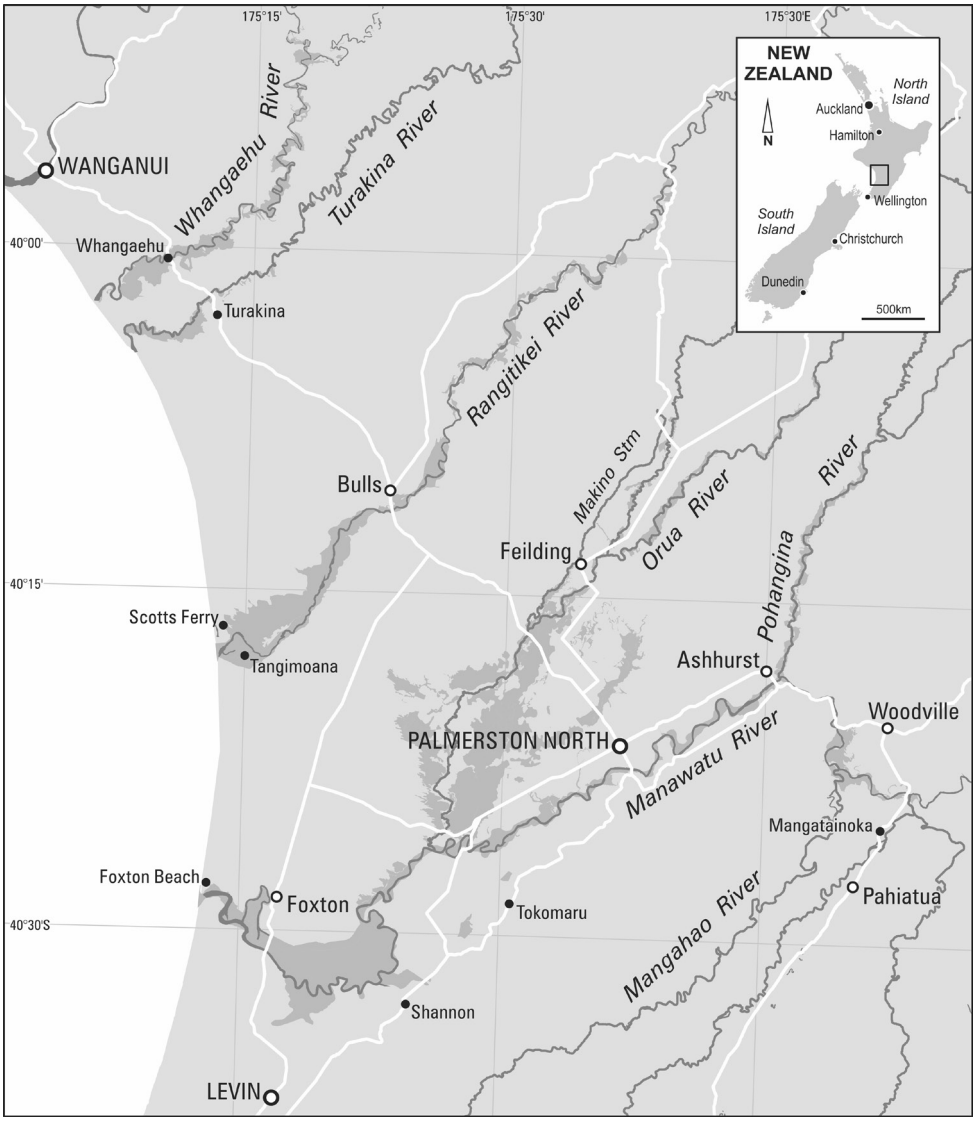
Figure 1 Flood areas, February 2004



Source: data provided by the Horizons Regional Council.

new agricultural practices, larger farms, a loss of farm labour due to technological developments, increased mobility, and the emergence of a new rural sector: the 'life-styler' (hobby farmer). Simultaneously, there has also been a significant decline in service provision and community facilities; for example, of the 114 post offices in the Wanganui and Palmerston North postal districts in 1951, only 92 remain today. Of these, more than 50 per cent are served only by rural delivery, that is, by an agency in a store or by a franchise attached to a business.[2] Policing also has contracted with the closure of five stations since the 1960s. Today, only 21 full-time stations and six community constables serve the total area.[3] A similar story pertains to schools: eight schools have closed since the mid-1980s, compounding the overall decline in

the population, particularly on stock and cropping farms. Associated with this is a significant increase in the average age of farmers. Indeed, this is particularly the case for New Zealand's livestock and cropping farms, where the average age increased from 40.8 years to 46.5 between 1981 and 2006; a trend consistent with other Western agricultural economies (Fairweather and Mulet-Marquis, 2009).

The cumulative result was that the floods of 2004 struck a rural environment very different to that which had existed only a few decades before. In this way, disasters frequently work to reveal or highlight fractures and problems within the society that had hitherto lain largely below the surface (Morrow, 1999; Sanderson, 2000). As this paper demonstrates, the floods revealed new vulnerabilities that until that point had been either underplayed or ignored in rural areas of Western societies. This is perhaps understandable. Dramatic urban floods, such as the impact of Hurricane Katrina on New Orleans (2005), pose an enormous threat to human life and receive massive media coverage. In contrast, rural flooding, while potentially devastating to those directly concerned, has much less severe ramifications for overwhelmingly urban, modern societies.

This paper explores the social consequences and the community response to the floods and evaluates the farm community's 'vulnerability' and 'resilience' in the face of major adverse storm events and hazards. It builds on previous work prepared for New Zealand's Ministry of Agriculture and Forestry (MAF) (Smith, Mackay and Bankoff, 2007).

'Natural' disasters and vulnerability, preparedness and community resilience

For most of the twentieth century, approaches to the management and mitigation of disasters were top-down, and were conducted for, not with, the communities primarily affected by such events (Cannon, 1994; Pearce, 2003; Allen, 2006). Such responses usually were based on technocratic solutions that attempted to control 'nature' or alleviate losses after the event. In the case of floods, this has commonly taken the form of large-scale engineering works aimed at protecting vulnerable areas through interventions such as river channel modifications, embankments, reservoirs, and barrages designed to control the flow of rivers (Few, 2003). This traditional view of catastrophes is problematic because, in effect, it never addresses causes or explores why 'natural' disasters occur in the first place (McEntire et al., 2002). Rather, effort centres on the restoration of the local community to a state of normalcy, which, while an understandable objective, often leads to a continued cycle of disaster–damage–repair–disaster (Tobin, 1999).

More recently there has been a shift in attitudes towards disaster management and the assumptions that underpin this field. In particular, there is now widespread acknowledgement that there is a distinction between 'hazards' and 'disasters'. In this regard, Cannon (1994, p. 13) argues that 'hazards are natural, but that in general disasters are not, and should not, be seen as the inevitable outcome of a hazard's

impact'. This distinction focuses on the fact that the outcomes of particular hazards vary depending on where, when, how and to whom they occur. In other words, disasters invariably exhibit social, economic and political, as well as environmental, characteristics. Indeed, researchers have begun to concentrate on the ways different societies, communities or individuals are more or less 'vulnerable' to the effects of natural hazards. Recently within the study of disasters, this concept of 'vulnerability' has come to be seen as one of the key tools for explaining the social and spatial variability of disasters (Alexander, 1997; Bankoff, Frerks and Hilhorst, 2004).

As part of this changing emphasis, the research focus has shifted from technical solutions to disasters to analyses of what makes communities unsafe. Vulnerability, in this sense, reflects the processes 'that deprive people of the means of coping with hazards without incurring damaging losses that leave them physically weak, economically impoverished, socially dependent, humiliated and psychologically harmed' (Bankoff, 2001, p. 25). To combat vulnerability, people may implement a range of actions to prepare themselves for hazards. These can take multiple forms and involve various actors whose perceptions of what constitutes a hazard and how it is best managed may differ significantly. At an individual level, preparedness can be affected by awareness of risk, prior experience, perception of the likelihood of a disaster occurring, and socioeconomic criteria. Community resilience also is recognised as a crucial variable (Tobin, 1999; Fothergill and Peek, 2004). Nevertheless, there is no single interpretation of what constitutes a resilient community. Indeed, Klein, Nicholls and Thomalla (2003) identify an assortment of contested understandings of the term. In a policy context, though, resilient communities may be characterised as 'societies which are structurally organised to minimise the effects of disasters, and, at the same time, have the ability to recover quickly by restoring the socio-economic vitality of the community' (Tobin, 1999, p. 13). Consequently, the concept of community resilience has shifted the focus of disaster studies from preparation for, experience of, and responses to hazards to a much longer-term effort to develop communities that are less vulnerable to the effects of disasters.

These arguments are expressed in the recent literature in terms of the need to build social capital. Scholars argue that social capital, developed through both informal and formal networks, is fundamental if communities are to establish collective ways of dealing with the challenges of extreme climatic events using new approaches to the resources on which they depend. In effect, social capital is viewed as the key to shift the field of disaster management from response and recovery to sustainable hazard mitigation. This requires greater integration of public participation into disaster management planning and the fostering of associations and networks for collective help and mutual assistance (Putnam et al., 1993; Pearce, 2003; Bankoff, 2007).

The 2004 floods and their implications

The Manawatu floods of February 2004 constituted the largest emergency management event in New Zealand for 20 years. It was the first such incident to occur

under new civil defence legislation (Ministry of Civil Defence and Emergency Management, 2004). The months leading up to the storm had been unseasonably wet. On 14 February, a large low-pressure system developed east of New Zealand and descended on the country the following night, bringing extremely heavy rain followed by storm-force winds. Flooding centred on the Manawatu–Wanganui region, but extensive damage also was recorded across many surrounding areas. Most districts in the region recorded between four and six times the normal amount of rainfall for February, with up to 280 millimetres falling in Manawatu–Wanganui catchments on 15 and 16 February. The Manawatu River reached its second highest level on record and the highest for 100 years. The Rangitikei River reached its third highest level on record. Wind gusts in the Tararua Ranges reached 230 kilometres per hour (Hancox and Wright, 2005). Flooding occurred across large swathes of Manawatu–Wanganui district (see Figure 1), including in areas that had not experienced flooding in living memory. A regional civil defence emergency was declared on 16 February after several district councils declared local emergencies (Environmental Management Services Limited, 2004).

The total cost of flood-related damage was estimated at almost USD 400 million (Ministry of Civil Defence and Emergency Management, 2004). Roads in Manawatu–Wanganui district sustained approximately USD 20 million worth of damage, four bridges were destroyed and 21 were seriously damaged. Up to 2,500 people were displaced by the flooding and one month after the flood at least 500 homes remained uninhabitable (New Zealand Press Association, 2004). The flooding caused substantial breaks in the road network and disruption to telecommunications, sewage treatment, water supplies, electricity, and gas across the whole region.

Rural residents were particularly affected through a combination of greater vulnerability to property damage (flooding, high winds and landslides) and breakdowns in communications. Many rural people were unaware of impending flooding until it was too late to move important equipment and livestock. More than 2,000 farm properties experienced flood damage; 800 were seriously affected (Ward, 2005, p. 5). Milking sheds, fencing and tracking, irrigation facilities and access roads frequently were damaged or destroyed. Inevitably, farm production was adversely affected. In monetary terms, the direct impacts included livestock losses from drowning, interruptions to milking, the destruction of crops, loss of grazing due to erosion, damage to farm tracks and fences resulting in loss of livestock, loss of plant and equipment, damage to or loss of buildings, silting and flood damage, and loss of feed and pasture control. In summary, it is estimated that the cost to dairying was NZD 41.4 million; sheep, beef and deer NZD 66 million, crops NZD 24 million, and forestry NZD 29 million (Horizons Regional Council, 2004, p. 13).

In the river valleys and on the flats, there was extensive damage to erosion protection structures. Stopbanks were damaged and riverbed levels were raised, reducing their capacity. In the hill country, which constitutes approximately 60 per cent of the land in the Manawatu–Wanganui region, 62,000 individual landslides were recorded, covering an area of 18,000 hectares. In total, some 29,000 hectares were severely eroded (Horizons Regional Council, 2004, p. 31).

What is much more difficult to establish is the human cost of the floods. Although no lives were lost, there were many close calls. The children's book released subsequently, *Cow Power* (Riley, 2004), relating the tale of a farmer carried to safety by a cow, confirms the almost mythical status that the floods rapidly assumed.

Methods

To gain an understanding of the experiences and responses of those affected by the 2004 Manawatu–Wanganui floods, a questionnaire survey and face-to-face interviews were conducted with farmers and others closely associated with the floods and their aftermath. The themes explored were shaped by insights drawn from the literature related to community preparedness, response and resilience in the face of disasters (Paton and Johnston, 2006), and from discussions with MAF officials and other experts.

In total, 39 farm households were interviewed between summer 2004 and December 2006, as well as 17 individuals who were directly involved in the management of the recovery programme, including representatives of local government, aid agencies and the police. The farm households were selected from a composite list of names supplied by both official government sources and service organisations to ensure the inclusion of a cross-section of farms in the upper catchment and on the plains, and a range of farm types—sheep, beef, dairying and horticulture. Other key individuals interviewed were identified from media reports and official records. In addition, input was provided by officials who had been employed to facilitate post-flood community workshops.

Community

This research is concerned with how rural residents in developed Western societies consider 'community'. Many farmers explicitly identified 'farmers' as their community, citing the sense of camaraderie among farmers and the general feeling that, in an abstract sense, they are 'in it together'. What is notable, however, is that this 'community' of farmers is by no means homogeneous or consistent. Some farmers excluded individuals like farm managers and farm workers from their definition. For others, community meant anyone who was farming regardless of whether 'next door, in Taranaki, or overseas'. While often it is assumed that 'community' correlates with a delineated territory or place, such conceptualisations tend to overlook the ways in which communities as social constructs are continually made through daily practices and experiences (Agrawal and Gibson, 2001). Furthermore, 'community' may be perceived dissimilarly by different individuals who claim to be members and it may be deployed in different ways at different times and in different spaces as a means of achieving particular goals (Anderson, 1983; McCarthy, 2005).

Some survey respondents viewed the rural community more broadly, but believe that there is a hierarchy with sheep/cattle farmers at the top, then dairy farmers, then employees, and lastly, the unemployed. Others, frequently those who were town-based or had links with professional or service organisations, tended to embrace 'everyone' as part of the community with no explicit categorisation.

One group consistently excluded from any definition of community was those who lived on hobby farms. Both farmers and support workers commonly described this group as having different values and priorities, and in the face of disaster were perceived to have excessive expectations of external assistance. This was said to be a result of their lack of 'real farming experience'. Conversely, some hobby farmers felt neglected in the aftermath of the floods:

> *Farmers got help whereas others who did not depend on the land for the bulk of their income were neglected.*[4]

The interviews generated repeated references to the ways in which rural communities are changing and the increasing focus on 'town' as the centre of activity for farmers and others. This was seen as a considerable shift away from the immediate farm neighbourhood of even a generation ago:

> *There is no real community any more like our parents had. We don't rely on our neighbours like we used to. For example, if we run out of drench, we call someone to replace it or go to town, instead of asking our neighbour.*[5]

The above perspective, and the comments of other respondents, suggest that, whether in terms of where farm inputs are bought, or where children are sent to school, the spatial pattern of activities has shifted with a subsequent effect on farm households' perceptions of their own community and on the daily life experience of rural residents. This changing understanding of community was used to explore the impact on mutual assistance networks and reciprocity in rural areas.

Preparation and isolation

By their nature, summer storms pose more of a threat than those at the end of a long cold winter. Most respondents noted that they had not made any specific plans for such an event and indeed, timing appears to have been a major contributing factor to the problems caused by the floods. However, what stood out was that those respondents living in low-lying areas were more likely to have made some kind of preparations or at least were more likely to be aware of the possibility of flooding. In addition, they were more likely to have experienced flooding previously, although not to the extent of the 2004 event. For some of those living in the hills, the event was unprecedented and the households in these areas were ill-prepared.

Despite the issues surrounding preparation for flooding and their impact on farmers' ability to cope with the floods, evidence that attitudes to preparation have changed is inconsistent. In a more recent survey of farmers and the ramifications of drought (Smith, Owen and Kelly, 2008), though, all of those interviewed who had had direct experience of flooding in 2004 had subsequently taken steps to protect their household against floods.

One of the key things that many respondents had not anticipated was the level of isolation they experienced. The floods left many households cut off for several days. In part, this isolation was a result of many farmers' high level of reliance on mobile telephones and the expectation that communications are now '24/7'. For those farmers on the plains close to urban centres (often dairy farmers), this technological dependency was heightened by an assumption of ready access to food supplies and other urban services. In comparison, farmers in the hill country, physically isolated from such services, frequently were better placed to meet their daily needs using their own stored food and other supplies.

Few farms in the rural areas had radio transmitters and many of those that did lacked sufficient batteries. Many respondents noted that they had not realised that their mobile telephones would fail as the power supply ceased, putting mobile telephone towers out of service. With roads and bridges blocked or washed away, this meant that many people were effectively stranded on their properties. Although such isolation rarely posed a physical threat, and most farms had sufficient supplies of food and water, this unexpected isolation affected morale. Communication problems also meant that farm households had little idea of what rescue and recovery efforts were under way and what action they themselves should take. It forced them to draw on their own resources and many were ill-prepared.

The result was that the only available means of communication for many households was the 'bush telegraph'—information accessed through neighbours. There was also a reliance on 'the authorities' to restore utilities. Paradoxically, many respondents noted that they desired self-sufficiency, but argued that to achieve this end they needed functioning mobile telephone towers.

Community resilience

Respondents varied significantly on how the floods had affected the resilience of the farming community. Even three years on, many believed that if this sort of event occurred again, the challenges would be too great and they would be forced to walk off the land. This is despite the industry enjoying an extended period of high productivity and good financial returns. While those interviewed had all made the decision to stay on after the flood, they had found the clean-up to be time-consuming and challenging. In particular, it was reported that the effort required gave them little time for social activities and this placed significant strains on personal relationships. Resources required for rebuilding infrastructure put added

pressure on debt servicing and consumed passion and energy that otherwise would have been available for business growth. The drag on innovation and adoption of new technologies and the implications for the future health and vitality of the farm industry is another cost not itemised in any post-flood analysis.

There were also stories about deaths that had occurred after the floods that were attributed to post-event stress. Moreover, several respondents were re-evaluating priorities and considering cutting back on work or even quitting farming. At an individual level, two years after the floods some farmers reported continued symptoms of stress, including an inability to sleep when it rained and crying when recalling the trauma involved.

In many instances the floods appeared to have reignited community spirit as networks of helpers formed and reformed in response to the flooding. Furthermore, communal relationships became more significant in many respondents' daily lives. This caused an overall increased appreciation of their local community and rekindled a sense of community or camaraderie that until then, they believed, had seriously declined:

> *Their whole outlook has changed. They are no longer so individualistic, they think as a group.*[6]

> *The floods actually strengthened networks. They helped build resilience and the ability to cope in the future—we have been through this so we can cope again.*[7]

> *Because of the little community of farmers, 'we are in it together', they bounced ideas off each other and formed their own cooperative to help each other get through the situation.*[8]

It remains unclear whether such cooperation will last and whether the shared experience of the flood will contribute to permanent changes in the everyday lives of the communities affected. What it has done, however, is heighten awareness of the problems that manifest themselves where communities disintegrate, and this has prompted conscious efforts by individuals (specifically, local, rural police officers) to boost a sense of community in some areas.

Support groups

Support groups highlighted the need for a proactive approach as an important factor in supplying aid to individuals and communities and recognised that many would not (or could not) ask for assistance. Consequently, the effectiveness of support also was linked to pre-existing networks. Those long established and best known in the community had the most positive views on the aid provided. Equally, as one retired hobby farmer noted, 'People with stronger pre-existing ties within the community could access more help'. Similarly, organisations with an established local history, ranging from Rural Support Trusts (government-supported advisory services provided in adverse events) and Federated Farmers (the national farm union) to the Vet

Club (local cooperative veterinary group), stated that they found it easier to work with communities and to act as a buffer between residents and government agencies. At the same time, some support groups acknowledged that they were not as effective as they might have been because communities lacked full knowledge of their purpose and the support they could give.

Many respondents argued that aid agencies, particularly those organised at a regional or national level, lacked local knowledge and understanding of the area. They suggested that the official flood response was top-down and that local initiatives were stymied in some areas by bureaucracy 'further up the chain'. In this sense, the following quotes are indicative and illustrate how official responses were incompatible with 'community response' and 'local knowledge':

> *The community response for helping out was overwhelming and the council just seemed to get in the way. An example of this was how they closed off the road into the valley which prevented relatives and friends, who were trying to help, from entering.*[9]

> *Many officials had all the trained 'city-ised' knowledge but this could not replace the local knowledge and experience which was often ignored.*[10]

> *The bureaucracy was way over the top. For example: many people were stopped from coming into town with their shovels as there were OSH [Occupational Safety and Health] issues.*[11]

> *When government officials came they simply got in the way of the effort. Their systems of process defy all kinds of common sense which farmers have about their land and stock.*[12]

Such accounts reinforce the views of researchers such as Pearce (2003) regarding the importance of social capital in hazard mitigation and the need for public participation in disaster planning and recovery. These accounts, conversely, suggest a significant disconnect between government and farmers in their expectation of response. This is particularly notable in the distinctions made by many farm households between knowledge and expertise—either as something that is gained through experience of the locality or as 'trained "city-ised" knowledge', commonly viewed as inappropriate in practice. There appears also to have been a breakdown in communication between these two groups in the aftermath of the floods. At a more general level, though, these differences suggest as well that community perceptions, particularly those based on a distinction between 'us' and 'them', may in fact have been nurtured by the experience of the floods and the official response.

For many, the resounding message as expressed by a sheep/cattle farmer was that, 'at the end of the day, they knew they were on their own. They should not rely on government to help them'. This echoes the advice to householders from the Ministry of Civil Defence and Emergency Management listed in all New Zealand telephone directories: 'Get ready, get thru—you could be on your own for three days'.

Conclusion

In 2009, five years after the floods hit the Manawatu–Wanganui region, their physical impact is rarely evident. Individual landowners have, to a greater or lesser degree, made adjustments in anticipation of a future flood and government and other authorities have reviewed their policies should any such event occur. What this paper shows, however, is the urgent need to refocus efforts in order to strengthen local communities and to make them the primary bulwark against any future disaster and to support those agencies currently working towards this end. The resilience of rural communities is shaped by a wide array of economic, social and political drivers that operate in isolation from any debate on resilience or disaster management, but, as shown, it is the coherence and strength of communities that underpin the capacity of individual farm households to respond to adverse events. This suggests a need to harness some of the pioneering spirit of the past to address current needs.

The traditional view of rural New Zealand as primarily made up of farm households with a sense of common values and purpose and with a clear community structure centred on church, school or pub, has gone. Modern agriculture and the structural changes characteristic of rural societies in all Western industrial economies have introduced new elements to the rural environment unrelated to the farm industry and with values and interests that make community development in rural areas increasingly problematic.

The 2004 flood clearly exposed the vulnerability of rural communities. It forced people to rethink what, or, more correctly, who, constitute their community. In certain cases, this revealed a complete breakdown of community. Such a realisation links these individuals to the long-term hollowing out of rural New Zealand where the loss of services is compounded by a lack of young people. Within this context, the absence of a close-knit community is a major concern. Intimately connected to this is a resultant shortfall in the communication networks within the rural population linked to continued social decline. This is exacerbated by the decreasing availability of common facilities, whether churches, stores, banks or schools, as community foci. While some rural communities in the Manawatu–Wanganui region have remained strong, or even been strengthened by the 2004 flood, other communities have experienced only further disintegration.

While this paper concentrates almost solely on farmers and farm families, it exposes also the fact that farmers themselves, confronting adverse events, often require broader community support. Consequently, building resilience must go further than any narrow focus on the economic productivity of the land. Despite increasing emphasis in the literature on farming as a business, adverse events highlight the continued need to recognise that farming in New Zealand, for the most part, remains a family enterprise and that, for farm families, the farm remains both a business and a home. Herein lays a paradox. The modern New Zealand farm is bigger than before but now generally lacks any resident labour force other than immediate family members. From this has emerged an increasing technological dependency symbolised by a reliance on electronic communications. Any compromise of the communication

infrastructure leaves farm households feeling and experiencing a sense of physical isolation often much greater than earlier generations might have known.

There is growing recognition among farmers that many of their land-use practices need to change if their farms are to become sustainable. However, achieving the goal of sustainability requires more than an appreciation of the importance of appropriate land-use practices among farmers. To this end, the sustainability of the community as a social organism must be viewed within a context of ongoing rural decline in which the health of both the individual and the community has suffered. This has global implications for governments and other stakeholders. For example, it informs strategic thinking on initiatives that seek to improve and incorporate the way communities face the challenge posed by adverse events. In addition, it lays the ground for the better management of long-term flood risks as part of any programme designed to create a more sustainable environment.

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[2] Personal communication with Robin Startup, Research Officer, Postal History Society of New Zealand, Masterton, 21 September 2007.

[3] Personal communication with Murray Jackson, Business Manager, New Zealand Police, Palmerston North, 11 October 2007.

[4] Retired hobby farmer, interview notes.

[5] Sheep/cattle farmer, interview notes.

[6] Dairy farmer, interview notes.

[7] Beef/sheep farmer, interview notes.

[8] Dairy share-milker, interview notes.

[9] Dairy farmer, interview notes.

[10] Sheep/cattle farmer, interview notes.

[11] Publican, interview notes

[12] Share-milker, interview notes.

References

Agrawal, A. and C.C. Gibson (2001) *Communities and the Environment: Ethnicity, Gender and the State in Community Based Conservation*. Rutgers University Press, Chapel Hill, NC.

Alexander, D. (1997) 'The study of natural disasters, 1977–97: some reflections on a changing field of knowledge'. *Disasters*. 21(4). pp. 284–304.

Allen, K. (2006) 'Community-based disaster preparedness and climate adaptation: local capacity-building in the Philippines'. *Disasters*. 30(1). pp. 81–101.

Anderson, B. (1983) *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. Verso, London.

Bankoff, G. (2001) 'Rendering the world unsafe: "vulnerability" as Western discourse'. *Disasters*. 25(1). pp. 19–35.

Bankoff, G. (2007) 'The dangers of going it alone: social capital and the origins of community resilience in the Philippines. *Continuity and Change*. 22(2). pp. 327–355.

Bankoff, G., G. Frerks and T. Hilhorst (eds.) (2004) *Mapping Vulnerability: Disasters, Development and People*. Earthscan, London.

Cannon, T. (1994) 'Vulnerability analysis and the explanation of "natural" disasters'. In A. Varley (ed.) *Disasters, Development and Environment*. John Wiley and Sons, New York, NY. pp. 13–30.

Easterling, W.E. et al. (2007) 'Food and fibre and forest products'. In M.L. Parry et al. (eds.) *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the 'Fourth Assessment Report of the Intergovernmental Panel on Climate Change'*. Cambridge University Press, Cambridge. pp. 273–313.

Environmental Management Services Limited (2004) *Review of Flood Response 2004*. A report prepared for the Horizons Regional Council. Mimeo. 45 pp.

Fairweather, J. and S. Mulet-Marquis (2009) 'Changes in the age of New Zealand farmers: problems for the future?' *New Zealand Geographer*. 65(2). pp. 118–125.

Few, R. (2003) 'Flooding, vulnerability and coping strategies: local responses to a global threat'. *Progress in Development Studies*. 3(1). pp. 43–58.

Fothergill, A. and L. Peek (2004) 'Poverty and disasters in the United States: a review of recent sociological findings'. *Natural Hazards*. 32(1). pp. 89–110.

Hancox, G.T. and K. Wright (2005) *Landslides Caused by the February 2004 Rainstorms and Floods in Southern North Island, New Zealand*. Institute of Geological & Nuclear Sciences science report 2005/10. http://www.geonet.org.nz/docs/landslide/reports/report6.pdf (accessed on 16 November 2010).

Horizons Regional Council (2004) *Storm: Civil Emergency – Storm and Flood Report*. Horizons Regional Council, Palmerston North.

Klein, R., R. Nicholls and F. Thomalla (2003) 'Resilience to natural hazards: how useful is this concept?' *Environmental Hazards*. 5(1). pp. 35–45.

McCarthy, J. (2005) 'Devolution in the woods: community forestry as hybrid neoliberalism'. *Environment and Planning A*. 37(6). pp. 995–1014.

McEntire, D., C. Fuller, C. Johnston and R. Weber (2002) 'A comparison of disaster paradigms: the search for a holistic policy guide'. *Public Administration Review*. 62(3). pp. 267–281.

Ministry of Civil Defence and Emergency Management (2004) *Review of the February 2004 Flood Event*. Ministry of Civil Defence and Emergency Management, Wellington.

Morrow, B.H. (1999) 'Identifying and mapping community vulnerability'. *Disasters*. 23(1). pp. 1–18.

New Zealand Press Association (2004) 'Government boosts flood aid to $30 million' *New Zealand Herald*. 4 August.

Paton, D. and D. Johnston (eds.) (2006) *Disaster Resilience –An Integrated Approach*. Charles C. Thomas, Springfield, IL.

Pearce, L. (2003) 'Disaster management and community planning, and public participation: how to achieve sustainable hazard mitigation'. *Natural Hazards*. 28(2–3). pp. 211–228.

Putnam, R., R. Leonardi and R. Nanetti (1993) *Making Democracy Work: Civil Traditions in Modern Italy*. Princeton University Press, Princeton, NJ.

Putnam, R. (1995) 'Bowling alone: America's declining social capital'. *Journal of Democracy*. 6(1). pp. 65–78.

Riley, K. (2004) *Cow Power*. Random House, Auckland.

Sanderson, D. (2000) 'Cities, disasters and livelihoods'. *Environment and Urbanization*. 12(2). pp. 93–102.

Smith, W., A. Mackay and G. Bankoff (2007) *Resilience and Farm Family Response in the Aftermath of the 2004 Manawatu Floods*. A contract report prepared for the Ministry of Agriculture and Forestry, Wellington.

Smith, W., S. Owen and S. Kelly (2008) *The Social Impact of the 2008 Drought on Hill Farm Households*. A contract report prepared for the Ministry of Agriculture and Forestry, Wellington.

Tobin, G. (1999) 'Sustainability and community resilience: the holy grail of hazards planning'. *Environmental Hazards*. 1(1). pp. 13–25.

Ward, C. (2005) 'The floods of 2004 – looking back'. *RMupdate*. 16 (February). p. 5. http://www.maf.govt.nz/mafnet/publications/rmupdate/rm16/rm-february-2005.pdf (accessed on 29 November 2010).