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Land-use planning for natural hazards in New Zealand: the setting, barriers, 'burning issues' and priority actions

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Abstract Land-use planners have a critical role to play in building vibrant, sustainable and hazard resilient communities in New Zealand. The policy and legal setting for natural hazards planning provides a solid foundation for good practice. But there are many examples of 'bad practice' that result in unnecessary risks and, in some cases, exposure to repeat events and potentially devastating impacts. Much, therefore, remains to be done to improve hazards planning policy and practice in New Zealand. This article explores the questions: What role does land-use planning play in managing hazard risks in New Zealand; and what needs to be done to reduce hazard risks and build community resilience? The article starts by describing the milieu within which natural hazards planning takes place. It goes onto outline the stakeholders and institutional and legal setting for natural hazards planning in New Zealand, including barriers to realising the potential of natural hazards planning. This synthesis reveals a number of 'burning issues', including the need to: (a) Improve understanding about the nature of hazards; (b) Prioritise risk avoidance (reduction) measures; (c) Provide national guidance for communities exposed to repeat events and address the relocation issue and (d) Mainstream climate change adaptation. Each 'burning issue' is discussed, and priority actions are recommended to realise the potential of land-use planning to reduce natural hazard risks and build community resilience in New Zealand. Ultimately, the challenge is to develop a cooperative hazards governance approach that is founded on coordinated policies, laws and institutions, cooperative professional practice and collaborative communities.

Keywords Natural hazards · Land-use planning · Risk reduction · Resilient communities · New Zealand

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1 Introduction

New Zealand is situated in the Pacific Ocean along an active geological plate boundary, with the Australian Plate located to the west and the Pacific Plate to the east (Fig. 1). As a consequence, the country is subject to a variety of geological hazards. New Zealand also has a history of extreme hydro-meteorological events. The most frequently occurring peril is flooding, but communities may also have to contend with landslides, coastal storms and erosion, severe winds, snow, drought and the potentially catastrophic impacts of earthquakes, tsunamis and volcanic eruptions (ODESC 2007). To compound matters, New Zealanders are increasingly at risk. The protective function of natural systems (such as riverine vegetation that attenuates floods, native forests that stabilise slopes and minimise soil erosion, or dune systems that serve as a barrier against coastal storms) has been undermined by the progressive transformation of the natural environment to make way for agriculture and cities and towns (Pawson and Brooking 2002). Physical development patterns have put increasing numbers of people in harms way, exacerbating hazard risks.

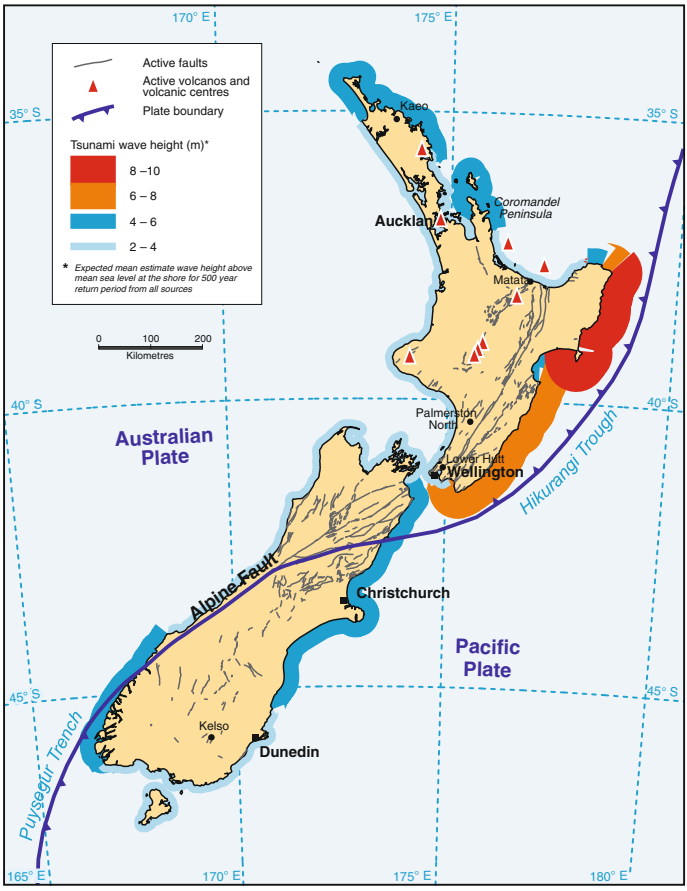

Fig. 1 The New Zealand setting (Drawn by: GNS Science). *Note*: All of New Zealand's coastline is subject to some form of tsunami risk and potential for coastal erosion. Likewise extreme weather events and landsliding can impact many places nationally, and flooding can affect catchments all across the country

Urbanisation has concentrated the population in cities and towns, many of which are vulnerable to hazards, for example coastal and volcanic hazards in Auckland and landslide and seismic risks in Wellington. In recent years, rapid development intensification along the coast (Cheyne and Freeman 2006; Freeman and Cheyne 2008) has increased exposure to coastal storms and erosion (Bell and Gorman 2007; Blackett et al. 2010). Furthermore, climate variability and change compounds the risks many communities face, especially those in floodplains and along low-lying coastal margins due to the projected increase in the intensity and frequency of storms and sea-level rise (Bell et al. 2002; Jacobson 2004, 2005; IPCC 2007; MfE 2008a).

New Zealanders aspire to live in communities that are vibrant, sustainable and hazard resilient, as reflected in and facilitated by legislation ranging from the Resource Management Act (RMA) to the Local Government Act (LGA) and Civil Defence Emergency Management Act (CDEMA). Land-use planning has a critical role to play in realising this vision and is key to translating legislative and policy intentions into practical reality (CAE 2004, 2009; Ericksen et al. 2000; Glavovic 2010; Mamula-Seadon 2009; Mamula-Seadon et al. 2008; May et al. 1996; Saunders and Becker 2008; Saunders and Glavovic 2009; Saunders et al. 2007; Tonkin and Taylor 2006). This article explores the questions: What role does land-use planning play in managing hazard risks in New Zealand; and what needs to be done to reduce risk and build community resilience? It starts by describing the milieu within which natural hazards planning occurs. It goes onto outline the stakeholders and institutional and legal setting for natural hazards planning in New Zealand. Barriers to realising the potential of natural hazards planning are outlined. This synthesis reveals a number of 'burning issues'. Priority actions are recommended to enhance future natural hazards planning efforts. These burning issues and priority actions have been identified on the basis of the authors experience working in natural hazards planning in New Zealand, including past and ongoing research contracts and consultancy work for a wide range of stakeholders. The work of others (e.g., CAE 2005; Ericksen 2005a, b; MfE 2008b) has also informed this analysis. There is, however, a compelling need for government to engage key stakeholders in a deliberative process to systematically identify key issues and priority actions for future natural hazards planning research, policy and practice. Such a process would help to build the common understanding and shared commitment that is necessary to build sustainable, hazard-resilient communities.

2 Land-use planning for natural hazards in New Zealand: the context

In 2007 and 2008, several communities in Northland, the northernmost region of New Zealand, were severely flooded, and others were cut off by raging floodwaters (see Fig. 2). Some towns, like Kaeo, experienced repeat flooding in the space of only 4 months. This experience stimulated public debate, including widely reported statements by then Prime Minister Helen Clark, about the wisdom of allowing development in flood-prone areas and the need to consider relocating 'at-risk' communities to safer locations (see e.g., Anonymous 2007). Similar concerns have been raised about other hazard-prone communities, such as Matata after devastating debris flows in 2005 (Bassett 2006). Allowing new development in flood-prone areas became a matter of heightened public concern in Palmerston North after the city came perilously close to being flooded in February 2004 (Fuller 2005; Goodwin 2005). Recently, the Palmerston North City Council decided not to allow new development in an area that had been identified previously as a desirable location for future urban growth, namely the Te Matai Road area. This decision reversed

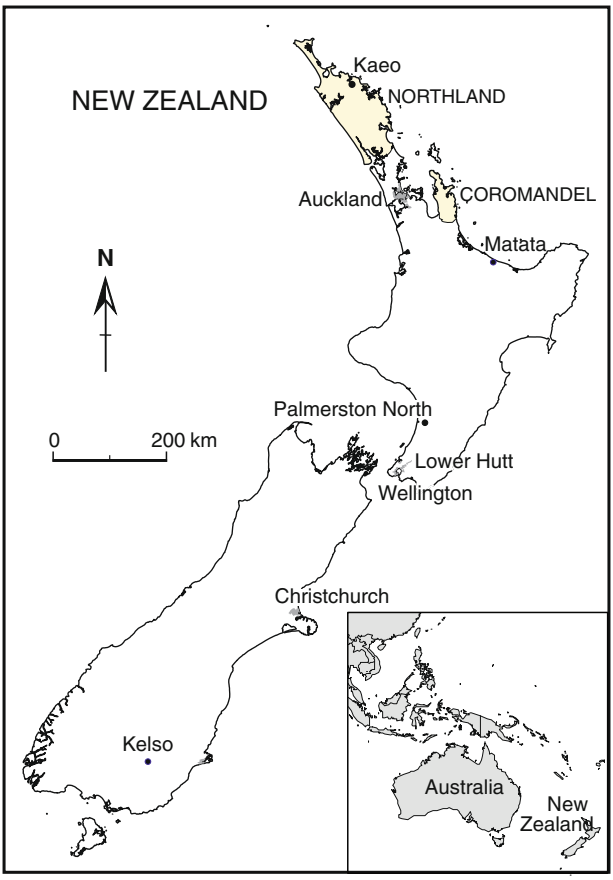

Fig. 2 New Zealand (Drawn by: GNS Science)

earlier Council decisions. Memories of the 2004 flood event were translated into unprecedented public concern and political will to avoid increasing future flood risk. In many other communities, however, it is difficult to get attention focused on hazards, because in the absence of a recent threat or event, more immediate concerns tend to dominate the public agenda. Taking proactive measures to reduce hazard risks is thus accorded a low priority, and it seems as if communities simply hope that 'it won't happen to them'. Experiences such as those described above underscore the pivotal role that land-use planning and political decision-making play in shaping community vulnerability to hazard events; and of the need to raise awareness about hazard risks and to take practical steps to reduce them.

Current planning options are strongly influenced by the legacy of historical land-use decisions that continue to shape public perceptions and risk management choices. Many New Zealand towns were established in a bygone era in localities that are prone to hazards, especially flooding. Protecting such communities was achieved historically through centralised government action and a tendency to rely primarily on efforts to 'control the hazard' through, for example, protective works such as flood levee banks (Ericksen et al. 2000; CAE 2005; MfE 2008b). With the passage of time and proliferation of development,

it has become imperative to maintain effective protective works to safeguard well-established communities that are prone to flooding, such as Palmerston North and Lower Hutt (which is the most densely populated floodplain in the country). Such works protect communities against events that are within design parameters. However, local and international experience shows that protective works tend to stimulate development intensification and, paradoxically, increase the risk of a disaster occurring when an event eventually exceeds design parameters (Burby 1998a; Mileti 1999; Ericksen et al. 2000; MfE 2008b). Insurance and relief measures have also been, and continue to be, used to enable communities to bear the burden of hazard events [e.g., through private insurance, Earthquake Commission (EQC) insurance and Mayoral Fund provisions]. When faced with the prospect of a hazard event, warnings and evacuation are important measures to avert disaster (see e.g., Garside et al. 2009). Local experience clearly demonstrates the need to move beyond traditional hazard management efforts that rely on a combination of structural protection to control or limit the impacts of hazard events, insurance and disaster relief, and warnings and evacuation. International scholarship and experience reiterates this conclusion and highlights the potential of land-use planning to reduce exposure to or avoid the impacts of natural hazard events (Board on Natural Disasters 1999; Burby 1998b; Burby et al. 1999; Godschalk et al. 1998a, b; Mileti 1999; Puszkin-Chevlin et al. 2006/7; Smith 2008).

In recent decades, there have been significant changes in the institutional and legal setting affecting land-use planning in New Zealand (see e.g., Bührs and Bartlett 1993; May et al. 1996; Memon and Perkins 2000; Ericksen et al. 2004). There has been a trend towards devolution of functions and an emphasis on local authorities and communities assuming responsibility for local matters, including natural hazards planning, particularly since 1991 with the enactment of and amendments to the RMA; and since 2002 with the introduction of the LGA. Reforms continue, with significant and contentious changes to the RMA and related institutions prioritised by the National Party led government that was elected at the end of 2008. In general, more attention is being focused on avoiding and mitigating hazard risks through land-use planning and building controls compared to past reliance on measures to control hazards, and insurance and other relief (Ericksen et al. 2000; Kerr 2005). As illustrated by the recent Palmerston North decision, however, communities still face important choices about whether or not to locate new development in high-risk areas. As discussed further below, the RMA requires avoidance or mitigation[1] of hazard risks. But responsibility is devolved to local communities to understand, identify and manage these risks. The RMA is not prescriptive about how communities should avoid or mitigate risks. Inevitably, and in keeping with the principle of devolving responsibilities to the local level, communities respond differently to the risks they face. However, in general, it is extremely difficult to counter new development proposals merely on the grounds of low probability hazard risks, even if public safety and community sustainability might be jeopardised, because economic growth, corporate interests and 'new development' are viewed as pre-eminent societal imperatives, and private property rights are held virtually sacrosanct (see e.g., Bührs and Bartlett 1993; Ericksen 2005a, b). Therefore, it is difficult to realise the full potential of land-use planning to reduce hazard risks, and there is still a tendency to rely on structural measures to control hazards, especially protective works for flooding and coastal erosion, and to expect rescue and relief in the aftermath of an event (see e.g., Ericksen et al. 2000; CAE 2005; MfE 2008b). Who then are the main

[1] In New Zealand, the term 'mitigation' is commonly used to mean reduce or alleviate hazard risk; not eliminate it. Mitigation in the USA, for example, is commonly used to mean reduce or eliminate hazard risk.

stakeholders and what are the prevailing institutional and legal provisions for natural hazards planning in New Zealand?

3 Stakeholders, and the institutional and legal setting for natural hazards planning

Land-use planning for natural hazards is undertaken at national, regional and district and city levels, by a variety of stakeholders. These stakeholders, their interests and primary legislative responsibilities are depicted in Fig. 3.

This conceptual 'box-and-whisker' diagram lists key stakeholders that have an interest in natural hazards planning (left hand side). These stakeholders are a mix of government

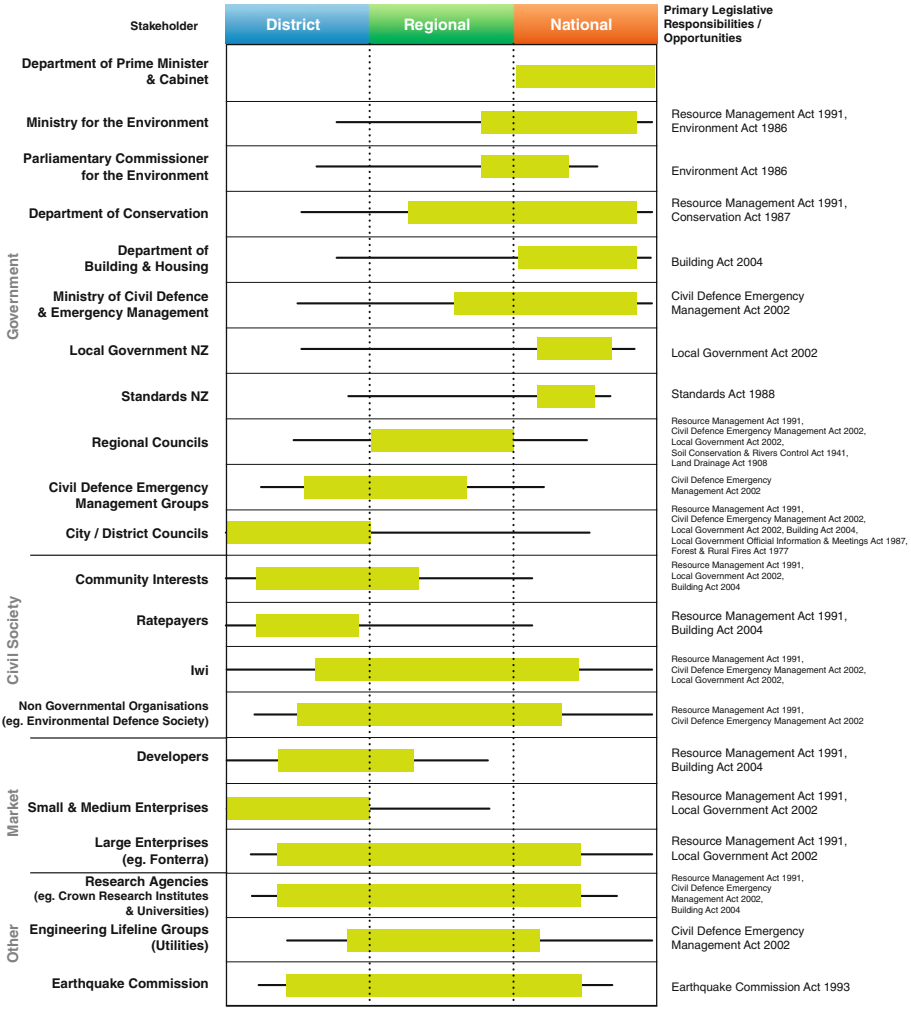

Fig. 3 Stakeholders with an interest in land-use planning for natural hazards (Drawn by: GNS Science)

agencies,[2] civil society and private sector interests and others such as research agencies (e.g., universities and Crown Research Institutes). The diagram distinguishes local, regional and national scales of primary stakeholder influence and interest. The *box* represents the main locus of stakeholder influence, responsibility and/or opportunity to influence natural hazards planning decisions. The *whiskers* indicate the extent of stakeholder interest. These stakeholders and their interests are summarised in Table 1. In broad terms, central government agencies assist communities in preparing for and managing hazard risks. Among other things, central government funds research to understand hazard risks and plays a role in ensuring that monitoring, forecasting and warning systems exist to alert communities to imminent perils. It empowers regional and local government to manage day-to-day risks in consultation with regional and local stakeholders. It thus has a critical enabling and capacity building role and an important responsibility to provide guidance on key national imperatives. When an event exceeds local capacity, central government helps communities recover. The primary legislative responsibilities and/or opportunities for regulated stakeholder involvement are listed on the right hand side of Fig. 3.

The responsibilities of some stakeholders are prescribed in legislation (e.g., councils and government departments), which also provides an opportunity for others to participate in the planning process (e.g., communities under the consultation processes of the RMA and LGA). Clearly, many different organisations and institutions have an interest in or are affected by natural hazards planning processes. These stakeholders have divergent interests, some of which are antithetical to risk reduction. Ensuring that there is common understanding about who these stakeholders are and reconciling their different interests constitutes the main challenge for improving natural hazards planning practice. It is beyond the scope of this article to detail the many legal provisions governing hazards planning in New Zealand. Table 2 summarises the purpose, responsibilities and legal mechanisms of the main Acts that influence natural hazards planning.[3]

The nature and effectiveness of natural hazards planning in New Zealand is chiefly a product of the institutional and legal regime governing environmental management and land-use planning. Extensive institutional and legal reforms took place in the late 1980s and early 1990s. These far-reaching and innovative reforms transformed planning practice, chiefly through the introduction of the RMA, and held much promise for promoting sustainability (Bührs and Bartlett 1993; May et al. 1996; Memon and Perkins 2000). But this promise has not been realised fully for a complex set of reasons, including confusion about the RMA mandate, limited local planning capability and weak local plans and inadequate involvement of central government in addressing these capacity building needs. According to Ericksen et al. (2004), the failure to realise the full potential of the RMA reflects shortcomings in governance, and inter-governmental cooperation in particular, rather than legal inadequacies specific to the RMA. This view is supported by the findings of the 2007 Environmental Defence Society Conference that concluded that RMA provisions are adequate for achieving its fundamental purpose, but that these provisions are not used effectively in implementing the Act (EDS 2007). Notwithstanding reforms since 2000,

[2] For the purpose of this article, central government refers to ministries and national level agencies. 'Regional councils' refer to councils that have jurisdiction over a region, while 'district councils' refer to councils that have jurisdiction over a district. City councils and unitary councils (e.g., Napier City Council, Gisborne District Council) are included with district councils. In some instances, 'territorial authority' is used in place of 'district/city/unitary council', and 'regional authority' is used instead of 'regional council'. Local government refers to both regional and district councils collectively.

[3] See Tonkin and Taylor (2006) for a detailed overview of hazard-related laws and landmark law cases.

Table 1 Stakeholder responsibilities and interests relating to natural hazards planning

Stakeholder	Responsibilities and interests relating to natural hazards planning
Department of Prime Minister & Cabinet	Coordinates the work of the core public service departments and ministries, so that decision-making takes account of all relevant viewpoints and is as coherent and complete as possible (http://www.dpmc.govt.nz/dpmc/index.htm)
Ministry for the Environment	Responsible for national policy statements, environmental policies, standards, plans, guidelines. Plays a lead role in reducing hazard risks through provisions in the RMA that are mainly carried out by Regional Councils and Territorial Authorities
Parliamentary Commissioner for the Environment	Assesses the system of environmental administration; provides advice to environmental managers, including natural hazards. Instigated the Active Fault guidelines for consent and policy planners
Department of Conservation	Responsible for the NZ Coastal Policy Statement; involved in submitting to regional and district planning consultative processes; and as an interested party to resource consent applications via conservancies
Department of Building & Housing	Administers and provides support for responsibilities under the Building Act to ensure the safety and integrity of buildings
Ministry of Civil Defence & Emergency Management	Provides guidance through a national strategy, plans, guidelines and advice on incorporating reduction through land-use planning. National, regional and district influences
Local government New Zealand	Represents the national interests of councils of New Zealand, champions best practice in the local government sector, provides policy, advice and training to councils (http://www.lgnz.co.nz/)
Standards New Zealand	An independent organisation that develops standards, including the Risk Management Standard 4360:2004, and a proposed Flood Risk Management Standard as well as others
Regional Councils	Control the use of land for the avoidance and mitigation of natural hazards. Monitor and record natural hazards
CDEM Groups	Identify and understand hazards and risks; prepare CDEM Group Plans and manage hazards and risk in accordance with the 4Rs (reduction, readiness, response and recovery) (www.civildefence.govt.nz)
District/City Councils	Control the effects of the use of land for the avoidance and mitigation of natural hazards. Monitor and record natural hazards. Issue Land and Project Information Memorandums
Communities	Through *inter alia* Long-Term Council Community Plans (LTCCPs), define a community vision and levels of acceptable hazard risk. Predominantly interested in regional and local issues
Private Property Owners	Safeguard private property interests. Predominantly interested in site-specific issues and requirements
Developers	Profit from new property development opportunities. Predominantly interested in local issues and specific development projects
NGO's, e.g., Environmental Defence Society	Environmental advocacy groups work at all levels of planning, e.g., from community to national levels. EDS is a not-for-profit environmental advocacy organisation, comprised of resource management professionals who are committed to improving environmental outcomes in New Zealand
Research agencies	Universities, Crown Research Institutes, national centres. Provide hazard research and advice to many bodies from central government to communities

Table 1 continued

Stakeholder	Responsibilities and interests relating to natural hazards planning
Fish & Game	Responsible for the sports of freshwater sport fishing and game bird hunting (http://www.fishandgame.org.nz). Often involved in consultation as an affected party for hazard mitigation works i.e. river bank works
Engineering lifeline groups	A regionally based process of lifeline utility representatives working with scientists, engineers and emergency managers to identify interdependencies and vulnerabilities to regional scale emergencies. Provides a framework to enable integration of asset management, risk management and emergency management across utilities (www.civildefence.govt.nz)
Earthquake Commission (EQC)	New Zealand's primary provider of natural disaster insurance to residential property owners. It insures against damage caused by earthquake, natural landslip, volcanic eruption, hydrothermal activity, tsunami; in the case of residential land, a storm or flood; or fire caused by any of these (www.eqc.govt.nz)

including amendments to the RMA and the introduction of the LGA, planning for sustainability, including hazard risk reduction, remains an ongoing challenge in New Zealand (see e.g., Perkins and Thorns 2001; Gunder and Mouat 2002; Ericksen et al. 2004; Schofield 2007; Thomas and Memon 2007; Cheyne 2008). RMA reforms that were proposed at the start of 2009 are likely to significantly restructure and 'streamline' agencies with responsibilities for natural hazards planning, notably MfE. Among other things, the proposed changes to 'speed-up' RMA decision-making may result in more centralised decision-making contrary to the devolution trend of recent decades. There is also likely to be reduced opportunity for civic engagement in local planning processes. Paradoxically, the proposed RMA changes are likely to reduce government and community capacity to address the complex interconnections between land-use planning and emergency management, and sustainability, resilience, disaster risk reduction and climate change adaptation at the very time that these issues demand greater investment in national leadership and community planning capacity. Consequently, building sustainable, hazard-resilient communities is a very difficult undertaking in practice.

The institutional and legal regime for natural hazards planning in New Zealand has a solid policy, legal and institutional foundation. The framework established by the RMA and LGA recognises interrelationships between community sustainability and natural hazard risk reduction. It devolves responsibilities to local authorities through a cooperative governance approach. Planning provisions in terms of the LGA require the preparation of a 10-year Long-Term Council Community Plan (LTCCP) that includes a community vision and a complementary Annual Plan to translate this vision into practical reality. The RMA requires Regional Councils and Territorial Authorities to identify and avoid or mitigate natural hazards through a system of policies, plans and consent approval processes. These planning provisions are supported by the CDEMA which aims to build community resilience through an all-hazards approach that is based on a '4R' (namely Reduction, Readiness, Response and Recovery) emergency management approach. These legislative provisions for natural hazards planning need to be viewed as a whole. Together, they provide a legal foundation for building sustainable, hazard-resilient communities and provide planners with a range of tools to avoid and mitigate hazard risks.

Table 2 Summary of purpose, responsibilities and legal mechanisms affecting natural hazards planning (Based on Tonkin and Taylor 2006; ODESC 2007)

	Responsibilities and mechanisms for natural hazards planning by government Agencies
Resource Management Act (1991 with amendments) *Purpose:* Sustainable management of natural and physical resources, including natural hazards management and climate change. Requires Regional Councils and Territorial Authorities to avoid or mitigate hazards	Ministry for the Environment/Dept. of Conservation *Responsibilities:* National policy statements; standards; guidance *Mechanisms:* NZ Coastal Policy Statement; other national policy statements (a draft flood national policy statement is currently in the process of being developed); National Environmental Standards, including future hazards-related standards Regional Councils *Responsibilities:* Control use of land for avoidance of hazards; monitor and keep records of hazards *Mechanisms:* Regional Policy Statements; Regional Coastal Plans; Other Regional Plans; Process resource consent applications Territorial Authorities *Responsibilities:* Control *effects* of use of land for avoidance of hazards; monitor and keep records of hazards *Mechanisms:* District plans; process resource consent applications; exceptions for emergencies
Local Government Act (2002) *Purpose:* Facilitate democratic and effective local government, including defining community vision	Territorial authorities *Responsibilities:* Set strategic direction and actions of local authorities (including hazard management); flood protection and control works *Mechanisms:* LTCCP; Bylaws
Civil Defence Emergency Management Act (2002) *Purpose:* Sustainable management of all hazards by encouraging communities to achieve acceptable risk levels. Aims to build community resilience. Adopts all-hazards approach. Emphasises '4Rs'—reduction, readiness, response and recovery. CDEM Groups encourage collaboration	Ministry of Civil Defence Emergency Management/ Dept. of Internal Affairs *Responsibilities:* Sustainable management of hazards; Identify hazards of national significance; Planning and preparation for Readiness, Response and Recovery (Note: Reduction mainly by RMA and LGA02) *Mechanisms:* National Emergency Management Strategy; NEM Group Plans (with CDEM Group input); Directors Guidelines Local Authorities *Responsibilities:* Form a CDEM Group; Identify and manage hazards and risks; Consult and communicate about risks; Implement risk reduction; Respond to emergencies; Carry out recovery activities; Plan and prepare for emergencies and for response and recovery *Mechanisms:* CDEM Group plans; Maintain organisational structure; Recruit and train volunteers; Conduct Training Exercises; Provide warning systems; Provide communications, equipment, accommodation; Participate in MCDEM Strategy/ Plans

Table 2 continued

	Responsibilities and mechanisms for natural hazards planning by government Agencies
Building Act (2004) *Purpose:* Regulate building work to ensure safety and integrity of structures, especially against earthquake risk. Land to be built upon and subject to hazards may be notified to inform interested parties	Dept. of Building and Housing *Responsibilities:* Establish licensing regime; Set performance standards for buildings *Mechanisms:* Building regulations (building code) Territorial authorities *Responsibilities:* Identify and inform re hazard-prone land; Restrict construction on hazard-prone land; Control earthquake prone buildings *Mechanisms:* Earthquake Prone Buildings policies and controls; Project Information Memoranda; Building consents and conditions on consents
Local Government Official Information Management Act (1987) *Purpose:* To make local authority information available to public, incl. information about land prone to hazards	Local authorities *Responsibilities:* Make local authority information publicly available (incl. identifying hazards) *Mechanisms:* Land Information Memoranda

Planners can draw on a wide range of tools and mechanisms to reduce hazard risks. Regulatory planning tools under the RMA include National Policy Statements, Regional Policy Statements, Regional Plans, District Plans and the resource consent process. The Building Act has provisions for making publicly available hazard information about a particular site in a project information memorandum (PIM), which is required for building consent. The Building Code and related provisions can also be used to ensure that the design and construction of buildings and structures is hazard resistant, particularly with respect to earthquake and wind loadings. According to the Local Government Official Information and Meetings Act 1987 (LGOIMA), a land information memorandum (LIM) can be requested (usually before purchasing a property) to obtain information that the Council is aware of about hazards that may affect the land parcel. Planners can also draw on many other tools such as financial incentives/disincentives; hazard registers; insurance provisions to influence patterns of development; set-back lines and no build zones; conservation easements and land swaps; resource consents; structure plans; growth strategies; iwi management plans[4]; emergency management warning and evacuation planning; education; research; and advice and advocacy (Tonkin and Taylor 2006). It is important to draw upon sound legal and scientific advice to ensure effective use of these tools. While these tools have considerable potential to reduce hazard risk, there is little awareness about these tools, and many are not used to their full potential. Increased attention, therefore, needs to be focused on raising awareness about the strengths, weaknesses, opportunities and constraints of alternatives tools and measures for hazard risk reduction.

Table 3 shows that a wide variety of tools has been used in attempting to reduce flood risks. Attention has recently been given to a proposed National Policy Statement on Flooding that, if introduced, will significantly increase the range of tools available to planners. Planning tools for adapting to climate change are also well supported. In contrast, tsunami followed by volcanic eruption are the least supported; primarily because

[4] Iwi management plans have statutory recognition under the RMA and reflect Maori tribal knowledge about and provisions for dealing with resource management issues.

Table 3 Land-use planning tools for managing specific natural hazards

Natural hazard	Land-use planning tools available and used									
	National policy statement	NZ coastal policy statement	Standards	Regional policy statement	District plan	Specific hazard plan	National guidelines	Structural measures	Financial incentives	Warnings & evacuation planning
Earthquake/Fault rupture	×	×	?	✔	✔	–	✔	✔	×	×
Volcanic eruption	×	×	?	–	–	–	×	×	×	–
Slope instability	×	×	?	✔	✔	×	✔	✔	×	–
Flooding	?	✔	✔	✔	✔	✔	✔	✔	×	–
Coastal erosion	×	✔	?	✔	✔		✔	✔	×	–
Tsunami	×	×	?	–	–	×	×	×	×	–
Climate change	×	✔	?	✔	✔		✔	–	×	n/a

✔ = mostly yes; – = variable; × = No; ? = proposed; n/a = not applicable

resourcing of tsunami research is a recent response to awareness raised by the 2004 Indian Ocean tsunami and the localised nature of active volcanoes on the North Island. These are the only two listed hazards that do not have hazard-specific guidelines available for planners to use. However, both perils do have established monitoring and warning system hardware available. Additionally, there are opportunities for these hazards to be planned for at a regional and local level. But these have yet to investigated thoroughly [see Becker et al. (2010) re land-use planning for volcanoes]. All perils are included to varying degrees in Regional Policy Statements and District Plans.

Warning and evacuation planning is included as a planning tool in Table 3, even though it has historically been seen as an emergency management tool. Warning and evacuation planning is required to mitigate the risk of hazards such as tsunami that do not have return periods as great as some other hazards (e.g., flooding) and therefore may not warrant strict hazard avoidance zones. Currently, there is a range of flood warning systems in place throughout the country. There is an opportunity for consent decisions to incorporate warning systems and evacuation procedures into consent conditions. For example, the Kaihikatea Estates development in the Coromandel (see Fig. 2) is required to have an emergency management plan that includes a private flood warning system and an evacuation plan. Additionally, subdivision and road design could incorporate mitigation for some of these hazards.

New Zealanders benefit from a government insurance scheme for natural disasters, namely EQC insurance, which is automatically purchased when buying insurance for residential dwellings and contents. The EQC pays out on claims from New Zealand residential property owners for damage caused by earthquake, natural landslip, volcanic eruption, hydrothermal activity and tsunami; and in the case of residential land, a storm, flood or fire caused by any of these perils. Dwellings are insured up to a maximum of $100,000 plus goods and services tax (GST), and personal effects are insured up to $20,000 plus GST. The EQC pays the value of damaged land at the time of the earthquake or natural disaster, or the repair cost, whichever is lower (see www.eqc.govt.nz). Private insurance then 'tops up' the outstanding amount. While insurance is a tool for managing residual risk, its full potential for risk reduction has yet to be realised. For example, if a house is affected by a flood and could be elevated to mitigate future flood impacts, the insurance payout will not cover this improvement. Insurance payouts can only be used to reinstate the damaged house to the condition that it was in before the event occurred, and not to make any improvements even if they reduce future risk. This is a 'lost' opportunity for risk reduction. In the future, there is also an opportunity for insurance companies to play a more proactive role in development proposals located in high-risk areas, by compelling those who seek to develop in such areas to assume greater personal responsibility for taking such risks. In extreme cases, it may be appropriate to limit or even decline insurance cover.

Community development initiatives can play a very important role in building hazard-resilient communities. Hazard education programmes that are integrated into community development initiatives will be more effective than stand-alone, one-off programmes (Finnis et al. 2007). Such programmes can help people become more aware about local hazards and the associated risks and learn how they can reduce these risks. Such integrated community development initiatives enable people to become directly involved in hazard risk management, devising their preferred solutions, and thus empowering the community to take responsibility for their own resilience (Paton 2006).

This brief overview of land-use planning for natural hazards in New Zealand reveals the many interests involved in and the institutional and legal complexity of this field. Despite

the strong foundation established for natural hazards planning, coupled with growing awareness about the role that planning can play in averting disaster by avoiding or at least mitigating hazard risks, some communities, for example Kaeo, are exposed to repeat events and potentially devastating impacts. In other cases, 'bad practice' occurs with development taking place in localities that expose communities to unnecessary risks. The next section highlights barriers to realising the potential of natural hazards planning and outlines 'burning issues' and priority actions for New Zealand.

4 Barriers, 'burning issues' and priority actions

4.1 Barriers for realising the potential of natural hazards planning

Scholars, chiefly in the United States of America (USA), have clearly demonstrated the pivotal role that land-use planning can play in averting disaster (Board on Natural Disasters 1999; Burby 1998a; Burby et al. 1999; Godschalk et al. 1998a, b; Mileti 1999; Puszkin-Chevlin et al. 2006/7; Smith 2008). Nonetheless, community sustainability and resilience is an elusive pursuit. Reflecting on natural hazards planning scholarship in the USA, Glavovic (2010) identifies four key barriers that stand in the way of planning sustainable, hazard-resilient communities. First, the public typically prioritises issues of immediate import and direct impact rather than taking steps to reduce hazard risks (Berke 1998; Berke et al. 1996; Birkland 1996; May and Williams 1986; Petak 1985). Many New Zealand communities discount hazard risks and prioritise more immediate concerns. A recent hazard event can, however, transform public opinion and lead to risk avoidance measures as demonstrated by the decision not to allow new development in the flood-prone Te Matai Road area of Palmerston North in the wake of the 2004 flood event. Second, the introduction of local level planning provisions to reduce risk, and risk averse behaviour more generally, may be discouraged by well-intentioned higher-level policies and provisions that remove or reduce the risk on individual property owners, businesses, communities and local authorities (Burby 1998a; May and Deyle 1998). As outlined above, the New Zealand legal and institutional framework for land-use planning is robust and facilitates coordinated, devolved decision-making to promote community sustainability and resilience. There is an opportunity to better align policies and laws (including insurance provisions) to promote more effective and integrated natural hazards planning, because important measures are spread out across various statutes with inevitable gaps, overlaps and inconsistencies (see Table 2). But the more compelling challenge in New Zealand is to translate policy and legal intentions into practical reality through better inter-governmental cooperation (EDS 2007; Ericksen et al. 2004). Third, experience in the USA demonstrates that it is difficult to develop the requisite coordination and collaboration across different spheres of government and between the many role-players involved in natural hazards planning. Local authorities in the USA can avoid planning for hazard risks unless compelled to do so by higher authorities; and it is difficult to ensure that the plans that are produced are well crafted, regularly updated and effectively enforced (Godschalk et al. 1998b; Steinberg and Burby 2002). Local authorities in New Zealand must give effect to provisions in the RMA, LGA and CDEMA, among other laws. But there continues to be considerable variability in how hazards are integrated into planning provisions in New Zealand—be they Regional Policy Statements, or Regional or District/City Plans. Much, therefore, remains to be done to realise the intentions of planning legislation, fully align regional and territorial authority planning processes (Ericksen et al.

2004) and prioritise hazard avoidance through proactive planning efforts (Becker and Johnston 2000). Furthermore, alignment and integration of planning and emergency management practice is necessary for effective natural hazard risk reduction (Saunders et al. 2007). Fourth, prevailing societal values, political imperatives and regulatory provisions promote economic growth over community safety and sustainability. Consequently, local authorities are more inclined to facilitate rather than restrict property development, even in high-risk localities (May et al. 1996; Puszkin-Chevlin et al. 2006/7). Reconciling short-term, narrow interests with longer-term community interests is an underlying challenge for those advocating hazard risk reduction, sustainability and community resilience in New Zealand.

These barriers make it difficult to realise the potential of natural hazards planning, especially given the diversity of stakeholders with divergent interests (see Fig. 3 and Table 1), and the complex legal and institutional milieu (see Table 2). Government agencies and other stakeholders are taking a variety of steps to improve natural hazards planning practice in New Zealand. Based on the foregoing synthesis of prevailing stakeholders, institutions, laws and practice, and given the above barriers, we identify four 'burning issues' and associated priority actions that need to be taken to realise the potential of land-use planning for reducing natural hazards risks and building resilient communities in New Zealand. Ultimately, the fundamental challenge is to facilitate cooperative governance for community sustainability and resilience (Saunders and Glavovic 2009)—which we consider to lie at the heart of natural hazards planning practice (see Fig. 4).

Fig. 4 Cooperative hazards governance: Barriers, burning issues and priority actions (Drawn by: GNS Science)

4.2 Burning issues and priority actions

Four burning issues and associated priority actions are identified, namely

1. Improve understanding about the nature of hazards;
2. Prioritise risk avoidance (reduction) measures;
3. Provide national guidance for communities exposed to repeat events and address the issue of relocating at-risk communities and
4. Mainstream climate change adaptation.

Overcoming the above barriers and addressing these burning issues through the recommended priority actions is ultimately a governance challenge.

4.2.1 Improve understanding about the nature of hazards

The recent hazard events at Kaeo, Matata and Palmerston North highlight the tendency for communities to focus attention on hazards only when they experience an event or face a tangible threat. Otherwise, hazards risks are downplayed relative to more immediate concerns. Much, still, needs to be done to improve the understanding amongst the public, community leaders and professionals about the nature of hazards and their potential impacts (Smith 2009). Improved understanding then needs to be translated into actions that promote community preparedness and resilience. Natural hazards are commonly thought of as a physical peril, such as an earthquake or flooding, to life and/or property. Focusing on the physical peril leads to a preoccupation with measures to control the threat. For example, stopbanks are constructed to keep the peril of flooding away from communities. However, social conditions and human choices are key factors shaping community exposure to hazards. Little can be done to change the nature of physical perils. But steps can be taken to reduce human vulnerability to hazards. It is, therefore, important to recognise that hazard risk is a product of the physical peril and social vulnerability of communities (Alabala-Bertrand 1993; CDRSS 2006; Comfort 1999; Haque and Etkin 2007; Hewitt 1983; Hoffman and Oliver-Smith 2002; Pelling 2003; Varely 1994; Wisner et al. 2004). Recognising the interactive nature of the physical threat with human use and social conditions underscores the need to take proactive steps to keep people away from perils. For example, land-use planning decisions need to be taken that avoid locating development in high-risk areas. Increasing attention is being focused on the human dimensions of hazards through, inter alia, a portfolio of New Zealand government funded research programmes together with investment by the EQC. However, social science disaster researchers, policy-makers and practitioners have called for more focused attention and strategic research investment to deepen and extend our understanding about the social dimensions of natural hazards. Key questions concern the nature of and relationships between hazard risk reduction measures, vulnerability, sustainability and community resilience; public perceptions of risk; Maori worldviews and practices to reduce risk (see e.g., King et al. 2007); understanding the barriers to building public awareness and understanding about hazards; and how to foster more effective collaborative hazard risk reduction in this era of climate change (Glavovic et al. 2008, 2009). At a very basic level, there is a need to improve public understanding about hazard terms that are commonly used but easily misunderstood, such as the meaning of the '1-in-a-100-year flood'. It is often thought that if a flood has occurred, then it will not happen again for another 100 years; whereas this term refers to the probability of a flood of a particular magnitude occurring in any one year. Some have suggested the use of an alternative term such as

Annual Exceedance Probability to avoid this confusion (Ericksen 2005a; Saunders and Glassey 2007).

Priority actions

The following priority actions are recommended to improve natural hazards understanding in New Zealand.

1. Notwithstanding recent investment in social science disaster research, much remains to be done to better understand the social dimensions of hazards. Important questions include What risks do communities face? What are the likely social impacts of hazard events? What are the underlying and proximate drivers of social vulnerability? What can be done to build community resilience, especially in the context of climate change? There is also a compelling need to review existing social science disaster research and to define strategic priorities for targeting future investment in social science disaster research.
2. Continued attention needs to be focused on integrating research findings into day-to-day decisions that have a bearing on community sustainability and resilience. Such integration will help to promote evidence-based community planning and development. Among other things, research initiatives need to be informed by policy and practice imperatives. Research findings need to be written in plain-language and presented in accessible media and formats that can readily be used by planners and decision-makers. Ongoing attention needs to be focused on developing practical tools that can be used by those involved in planning processes (e.g., consent tables as part of the Active Fault and Landslide Guidelines; Natural Hazards Guidance Note from MfE; and planning guidance for hazards such as volcanoes and tsunami). In addition, interaction between scientists and planners is essential to ensure two-way communication about practitioner needs and transfer scientific hazard information, and to develop and successfully apply guidance and practical planning tools. Such interaction and collaboration has developed over recent years. However, further opportunities exist to enhance and perhaps even formalise these endeavours (e.g., Glavovic et al. 2008, 2009). Ongoing collaboration could be facilitated by key government role-players such as EQC, MCDEM and MfE, and needs to be resourced and expanded to facilitate broader interaction and collaboration.
3. Particular attention needs to be focused on the role of land-use planning in dealing with high impact-low frequency events, such as tsunami; and the implications of climate change for future hazard risks. The government, notably through MfE, has explored these issues in recent years. Sustained practical steps need to be taken to facilitate deliberation and joint learning about these issues amongst scientists, land-use planners, emergency managers, emergency services, lifelines groups, community-based organisations, non-governmental organisations, business interests and other relevant stakeholders. A targeted and practical approach is recommended that takes place in communities that are predisposed to such perils.
4. Dedicated and systematic training and capacity building needs to be developed for land-use planners to improve their understanding about the nature of hazards, and to ensure that hazards are 'mainstreamed' into their daily work. Some opportunities are already provided at a tertiary level (e.g., the natural hazards planning courses through the Massey University Planning programme), and through professional development programmes (e.g., through training courses offered by the GNS Science and NIWA Natural Hazards Centre, the biennial Natural Hazards Management Conference and

associated workshops, and New Zealand Planning Institute initiatives). These opportunities ought to be extended and deepened with the active involvement of key government agencies, tertiary institutions and practitioners from local government and the planning profession more generally. Similarly, targeted training and capacity building needs to be provided for emergency managers, so that they can develop a better understanding about the role of land-use planning in reducing hazard risks. There is a compelling need to improve hazard awareness and understanding amongst elected officials and community leaders given their critical decision-making responsibilities.

4.2.2 Prioritise risk avoidance (reduction) measures

At present, the CDEMA and supporting Strategy, Plans and Director's Guidelines do not focus adequate attention on risk avoidance (i.e., reduction in terms of the 4 R approach) or the pivotal role that land-use planning plays in building resilient communities. It is assumed that reduction measures will be taken through the RMA. Consequently, emergency management efforts have been largely preoccupied with readiness, response and recovery; and reduction has been neglected (Saunders et al. 2007). This shortcoming is increasingly recognised, and the emergency management sector is developing growing appreciation of the important role that land-use planning plays in hazard avoidance and risk reduction (Saunders and Becker 2008). This awareness is reflected inter alia in a proposed Director's Guideline being drafted on 'Second Generation' emergency management plans which promotes land-use planning as a reduction measure. The planning profession also needs to focus more attention on hazards and the relationship between planning and emergency management. Particular attention needs to be focused on mainstreaming natural hazards, and hazard avoidance and risk reduction, into day-to-day planning processes. In addition to improved policy and legal alignment, there is a compelling need to improve communication between emergency managers and planners to ensure that every effort is made to prioritise risk avoidance, especially in situations where there are opportunities to avoid locating new development in high-risk areas, such as the Te Matai Road area of Palmerston North. Making such decisions in the interests of community safety, resilience and sustainability will, however, be difficult given prevailing development imperatives and the tendency to downplay hazard risks. Planners have a critical role to play in enabling communities to make wise choices that reconcile contending imperatives—a challenge that is likely to grow in the light of future climate variability and change, especially in areas prone to flooding and coastal areas vulnerable to erosion and sea-level rise. Two issues related to reduction need to be highlighted. First, careful consideration needs to be given to the societal costs and benefits of structural vs. non-structural mitigation measures when contemplating different options for reducing hazard risks. The apparent advantage of protective works may be less compelling when considering the long-term maintenance costs of such works, especially in the face of climate change, and any residual risk; and in light of who benefits from and pays for such works. Secondly, attention needs to be focused on enabling communities to become more self-reliant and resilient, so that they become less dependent on being 'bailed out' after an event. Practical measures need to be taken to build community resilience, including pre-event recovery planning to iron out problems before they arise in the post-event recovery phase (Becker and Saunders 2007; Becker et al. 2006, 2008; Rubin and Burbee 1985; Schwab et al. 1998; Smith 2010; Smith and Wenger 2006; Wright et al. 2009).

Priority actions

Four priority actions are recommended to prioritise risk avoidance measures.

1. Key government agencies with responsibilities for planning and emergency management need to investigate the ways in which relevant policies and laws, notably those pertaining to the CDEMA, RMA and LGA, facilitate or hinder disaster risk reduction through land-use planning. There is a need to clarify roles and responsibilities and ensure that reduction is prioritised in Regional Policy Statements, Regional and District Plans, LTCCPs, CDEM Plans and other related policies and plans (including dedicated hazard management plans and growth plans). MCDEM is addressing this issue, but much remains to be done to develop an effective 'whole of government' approach.
2. Translating reduction rhetoric into reality takes place at the local level. Regional and Territorial Authorities, therefore, need to take practical steps to ensure that planners and emergency management staff coordinate their activities and work towards more effective integration of their respective responsibilities. Second Generation RMA, LGA and CDEM plans provide valuable opportunities for practical integration of responsibilities to avoid and mitigate hazard risks and build community resilience.
3. Regional and Territorial Authorities also need to explore opportunities to integrate reduction measures into more general community planning and development efforts, such as growth strategies and structure plans, to raise public awareness about hazard risks and to foster community resilience.
4. Pre-event recovery planning is an important but poorly appreciated component of reduction. Pre-event recovery plans facilitate integration of sustainable hazard mitigation measures into decision-making prior to an event and provide significant benefits for post-disaster recovery and reconstruction.

4.2.3 Provide national guidance for communities exposed to repeat events and address the relocation issue

Some hazards, such as riverine flooding and coastal hazards, occur relatively frequently and may be exacerbated by climate change. Exposure to high-frequency repeat events should not be dealt with on an ad hoc basis in the aftermath of events. There is a compelling need to address this issue in a proactive and systematic manner by taking nationally consistent practical steps to improve the safety and sustainability of at-risk communities. This is a vexing and complex issue with profound sociological consequences that demand very careful consideration. Relocation can be difficult to achieve due to land-ownership issues, social disruption and the trauma associated with disasters and relocation (Becker et al. 2008; Mileti and Passerini 1996). International experience shows that relocation is likely to be more successful when it is an agreed-upon community decision, supported by authorities, such as in the case of Allenville, Arizona, where the township collectively decided to re-locate. They successfully moved the entire community and re-established valued social networks and systems (Perry and Lindell 1997). There is limited experience of relocating at-risk communities in New Zealand. One example is the town of Kelso in the Clutha district of Otago (see Becker et al. 2008) (see Fig. 2). This small town of less than 200 residents was struck by severe floods in 1978 and then again just 15 months later. Increasing protection through flood mitigation works was deemed unaffordable, and the residents decided to relocate on an individual basis. Those living on higher ground initially opted to stay, whereas those on the vulnerable floodplain chose to relocate. People moved

to the neighbouring towns of Tapanui and Heriot. The local post office, town store and school closed. In the absence of these community amenities, remaining residents also decided to relocate, and the town was abandoned. Residents subsequently held reunions. But this long-standing, close-knit community could not sustain community ties once they relocated. More focused analysis of the social impacts of alternatives, an inclusive and collaborative planning process and dedicated governmental support, may have enabled the residents to relocate in a way that sustained community ties. More generally, attention needs to be focused on removing the incentives that encourage people to remain at risk, such as insurance contracts that encourage people to rebuild in a high-risk location or renovate a damaged building to the state it was in prior to an event. Ideally, new development should be concentrated in less risky locations; and where necessary, and with careful consultation and planning, it may be appropriate to relocate especially vulnerable communities.

Priority actions

Three priority actions are recommended for developing appropriate national guidance to address the issue of repeat events and relocation.

1. There is an urgent need for national guidance on how local communities should deal with flood risk. Work has been undertaken on developing a National Policy Statement on Flooding, but this work has yet to be translated into formal government policy. Local authorities urgently need guidance for dealing with the flood hazard as well as other perils that pose a repetitive risk to communities, such as coastal erosion, storms and sea-level rise. After thorough investigation, such guidance should also address the issue of relocation.
2. There is a paucity of research on how to deal with repetitive events and relocating at-risk communities. Such research is urgently needed in New Zealand but needs to be informed by international experience. Among other things, the research design should include case studies of vulnerable communities that have recently experienced events (such as Kaeo) and communities that have not experienced a recent event; as well as 'successful' and 'unsuccessful' relocation experiences. The research should focus on the process of how to resolve the issue of repeat exposure, including the relocation option, as well as the practical tools used and outcomes realised. Such research is essential for developing nationally consistent best-practice guidance.
3. Research also needs to be initiated to improve understanding about perverse insurance provisions that entrench exposure to repeat events. Such research needs to be complemented by efforts to raise public awareness about opportunities for property owners to negotiate with their insurance providers about how to undertake post-event repairs that reduce future risks. For example, what are the barriers and opportunities for those living in flood-prone areas to obtain insurance coverage for post-event repairs that include mitigation measures such as flood-resistant building materials, raising electrical power points and elevating buildings?

4.2.4 Mainstream climate change adaptation

The Intergovernmental Panel on Climate Change (IPCC) has confirmed the reality of climate change and the major challenges it poses for humanity (IPCC 2007). New Zealanders will have to contend with changes in parameters such as temperature, rainfall and sea level that are likely to change the intensity and frequency of hazards events. In addition to vital mitigation measures to reduce greenhouse gas emissions, communities

will need to take practical steps to adapt to climate change. Climate-related risks and impacts will, therefore, need to be addressed through day-to-day community planning processes. Practical steps to adapt to climate change need to be taken in the short-term, even though the benefits of some measures may not materialise until climate change impacts become more apparent in coming decades. Government, notably MfE, is playing an active role in helping local authorities, and communities understand the climate change issue, its likely impacts and mitigation and adaptation options. Particular attention has been focused on providing guidance to local government through a series of publications about how to adapt to climate change (see MfE 2008a, b, c).

Priority actions

The following priority actions are recommended to mainstream climate change adaptation.

1. A National Policy Statement on Climate Change Adaptation needs to be developed to ensure a nationally consistent approach to how local authorities and communities plan for resilience and build adaptive capacity.
2. Comparative case study research is needed to understand the challenges and opportunities being faced by communities that are already taking steps to adapt to climate change. Such research will help to understand lessons learned and will be especially valuable in determining how best to mainstream effective measures. Attention needs to be focused on the process through which such adaptation is occurring, including practical barriers and opportunities for changing perceptions, bringing about behavioural changes and integrating adaptation into prevailing governance processes. Such research needs to complement related climate change research that is already underway.
3. Existing guidance needs to be complemented by new guidance that addresses issues of strategic import relating to land-use planning and climate change. For example, guidance is needed on how to integrate climate change impacts and adaptation into Second Generation Plans. Practitioners need practical guidance about the relationship between climate change, vulnerability, resilience and adaptive capacity in local communities. Guidance is also needed on climate change implications and options for communities likely to be exposed to elevated risks, such as communities that might experience more intensive riverine flooding and/or coastal erosion, storms and sea-level rise.
4. There is a need to monitor local authority and community uptake and effective use of existing MfE guidance about climate change adaptation. If appropriate, guidance needs to be revised. Attention also needs to be given to how best to translate guidance into practice through, among other things, training, public awareness and outreach activities.

Overcoming the barriers to effective natural hazards planning and addressing the above burning issues and taking the recommended priority actions is ultimately a natural hazards governance challenge (see Fig. 4).

4.3 Develop a cooperative hazards governance approach for planning sustainable, hazard-resilient communities

As discussed earlier, the basic institutional and legal provisions for natural hazards planning in New Zealand are well grounded. They facilitate an all-hazards, community

resilience focused approach to natural hazards planning and emergency management that takes account of the '4Rs' in a devolved, cooperative modality that is geared towards avoiding and mitigating hazard risks. The fundamental challenge is to turn the existing policy rhetoric into tangible reality in local communities. At a basic level, this is a cooperative governance challenge. How can we enable people to work together better, including all spheres of government, civil society, business interests, lifeline utility providers, and the research community? Improving cooperative governance is a challenging endeavour that bedevils New Zealand planning efforts in general. Progress will need to be made in a step-wise manner whereby *attention* is focused on hazard risk reduction; *awareness* of and *understanding* about hazards is improved; and *dialogue and information sharing* leads to more *coordinated* and *collaborative* practice that builds community sustainability and resilience. Meaningful progress can only take place in real communities as they contend with real risks and community concerns. Improved cooperation needs to take place on many levels and across the range of divergent interests, institutions, laws, and professional practice. Three aspects of the cooperative hazards governance imperative need to be highlighted.

1. Coordinate policies, laws and institutions to improve hazard risk reduction in the face of climate change: Effective risk reduction is hampered by gaps, overlaps, redundant provisions, contradictions and perverse incentives. Once identified, these issues need to be addressed, and where appropriate, policies and laws need to better aligned to facilitate a more holistic and cooperative governance approach, with more effective institutional coordination. Figure 5 outlines the five main statutes that govern natural hazards planning at different levels of government, namely central (orange), regional (green) and district/city (blue) levels. The hierarchy of plans established under each law provide various statutory and non-statutory tools for natural hazards planning (see solid and hashed boxes). The solid arrows show established relationships in the hierarchy of provisions. The hashed arrows highlight relationships between existing provisions that ought to be improved. These relationships may be one- or two-way. These legislative provisions and the array of tools they provide constitute a robust 'toolkit' for natural hazards planning. However, many of these tools are not well known or used to their full potential to reduce hazard risk and build community resilience. Arguably, all local authority natural hazard information should be held in a central repository, such as a hazards register. Protocols, however, need to facilitate systematic and consistent inputting of new information, verification, updating and use.
2. Cooperative professional practice: The above barriers, 'burning issues' and priority actions, explicitly or implicitly require more effective cooperative practice. There are ongoing efforts to improve dialogue and cooperation between and within different spheres of government and between different agencies. However, there is a compelling need to increase the capacity of key central government agencies involved in natural hazards planning, notably MCDEM and MfE, to ensure even more effective support of regional and local natural hazards planning efforts. Notwithstanding pressures to 'streamline' staffing, it is imperative to build dedicated capacity at a national level to provide leadership on the roles of land-use planning and emergency management in promoting community sustainability, resilience and disaster risk reduction in this era of climate change. Local risks ought to be managed locally, but not at the cost of each locality re-learning bitter and possibly avoidable disaster lessons. Central government should ensure that there is consistency in how pervasive perils are addressed, whilst building the capacity of and enabling local communities to develop robust local plans

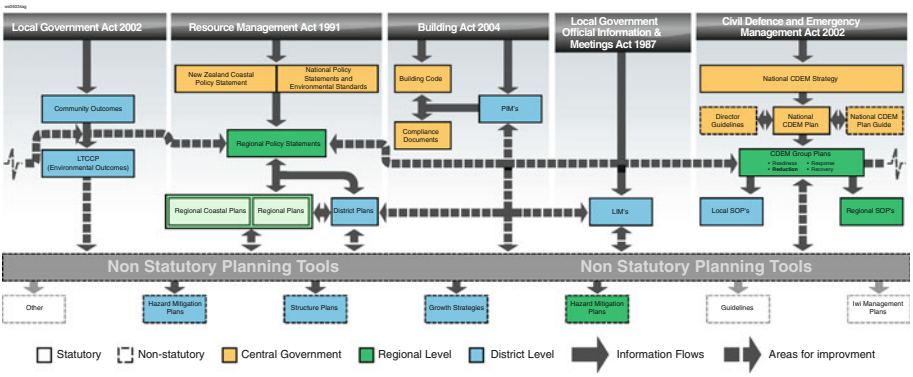

Fig. 5 Primary natural hazard responsibilities and relationships for natural hazard planning in New Zealand: Opportunities for building synergies (Drawn by: GNS Science). Key: LTCCP = Long-Term Council Community Plan; PIM = Project Information Memorandum; LIM = Land Information Memorandum; SOP = Standard Operating Procedure

that incorporate locally appropriate avoidance and mitigation measures. Practical steps, such as national guidance, need to be taken to reduce national hazard risks (which are not simply the sum of local risks). Local authorities and communities need to ensure that safety and sustainability are not jeopardised by narrow, short-term development interests. Planners, emergency managers, developers and other professionals whose activities have a bearing on hazard vulnerability, resilience and adaptive capacity need to learn to work together more effectively. Ongoing efforts are also needed to facilitate and improve dialogue between disaster scholars and natural hazards planning practitioners. There is a special onus on government agencies to ensure that their decisions constitute best practice, including, how they locate and operate infrastructure and assets. In so doing, government can be an exemplar for citizens, infrastructure providers and the private sector.

3. Collaborative communities: Council decisions about land use have a long-lasting impact. Community safety, sustainability and resilience can be compromised by narrow, short-term interests. Whilst New Zealand policies and laws promote longer-term community interests, vigilant efforts are needed to overcome barriers (see above) and translate rhetoric into practical reality. Ongoing efforts need to be made to improve public awareness about the nature of hazard risks and the practical steps that can be taken to reduce or at least mitigate these risks. Awareness and capacity building efforts need to target citizens, community leaders and the professionals, such as land-use planners and emergency managers, who advise them. Ultimately, business as usual is antithetical to community sustainability and resilience. Innovative partnerships between key stakeholders from government, the private sector and civil society will need to be developed to reconcile contending interests and realise the potential of natural hazards planning.

5 Conclusion

This article set out to explore the questions: What role does land-use planning play in managing hazard risks in New Zealand; and what needs to be done to reduce hazard risks

and build community resilience? With regard to the former question, clearly planning plays a pivotal role, but its full potential has yet to be realised. New Zealand towns are prone to many hazards, with flooding being the most frequent. In the past, protecting communities was achieved through centralised government action and reliance on efforts to 'control the hazard' through protective works. Insurance and relief measures have also been and continue to be used to enable communities to bear the burden of hazard events. In recent decades, there have been significant changes in the institutional and legal setting affecting land-use planning. There has been devolution of functions and an emphasis on local authorities assuming responsibility for local matters, including natural hazards planning. Central government agencies assist communities in preparing for and managing hazard risks. When an event exceeds local capacity, central government helps communities recover. These far-reaching and innovative reforms held much promise. But this promise has not been realised fully due to shortcomings in governance, and inter-governmental cooperation in particular. Central government needs to assume a more effective role in enabling local government and communities to reduce hazard risks and build resilience.

There are many different organisations and institutions that have an interest in or are affected by natural hazards planning processes. These stakeholders have divergent interests, some of which conflict with the goal of risk reduction. Ensuring that there is common understanding about who these stakeholders are and reconciling their different interests constitutes the major challenge for improving natural hazards planning practice. Local communities often downplay the importance of hazards relative to day-to-day concerns. Furthermore, it is difficult for local communities to counter new development proposals that promise economic benefits but may jeopardise public safety and community sustainability, merely on the grounds of low probability hazard risks. Economic growth, corporate interests and 'new development' are given priority, and private property rights are held virtually sacrosanct. Narrow, short-term interests, thus, often prevail over community safety and sustainability. There is still a tendency to rely on protective works and to expect rescue and relief in the aftermath of an event. Consequently, it is difficult to realise the full potential of land-use planning to reduce hazard risks. Building sustainable, hazard-resilient communities, therefore, remains elusive and demands a transformative planning approach to overcome entrenched barriers. On a positive note, increasing attention is being focused on hazard risk reduction through land-use planning and building controls. In sum, the New Zealand institutional and legal setting provides a robust and enabling foundation for building resilient communities and provides planners with a range of tools to avoid and mitigate hazard risks. The challenge is to translate legislative provisions into practical reality in local communities.

With regard to the second question—what needs to be done to reduce hazard risks and build community resilience?—this synthesis highlights four 'burning issues' and associated priority actions that need to be addressed if the ideal of sustainable, hazard-resilient communities is to be realised. First, we need to deepen and extend understanding about the nature of hazards. Particular attention needs to be focused on the social dimensions of hazards to reduce vulnerability and build resilience and adaptive capacity. Research findings need to be more effectively integrated into community planning and development initiatives. Increased attention needs to be focused on (a) planning for high impact-low frequency events, such as tsunami and (b) the implications of climate change for future hazard risks. More focused and comprehensive training and capacity building needs to be provided for land-use planners and emergency managers to realise the potential synergy between these professions, and mainstream hazard risk reduction into day-to-day decision-making. Second, priority attention needs to be given to reducing hazard risks by keeping

people out of harms way through prudent land-use decisions rather than trying to keep perils away from people through protective works and relying on 'bail outs' to help people recover. Third, attention needs to be focused on how to deal with communities that are exposed to repeat events and the vexing issue of relocation. National guidance is urgently needed to ensure consistency in how local communities deal with these issues. However, there is a need to improve understanding based on applied research on local and international experience, including the conditions that entrench vulnerability to repeat events and opportunities to reduce such vulnerability. Fourth, hazard risks are likely to intensify in this era of climate change. Opportunities exist to make changes in the short-term that will make it much easier to adapt to future climate change. Much, however, remains to be done to mainstream climate change adaptation into community planning and decision-making. A National Policy Statement is needed to guide local communities in addressing this issue consistently. Learning lessons from comparative international and local experience would help to frame such guidance. Finally, notwithstanding the strong foundation established in policy and law, the fundamental overarching challenge is to facilitate cooperative hazards governance. Central government, in particular, needs to play a more effective role in enabling communities to reduce hazard risks. Community leaders, planners and emergency managers have pivotal roles to play in creating vibrant, sustainable and more resilient communities. Ultimately, collaborative partnerships need to be built between government, private sector and civil society actors to reconcile contending community interests and make decisions that reduce social vulnerability and cultivate sustainability, resilience and adaptive capacity.

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