

THE HANG-UP IN FLOOD HAZARD PLANNING (PART II)

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In the last issue of *Planning Quarterly*, Part I of this paper opened with the observation that:

For decades, legislation has enabled local territorial authorities to plan in ways that minimize damages. Yet recent community flood disasters suggest that there is a gap between legislative intent and the practical response to it. This may be due to planning decisions that are resulting in an increase in flood hazard, rather than there being a corresponding rise in the severity of flood events. Why would this be so?

In answering this question, Part I of the paper identified five factors that impede good flood hazard planning, including: 1) the need for better understanding of flood occurrences; 2) blaming worsening flooding on global warming is unhelpful; 3) the need for a better understanding of the meaning of flood hazard; 4) the failure of Government to adequately support implementation of the RMA as a devolved and co-operative mandate; and 5) constraints on cooperation between regional and local councils. Readers were invited to add to a diagram at the end of the paper by joining relevant dots after completing each factor. Part II of the story continues with the sixth of 10 factors. Read on.

Factor 6: Managerialism and Integration within Councils

Reforming councils to increase efficiency and bring down costs along with quickly processing consents is a reasonable objective, but it may well have been at the expense of effective planning. For instance, moves towards increasing transparency and accountability in councils further entrenched functional splits that made dealing with issues in an integrated manner difficult. Policy and regulatory aspects of planning are typically separated and unproductive rivalry has been known to occur. Both are separated from engineering units that manage storm-water and flooding problems. Separate again, is the emergency unit (Chapman, 1995; Ericksen, 1992; Ericksen, 1998; Ericksen et al., 2003). As well, within councils are differing views of

flood management. On the one hand, in the asset management section, engineers seek asset solutions to flood problems. On the other hand, in the policy section, planners seek land use management and avoidance solutions. While these options need to be considered in an integrated manner, there is too often conflict between these functionally split sections.

A related form of integration essential to effective planning and management is in policy implementation. How well are the policies and methods in plans implemented? Recent research examined this question with respect to storm-water management. It aimed to find out how well the policies and methods in a district plan lined up with techniques used in resource consents (Day, Backhurst, Ericksen, et al., 2003). An implementation gap was evident in all six councils studied, regardless of capacity to act. This meant that instead of the environmentally friendly policies and methods in plans being adopted in resource consents, conventional or traditional techniques were still used, in part due to the aforementioned functional splits. While this sort of analysis has not been applied to riverine flood hazards, one could speculate that the results might well be similar – aggravated perhaps by poor definition of the hazard.²

Another aspect of the managerial reforms was the move in many councils to restructure, some more than once over a few years. This often had the debilitating effect of losing skilled staff and eroding important institutional memory. In the absence of a robust system, this could influence the effectiveness of some councils to implement plans, including flood hazard plans. For instance, in 1993 engineers and planners in Waikato Regional Council and Thames-Coromandel District Council (TCD) prepared a joint flood-management plan for Thames (Waikato Regional Council, 1993; 1994). It was judged an exemplary plan (May et al., 1996, pp. 160-62). It aimed to “minimise flood hazard without unnecessary restrictions on the rights of land-owners” through using a mix of measures in a

comprehensive yet flexible approach that reflected the spirit of the RMA. Implementation would depend upon successful public consultation and political buy-in. A few years later, TCDC extensively restructured and staff members were lost to private enterprise. This, combined with councillor turnover, resulted in a major loss of institutional knowledge regarding flood hazard planning and management. This meant that without Council commitment and capacity, the flood management plan was poorly interpreted and applied for several years. Indeed, new staff members were not properly trained in its use and in some cases did not even know of the flood plan's existence. It was not until the flood in 2002 that the Plan re-emerged on the Council's radar screen. Seeking efficiencies through managerialism has shown in this case, and in many other similar circumstances, to have resulted in poor planning effectiveness (Day, et al., 2003; Ericksen, et al., 2003).

The lesson here is that council organisation and restructuring need to consider both efficiency and effectiveness principles ahead of implementation, so that essential integration is not lost. Careful consideration should also be given to how best to implement policies and methods in plans so that desired outcomes are achieved. (Link dots 6 in Figure 5.)

Factor 7: The Thin Blue Line

Recently, a senior manager of a regional council pointed to not only technical difficulties when drawing flood lines on maps, but also legal implications for properties identified as flood-prone or not. This hoary issue is not new. It emerged in research 25 years ago (Ericksen, 1986a; 1986c). A planner then asked: “How do you justify giving development rights to one property owner on one side of a boundary while taking them away on the other side.” Another worried that council could be “liable for compensation to landowners if (owners) could not realize an existing use subsequent to an area being identified as hazardous, and which is then rezoned or controlled in accordance with the

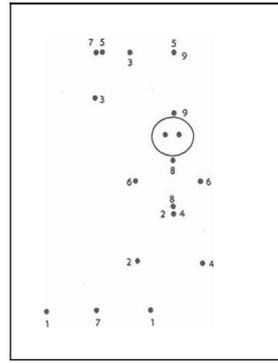
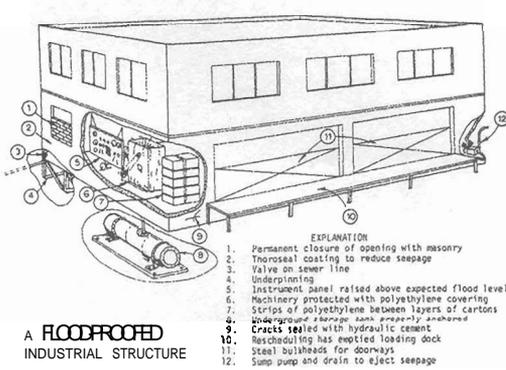


Figure 4 (far left):: Flood-proofing an industrial building. (Could this measure have averted failure of the transformer and pump station in Awotapu, Whakatane, caused by rising flood waters?)

Figure 5 (left):: Responding to flood hazard, 1988-2005.

planning Acts" (Ericksen, 1986a, 226).

In the days of Water and Soil Directorate (WSD)³, councils were advised that as long as the best information available at the time was used in the mapping, council would not be legally liable. Even though this was known in the early 1960s, few flood-prone communities had, by the 1980s, flood maps or the quantitative data needed for establishing flood levels and frequencies for planning purposes. Are these concerns of yesteryear germane today? Both research and anecdotal evidence suggest that they are.

A case study of policy development in Tasman District Council (TDC) in the late 1990s showed that well over 90 percent of remedies sought for flood hazards in six communities supported the objectives and policies in the notified Tasman Resource Management Plan. However, less than 50 percent of remedies supported the rules for achieving the objectives. Councillors therefore deleted the Flood Hazard Area notations from the Planning Maps explaining that.

"...identification of many historically flooded areas on flood plains, as notations on the planning maps ... is not appropriate (although) rules affecting activities in relation to stopbanks ... are necessary... The Building Act 1991 (Section 36) and the Resource Management Act 1991 (Section 106) are relied on by Council to regulate buildings and subdivision in areas subject to flooding. Council will make information on such areas available to the public."

In the absence of maps, what information would be available to the public? Council staff conceded that the flood area information on the maps was not ideal, because it was based on plots of historical floods and did not include areas for possible larger floods in future. Lack of relevant contour, river cross-sectional data, and software for modelling meant that the flood frequency estimates for flood areas on the maps were based on professional best guesses rather than detailed analyses. Staff in TDC needed around \$50,000 to address this problem, which had not been granted two years after the

survey. Across six communities, flood estimates ranged from 10 to 60-year floods; not rare events since they had a 60 percent to 18 percent chance of being equalled or exceeded in a 10 year period, respectively (see Figure 1, Part I). Was this really a case of dubious estimates and fears of litigation, or was some other issue involved? Further research showed that influential urban dwellers did not want their properties to be mapped in a flood hazard area for two reasons: hazard disclosure followed by exclusionary rules would affect their freedom to develop the flood-prone land; and hazard disclosure would negatively influence property values – a matter addressed under Factor 8.

Use of s36 of the Building Act (1991) to deal with flood risk has been itself a source of considerable concern. Providing a LIM (Land Information Memorandum) that indicates flood risk and then tagging the property title accordingly may reduce the exposure of council to litigation following flooding, but does nothing to reduce the hazard, unless the owner has information on how to meaningfully deal with the risk (see Factor 9). In its absence, the incremental or cumulative effects of building approvals do much to escalate the flood hazard – a problem that s3 in relation to other pertinent sections of the RMA says should be avoided (Chapman, 1995; Ericksen, 1998; Ericksen, et al., 2000; Ericksen et al., 2003; May, et al., 1996).

The processes identified in the new Building Act (2004) ought to make a difference in reducing flood risk. There is a requirement for building consent applicants to also apply for a PIM and that it must contain information on the district plan/activity status under the RMA (ss71-74 and 31-39). Applicants should therefore be better informed before they become overly committed to a development. This in turn ought to lead to more avoidance and mitigation measures being adopted. However, according to feedback from some council staff, practices under the new Building Act are not likely to differ much from the previous Act.

The lesson from this factor is that there is still

a lot of concern over flood hazard mapping and legal liability matters, which may account for why (subdivisions apart) most councils emphasise use of the Building Act over the RMA. This matter warrants careful research and definitive answers to better guide councils in their decision-making! (Link dots 7 in Figure 5)

Factor 8: Flood Events, Hazard Disclosure and Property Values

A commonly held view is that hazard disclosure (through publication of maps or the arrival of a flood event) adversely affects property values. Indeed, this was a driving force behind the exclusion of flood maps from a number of district plans in the 1990s – including the case in Factor 7. International research shows that hazard disclosure does not generally have a lasting adverse effect on property values.

In New Zealand, Montz (1992)⁵ did a systematic study of three flood-prone towns that had experienced recent flooding and for which plans and maps had been prepared. Results for Paeroa showed that: the impact of flooding on property values was temporary; the repairs and renovations made to damaged houses increased their values; and either the flood was seen as an once-in-a-lifetime event or new flood control works had provided security from flooding. Any or all of these factors had minimised any hazard-related differences between house values.

Results for Te Aroha showed that following the release of a hazard designation map, no significant differences in the selling process were documented. Analysis of selling prices of houses before and after disclosure indicated no significant influence from locational characteristics. Instead, it appeared that normal market fluctuations dominated, as was the case before the disclosure.

For Thames, where flooding was more frequent than in the two other communities, and where an integrated flood hazard management plan with maps delineating at risk areas had been published,

the finding was that neither flood experience nor hazard disclosure had any depreciating impacts on affected housing. The 1981 flood may have decreased the increase for flooded properties over the short-term, but neither the 1985 flood nor subsequent disclosure of flood hazard zones had the same effect.

The lesson here is that the often reported view that hazard disclosure by event and/or mapping causes property values to fall seems to be something of a myth. The sooner that this is widely known and accepted amongst councillors and their influential constituents, the less resistance there may be to flood hazard planning and management. (Link dots 8 in Figure 5.)

Factor 9: Choice Freedoms and Information in a Liberal Democracy

The development of a liberal democracy in New Zealand over the past 20 years (in place of social democracy) favours individual choice and market forces over social intervention, especially regulation. However, making good choices requires appropriate information. Providing information (nationally, regionally and locally) is consistent with notions of free choice and individual responsibility. Indeed, in the early days of the RMA, councillors and others were prone to say "educate, don't regulate?" However, education programmes are not only costly, but also require sophisticated knowledge and skills in their development and delivery to be effective (Ericksen, 1986a; 1986d). For flood problems, this means not only providing information about flood events, but also the flood hazard and the range of measures that both individuals and communities can take to reduce them. The WSD started doing this in 1987, just prior to its disestablishment, following which the momentum was lost (NVASCO, 1987). While many councils provide reports with this type of information in them, much more needs to be done with the information for successful flood hazard education to occur.

Why is it that when researchers go into flood-prone communities most residents (owners and renters) have no knowledge that the house they occupy was or is floodable? In Paeroa after the 1981

flood 72 percent of residents did not know they were at risk. A quarter century later it was around 76 percent in flooded Awatapu suburb of Whakatane. What then is the nature of flood information that is being made available by councils to floodplain occupants and how is it being conveyed to at-risk people? Is it simply what is contained in the district plan or what one might be told at the regulatory counter? Does one have to front up for a LIM/PIM to become informed, and if so how then is the high proportion of occupants who rent properties (commercial and residential) advised?

A recurring problem is that the necessary information is all too often held by one individual, such as council engineer, and has not been put into a policy context and shared with others for multiple purposes. Another problem is that insufficient information is being transferred from regional to district councils. For example, in the Manawatu-Wanganui Region, planners in one district council said that they held no flood data on which to make land use decisions on LIMs and consents. Instead they simply phoned the regional council for advice. Is this good enough? If these sorts of practices are typical across territorial authorities, then no wonder hazards persist and disasters occur.

Research in many contexts long ago showed that for many reasons information will not of itself necessarily shape attitudes towards the flood problem that lead to flood-compatible actions. This is because the flood information competes with a whole cluster of beliefs and attitudes forming the overall view of an individual (Ericksen, 1986a).

Where information and education programmes are effective is in helping people realise goals to which they are already favourably disposed. Even if attitudes do change, it may not lead to flood-wise actions because the individual may either:

- lack knowledge on how to act;
- have knowledge, but lack the ability to act; or
- have knowledge and ability, but be constrained from acting through social (including political) and/or cognitive factors.

Thus, providing a map in a district plan or at the regulatory counter showing a property owner or intending owner (not a renter) where flooding may

occur is not all that useful, especially if flooding is identified by return periods instead of probability statements (see Factor 1). A flood hazard education and information programme needs to be much more sophisticated than having blue lines on maps held within council. The messages must reach the relevant stakeholders and be both salient and ongoing to be effective. That means they must address at a minimum the three aspects noted above regarding how best to act in the face of new knowledge about flood-risk. For someone interested in, say, buying a section on which to build a house, actions could, for example, include either:

- locating as planned, but ensuring house and contents are adequately insured;
- using land and/or building elevation techniques;⁸
- flood-proofing the building (e.g., Figure 4)⁹;
- implementing all three of the above measures; or
- seeking an alternative flood-free location.

For detailed information on the range of measures or adjustments available for effective flood hazard planning and management, see Ericksen, 1986, Ch. 6, 99-114.

It is not just property owners seeking to build to whom the information should be aimed, but also renters of buildings, since they too need to be insured and know how to react in an emergency, and have knowledge for the day when they too may be property owners.

The lesson here is that not only do councils need to identify flooding and flood hazards on maps in educative pamphlets in terms that are meaningful to ordinary people, but also the range of measures that can be taken to reduce the hazard and avoid losses. This flood information and education programme needs to be done in an ongoing manner and involve a wide spectrum of affected and affecting parties. (Link dots 9 in Figure 5.)

Factor 10: Mainstreaming Flood-Risk Reduction into Policies, Plans and Practices

Having sound flood hazard information in councils that includes the wide range of measures for reducing the risk of losses from flood events is obviously important. But to be useful, flood hazard

policies and plans must be effectively implemented. In that regard, councillors have an extremely important role to play. This is because they must have a commitment to plan and thereby provide the resources necessary for ensuring staff capacity for developing and implementing integrated flood hazard reduction policies. Their education on these matters is, therefore, imperative.

Of equal importance, however, is having information for people in other key institutions who are responsible for the social structures and technologies that help create flood-loss potentials. This not only includes decision-makers in the cascade of intergovernmental agencies noted in Factor 4, but also others such as professional appraisers and mortgage officers, bankers, insurers, engineers, builders, and developers, whose knowledge of flooding, flood hazards, and loss-reducing measures can do much to help shape flood-conscious development of the nation's floodplains.¹⁰

The creation of a devolved and cooperative system of planning and governance under RMA and LGA ought not to mean that the burden for this institutional and systemic approach to flood-loss reduction falls entirely on councils. Rather, it ought to be the role of Government to help develop an integrated systemic approach to the problem that involves a wide range of institutions.

Think of it this way. The range of institutions and actors involved in the building industry embraces the Building Industry Authority (BIA), architects, building suppliers, developers, builders, council regulators, lending institutions, insurers and so on. When the "leaky building" problem arose in 2002, all of these groups were identified as having some responsibility for what was termed "a systemic problem."

It is this sort of "systemic problem" that has always applied to the flood hazard creation syndrome explained in Factor 3 (Part I). The problem is not just the active individual developer or the council, but the wide range of institutions and actors who remain passive in the face of flood hazard escalation.

Making these institutions and actors active, is

much more the role of Government than councils. While councils have responsibility for providing resources for effective floodplain planning and management, the Government has responsibility for providing the resources (policies, methods, funding) for developing an effective system of flood-risk management, presumably through the Ministry for the Environment! In other words, Government is, and always has been (or should have been), responsible for the systemic flood hazard problem in New Zealand, because only Government, taking a long-term view, can deal with the legislative framework, including questions of liability.

New Zealand having experienced several major flood disasters in the last few years, and with many more that are sure to follow, it is time for Government to take a major lead in developing an integrated approach to flood-hazard reduction, and to help mainstream flood-hazard reduction thinking into the policies, plans, and practices of the key institutions.¹²

Unfortunately, the Government's response to the "leaky buildings syndrome" does not give cause for much hope for it dealing effectively with the flood hazard syndrome. There is a clear impression that the BIA has tried to avoid accountability for problems resulting from its light-handed regulatory approach. And, apart from setting up the Weather-tight Homes Resolution Service, the Government has left liability and the associated financial burden to affected councils. It seems as though Government plays up "devolution" to its advantage, while at the same time minimising "cooperation" to a least-cost option, resulting in a lop-sided partnership between central and local government (Link dots 10 in Figure 5).

The lesson from this factor is that Government ministers must take much greater responsibility for dealing with the systemic flood hazard problem (and other matters), and stop acting as if they believe that by having devolved responsibilities for resources and hazard management to councils they can, like a latter day Pontius Pilate, wash their hands of the problem.

A Stay of Execution?

There are situations in flood-prone communities

where development should be avoided. There are other situations in communities where flood control works are essential. However, having provided "protection," it is still the responsibility of councils to inform people not only about hazard creation and flood risk, but also the range of measures that can be taken to reduce it. The 10 factors outlined in this paper underscore this view.

The 10 factors are, of course, variously related, some more closely than others. Thus, dealing more fully with some factors in the short-term would enable large gains to be made in flood hazard planning and management. This would eventually translate into flood hazard reduction and thereby flood damages when extreme flood events occur. Which factors might best yield this happy result?

With an intergovernmental protocol in place (see Factor 5, Part I), would the leopard that is central government really change its spots? It would require a huge shift in thinking and financial resources for that to happen, which seems very unlikely. This suggests that more headway might be made through building greater cooperation within local government. There have been some good initiatives in this regard, and perhaps more can be achieved in the short-term – no doubt pushed along by further regional flooding. Achieving this cooperation is also an attitudinal and financial matter – barriers not easily overcome.

Be this as it may, research suggests that the single most important factor for improving flood hazard planning is number nine – the hangman's noose in Figure 5. This is because dealing effectively with flood problems in a liberal democracy requires a comprehensive information and education programme, which in turn requires councils to come to grips with several other factors, such as: use of more relevant and less misleading flood frequency terms (Factor 1); better definition of hazard (Factor 2); getting better determination over mapped areas and issues of liability (Factor 7); and exploding the myth about the effects of hazard disclosure on property values (Factor 8). Not only would there be a stay of execution if Factor 9 applied, but a full pardon if Factor 10 was given serious consideration.

Footnotes

1 IGCI is The international Global Change Institute, a stand-alone, self-funding research unit established within the University of Waikato in 1996. Neil Ericksen also leads the on-going FRST-funded collaborative research programme on Planning Under Cooperative Mandates (PUCM). Further information about IGCI and PUCM is available at www.waikato.ac.nz/igci/pucm.

2 This would make an interesting thesis research topic. 3 Recall that the Water and Soil Directorate (WDSO) was in the Ministry of Works and Development, which was disestablished in reforms of the central bureaucracy in 1988. The work of WDS serviced the National Water and Soil Conservation Organisation/Authority, which developed national policies on soil and water.

4 This would make an interesting thesis research topic. 5 Burrell Montz was visiting IGCI as a Fulbright Fellow from SUNY, Binghamton, USA.

6 Unfortunately, at the same time, Government was closing down some excellent sources of public information, and pushing its continuance onto under-resourced regional and local councils. (See Factor 4 regarding MFE.)

7 This would make an ideal thesis research topic. 8 While land and building elevation options are commonly cited in RMA plans, it is doubtful that there is much monitoring to ensure compliance. For example, although floor elevation above a given datum was required before development of Awatapu, Whakatane, commenced in 1978, there are clusters of buildings with floors at ground level, and these were the worst affected in the 2004 floods.

9 Manuals for flood-proofing buildings (and related techniques) have been available in other countries, like the USA, since the 1960s, but the practice is little considered in New Zealand.

10 This problem is being investigated by researchers at IGCI.

11 For example, Government could devolve funding to councils, especially low-capacity councils, to support use of the prohibited activity category of application for preventing building in high risk areas or aerial photography for monitoring purposes.

12 A study on mainstreaming the implications of climate change for flood problems into council policy, plans and practices in the Bay of Plenty region is being carried out by the IGCI under a FRST-funded research programme. IGCI has done similar research in the Pacific islands funded by the Asian Development Bank. In that study, mainstreaming climate change and flood-loss reduction was applied throughout the intergovernmental system.

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References Cited:

Bewick, D.J. (1988): *Guidelines for Floodplain Management Planning Studies*. Wellington: Ministry of Works and Development, Water and Soil Directorate, Water and Soil Misc. Publ. No. 129.

Campbell, J. and Ericksen, N. (1990): *Change, extreme events, and natural hazards*, Chapter 3 (pp 19-28) in *Climate Change: Impacts on New Zealand*. Wellington: Ministry for the Environment.

Campbell, J. (with N. Ericksen and G. Griffiths) (1988): *Natural*

Hazards and Resource Management Law: Part A. Wellington: Ministry for the Environment, Resource Management Law Reform, Working Paper No. 15, 1-19.

Canterbury Regional Council and Christchurch City Council (1997): *Avon River: Issues and Options for Managing the Avon River Floodplain*. Christchurch: CRC & CCC, 41pp.

Centre for Advanced Engineering (2005) *Managing Flood Risk: The Case for Change*. Christchurch: University of Canterbury. (Report prepared for the Flood Risk Governance Group), 24pp.

Chapman, S. (1995): *Dangerous Liaisons: Legislative Change and Natural Hazards in New Zealand*. Hamilton: University of Waikato. Department of Geography, MSc Soc Thesis, 158 pp.

Court of Appeal (1995): *Canterbury Regional Council vs Banks Peninsula District Council and Others, Declaratory Judgement, CA 29/95*. Wellington: Court of Appeal.

Day, M., Backhurst M., and Ericksen, N., et al. (2003): *District Plan Implementation Under the RMA: Confessions of a Resource Consent (PUCM Second Report to Government)*. Hamilton: The University of Waikato, International Global Change Institute, 110pp.

Ericksen, N.J. (1971): *Human adjustment to floods*, *New Zealand Geographer*, 27, 105-129.

Ericksen, N.J. (1974): *Flood in formation, expectation, and protection on the Opotiki floodplain, New Zealand*, Chapter 8 (pp 60-69) in G.F. White (ed.), *Natural Hazards: Local, National and Global*. New York, Toronto, and London: Oxford University Press, 288 pp.

Ericksen, N.J. (1975): *Is a comprehensive flood plain strategy needed in New Zealand? Soil and Water*, October Issue, 1975, pp. 17-18 & 33-34.

Ericksen, N.J. (1976): *The role of planner in floodplain management: an overview*, *Town Planning Quarterly*, 43, 13-15.

Ericksen, N.J. (1986a): *Creating Flood Disasters: New Zealand's Need for a New Approach to Urban Flood Hazard*. Wellington: National Water and Soil Conservation Authority (NWASCA), Water and Soil Miscellaneous Publication Number 77, pp 323.

Ericksen, N.J. (1986b): *Natural Hazards: Basic Concepts*. Hamilton: University of Waikato, Department of Geography. (Natural Hazards, Resource Kit 1, Teachers' Guide 1, pp 21.)

Ericksen, N.J. (1986c): *Made in New Zealand: flood hazards*. *Soil and Water*, Vol. 22, Issue 1, pp. 3-19.

Ericksen, N.J. (1986d): *Forecasting for whom and what? Chapter 16 (pp. 223-234) in D.I. Smith and J.W. Handmer (eds), Nood Warning in Australia*. Canberra: Australian National University, Centre for Resource and Environmental Studies, 310 pp.

Ericksen, N.J. (1990): *Natural Hazards: An Interactive Systems Approach*. (Key Note Address to a Conference on Natural hazards 1990). Chapter 1, pp. 1-18, in M.J. Crozier (ed.), *Natural Hazard Assessment in New Zealand*. Wellington: Victoria University of Wellington, Research School of Earth Sciences.

Ericksen, N.J. (1992): *Natural hazards: time for coordination*, *Terra Nova*, issue 14, pp. 15-18.

Ericksen, N.J. (1998): *Integrated hazard and disaster planning*, *Planning Quarterly*, No. 128, pp. 10-12.

Ericksen, N., Berke, P., Crawford, J., and Dixon, J. (2003): *Plan-making for Sustainability: The New Zealand Experience*. Aldershot, England: Ashgate Publishing Ltd. pp 350. Available in New Zealand from IGCI. University of Waikato Hamilton under the title: *Planning for Sustainability: New Zealand Under the RMA*.

Ericksen, N., Crawford, J., Berke, P., and Dixon, J. (2001): *Resource Management, Plan Quality, and Governance (PUCM First Report to Government)*. Hamilton: University of Waikato,

International Global Change Institute, 71 pp.

Ericksen, N., Dixon, J., and Berke, P. (2000): *Managing natural hazards under the Resource Management Act*, in A. Memon and H. Perkins (eds), *Environmental Planning and Management in New Zealand*, Dunmore Press, pp 123-132.

Hinton, S. and Hutchings, J. (1994): *Regional councils debate responsibilities*, *Planning Quarterly*, 115, 4-5.

Kates, R.W. (1971): *Natural hazards in human ecological perspective: hypotheses and models*, *Economic Geography*, 47, 438-51

Kates, R.W. (1985): *The interactions of climate and society*, in R.W. Kates, J.H. Ausubel and M. Berberian (eds), *Climate Impact Assessment*. Chichester, John Wiley and Sons (SCOPE 27).

Keiman, I. (2004): *Flood Vulnerability and Impacts in New Zealand*. Research being conducted in the institute for Geological and Nuclear Sciences, Wellington, pers.com.5 March 2004.

Kouwenhoven, P. (2005): *Trends in rainfall in the 50 years to 2005 at selected rain gauges in Eastern Bay of Plenty*. Hamilton: University of Waikato, IGCI, Unpublished paper.

McKercher and Henderson, (2003): *Shifts in flood and low-flow regimes in New Zealand due to interdecadal climate variations*, *Hydrological Science Journal*, vol., 48, Pt 4, pp 637-654.

May, P., Burby, R., Ericksen, N., Handmer, J., Dixon, J., Michaels, S., and Smith, D. (1996): *Environmental Management and Governance: Intergovernmental Approaches to Hazards and Sustainability*. London & New York: Routledge Press, 254 pp.

Ministry for the Environment (1992): *Resource Management Subsidies Criteria 1992/93*, Wellington: Ministry for the Environment.

Montz, B. E. (1992): *The Impact of Hazard Area Disclosure on Property Values in Three New Zealand Communities*. Boulder, Colorado: University of Colorado, Institute of Behavioral Science, Natural Hazards Research and Applications information Centre, Working Paper #76, 45pp.

Montz, B. E. and Tobin G. A. (1997): *Natural Hazards: Explanation and Integration*. New York and London: The Guilford Press, 388pp.

National Water and Soil Conservation Authority (1987): *Floodplain Management Policy*. Wellington: NWASCA Circular no 1987/1.

National Water and Soil Conservation Organisation (1987): *Stemming the Now of Our Flood Problems* (NWASCO 54 information leaflet – based on the book *Creating Flood Disasters* by N.J. Ericksen). Wellington: Water and Soil Directorate, 8 pp.

New Zealand Statutes Building Act (1991)

Local Government Act (2002)

Resource Management Act (1991)

Parliamentary Planning and Development Committee (1989): *Inquiry into Planning for Flood Mitigation*. Wellington: Report of the Planning and Development Committee, Tabled at the First Session, Forty Second Parliament, 19pp.

Waikato Regional Council and Thames Coromandel District Council (1993): *Draft Thames Flood Management Plan, Stage 1*. Technical Publication No. 1993/2. Hamilton: Environment Waikato.

Waikato Regional Council and Thames Coromandel District Council (1994): *Issues and Options Report: Thames Flood Management Plan Stage 2*. Technical Publication No. 1994/2. Hamilton: Environment Waikato.

White, G.F., ed. (1974): *Natural Hazards: Local, National and Global*. New York, Toronto, and London: Oxford University Press, 288 pp.