BAY OF PLENTY REGIONAL COUNCIL TOI MOANA

12 May 2016
Version 10.2b

Proposed Change 2 (Natural Hazards) to the Bay of Plenty Regional Policy Statement

This version incorporates additions and deletions giving effect to the Consent Order, together with minor amendments, inserted into the Council decisions on submissions version

Clear copy

This version shows Consent Order outcomes and minor amendments inserted into the Bay of Plenty Regional Council's decisions on submissions and further submissions version by the Regional Direction and Delivery Committee at its meeting on 12 May 2016.

Relocated provisions retain their original numbering in this version; provisions will be renumbered prior to the Change becoming operative.

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2.8 Natural hazards

Natural occurrences become hazards when they adversely affect human life, property, or other aspects of the environment.

Under the Act, regional councils have the function of controlling the use of land to avoid or mitigate natural hazards and city and district councils have the function of controlling any actual or potential effects of the use, development or protection of land to avoid or mitigate natural hazards. These controls, when exercised through plans, are subject to section 32 evaluation. Such controls are among a wide range of available responses to the risk of natural hazards.

Local authorities also have a broad civil defence and emergency management (CDEM) role. This includes identifying and communicating hazards, and the four Rs:

- Planning and implementing risk *reduction*;
- Maintaining a state of *readiness* (having the capacity and planning in place should an event occur);
- *Responding* at the time of a civil defence emergency; and
- Overseeing *recovery* operations once an event has occurred.

Local authorities' RMA functions of avoiding or mitigating natural hazards contribute to the first of those "Rs" - risk reduction.

Within te Ao Māori, the Māori environmental resource management system recognises the association of several atua with natural occurrences that can lead to natural hazards. As well as Ranginui and Papatūānuku, these include Rūaumoko, atua of earthquakes and volcanoes, Tangaroa, atua of the fish in the sea and sea life, and Tāwhirimatea, atua of the winds and storms. It is evident from oral histories that Māori have long observed, recorded, monitored and forecast changes in the physical environment. These forms of local knowledge contribute to hazard avoidance and mitigation. Appropriate sharing of these local understandings can inform and raise community awareness of past hazard events and the potential for them to occur again.

Territorial authorities have particular roles in communicating information about natural hazards through land information memoranda (LIMs) under the Local Government Official Information and Meetings Act 1987 and project information memoranda (PIMs) under the Building Act 2004. Those Acts do not limit what natural hazards are to be included in these memoranda even though some natural hazards affecting the Bay of Plenty region are not specified by those Acts as being required to be included.

The Bay of Plenty CDEM Group Plan identifies a wide range of natural hazards that affect the region. The natural occurrences and associated hazards that exist in the region are as follows:

Natural occurrence	**Resulting natural hazard**
Volcanic activity	Ash fall Pyroclastic and lava flow Landslip, debris flow and lahar Geothermal hazard Caldera unrest
Earthquakes	Fault rupture. Liquefaction and lateral spreading. Ground shaking. Landslide and rock fall. Tsunami.
Coastal/marine processes	Coastal inundation Coastal erosion
Extreme (prolonged or intense) rainfall	Flooding Landslide Debris flow/flood

Taking a risk management approach means that the extent to which we manage natural hazards depends on

the risk they present. Risk is the combination of likelihood and consequence. That is, the risk of a natural hazard is determined by a combination of an event's likelihood (i.e. the chance of it occurring) and its potential consequence (i.e. amount of damage it would cause should it occur).

The damage from a natural hazard event possible in the Bay of Plenty can range from minor disruption to significant loss of life and property. Similarly, the likelihood of natural hazards range from very frequent (e.g. annual) events to events that may only happen on average once every few thousand years. The highest risk hazards are those with a high likelihood of a very damaging event.

For some natural hazards (such as flooding) steps can be taken to reduce the likelihood of an event occurring. However for most natural hazards whether an event occurs is largely beyond human control. In those circumstances, the way to reduce risk is to ensure that the consequences of events, when they occur, are as low as practicable.

Although far from the only tool available to local authorities to manage risk associated with natural hazards, land use control is important. It responds to the evaluated level of natural hazard risk to protect lives and property. Similarly, conditions relating to how land is used can be imposed to reduce or avoid the consequences should an event occur. That is why the Act provides for local authorities to control land use to avoid or mitigate natural hazards. Other statutes, for example the Building Act 2004, also address aspects of natural hazards.

However, controlling land use to limit the potential consequences of a natural hazard can be costly and disruptive to communities and affected property owners. Conversely, under-acknowledgement of high hazard risk in land use planning decisions would be irresponsible and contrary to sustainable management. Hence, local authorities need to recognise the benefit of other interventions and ensure the level of land use control is proportional to the remaining risk that exists (and that risk is assessed by considering both the likelihood of an event and the event's potential consequences).

An ongoing challenge is the complex and uncertain nature and frequency of natural hazards, particularly those that are of low likelihood.

In taking a risk-based approach to managing natural hazards the Statement follows the risk management process prescribed in the New Zealand Standard AS/NZS ISO 31000:2009. This is illustrated in Figure 1 below.

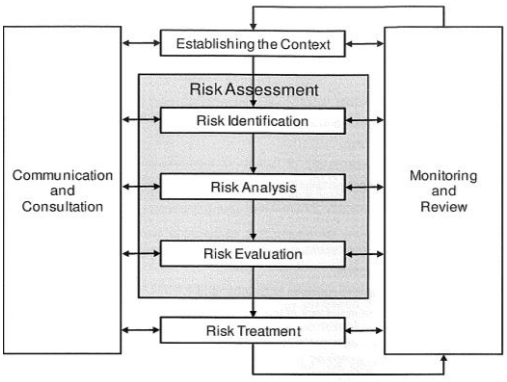


Figure 1 Risk management process from AS/NZS ISO 31000:2009.

The core components of the risk management process form the framework for the natural hazards policies as shown in Appendix M. The process of identify, analyse, evaluate and reduce[1] risk applies consistently to all natural hazards.

The methodology for carrying out the risk analysis and evaluation stages of the process is provided as Appendix K.

Potential risk reduction measures are contained in Appendix L.

The Statement also needs to provide clarity and direction for the risk evaluation and risk treatment stages. In that regard the Statement sets risk

[1] Although risk management terminology refers to "treating" risk, in the context of the Statement this stage of the process is referred to as risk reduction.

thresholds and a management framework requiring different policy responses depending on the level of risk that is present.

Allowance must also be made for some activities that are specifically provided for by this Statement that inherently add to risk. Integrated management, required under section 30(1)(a) of the Act, recognises that the establishment or continuance of such activities is provided for (albeit natural hazard risk needs to be managed).

Geothermal energy development is an example. Such development, of necessity, must be located within geothermal fields and may increase both the consequence and, if not properly managed, the likelihood of a geothermal hazard (such as subsidence or hydrothermal eruption). The geothermal provisions of section 2.4 of this Statement specifically provide for such development and provide the policy framework to manage hazard risk associated with use and development of geothermal energy resources. Accordingly, geothermal hazard risks are not managed under this section of this Statement. Those risks will be managed under this Statement's section 2.4 and the Geothermal Resources Policies and Methods.

Similarly, the management of urban growth in the region has been provided for in district plans and, in the western Bay of Plenty sub-region, through the Urban and Rural Growth Management policies and methods and in section 2.9. As more detailed planning and consenting is undertaken for those growth areas, the natural hazard risk will need to be identified and managed. However, by specifically providing for western Bay of Plenty urban limits in Appendix E, the Statement anticipates that any required risk reduction can be achieved within those urban limits while providing for urban development. This does not obviate the need to manage natural hazard risk by, for example, influencing the design and location of development within growth areas. Method 18 of the Statement is a key means by which that can occur.

Growth will increase pressure to develop in areas susceptible to natural hazards. Also, some existing settlements and lifeline utilities are located on land that may be subject to natural hazards. Hence, although the risk assessment process should be consistently applied across the region, the management response to identified risk will vary according to the nature of the land uses potentially affected.

Risk management is not a static exercise. Potential consequences may change as development patterns change and intensify over time (potentially increasing exposure to an event). Furthermore knowledge of hazards and their likelihood may change over time. For that reason, although the responsibility for natural hazard risk assessment falls predominantly on the regional, city and district councils as part of plan-making processes, some targeted risk assessment may be necessary for large-scale developments particularly in the period before regional and district plans are changed to give effect to the natural hazards provisions of the Statement.

Another key factor is climate change. While not regarded as a natural hazard in its own right, climate change may increase the risk associated with some natural hazards. In the Bay of Plenty, heavy rainfall events and flooding may occur more frequently. Drought could occur more frequently, particularly in coastal areas, and the impact of storms of tropical origin might be greater. The rate at which sea level is expected to rise is one area of uncertainty. The long-term effects of climate change and uncertainty about the magnitude of anticipated effects need to be taken into account in decision making about avoiding or mitigating hazards and risk reduction.

2.8.1 Regionally significant natural hazard issues

1 Potential for natural hazard events to generate major or catastrophic consequences

Many natural hazards in the Bay of Plenty have the potential to generate major or catastrophic consequences for people and communities.

2 Availability of natural hazard risk information

In making their individual choices about where they live and work, and how they develop the land, people require sound information on natural hazard risks.

3 Existing risks from natural hazards

Existing land uses and lifeline utilities are at risk from a wide range of natural hazards, including low-likelihood but high-consequence natural hazards (particularly earthquake, tsunami and volcano related hazards).

4 Co-ordinating agencies' roles to avoid and mitigate natural hazards and manage residual risk

Integrated management requires many agencies to co-ordinate their roles in avoiding and mitigating existing and potential natural hazards, and managing any residual risk.

Table 1 Natural hazards objectives and titles of policies and methods to achieve the objectives.

Objectives	Policy titles	Page no.	Method titles	Implementation	Page no.
Objective 23 Avoidance or mitigation of natural hazards by managing risk for people's safety and the protection of property and lifeline utilities	Policy NH 1B: Taking a risk management approach	11	Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	Regional council, city and district councils	23
	Policy NH 2B: Classifying risk	11	Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	Regional council, city and district councils	23
	Policy NH 6B: Natural hazard risk outcomes	12	Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	Regional council, city and district councils	23
			Method 18: Structure plans for land use changes	Regional council, city and district councils	23
			Method 23B: Investigate and apply measures to reduce natural hazard risk	Regional council, city and district councils	23
			Method 73: Provide information and guidance on natural hazards	Regional council, city and district councils	23
			Method 74: Collaborate to establish natural hazard risk	Regional council, city and district councils	24
	Policy NH 7B: Managing natural hazard risk on land subject to urban development	13	Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	Regional council, city and district councils	23
			Method 18: Structure plans for land use changes	Regional council, city and district councils	23
			Method 23A: Review hazard and risk information	Regional council, city and district councils	23
	Policy NH 9B: Avoiding increasing and encouraging reducing natural hazard risk in the coastal environment	13	Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	Regional council, city and district councils	23
			Method 18: Structure plans for land use changes	Regional council, city and district councils	23
			Method 23B: Investigate and apply measures to reduce natural hazard risk	Regional council, city and district councils	23

Objectives	Policy titles	Page no.	Method titles	Implementation	Page no.
			Method 23C: Natural defences against natural hazards	Regional council, city and district councils	23
	Policy NH 10B: Exemptions from the natural hazard risk management approach	14	Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	Regional council, city and district councils	23
	Policy NH 3A: Identifying areas susceptible to natural hazards	15	Method 1A: City and district plan implementation (phased)	City and district councils	23
			Method 2A: Regional plan implementation (phased)	Regional council	23
			Method 23A: Review hazard and risk information	Regional council, city and district councils	23
	Policy NH 4A: Assessment of natural hazard risk at the time of plan development	15	Method 1A: City and district plan implementation (phased)	City and district councils	23
			Method 2A: Regional plan implementation (phased)	Regional council	23
			Method 23A: Review hazard and risk information	Regional council, city and district councils	23
	Policy NH 5B: Assessment of natural hazard risk at the time of subdivision, or change or intensification of land use before Policies NH 3A and NH 4A have been given effect to	16	Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	Regional council, city and district councils	23
			Method 18: Structure plans for land use changes	Regional council, city and district councils	23
			Method 23A: Review hazard and risk information	Regional council, city and district councils	23
	Policy NH 5B(a): Assessment of natural hazard risk at the time of subdivision, or change or intensification of land use after Policies NH 3A and NH 4A have been given effect to	17	Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	Regional council, city and district councils	23
			Method 18: Structure plans for land use changes	Regional council, city and district councils	23
			Method 23A: Review hazard and risk information	Regional council, city and district councils	23

Objectives	Policy titles	Page no.	Method titles	Implementation	Page no.
	Policy NH 8A: Managing natural hazard risk through regional, city and district plans	18	Method 1A: City and district plan implementation (phased)	City and district councils	23
			Method 2A: Regional plan implementation (phased)	Regional council	23
			Method 18: Structure plans for land use changes	Regional council, city and district councils	23
			Method 23B: Investigate and apply measures to reduce natural hazard risk	Regional council, city and district councils	23
	Policy NH 12C: Allocation of responsibility for natural hazard identification and risk assessment	18	Method 23A: Review hazard and risk information	Regional council, city and district councils	23
	Policy NH 13C: Allocation of responsibility for land use control for natural hazards	19	Method 23A: Review hazard and risk information	Regional council, city and district councils	23
			Method 23B: Investigate and apply measures to reduce natural hazard risk	Regional council, city and district councils	23
			Method 24A: Provide guidance on taking a risk management approach to natural hazards	Regional council	23

3.1 Policies

Table 2 Policy name and page number.

Policy title	Page no.
Natural Hazards	
Broad directive policies for district and regional plans	
Policy NH 3A: Identifying areas susceptible to natural hazards	15
Policy NH 4A: Assessment of natural hazard risk at the time of plan development	15
Policy NH 8A: Managing natural hazard risk at time of plan development	18
Specific directive policies for plans and consents	
Policy NH 1B: Taking a risk management approach	11
Policy NH 2B: Classifying risk	11
Policy NH 5B: Assessment of natural hazard risk at the time of subdivision, or change or intensification of land use before Policies NH 3A and NH 4A have been given effect to	16
Policy NH 5B(a): Assessment of natural hazard risk at the time of subdivision, or change or intensification of land use after Policies NH 3A and NH 4A have been given effect to	17
Policy NH 6B: Natural hazard risk outcomes	12
Policy NH 7B: Managing natural hazard risk on land subject to urban development	13
Policy NH 9B: Avoiding or mitigating natural hazards in the coastal environment	13
Policy NH 10B: Exemptions from the natural hazard risk management approach	14
Allocation of responsibilities	
Policy NH 12C: Allocation of responsibility for risk assessment of natural hazards	18
Policy NH 13C: Allocation of responsibility for land use control for natural hazards	19

Natural Hazard Policies

The Natural Hazards Risk Management Policy Framework is shown in Appendix M.

Policy NH 1B: Taking a risk management approach

Take a risk management approach to control the use, development and protection of land to avoid or mitigate natural hazards by assessing the level of risk according to the likelihood of natural hazards occurring and their potential consequences.

Explanation

A risk management approach involves assessing the risk (i.e. the likelihoods and potential consequences) of hazards and managing that risk according to accepted thresholds.

A risk management approach is important to ensure that land use is managed so that the level of control corresponds to the level of risk. Evaluation of risk indicates when and how much risk reduction is required, and when land use controls may and may not be needed.

The approach ensures rational and consistent land use planning by applying the same framework irrespective of the type of natural hazard that may exist. It allows for the full range of risk mitigation measures (regulatory and non-regulatory) to be taken into account in determining the level of risk that exists at a particular locality. For example, where emergency management responses such as evacuation are proposed, their modelled effectiveness would be included in the risk assessment.

Risk management differs from the approaches that have tended to be taken in the past. The approach focuses on the presence and level of the risk rather than the presence and likelihood of the hazard. It means, for example, that a low level of response may be taken even where a hazard is likely if the consequence would be low. Conversely, it means that land use control may be required in respect of a hazard with a relatively low level of likelihood if the potential consequences of that hazard event, left unmanaged, are high.

*Table reference: **Objective 23**, Method 3*

Policy NH 2B: Classifying risk

Classify risk according to the following three-category risk management framework as detailed in Appendix K:

1 *High natural hazard risk* being a level of risk beyond what should be tolerated.

2 *Medium natural hazard risk* being a level of risk that exceeds the Low level but does not meet the criteria for High risk.

3 *Low natural hazard risk* being the level of risk generally acceptable.

The policy direction associated with these levels of risk is set out in Policy NH 6B Natural hazard risk outcomes.

Explanation

The risk-management approach to natural hazards management requires a framework of risk levels that provides a basis for consistent land use management decisions.

The concept of a three-tier risk framework is well-established in risk management practice and consistent with national risk standards and associated guidance.

Policy NH 2B establishes a framework for screening risk (and hence land and land use subject to risk) into three broad categories that allows for a differentiated natural hazard management policy position to be applied (as provided for in Policy NH 6B).

The levels of risk are established in two ways:

1 by applying likelihood and consequence assessments to the Appendix K Risk Screening Matrix which combines these factors and presents a risk level; and, if necessary,

2 by assessing the annual individual fatality risk and applying the criteria in Appendix K Step 5.

High risk generally occurs where both likelihood and consequence are relatively high. In the Risk Screening Matrix, the red cells indicate High natural hazard risk.

Medium risk can be generated by various combinations of a natural hazard's likelihood and consequence In the Risk Screening Matrix, amber cells indicate Medium natural hazard risk.

Low risk generally occurs where both likelihood and consequence are relatively low. In the Risk Screening Matrix, green cells indicate Low natural hazard risk.

High, Medium and Low natural hazard risks are also defined by applying the annual individual fatality risk criteria set out in Step 5 of Appendix K.

Appendix K's Risk Screening Matrix colour array was established by the Regional Council following technical advice and community input. The annual individual fatality risk criteria in Step 5 align with national practice and the Council has adopted them accordingly.

Policies NH 1B and NH 2B provide the framework for the management of natural hazards in the Bay of Plenty Region. They apply to the development of plans and to the consideration of resource consent applications. However, unless Policy NH 5B applies, a resource consent application is not subject to the risk management approach of Policies NH 1B and NH 2B until Policy NH 4A has been implemented.

*Table reference: **Objective 23**, Method 3*

Policy NH 6B: Natural hazard risk outcomes

By the application of Policies NH 7B and NH 8A, achieve the following natural hazard risk outcomes at the natural hazard zone scale*:

(a) In natural hazard zones subject to High natural hazard risk reduce the level of risk from natural hazards to Medium levels (and lower if reasonably practicable); and

(b) In natural hazard zones subject to Medium natural hazard risk reduce the level of risk from natural hazards to be as low as reasonably practicable; and.

(c) In natural hazard zones subject to Low natural hazard risk maintain the level of risk within the Low natural hazard risk range.

*The risk outcome specific to new development on specific development sites is set out in Policy NH 7B.

Explanation

Policy NH 6B sets out the long-term strategic direction for the way natural hazard risk is managed throughout the Bay of Plenty region. The policy applies broadly to new development and to existing developed areas subject to natural hazard risk. Implementation of the strategy is reliant on the more specific direction in Policies NH 7B and NH 8A.

The policy uses the term "natural hazards zone". That term is defined in Appendix A – Definitions. It requires risk to be considered over a broad spatial context that extends beyond the site of a single development or land use. The concept of a natural hazard zone is important as a means of managing cumulative risk over time. It is also important for understanding existing natural hazard risk that may already be faced by a community or group of activities.

Consistent with Policy NH 2B, high natural hazard risk within a natural hazard zone should not be tolerated and requires a response to reduce risk. There may be occasions when the need to reduce natural hazard risk is immediate but in most cases reducing risk from high levels will need to occur over time. These timeframes may span years or even decades in order to manage disruption and cost. This is particularly true when risk reduction relies on land development and redevelopment processes that relate to design life of buildings and infrastructure.

There may be extraordinary circumstances where a high natural hazard risk is allowed to remain indefinitely or result from a land use decision. Those situations are addressed by Policy NH 10B.

Medium risk, while tolerable, is not desirable and opportunities to reduce risk from medium levels where it exists should be taken where practicable. Land use management decisions should not result in risk levels increasing from low to medium. Nor should they result in the level of risk increasing in areas already subject to medium risk. Again, there may be circumstances where strict application of that principle does not promote sustainable management. Those situations are also addressed by Policy NH 10B.

Managing risk to achieve the outcomes of Policy NH 6B does not relate solely to preventing development occurring. Ensuring future development adopts risk reduction measures may be sufficient to achieve the required level of risk.

For the avoidance of doubt, the policy does allow for an increase in the level of risk in low risk areas provided that the level of risk remains within the low risk range.

By requiring action to reduce or maintain risk levels Policy NH 6B, together with Policies NH 7B and NH 8A, represent the risk reduction (treatment) stage as indicated in Figure 1.

*Table reference: **Objective 23**, Methods 3, 18, 23B, 73 and 74*

Policy NH 7B: Managing natural hazard risk on land subject to urban development

Require a Low natural hazard risk to be achieved on development sites after completion of the development (without increasing risk outside of the development site) by controlling the form, density and design of:

(a) Greenfield development;

(b) Any urban activity within the existing urban area that involves the construction of new and/or additional buildings or reconstruction of or addition to existing buildings (including any subdivision associated with such activities); and

(c) Rural lifestyle activities;

except that a Low level of risk is not required to be achieved on the development site after completion of the development where the development site is located within a natural hazard zone of Low natural hazard risk and that natural hazard zone will maintain a Low level of natural hazard risk after completion of the development.

Explanation

In general, the purpose of Policy NH 7B is to ensure that wherever and whenever new urban development (or redevelopment) occurs it is designed and built to achieve Low natural hazard risk. This applies regardless of whether a plan specifically provides for the activity or not.

Importantly, the policy requires consideration of natural hazard risk at the scale of the "development site". That term is defined and confines the consideration of risk to that area of land where development is proposed.

Consideration at the site scale avoids the risk associated with new development being distorted by an existing level of risk that might exist elsewhere in the natural hazard zone.

An important exception to that general policy approach is that a Low level of risk need not be achieved on a development site as a result of development provided that after completion of the development the risk level within the natural hazard zone remains Low. This can only be achieved within a natural hazard zone that has a pre-existing natural hazard risk that is Low. It means that on some development sites achieving a Low level of risk may not be necessary. This provides an element of flexibility to future land development and is consistent with Policy NH 6A and the explanation of that policy as set out in this Statement.

Options for reducing natural hazard risk may take many forms. Some potential risk reduction measures are set out in Appendix L.

Requiring new development or redevelopment to achieve a Low level of risk will, over time, reduce aggregate risk over a natural hazard zone that may be subject to risk that exceeds the Low level.

City and district councils and the Regional Council will need to either require those undertaking development or redevelopment of land to undertake risk management as part of that development process (consistent with Policy NH 7B) or ensure development achieves low natural hazard risk through the provisions of district and regional plans (consistent with Policy NH 8A).

There may be extraordinary circumstances where new development (or specific urban activities within such development) can appropriately be subject to greater than Low natural hazard risk. Those situations are addressed by Policy NH 10B.

*Table reference: **Objective 23**, Methods 3, 18 and 23A*

Policy NH 9B: Avoiding increasing and encouraging reducing natural hazard risk in the coastal environment

Despite Policies NH 6B, NH 7B and NH 8A, ensure that on any land within the coastal environment that is potentially affected by coastal erosion or coastal inundation over at least the next 100 years:

(a) no land use change or redevelopment occurs that would increase the risk from that coastal hazard; and

(b) land use change or redevelopment that reduces the risk from that coastal hazard is encouraged.

Explanation

Policy 25 of the New Zealand Coastal Policy Statement 2010 (NZCPS) requires that in areas

"potentially affected" by coastal hazards over at least the next 100 years land use change that would increase risk is avoided.

This requirement applies irrespective of the level of risk of the coastal hazard. It is also specific that the risk should not be increased as a result of redevelopment or change in land use. Mitigation or management actions can be undertaken to maintain risk at the required level.

The Statement is required to give effect to the NZCPS. For that reason Policy NH 9B is included. It provides a bottom-line obligation on councils to avoid land use change in areas subject to coastal hazards over a 100-year planning period.

All areas are potentially affected by hazards over a 100-year period, although the likelihood of some events over such a period is very low. For that reason, the Statement limits the consideration to coastal erosion and coastal inundation being events of high likelihood over a 100-year planning period.

Moreover, the 100-year planning horizon signals that the projected increase in sea level and storminess is to be taken into account in determining the areas potentially affected by both coastal erosion and coastal inundation.

Other hazards affecting the coastal environment are managed under the general Policies NH 6B, NH 7B and NH 8A.

Table reference: ***Objective 23****, Methods 3, 18, 23B and* 23C

Policy NH 10B: Exemptions from the natural hazard risk management approach

Policies NH 6B, NH 7B, NH 8A and NH 9B, do not apply to the establishment, operation, maintenance and upgrading of activities that have more than low natural hazard risk or which are located in high and medium risk natural hazard zones if the activity:

(a) Has a significant social, economic, environmental or cultural benefit to the community it services, or is a lifeline utility; and

(b) Has a functional need for the location.

In the circumstances described in (a) and (b) above, risk management measures (including industry standards, guidelines or procedures) must be applied to reduce risk to life and property to be as low as reasonably practicable. Infrastructure should be located away from coastal hazard risk where practicable.

Explanation

There are some activities that must locate in susceptible locations in order to access a natural or physical resource and/or provide a necessary community, social, cultural, environmental or economic service. Ports and surf life-saving clubs for example must be located on the coast and geothermal energy development must be located in geothermal fields notwithstanding that these coastal and geothermal locations may be subject to natural hazards. Similarly, the efficient and effective provision of certain infrastructure (such as hydroelectricity generation and electricity transmission) is also limited to particular locations and corridors. These activities can be said to have a functional need for the location.

Moreover, by their nature some activities (for example, geothermal energy development or water storage for hydroelectricity) may, if not properly managed, increase the likelihood of a hazard event. For the purpose of the Statement, the risk associated with the increased likelihood of an event associated with activities such as geothermal development or large-scale water storage is regarded as being managed by the other means - section 2.4 of this Statement in the case of geothermal development and the Building (Dam Safety) Regulations in the case of water storage.

Policy NH 10B provides an exception for the types of activities described to remain where they already exist, or establish in the future should the need arise, notwithstanding that Policies NH 6B, NH 7B, NH 8A or NH 9B might otherwise require such uses to locate in areas less susceptible to natural hazards.

For the avoidance of doubt, Policy NH 10B does not obviate the need for activities to undertake hazard risk assessment to the extent that Policy NH 5B applies. Nor does it obviate the need for local authorities to assess risk in accordance with Policy NH 4A.

The exception that Policy NH 10B provides relates to the need to comply with the risk management strategy of Policy NH 6B and the requirement for development to achieve low natural hazard risk under Policy NH 7B. Even where risk reduction is not undertaken in accordance with those policies it will be important to be aware of the natural hazard risk that exists.

Table reference: ***Objective 23****, Method 3*

Policy NH 3A: Identifying areas susceptible to natural hazards

Identify natural hazards and the locations where those natural hazards could affect people, property and lifeline utilities by mapping hazard susceptibility areas for the following natural hazards:

(a) Volcanic activity
  (i) pyroclastic and lava flow;
  (ii) landslip, debris flow and lahar;
  (iii) ash fall;
  (iv) geothermal hazard; and
  (v) caldera unrest.

(b) Earthquake
  (i) liquefaction and lateral spreading;
  (ii) fault rupture;
  (iii) landslide and rock fall; and
  (iv) tsunami[2].

(c) Coastal/marine processes
  (i) coastal erosion; and
  (ii) coastal inundation.

(d) Extreme rainfall
  (i) landslip and debris flow/flood; and
  (ii) flooding.

Hazard susceptibility mapping may be undertaken in stages allowing for prioritisation of effort taking into account demand for land use change or intensification.

Explanation

Policy NH 3A defines the natural hazards that need to be identified as the first step of hazard risk assessment. It links to Policy NH 12C where responsibility for susceptibility mapping is specified.

Natural hazards associated with volcanic activity and some hazards associated with earthquakes should be identified at the regional scale. Natural hazards with more spatially predictable, localised effects should be identified at scales relevant to the type of hazard.

The policy allows for hazard susceptibility mapping to be undertaken in a staged way rather than being carried out for the entire district or region all at one time. This will allow for prioritisation of effort as particular areas are subject to, for example, plan changes associated with urban growth. This also recognises the challenge arising from Taupō District being within four regions and subject to four regional policy statements; without this proviso, Taupō District Council could potentially be obliged to apply multiple assessment methodologies for natural hazard identification and mapping.

Importantly, mapping susceptibility involves identifying the spatial extent of a potential hazard event. It does not represent risk as it does not take into account consequences. The purpose of mapping susceptibility is to identify where risk assessment should be undertaken and where it is not required.

The spatial scale of mapping should correspond with the boundaries of the agencies with responsibility for susceptibility mapping under policy NH 12C, or such other scale as may be defined by the responsible agency to represent a planning study area.

Earthquake ground shaking is not covered by this policy. Its spatial distribution is such that it is not amenable to being managed through differentiated land use controls. Ground shaking's main consequence, its effect on structures, and similarly wind, are managed through the Building Act.

*Table reference: **Objective 23**, Methods 1A, 2A and 23A*

Policy NH 4A: Assessment of natural hazard risk at the time of plan development

Assess natural hazard risk by:

(a) Defining natural hazard zones within hazard susceptibility areas; and

(b) Determining the level of natural hazard risk within each natural hazard zone by undertaking a risk analysis using the methodology set out in Appendix K; and

(c) Classifying natural hazard risk within each natural hazard zone as either High, Medium or Low natural hazard risk using the methodology set out in Appendix K.

[2] For the avoidance of doubt, the potential inundation effect of tsunami from any source (whether seismic or submarine landslide) should be mapped in accordance with Policy NH 3A.

Explanation

Although natural hazards may exist at various locations, the risk they pose may be different at each location. Whether the hazard warrants a land use planning response, or what level of planning response may be warranted, depends on the level of risk that is present.

Policy NH 4A requires that risk analysis be undertaken for each location at which a natural hazard has been identified to determine the level of risk that exists taking account of existing and any proposed land use and development. A hazard susceptibility area may contain more than one natural hazard zone. Risk management responses will vary accordingly.

Appendix K sets out in detail the methodology to be followed in undertaking that analysis. It ensures that the potential adverse effects on people and communities (including loss of life, injury, property loss/damage, and infrastructure loss/damage/disruption) from hazard events are taken into account in a consistent way.

Policy NH 4A requires risk assessment to be undertaken in the context of district or regional plan development. It should consider consequences in terms of potential adverse effects on existing development and on any proposed development (or development provided for in the plan).

The methodology in Appendix K includes the use of two different risk metrics:

1. The maximum possible risk from each hazard (taking into account the full range of impacts outlined above).

   This is determined by assessing a range of events of different likelihoods and their potential consequences and applying a matrix to categorise risk levels. The matrix is termed the Risk Screening Matrix. It does not attempt to strictly quantify risk but to broadly screen risk into the three categories previously discussed based on the consequences relative to the likelihood.

2. The annual individual fatality risk (AIFR).

   The AIFR is obtained by multiplying the modelled number of deaths from a hazard event by the annual exceedance probability of the event and dividing by the population within the hazard assessment area. Thresholds are set for the AIFR that classify risk using the framework set out in Policy NH 2B. The AIFR is another means of combining the consequence of an individual death with the likelihood of the event without using the Risk Screening Matrix. In the AIFR metric, the significance of the loss of human life is proportional to the size of the population susceptible to the hazard (whereas the Risk Screening Matrix values a human life the same regardless of the size of the population). AIFR allows for a rare event resulting in many deaths to result in high risk.

Appendix K provides for the determination of the likelihoods and consequences to be quantitative or qualitative although a high degree of quantification will be appropriate in some circumstances (as identified in Appendix K).

Policy NH 4A is an "A" policy and must therefore be given effect to in the context of regional and district plan development.

Table reference: ***Objective 23****, Methods 1A, 2A and 23A*

Policy NH 5B: Assessment of natural hazard risk at the time of subdivision, or change or intensification of land use before Policies NH 3A and NH 4A have been given effect to

Before a district or, where applicable, regional plan gives effect to Policies NH 3A and NH 4A, assess natural hazard risk associated with a development proposal to subdivide land or change or intensify land use using the methodology set out in Appendix K where:

(a) The subdivision of land or the change or intensification of land use is proposed to occur on an urban site of 5 ha or more; or

(b) The relevant consent authority considers risk assessment appropriate having regard to:

   (i) the nature, scale and/or intensity of the activity,

   (ii) the location of the development site relative to known hazards,

   (iii) the cumulative effect on risk of developments on sites less than 5 ha,

(iv) the nature and extent of any risk assessment that may be required under, or incorporated within, the operative district or regional plan,

except that the obligation to assess the risk of the natural hazard under this policy shall not arise where the risk derives from a geothermal hazard which is managed under this Statement's section 2.4 and the Geothermal Resources Policies and Methods.

Explanation

Although Policy NH 4A requires risk assessment in the context of the development of district plans (and any regional plan controlling land use), there are other circumstances when it is appropriate to assess natural hazard risk. Policy NH 5B defines the circumstances when risk assessment for a development proposal is appropriate in the interim period before district and regional plans give effect to policies NH 3A and NH 4A ("the interim period").

The scale and the nature of development are important as they determine the potential consequences of a hazard event. For that reason, Policy NH 5B applies a threshold test of developments or redevelopment on sites of 5 ha or more. Moreover, such developments represent a significant change to the urban environment and offer an opportunity to "design-in" measures that can achieve a Low level of natural hazard risk.

While large-scale development proposals ought to involve an assessment of natural hazard risk as a matter of course, there may well be other smaller scale developments that should also be subject to risk assessment in the interim period. Policy NH 5B should not foreclose the opportunity for city and district councils to exercise discretion at the time of any resource consent application, notice of requirement or private plan change to require an assessment to be undertaken under Appendix K. Policy NH 5B (b) sets out the matters that will be relevant for a city or district council to consider when deciding whether to exercise that discretion.

Policy NH 5B also provides that risk assessment does not need to be undertaken when the natural hazard is managed under section 2.4 in this Statement. Note that section 2.4 and its associated Geothermal Resources Policies and Methods do not manage non-geothermal hazard risks to which a geothermal system, by its location, might be susceptible (e.g. tsunami or flooding). Those non-geothermal risks require assessment under this policy.

*Table reference: **Objective 23**, Methods 3, 18 and 23A*

Policy NH 5B(a): Assessment of natural hazard risk at the time of subdivision, or change or intensification of land use after Policies NH 3A and NH 4A have been given effect to

After the relevant district or, where applicable, regional plan gives effect to Policies NH 3A and NH 4A assess natural hazard risk associated with a development proposal to subdivide land or change or intensify land use using the methodology set out in Appendix K where the relevant district or regional plan specifically requires that natural hazard risk assessment be undertaken

except that the obligation to assess the risk of the natural hazard under this policy shall not arise where:

(a) An assessment of the susceptibility of the land subject to the development proposal has demonstrated that the land is not susceptible to the hazard; or

(b) The risk derives from a geothermal hazard which is managed under this Statement's section 2.4 and the Geothermal Resources Policies and Methods.

Explanation

Policy NH 5B(a) applies in the period after district and regional plans have given effect to policies NH 3A and NH 4A.

The 5 ha site size threshold and discretion that apply in the interim period, in accordance with Policy NH 5B, do not apply after the interim period. Instead Policy NH 5B(a) makes clear that whether assessment at the time of development proposals occurs is dependent on the provision being made for such assessment within the relevant regional or district plan.

It is expected that regional and district plans will require assessment of natural hazard risk in respect of development proposals that have not been anticipated by the plan (and hence may significantly alter the natural hazard risk in a

particular locality that would otherwise be considered low).

Policy NH 5B(a) also provides that risk assessment does not need to be undertaken when the natural hazard is managed under section 2.4 in this Statement. Note that section 2.4 and its associated Geothermal Resources Policies and Methods do not manage non-geothermal hazard risks to which a geothermal system, by its location, might be susceptible (e.g. tsunami or flooding). Those non-geothermal risks require assessment under this policy.

For the avoidance of doubt, Policy NH 5B(a) also makes clear that no assessment is required if a hazard susceptibility assessment has determined that the land is not susceptible to natural hazards.

Together, Policies NH 3A, NH 4A, NH 5B, and NH 5Ba represent the risk identification stage as indicated in Figure 1. Appendix K represents the risk analysis and risk evaluation stages.

*Table reference: **Objective 23**, Methods 3, 18 and 23A*

Policy NH 8A: Managing natural hazard risk through regional, city and district plans

Promote the natural hazard risk outcomes set out in Policy NH 6B by:

(a) Providing for plans to take into account natural hazard risk reduction measures including, where practicable, to existing land use activities, and, where necessary,

(b) Controlling the location, scale and density of the subdivision, use, development and protection of land and land use change in city, district and regional plans.

(c) Ensuring that regional, city and district plan provisions provide a high degree of certainty for the establishing and maintaining of essential risk reduction works and other measures.

Explanation

Policy NH 8A applies in the context of the development of city, district and regional plans. It seeks to ensure that in planning for new greenfield or infill development regard is had to existing and future natural hazard risk. It also applies to existing land use and existing risk.

One of the key differences between Policy NH 7B and NH 8A is the scale at which risk is to be managed. While Policy NH 7B addresses risk within the development site, Policy NH 8A considers the broader context at plan development stage. This requirement seeks to address cumulative risk that may result from the incremental adding of people and buildings to a natural hazard zone.

Consideration of cumulative natural hazard risk is best undertaken by the local authority at the time city, district and regional plans are prepared.

Consistent with the comment made in Section 2.8, in identified urban growth areas Policy NH 8A requires city and district plans to manage natural hazard risk through a range of methods including land use controls where necessary except that the suitability of the land for urban development is accepted.

For existing at-risk development, protection works at varying scales will often be necessary to achieve the risk management strategy. Community safety and well-being may be reliant on protection works (such as stopbanks) being developed and maintained on a continuing basis to achieve the necessary risk reduction, and regional, city and district plan must recognise this.

Options for reducing natural hazard risk may take many forms. Some key risk reduction measures are provided in Appendix L.

*Table reference: **Objective 23**, Methods 1A, 2A, 18 and 23B*

Policy NH 12C: Allocation of responsibility for natural hazard identification and risk assessment

Require the natural hazard identification and risk assessment approach described in Policies NH 1B to NH 5B and NH 5B(a) above to be given effect to by:

(a) Regional council undertaking area-based natural hazard susceptibility mapping in accordance with Policy NH 3A for:

  (i) Hazards related to volcanic activity;

  (ii) Hazards related to earthquakes;

  (iii) Tsunami;

  (iv) Coastal erosion and coastal inundation; and

(v) Flooding from natural water courses outside urban areas with reticulated stormwater networks.

(b) Regional council undertaking area-based natural hazard risk analysis and evaluation in accordance with Policy NH 4A for:

(i) Hazards related to volcanic activity;

(ii) Liquefaction; and

(iii) Tsunami.

(c) City and district councils undertaking area-based:

(i) Natural hazard susceptibility mapping in accordance with Policy NH 3A for those hazards listed in Policy NH 3A that are not listed in (a) above; and

(ii) Natural hazard risk analysis and evaluation in accordance with Policy NH 4A for those hazards listed in Policy NH 3A that are not listed in (b) above.

Explanation

Policy NH 12C clarifies the roles and responsibilities of the Bay of Plenty Regional Council and city and district councils for area-based natural hazard identification and risk assessment.

Regional council has responsibility for most of the susceptibility mapping. The exceptions are urban flooding, landslip and debris flow that are the responsibility of city and district councils. This distinction reflects the source of existing natural hazards information and the core technical competencies of regional council.

Regional council has a more restricted role in natural hazard risk analysis and evaluation on the basis that risk analysis and evaluation requires a detailed understanding of land use and development and associated infrastructure. Information and local expertise on those matters resides with city and district councils. Regional council is responsible for risk analysis and evaluation in relation to volcanic hazards, tsunami and liquefaction on the basis of the widespread nature of the potential consequences.

As well as councils having their formal roles, people undertaking subdivision, land use change or intensification also have their roles and responsibilities in accordance with Policies NH 5B and NH 5B(a).

*Table reference: **Objective 23**, Method 23A*

Policy NH 13C: Allocation of responsibility for land use control for natural hazards

The Bay of Plenty Regional Council, city and district councils shall be responsible for specifying objectives, policies and methods, including any rules, for the purpose of the control of the use of land for the avoidance or mitigation of natural hazards as set out in the table below.

Table 3 Natural hazards land use control responsibility table.

	Responsibility for developing objectives and policies	Responsibility for developing any rules	Responsibility for developing methods other than rules
Land except land in the coastal marine area	City and district councils and Bay of Plenty Regional Council	City and district councils*	City and district councils and Bay of Plenty Regional Council
Land in the coastal marine area	Bay of Plenty Regional Council	Bay of Plenty Regional Council	Bay of Plenty Regional Council

* Under section 30(1)(c)(iv) of the Act, the Regional Council has the function to control land use for the avoidance or mitigation of natural hazards. The Act allows the Regional Council to exercise that function in such a way as to override any existing use rights available under section 10(4) of the Act. The allocation of responsibilities under this policy does not remove the right of the Regional Council to exercise its functions and powers in that regard. Should it choose to do so, any such provisions will be subject to a plan or plan change process under Schedule 1 to the Act.

Explanation

In accordance with section 62 of the Act, Policy NH 13C sets out local authority responsibilities for specifying the objectives, policies and methods, including any rules, for the control of the use of land to avoid or mitigate natural hazards or any group of hazards in the Bay of Plenty region. Note that “land” includes land covered by water; in the coastal marine area, “land” includes the foreshore and seabed.

The policy provides that the Bay of Plenty Regional Council and city and district councils share responsibility for establishing objectives, policies and any rules, including conditions of resource consent, for the control of the use of land for the avoidance or mitigation of natural hazards, except in the coastal marine area which is the Bay of Plenty Regional Council’s exclusive responsibility.

City and district councils have primary responsibility for controlling land use (other than in

the coastal marine area); they may also control subdivision for the avoidance or mitigation of natural hazards. The Bay of Plenty Regional Council has the power to set land use rules, including conditions of resource consent, to address natural hazard risk to existing land uses and to address natural hazard risk on all land in the coastal marine area.

The Bay of Plenty Regional Council and city and district councils also share responsibility for establishing and implementing methods (excluding rules) used, or to be used, to implement the policies. Such methods might include, for example, provision of guidance on urban design, provision of information on hazards, or economic incentives or disincentives.

Table reference: ***Objective 23****, Method*s *23A*, 23B and 24A

3.2 Methods to implement policies

Table 4 Methods to implement policies.

Section 3.2: Methods to implement policies	Page no.
3.2.1: Directive methods	
Method 1A: City and district plan implementation (phased)	23
Method 2A: Regional plan implementation (phased)	23
Method 3: Resource consents, notices of requirement and when changing, varying, reviewing or replacing plans	23
Method 18: Structure plans for land use changes	23
Method 23A: Review hazard and risk information	23
Method 23B: Investigate and apply measures to reduce natural hazard risk	23
Method 23C: Natural defences against natural hazards	23
3.2.2: Guiding methods	
Method 24A: Provide guidance on taking a risk management approach to natural hazards	23
Method 73: Provide information and guidance on natural hazards	23
Method 74: Collaborate to establish natural hazard risk	24

3.2.1 Directive methods

Method 1A: City and district plan implementation (phased)

City and district plans must give effect to Policies NH 3A, NH 4A and NH 8A.

If a city or district plan does not currently give effect to these policies, then the city or district council must amend the plan to give effect to them as part of the next review of the city or district plan, or as part of any change to the city or district plan that provides opportunity for land use change or intensification.

Implementation responsibility: City and district councils.

Method 2A: Regional plan implementation (phased)

Regional plans must give effect to Policies NH 3A, NH 4A and NH 8A.

If a regional plan does not currently give effect to these policies, then the regional council must amend a relevant plan to give effect to them as part of the next review of the relevant regional plan, or as part of any change to the regional plan that provides opportunity for land use change or intensification.

Implementation responsibility: Regional council.

Insert into Method 3 the expression: "NH 1B, NH 2B, NH 5B, NH 5B(a), NH 6B, NH 7B, NH 9B, NH 10B,".

Amend Method 18(h) and insert new paragraph (ha) as shown:

(h) Identify all known ~~significant natural hazards and~~ contaminated sites that land to be used for urban purposes may ~~be subject to or~~ contain and show how ~~any intolerable natural hazard risks or~~ adverse effects from contaminated land are to be avoided, remedied or mitigated;

(ha) Identify all known natural hazards that land to be used for urban purposes may be subject to, or contain, and show how low natural hazard risk is to be maintained or achieved;

Method 23A: Review hazard and risk information

Review and update natural hazard and risk information held by local authorities whenever relevant research is released and, in any case, at the time of plan review or relevant plan change.

Implementation responsibility: Regional council, city and district councils.

Method 23B: Investigate and apply measures to reduce natural hazard risk

Investigate options for addressing existing use or development subject to high or medium risk and apply the most appropriate non-regulatory and/or regulatory risk-reduction measures.

Implementation responsibility: Regional council if the favoured response is regulation of existing uses; regional, city and district councils in all other instances.

Method 23C: Natural defences against natural hazards

Assess opportunities for the protection, restoration or enhancement of natural defences which assist in reducing natural hazard risk.

Implementation responsibility: Regional council, city and district councils.

3.2.2 Guiding methods

Method 24A: Provide guidance on taking a risk management approach to natural hazards

Provide guidance to local authorities in the application of this Statement's risk management approach to the avoidance or mitigation of natural hazards.

Implementation responsibility: Regional council

Method 73: Provide information and guidance on natural hazards

To guide local authority decision-making and raise awareness and understanding

of natural hazards within the community, gather and disseminate information about the following hazards (including relevant climate change effects) and their associated risks:

(a) Volcanic activity

  (i) pyroclastic and lava flow;

  (ii) landslip, debris flow and lahar;

  (iii) ash fall;

  (iv) geothermal hazard; and

  (v) caldera unrest.

(b) Earthquake

  (i) liquefaction and lateral spreading;

  (ii) fault rupture;

  (iii) landslide and rock fall; and

  (iv) tsunami.

(c) Coastal processes

  (i) coastal erosion; and

  (ii) coastal inundation.

(d) Extreme rainfall

  (i) landslip and debris flow/flood; and

  (ii) flooding.

Information about city, district and relevant regional natural hazards and risks shall be included within natural hazards registers or district plans, and provided in project and land information memoranda.

Implementation responsibility: Regional Council, city and district councils (except that obligations relating to coastal hazard information do not apply to inland district councils).

Method 74: Collaborate to establish natural hazard risk

Collaborate in gathering and disseminating hazard information and, with their communities, establishing boundaries of the risk categories.

Implementation responsibility: Regional council, city and district councils.

4.2 Objective, anticipated environmental results and monitoring indicators

Table 5 Objectives, anticipated environmental results (AER) and monitoring indicators.

Objectives	Anticipated environmental results (AER)	Monitoring indicators
Natural Hazards		
Objective 23 Avoidance or mitigation of natural hazards by managing risk for people's safety and the protection of property and lifeline utilities	Any natural hazard risk associated with new development is at a low level after risk mitigation measures have been taken into account.	District plan provisions and resource consent conditions are assessed to determine whether risk from natural hazards exceeds acceptable levels.
	The natural hazard risk to existing land use or development is not high and is as low as reasonably practicable.	High risks are reduced to medium or low levels. Wherever the risk from natural hazards exceeds the low level, conditions of resource consent for 1 the re-establishment of any use, or 2 the reconstruction or alteration of, or extension to, any existing building, require mitigation of risk to be as low as reasonably practicable. The coastal hazard risk indicators defined in *Confirmed Coastal Hazard Risk Indicators (Environment Bay of Plenty Environmental Publication 2006/05 April 2006)* show a trend of decreasing risk.
	People and communities are enabled by access to risk information to provide for their social, economic and cultural well-being and their health and safety.	Survey results show that the public understands natural hazard risk. Reviews of hazards and risk show a reducing trend in the level of risk from natural hazards.

Appendix A – Definitions

Definitions to be added to Appendix A

Annual individual fatality risk (AIFR) means the risk measure obtained by multiplying the modelled number of deaths from a hazard event by the annual exceedance probability of the event and dividing by the population within the hazard assessment area.

Critical buildings means land and buildings:

(a) owned or leased by agencies assisting the public in times of emergency, including the New Zealand Fire Service or an equivalent emergency fire service, the New Zealand Police, the Coastguard and ambulance services (including air ambulance services);

(b) public and private hospitals and other similar facilities providing emergency medical services;

(c) designated emergency shelters, emergency centres and designated safe zones.

(d) designated Civil Defence Emergency centres.

Development of land means the process of subdividing land and/or changing or intensifying the use of land.

Development site means an area on which development of land is undertaken, or proposed to be undertaken, either in one stage or in multiple stages over time that is:

(a) a parcel of land held in a separate Certificate of Title; or

(b) a parcel of land held in multiple Certificates of Title that are contiguous; or

(c) multiple-owned Maori land not necessarily held in a separate Certificate of Title.

Geothermal hazard means hydrothermal eruptions, dormant surface features, natural gases, subsidence and tomos from geothermal systems.

Hazard assessment area means the natural hazard zone or development site whichever is applicable.

Hazard susceptibility area means the spatial extent of a potential hazard event identified by susceptibility mapping.

Lifeline utilities means essential infrastructure services provided to the community such as water supply, wastewater networks and treatment facilities, transport facilities (including road, rail, airports and sea ports), telecommunication, television and radio facilities and structures, electricity generation and distribution facilities, and gas and liquid fuels storage and distribution/retail facilities.

Natural hazard zone means that zonewithin a hazard susceptibility area defined by the relevant regional, city or district plan, on the basis of existing or proposed land use, as the appropriate geographic scale to assess hazard risk. For the avoidance of doubt, a natural hazard zone may be an entire hazard susceptibility area or such smaller zone as is appropriate taking account of the nature and scale of actual and potential land uses that are exposed to the natural hazard.

Population in care means the population within the hazard assessment area that is in:

(a) Hospital; and

(b) Aged care facilities; and

(c) Schools; and

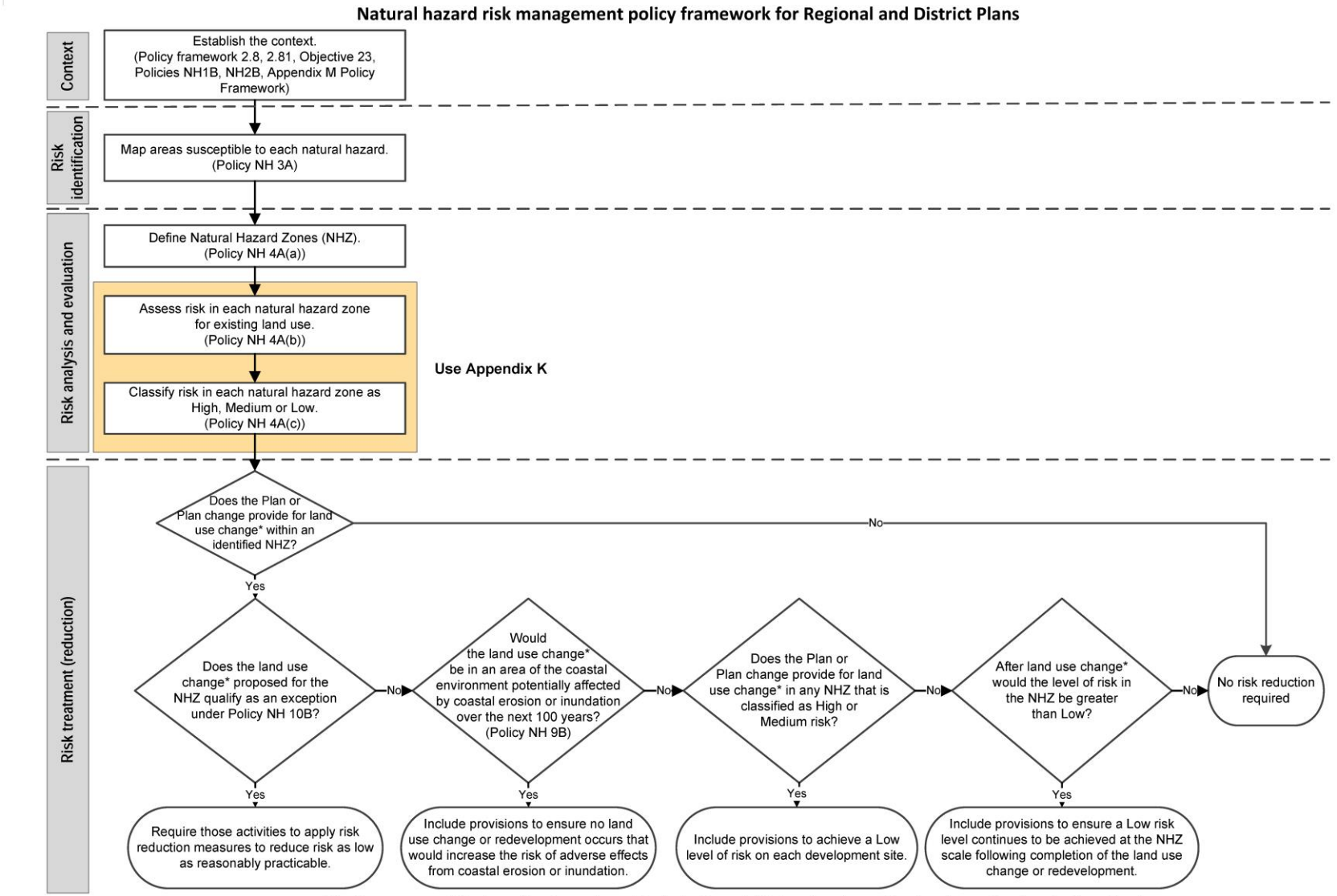
(d) Early education and infant day care facilities.

Risk means the likelihood and consequences of a hazard.

Social and cultural buildings means places of worship, marae, art galleries, museums, libraries and educational facilities.

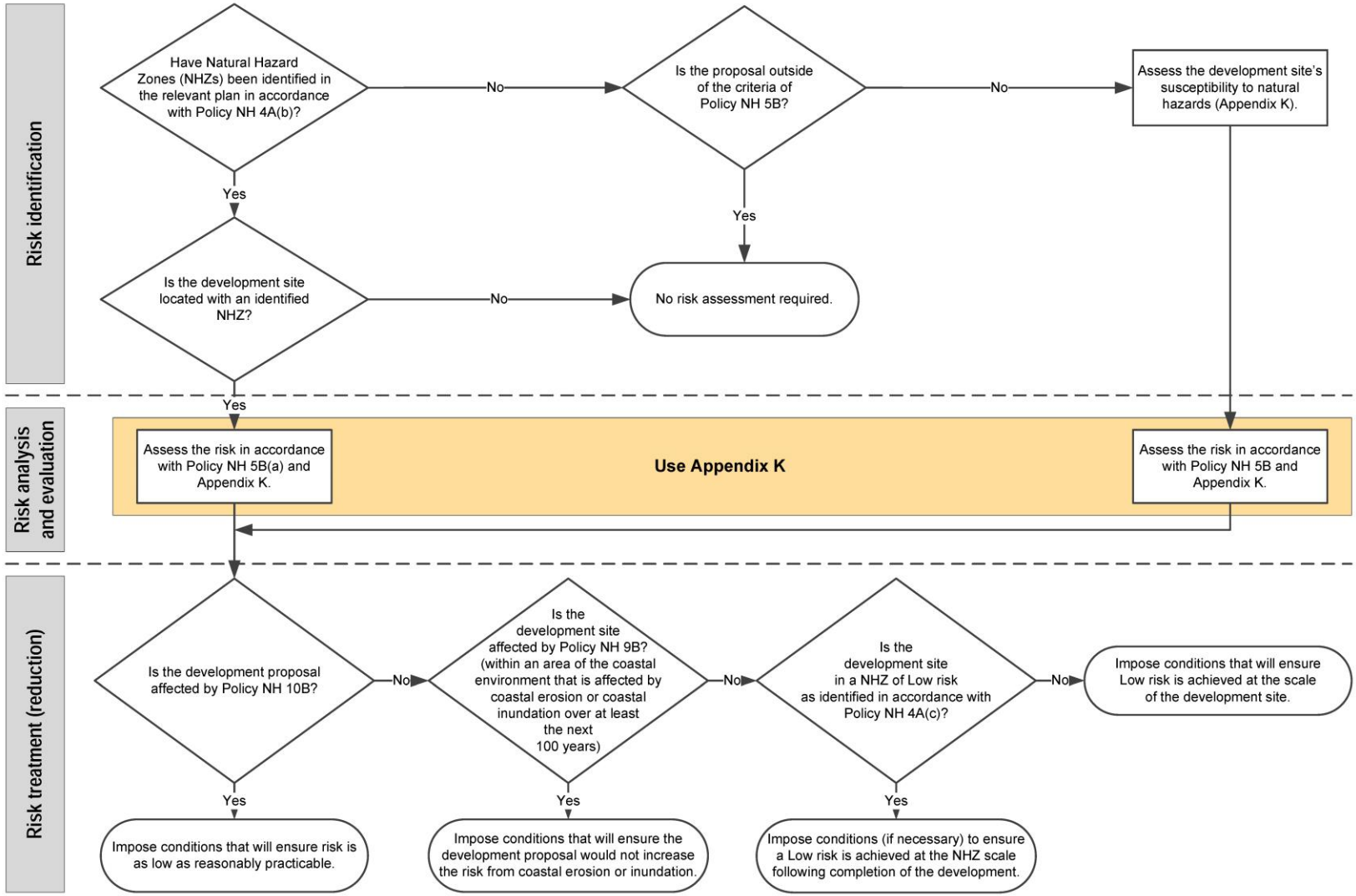
Susceptibility means potential of an area to generate and/or be affected by a natural hazard.

Appendix M – The Natural Hazards Risk Management Policy Framework



**For the purpose of this figure "land use change" includes the subdivision, development, redevelopment and protection of land.*

Natural Hazards Risk Management Policy Framework for Development Proposals*



**For the purpose of this figure the term "development proposal" means the subject of a resource consent, notice of requirement or private plan change*

Appendix K – Methodology for risk assessment

Compliance with Appendix K means:

(a) Use of Steps 1 to 6 below (the default methodology); or

(b) Use of a recognised risk assessment methodology included in a regional, city or district plan or recognised in the consideration of a resource consent application. This may include risk assessment methodologies incorporated in Regulations or industry codes of practice.

Appendix K sets out the default methodology to be used to analyse and evaluate risk where such analysis and evaluation is required under Policies NH 4A and NH 5B and no alternative methodology has been included in a relevant regional, city or district plan or is recognised in the consideration of a resource consent application. A diagram showing the default Appendix K methodology is shown in Figure 3 at the end of Appendix K.

Although it is obligatory to use the default methodology to give effect to Policies NH 4A and NH 5B where no other methodology has been approved, there are stages and tasks within the methodology where discretion is to be exercised. These include:

- whether the assessment of consequences is quantitative or qualitative
- interpretation of aspects of the consequences table
- whether assessment of hazard events with likelihoods other than those specified in Table 6 ought to be undertaken.

Therefore, in respect of the matters such as those listed above, compliance with Appendix K requires judgement by the suitably qualified and experienced practitioner carrying out the assessment.

The following default methodology incorporates two different risk metrics broadly described in the explanation accompanying Policy NH 4A.

Steps 1-4 relate to maximum risk as determined by combining likelihood and consequence through use of the Risk Screening Matrix.

Use of the annual individual fatality risk (AIFR) metric is also required in certain circumstances as described in Step 5 below.

Defining the event of maximum risk

Natural hazards manifest as hazard events. Typically, different sized hazard events occur with different frequencies (for example, very large events occur much less frequently than smaller events). Events of different likelihoods will have different consequences. Hence in any area subject to a natural hazard there may be a range of different risks associated with the same natural hazard. For the purpose of risk evaluation, it is important to identify the *maximum risk* being the event with the combination of likelihood and consequence that yields the greatest risk.

In conceptual terms, natural hazard risk can be plotted as a curve with likelihood on the vertical axis and risk (the product of likelihood and consequence) on the horizontal axis (see Figure 2). There is a point on that risk curve that represents the greatest risk, indicated on Figure 2 as "Maximum risk".

The maximum risk will be associated with an event of a particular likelihood (indicated by event likelihood "L_{MR}" on Figure 2). The likelihood that represents the greatest risk will vary for each hazard. For each hazard the maximum risk event should be identified for evaluation against risk thresholds (being the categories of risk described in Policy NH 2B). Note the maximum risk will not necessarily be the event with the greatest potential consequence.

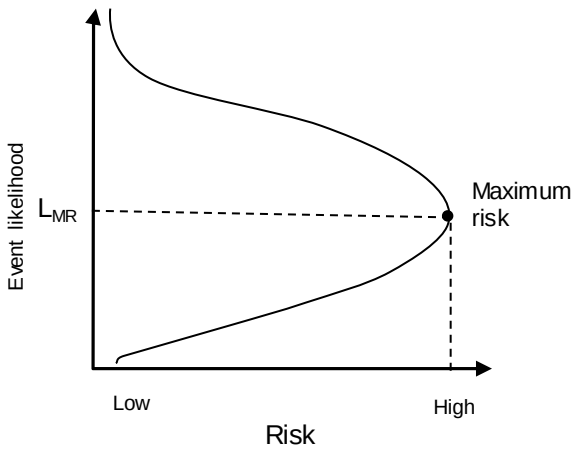


Figure 2 Conceptual curve of maximum risk.

For multiple hazards, follow the approach set out in Beban and Saunders, 2013[3], page 51.

Risk assessment in the absence of hazard susceptibility areas mapped in accordance with Policy NH 3A

In the period before regional and district plans give effect to Policy NH 3A, consent applicants, requiring authorities lodging notices of requirement, and proponents of private plan changes may be required to undertake risk assessment in accordance Policy NH 5B.

In those situations the risk assessment steps 1–5 of this Appendix should be preceded by an initial assessment of the development site's susceptibility to the range of natural hazards set out in Policy NH 3A. This should be required from the applicant as part of the assessment of environmental effects consistent with clause 7 of Schedule 4 to the Act (or as part of the information otherwise required as part of a notice of requirement or private plan change). The Regional Council, together with the territorial authorities, will hold information about the extent of natural hazards prior to hazards susceptibility mapping under Policy NH 3A. That information, together with published information from other agencies, is expected to form the basis of applicants' hazard susceptibility statements within their AEEs. Only in exceptional circumstances would applicants be expected to commission primary research to fulfil this requirement during this interim period.

Primary Analysis (Steps 1 – 4)

Step 1 – Selecting starting likelihood for risk assessment

Because it is not possible to know in advance of assessment which event likelihood corresponds with the maximum risk, it is often necessary to analyse events of a range of likelihoods. However, in each case, there is a preferred starting point (likelihood) for the analysis. This varies by hazard as indicated in Table 6.

Table 6[4] Likelihoods for initial risk assessment

Hazard	Column A: Likelihood for initial analysis[+] AEP (%)[#]	Column B: Likelihood for secondary analysis[+] AEP (%)[#]
Volcanic hazards (including geothermal)	0.1	0.2 0.005
Earthquake (Liquefaction)	0.1	0.2 0.033
Earthquakes (Fault rupture)	0.017	0.2 0.005
Tsunami	0.1	0.2 0.04
Coastal erosion	1	2 0.2
Landslip (Rainfall related)	1	2 0.2
Landslip (Seismic related)	0.1	0.2 0.033
Flooding (including coastal inundation)	1	2 0.2

[+]The term "initial analysis" refers to the starting point for risk analysis as described in Step 1 of this methodology. It is the first scenario to be assessed for risk. The term "secondary analysis" refers to any subsequent scenario that is assessed for risk in accordance with Step 5 of this methodology.

[#]AEP (Annual Exceedance Probability) is the probability that a natural hazard event of a certain size will occur, or will be exceeded, in a time period of one year. For example, an inundation level with a 2% AEP means that there is a 2% chance in any one year of that level being equalled or exceeded.

Those undertaking a risk assessment should begin by assessing the consequences of an event of the likelihood shown in Column A of Table 6.

Step 2 – Determining potential consequences

In accordance with Table 7 (consequence table), the following consequences of the hazard event shall be considered:

(a) The percentage of buildings of social/cultural significance within the

[3] Beban, J. G.; Saunders, W. S. A. 2013. Incorporating a risk-based land use planning approach into a district plan, *GNS Science Miscellaneous Series* 63. 52 p.

[4] Table 6 likelihoods, presented to guide the identification of the event with the highest risk, are derived from ranges suggested by relevant hazard specialists.

hazard assessment area that would have functionality compromised.

(b) The percentage of affected buildings within the hazard assessment area that would have functionality compromised.

(c) The percentage of critical buildings within the hazard assessment area that would have functionality compromised.

(d) The percentage of the population serviced by a lifeline utility affected by disruption of the lifeline utility and the length of time the service is likely to be compromised.

(e) The number of human deaths within the hazard assessment area.

(f) The number of injuries to people within the hazard assessment area.

Determining consequences

The default methodology provides for two means of determining the level of consequences:

- The quantitative method; and
- The qualitative method.

While the method to be used is generally to be determined by the party undertaking the risk assessment based on the vulnerability of the community to natural hazards and the resources available, the quantitative method must be used where:

- The hazard has generated a damaging event in the recent past and there is a high likelihood that events of a similar scale will continue, or occur again; or
- The hazard susceptibility area is greenfield land and is proposed to be developed with an ultimate urbanised footprint of five hectares or more; or
- The hazard susceptibility area has been subject to previous quantitative risk assessment and the development proposal that gives rise to the need for risk assessment would materially increase the potential consequences of an event.

For the avoidance of doubt:

- unless a quantitative method must be used, a risk assessment may use a combination of quantitative and qualitative measurement; and
- determination of consequences should take into account any existing risk reduction measure that may be in place and any risk reduction proposed.

Quantitative determination of consequences

Quantitative determination will typically involve the use of various models and reference data sets applied and interpreted by technical experts. Assumptions and estimates may underpin the models and methodologies used and hence even quantitative determination will often represent “best estimates”.

Although quantitative determination of consequences will often require technical expertise, a number of relatively simple approaches and data sources are available for use by the regional council and city and district councils.

Potential impacts on buildings - matters (a) to (c).

For earthquake and flood (inundation) consequences in relation to buildings, a degree of quantification will be possible by applying standards specified in the Building Code and building importance levels specified in AS/NZS 1170.0:2002. Analysis should assume full compliance with those standards in determining the potential consequences of an event on a greenfield development.

Where the spatial scale of the risk assessment incorporates existing development the degree of compliance with the Building Code should be modelled or estimated based on the age of buildings, historic building consent data or other survey method.

A degree of discretion will need to be exercised in determining whether buildings would have been “functionality compromised” and in determining whether a lifeline utility is out of service or just has service compromised. In the context of damage to buildings, “functionally compromised” will generally occur when a building cannot continue to be used for its intended use immediately after an event. However the nature and duration of loss of functioning will be relevant and judgement will need to be made as to whether the extent of likely damage has a serious or manageable impact on normal social and business functioning. This will form part of arriving at “best estimates”.

Potential impacts on lifeline services – matter (d).

In determining the level of consequence of an event on a lifeline utility, relevant industry standards and guidelines shall be assumed to have been followed unless the council has evidence to the effect that is not the case (in which instance an allowance for an estimated level of non-compliance should be made in the analysis).

Potential impacts on lives and safety - matters (e) and (f).

Estimates of lives lost and injuries sustained will be based on particulars of the hazards and context (e.g. likely warning time of an event and provision for evacuation (including vertical evacuation), occupancy rates of buildings) and frequency of occupancy.

Qualitative assessment of consequences

In many cases a qualitative assessment of the potential consequences of the hazard event may be sufficient.

As noted earlier, except for the specific circumstances listed above, those required to undertake risk assessment may choose either the quantitative or qualitative method (or some combination).

Where a qualitative approach is taken, judgement is to be exercised using best available information to estimate the level of each potential consequence and the assignment of an overall consequence rating and the corresponding likelihood rating.

Qualitative assessment should be undertaken by a suitably qualified and experienced practitioner. The council has the discretion to decide who it considers is suitably qualified; the term is not defined in the Statement. However, guidance on who a suitably qualified and experienced practitioner might be is provided in Box 1 at the end of this Appendix.

Qualitative assessments should be recorded in an assessment report with all assumptions and estimates made explicit. Where significant land use policy decisions are to be based on the findings of these qualitative assessments, reports should be peer reviewed by a person with appropriate natural hazard risk expertise to confirm that assumptions made are reasonable based on available information.

Step 3 – Assign a consequence level

Based on Step 2 a consequence level of insignificant, minor, moderate, major or catastrophic should be assigned by applying Table 7.

It is possible that the hazard event analysed will have different levels of consequence across each of the five types of consequence that have been measured, modelled or estimated. Where that is the case, the applicable consequence level will be the one that corresponds to the row in Table 7 that represents the highest measured or estimated consequence.

Step 4 – Determine the risk level

Based on the likelihood (AEP from Table 6) and the consequence level derived from Table 7, the level of risk is to be determined using the Risk Screening Matrix below.

Risk Screening Matrix

	Consequences				
Likelihood[5] (AEP %)	Insignificant	Minor	Moderate	Major	Catastrophic
≥2					
<2–1					
<1–0.1					
<0.1–0.04					
<0.04					

Key

High risk

Medium risk

Low risk

[5] The likelihood ranges allow for the evaluation of multiple hazards, e.g. flooding, landslip, tsunami, fault rupture. (Saunders, W.S.A.; Beban, J.G.; Kilvington, M. 2013. Risk-based approach to land use planning, *GNS Science Miscellaneous Series 67*)

Secondary Analysis

Step 5 – Iterate risk assessment and calculate annual individual fatality risk (AIFR) if necessary

Although steps 1–4 will categorise the risk associated with a natural hazard event of a certain likelihood, it will not demonstrate what event likelihood represents the greatest risk nor does it identify the AIFR.

That being the case, if the initial assessment determines natural hazard risk to be low or medium, further steps will be required. As outlined below, those further steps involve applying the likelihoods of Column B of Table 6. The use of those likelihoods will help to identify the point of maximum risk (refer Figure 2).

The following sequencing of steps is designed to minimise the further analysis that is required. However, in any particular situation it may be prudent to undertake comprehensive risk assessment beyond the minimum required approach set out below.

(a) Where the initial assessment results in a risk level categorisation of *High*:

(i) No further assessment is required (but see (ii) below). The risk for the purpose of Policy NH 6B is High. (While there might be a greater risk associated with a less likely event the management approach associated with that hazard will not change.)

(ii) Further iterative assessment may be undertaken to test the effect of alternative or additional mitigation options in an effort to reduce the risk level.

(b) Where the initial assessment results in a risk level categorisation of *Medium*:

(i) Calculate the annual individual fatality risk (AIFR) using the following formula:

AIFR = (D x P)/N

Where:

D = number of anticipated (modelled) deaths from the event

N = population (maximum number of people present within the hazard assessment area at any point in time over a 24 hour period)

P = the computed annual exceedance probability. Note that values of AEP expressed as a percentage (as in Table 6) must first be divided by 100.
E.g., from Column A of Table 6, using Flooding AEP(%) of 1:
P = 1/100 = 0.01

(ii) If the AIFR is greater than 1×10^{-4} re-categorise the risk as High.

(iii) If the AIFR is 10^{-4} or less, steps 1–5 should be repeated using the event likelihood(s) specified in Column B of Table 6.

(iv) If the risk screening matrix categorises risk from any secondary assessment as High, the risk for the purpose of Policy NH 6B is High.

(v) If the risk screening matrix does not categorise risk from any secondary assessment as High the risk for the purpose of Policy NH 6B is Medium.

(c) Where the initial assessment results in a risk level categorisation of *Low*:

(i) Undertake secondary assessment by repeating steps 1–5 using the event likelihoods specified in Column B of Table 6.

(ii) If the risk screening matrix categorises the risk from any secondary assessment as Medium, calculate the annual individual fatality risk (AIFR) using the formula described in Step 5 (b) above. If the AIFR is greater than 1×10^{-4} re-categorise the risk as High.

(iii) If the risk screening matrix categorises the risk from any secondary assessment as Low, calculate the annual individual fatality risk (AIFR) using the formula described in Step 5 (b) above.

- If the AIFR is 1×10^{-4} or less and greater than 1×10^{-5} re-categorise the risk as Medium.
- If the AIFR is 1×10^{-5} or less the risk is Low.

(d) Despite (b) and (c) above, re-categorise the risk as:

- Medium if the $AIFR^{pic}$ is 1×10^{-4} or less and greater than 1×10^{-6}; or
- High if the $AIFR^{pic}$ is greater than 1×10^{-4}

where the $AIFR^{pic}$ is calculated using the following formula:

$AIFR^{pic} = (D^{pic} \times P)/N^{pic}$

where:

D^{pic} = number of anticipated (modelled) deaths in the population in care from the event

N^{pic} = population (maximum number of people in care present within the hazard assessment area at any point in time over a 24 hour period)

P = the computed annual exceedance probability (as defined in (b) above).

If an assessment indicates High or Medium risk, further iterative assessment may be undertaken to test the effect of alternative or additional mitigation options in an effort to reduce the risk level.

Step 6 – Assign a risk level to each hazard assessment area

Following any secondary or subsequent analysis and any further iterations undertaken to test the effect of alternative or additional mitigation options, confirm the final risk level for each hazard assessment area and assign that risk level to the hazard assessment area and assessed actual and potential land use.

Box 1 - Guidance on suitably qualified and experienced practitioners

As a general guide, a suitably qualified and experienced practitioner is a person that is independent, applies good professional practice, and assesses consequences with reference to accepted benchmarks and industry guidelines. Environmental practitioners are not expected to act alone across the large number of disciplines required to deal with natural hazard risk issues. For example, someone may be suitably qualified in understanding the consequences associated with flooding but have no experience in assessing earthquake related consequences. The practitioner is essentially an expert in some specific and relevant fields and experienced in drawing together multidisciplinary inputs and drawing conclusions about likely consequences.

A suitably qualified and experienced practitioner would need to be willing to certify (by signature) that the content of the hazard consequence assessment complies with good practice and professional standards, and to stand by the conclusions of the report. For example, a person certifying a report should be someone who could ultimately stand in the Environment Court and provide expert testimony, and whose experience and qualifications stand up to Court scrutiny.

Table 7 Consequence table with qualitative and quantitative descriptions.

Consequence level	Built			Lifelines utilities	Health & safety
	Social/cultural	Buildings	Critical buildings		
Catastrophic	≥25% of buildings of social/cultural significance within hazard assessment area have functionality compromised.	≥50% of buildings within hazard assessment area have functionality compromised.	≥25% of critical buildings within hazard assessment area have functionality compromised.	A lifeline utility service is out for > 1 month (affecting ≥ 20% of the town/city population) OR out for > 6 months (affecting < 20% of the town/city population).	>101 dead and/or >1001 injured
Major	11–24% of buildings of social/cultural significance within hazard assessment area have functionality compromised.	21–49% of buildings within hazard assessment area have functionality compromised.	11–24% of critical buildings within hazard assessment area have functionality compromised.	A lifeline utility service is out for 1 week – 1 month (affecting ≥ 20% of the town/city population) OR out for 6 weeks to 6 months (affecting < 20% of the town/city population).	11–100 dead and/or 101–1000 injured
Moderate	6–10% of buildings of social/cultural significance within hazard assessment area have functionality compromised.	11–20% of buildings within hazard assessment area have functionality compromised.	6–10% of critical buildings within hazard assessment area have functionality compromised.	A lifeline utility service is out for 1 day to 1 week (affecting ≥ 20% of the town/city population) OR out for 1 week to 6 weeks (affecting < 20% of the town/city population).	2–10 dead and/or 11–100 injured
Minor	1–5% of buildings of social/cultural significance within hazard assessment area have functionality compromised.	2–10% of buildings within hazard assessment area have functionality compromised.	1–5% of critical buildings within hazard assessment area have functionality compromised.	A lifeline utility service is out for 2 hours to 1 day (affecting ≥ 20% of the town/city population) OR out for 1 day to 1 week (affecting < 20% of the town/city population).	≤1 dead and/or 1–10 injured
Insignificant	No buildings of social/cultural significance within hazard assessment area have functionality compromised.	<1% of buildings within hazard assessment area have functionality compromised.	No damage within hazard assessment area, fully functional.	A lifeline utility service is out for up to 2 hours (affecting ≥ 20% of the town/city population) OR out for up to 1 day (affecting < 20% of the town/city population).	No dead No injured

NB for the purpose of Table 7:

- *the term "town/city population" means the catchment of people within the hazard assessment area that is served by the lifeline utility, except that with respect to a lifeline utility that predominantly or exclusively serves a population outside the hazard assessment area, it means the population in the area served by the lifeline utility.*
- *the applicable consequence level will be the one that corresponds to the row that represents the highest measured or estimated consequence.*

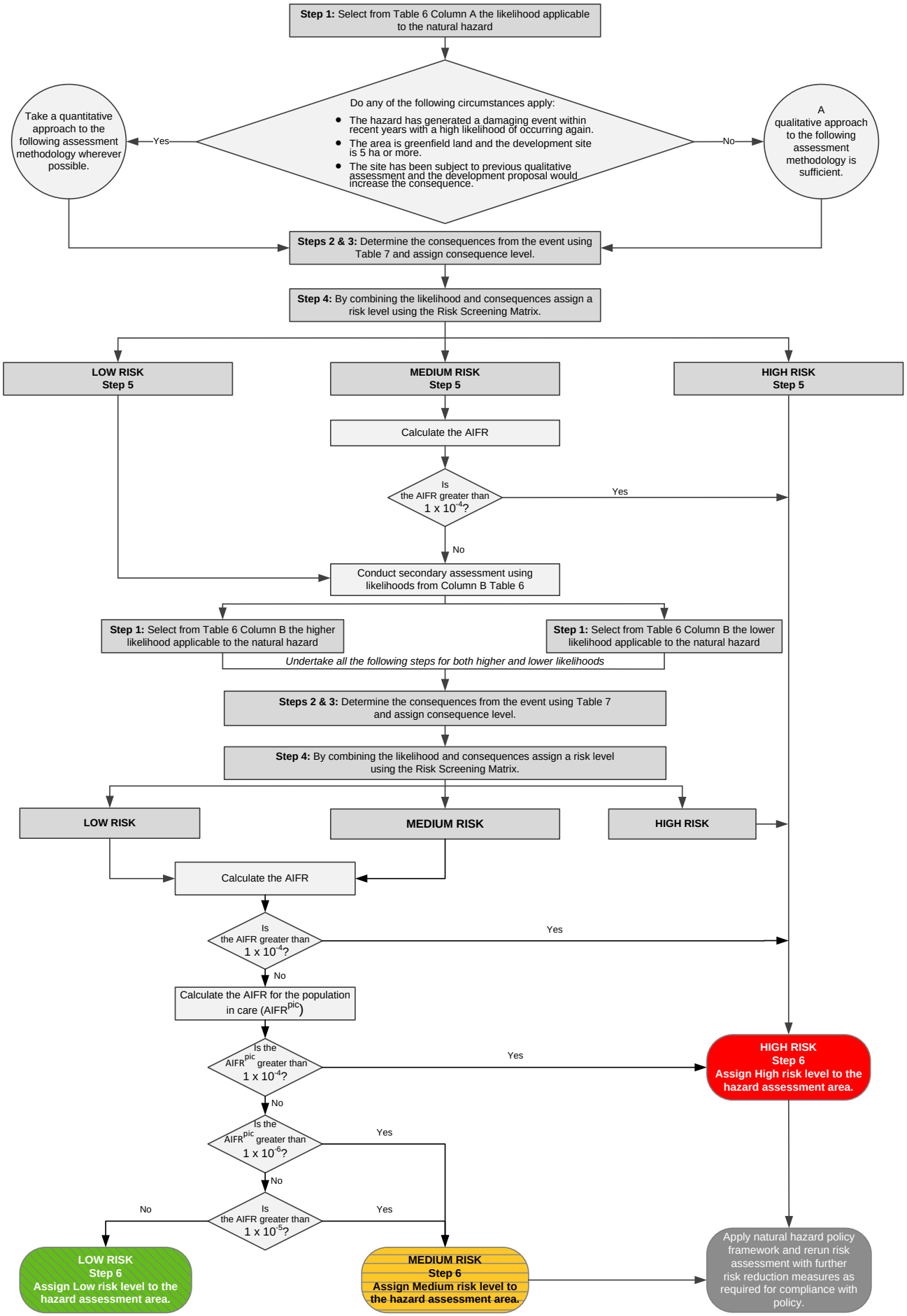


Figure 3 Appendix K Methodology for Risk Assessment Flow Chart.

Appendix L – Natural Hazards Risk Reduction Measures

The most appropriate solution to avoid or reduce natural hazard risk will likely be specific to the natural hazard and to the locality in which it occurs. However, there are various options available. The following list is not exclusive and included here for information purposes only.

(a) Ensuring new subdivision and development avoids specific hazard locations;

(b) Replacement or modification of existing development over time to reduce potential consequences.

(b1) Promoting the use of natural defences against coastal hazards and discouraging hard protection structures;

(c) Providing only for low intensity activities in specific locations;

(d) Setbacks and undeveloped buffer land within areas of new subdivision and development;

(e) Use of relocatable or recoverable structures;

(f) Restoration, retention or enhancement of natural defences against natural hazards (e.g. dunes and wetlands) as part of development proposals and promotion of the sustainable functioning of such natural defences to reduce the risk to existing development;

(g) Property-specific works (e.g. debris nets and slope stability works) as part of development proposals (excepting that community scale hard protection structures should be avoided in the coastal environment);

(h) Smart urban and building design (e.g. heights of building platforms, retention or reinstatement of stormwater overland flow paths, hazard resilient buildings and construction materials); and

(i) Ensuring new development anticipates possible hazard event emergencies and provides means to enable effective responses by people and communities including requiring:

  (i) Hazard warning systems; and/or

  (ii) Urban form and transport infrastructure (including for motor vehicles, cycles and pedestrians) that enables rapid and efficient evacuation; and/or

  (iii) Provision for, and safeguarding of, safe and accessible evacuation routes and zones (including, where appropriate, vertical evacuation zones).