

Land use planning for tsunami



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Introduction

- **Legislative responsibilities for hazard management**
- **Existing guidance**
- **Risk based planning**



Legislative context - five key statutes

- **Resource Management Act 1991 (RMA)**
- **Building Act 2004**
- **Civil Defence Emergency Management Act 2002 (CDEMA)**
- **Local Government Act 2002 (LGA)**
- **Local Government Official Information & Meetings Act 1987 – LIMS**

Similar purposes ...

Statue

Purpose

Resource Management
Act 1991

Promote the sustainable management of natural and physical resources ... managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety

Civil Defence Emergency
Management Act 2002

Improve and promote the sustainable management of hazards in a way that contributes to the social, economic, cultural, and environmental well-being and safety of the public and also to the protection of property

Building Act 2004

Buildings are designed, constructed, and able to be used in ways that promote sustainable development ... safeguard people from injury from critical fail

... Different definitions

Statue

Definition

Resource Management Act
1991

Any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire, or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment.

Civil Defence Emergency
Management Act 2002

Something that may cause, or contribute substantially to the cause of, an emergency.

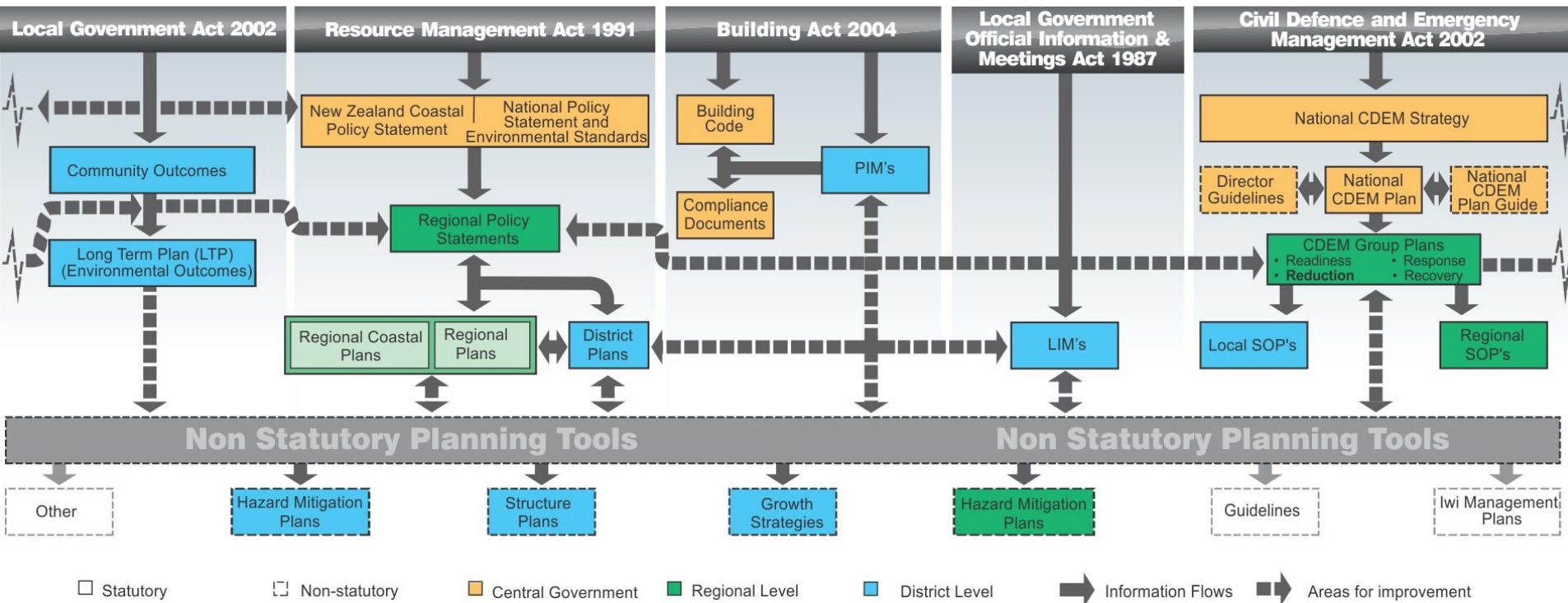
Building Act 2004

Erosion (including coastal erosion, bank erosion, and sheet erosion); falling debris (including soil, rock, snow, and ice); subsidence; inundation (including flooding, overland flow, storm surge, tidal effects, and ponding); and slippage.

Local Government Act 2002

As per RMA

Integrating natural hazard management



Sustainability vs resilience



- **RMA focus on sustainability**
- **CDEM focus on sustainability AND resilience**
 - Vision “Resilient New Zealand – communities understanding and managing their hazards”
 - Ability to withstand, recover from and thrive after a disaster
- **A resilient community is not necessarily a sustainable one**
- **A sustainable community should also be resilient**
- **Should the RMA include resilience?**

New Zealand Coastal Policy Statement

- **Tsunami specifically included**
- **Risk – not just hazard**
- **Cumulative effects of coastal hazards**
- **Definition**
 - Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence (AS/NZS ISO 31000:2009 Risk management – Principles and guidelines, November 2009).

Legislative requirements under the CDEM Act 2002 for managing hazards

- **To encourage and enable communities to achieve acceptable levels of risk including**
 - Identifying, assessing and managing risks
 - Consulting and communicating risk
 - Identifying and implementing cost-effective risk reduction
 - Monitor and review

What is reduction?

Reduction is:

“identifying and analysing the long-term risks to human life and property from natural or non-natural hazards; taking steps to eliminate these risks if practicable, and, if not, reducing the magnitude of their impact and the likelihood of their occurring”

(National CDEM Plan, 2005)

Risk reduction ... the role of the planner?

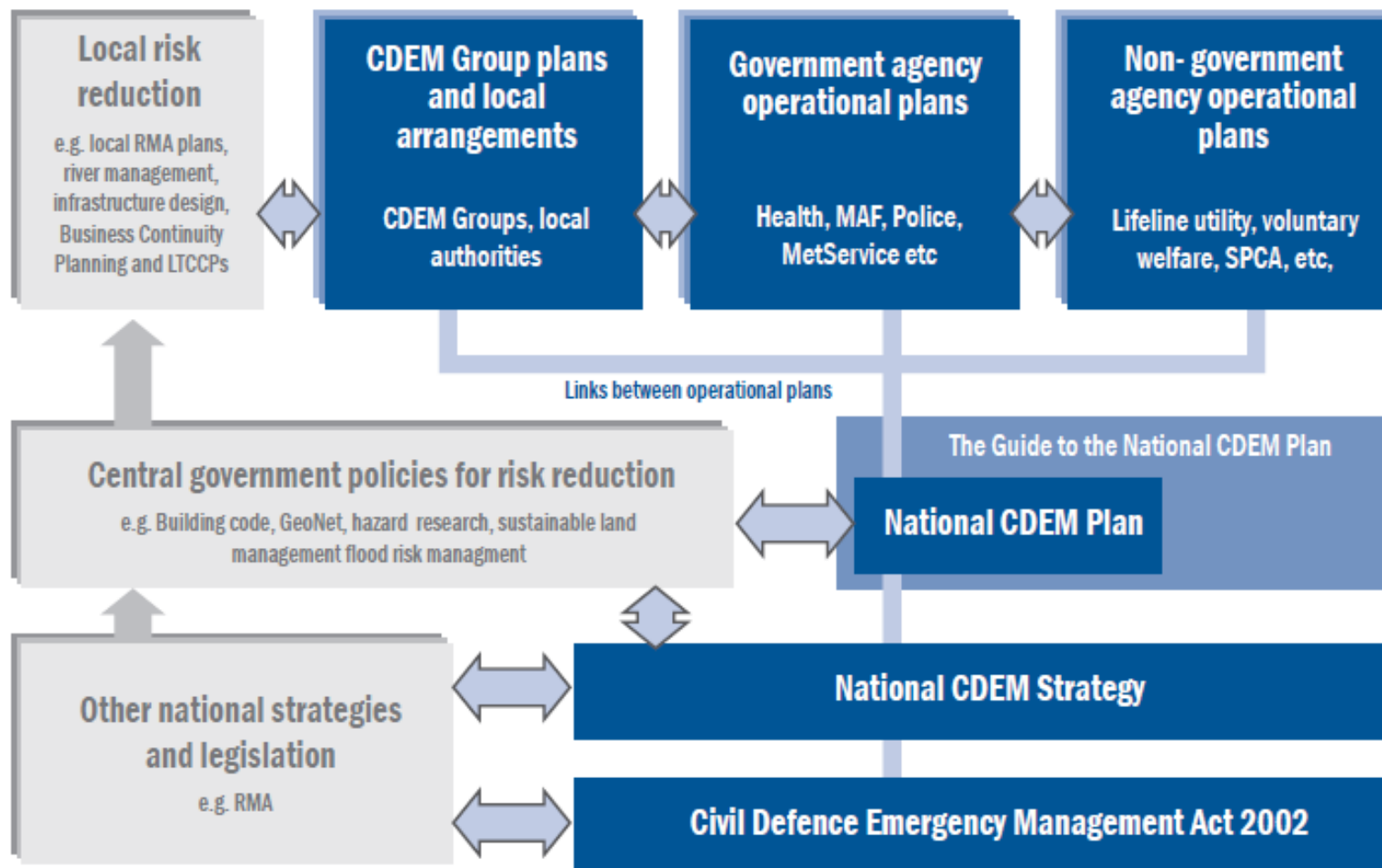


Figure 1.1: Linkage between national, regional and local operational plans and arrangements and risk reduction policies and programmes.

Interesting context

- **In a recent study:**
 - 7.2% of DPs & 25% of RPS's refer to CDEM Act.
 - 40% of council planning managers were unaware of CDEM plan risk reduction provisions
- **EQC:** *When the CDEM Act requirements were formulated it was expected that RMA land use planning would be one of the tools (possibly the main one) that would be used to deliver against the CDEM Group Plan priorities.*

RMA reforms: Six elements of reform package



Six elements of the proposed resource management system reform package (MFE, 2013, 33)

Natural Hazard Provisions – Part II Changes

- Combined s.6 and s.7
- Includes “the management of significant risks from natural hazards”
 - Introducing risk to the RMA
 - Elevating the consideration of natural hazards
 - Natural hazard risk would have to be considered as part of any RMA process
 - Natural hazard risks would have to be considered in appeals.
 - ‘Significant risk’ not defined

» Adding natural hazards to the principles of the RMA would lead to better consideration of natural hazards in planning and decision-making. «



AEE & effects

- (a) Any positive or adverse effect; and**
- (b) Any temporary or permanent effect; and**
- (c) Any past, present, or future effect; and**
- (d) Any cumulative effect which arises over time or in combination with other effects regardless of the scale, intensity, duration, or frequency of the effect, and also includes—**
- (e) Any potential effect of high probability; and**
- (f) Any potential effect of low probability which has a high potential impact.**

An introduction to risk-based land use planning



Risk-based land use planning
for natural hazard risk reduction

W.S.A. Saunders, J.G. Beban and M. Kilvington

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What is risk-based planning?

- Based on international risk management framework
- Consistency between governance, buildings, land use
- Decisions based on *risk* rather than hazard
- Risk = consequence x likelihood
- *Smarter* development NOT *no* development

Why risk-based planning?

- **Current approach resulting in an increase in risk**
- **RMA reforms**
 - Decision makers required to manage significant risks from natural hazards (s6)
- **NZCPS**
- **Christchurch**
- **“Acceptable level of risk”**
 - What is it?
 - How do you measure it?



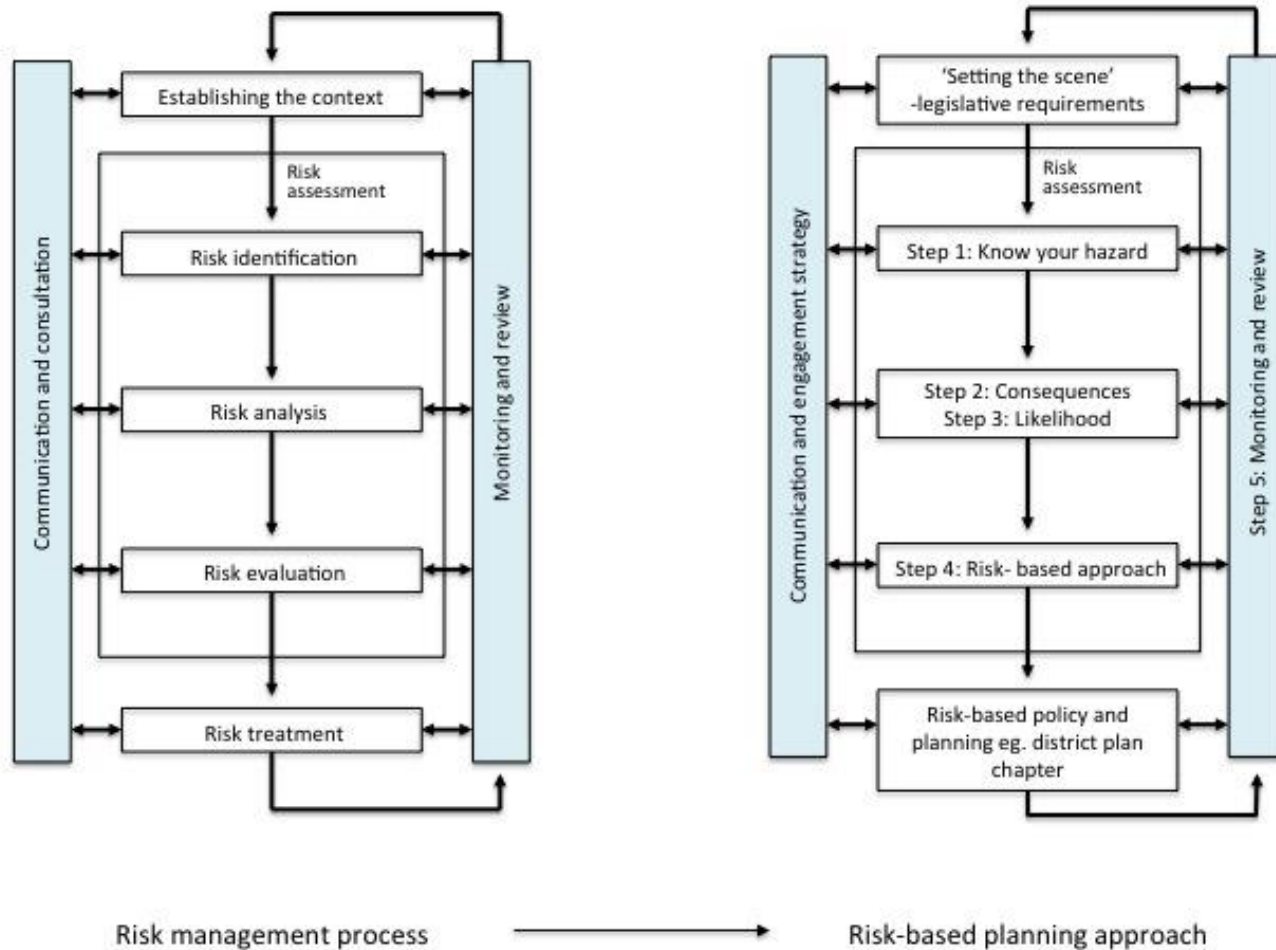
Why is it different from current practice?

- Focus on *risk* rather than *hazard*
- Consequence focused
 - Making meaning of likelihood
- Defines levels of risk based on well beings
- Encourages community engagement rather than consultation

The approach – a five step process

- 1. Know your hazard**
 - 2. Determine severity of consequences**
 - 3. Evaluate likelihood of event**
 - 4. Risk-based approach to policy and resource consents**
 - 5. Monitoring & Evaluation**
- Engagement strategy for each step**

Relationship to risk management process



Step 1: Know your hazard

- **Will inform policy, sets a baseline level of risk**
- **Tasks:**
 - Scope scale & timing of planning decision
 - Identify team & resources needed
 - Review available hazard information, identify gaps, uncertainties and assumptions
 - Assess complexity of hazard/risk situation
 - Information management

Step 2: Determine consequences

Severity of Impact	Built				Economic	Health & Safety
	Social/Cultural	Buildings	Critical Buildings	Lifelines		
Catastrophic (V)	≥25% of buildings of social/cultural significance within hazard zone have functionality compromised	≥50% of affected buildings within hazard zone have functionality compromised	≥25% of critical facilities within hazard zone have functionality compromised	Out of service for > 1 month (affecting ≥20% of the town/city population) OR suburbs out of service for > 6 months (affecting < 20% of the town/city population)	> 10% of regional GDP	> 101 dead and/or > 1001 inj.
Major (IV)	11-24% of buildings of social/cultural significance within hazard zone have functionality compromised	21-49% of buildings within hazard zone have functionality compromised	11-24% of buildings within hazard zone have functionality compromised	Out of service for 1 week – 1 month (affecting ≥20% of the town/city population) OR suburbs out of service for 6 weeks – 6 months (affecting < 20% of the town/city population people)	1-9.99% of regional GDP	11 – 100 dead and/or 101 – 1000 injured
Moderate (III)	6-10% of buildings of social/cultural significance within hazard zone have functionality compromised	11-20% of buildings within hazard zone have functionality compromised	6-10% of buildings within hazard zone have functionality compromised	Out of service for 1 day to 1 week (affecting ≥20% of the town/city population people) OR suburbs out of service for 1 week to 6 weeks (affecting < 20% of the town/city population)	0.1-0.99% of regional GDP	2 – 10 dead and/or 11 – 100 injured
Minor (II)	1-5% of buildings of social/cultural significance within hazard zone have functionality compromised	2-10% of buildings within hazard zone have functionality compromised	1-5% of buildings within hazard zone have functionality compromised	Out of service for 2 hours to 1 day (affecting ≥20% of the town/city population) OR suburbs out of service for 1 day to 1 week (affecting < 20% of the town/city population)	0.01-0.09 % of regional GDP	<= 1 dead and/or 1 – 10 injured
Insignificant (I)	No buildings of social/cultural significance within hazard zone have functionality compromised	< 1% of affected buildings within hazard zone have functionality compromised	No damage within hazard zone, fully functional	Out of service for up to 2 hours (affecting ≥20% of the town/city population) OR suburbs out of service for up to 1 day (affecting < 20% of the town/city population)	<0.01% of regional GDP	No dead No injured

Step 3: Evaluate likelihood

Level	Descriptor	Description	Indicative frequency
5	Likely	The event may occur several times in your lifetime	Up to once every 50 years
4	Possible	The event might occur once in your lifetime	Once every 51 – 100 years
3	Unlikely	The event does occur somewhere from time to time	Once every 101 - 1000 years
2	Rare	Possible but not expected to occur except in exceptional circumstances	Once every 1001 – 2,500 years
1	Very rare	Conceivable but highly unlikely to occur	2,501 years plus

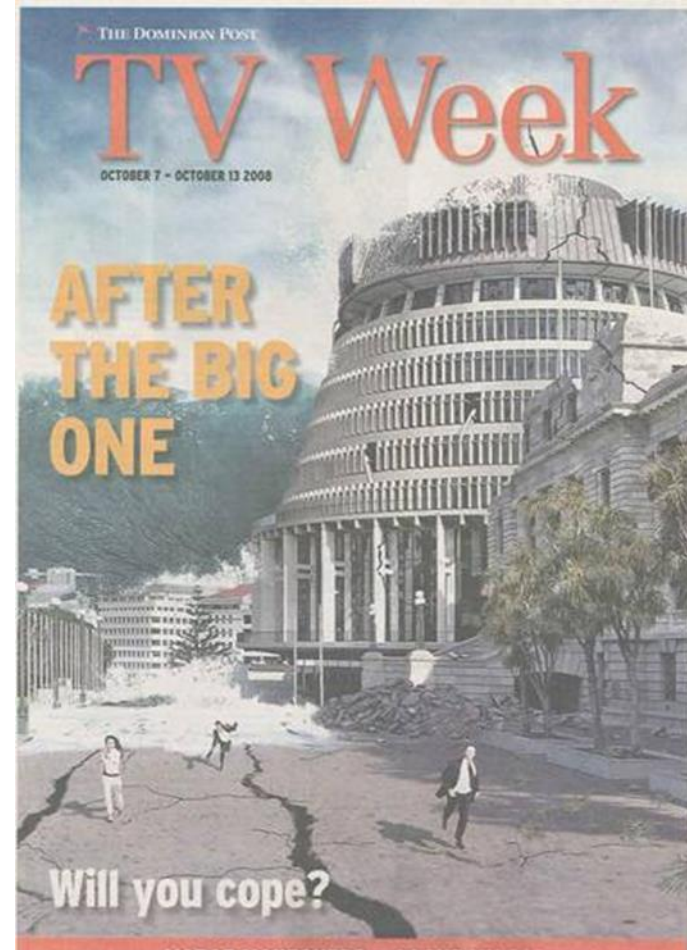
Step 4: Determining levels of risk

	Consequences				
Likelihood	1	2	3	4	5
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

Risk	Level of risk	Consent
1-4	Acceptable	Permitted
5-9	Acceptable	Controlled
10-14	Tolerable	Restricted Discretionary
15-19	Tolerable	Discretionary
20-25	Intolerable	Non complying, prohibited

Step 5: Monitor & review

- **Evaluate risk reduction effectiveness**
 - Policies
 - Consents
- **Evaluate acceptance of control options, residual risks & long term outcomes**



Toolbox available



Home / RBP / Risk based planning / A toolbox

Risk based planning

A toolbox

Project background
Setting the Scene
Risk-based planning
approach and steps
Examples
Assumptions,
limitations and
uncertainties
Site map
Feedback

A toolbox for risk based land use planning for natural hazards

This toolbox aims to support risk-based land use policy and plan development in local government. It offers a new approach where consequences of natural hazard events are the focus. It presents techniques, practice steps and options for enabling local government to review multiple natural hazard risks, both within councils and with external stakeholders.

The toolbox is presented in three key themes:

- setting the scene for why this approach is important;
- the five step risk based approach for natural hazards and;
- examples of implementation.

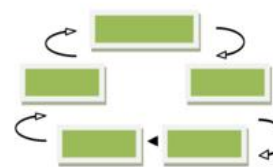
This toolbox is offered as a resource and guide, and is not intended as a prescription or as an off-the-shelf solution to successful management of natural hazards.

Setting the Scene



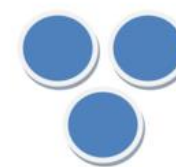
Why this approach is important, general information and principles of engagement

Risk based approach



Steps and actions of each phase of the approach

Examples



Implementation examples

- [Site Index](#) – a full index of the guide
- [What this toolbox does and does not do](#) – the limitations and assumptions of the approach
- Full report can be downloaded here - [MS67_Riskbased_planning_report.pdf](#) 3.32 MB
- [About the project](#) – background to the project and developers
- [Feedback](#) – this toolbox will continue to evolve, so let us know what you think, or your experience of using the toolbox

<http://www.gns.cri.nz/Home/RBP/Risk-based-planning/A-toolbox>

Options for land use planning

- Protection of evacuation routes
- Critical facilities, schools etc
- Greenfield vs brownfield development
- TCDC, CC RDP, BOP
- Avoidance zones ... other coastal hazards, climate change

Guidance available

- Risk based land use planning (GNS, 2013)
- Defining coastal hazard zones for setback lines (NIWA, 2011)
- New Zealand's Next Top Model (GNS, 2011)
- Coastal hazards & climate change (NIWA, 2008)
- Managed retreat from coastal hazards: options for implementation (EW, 2006)
- Seven principles for planning and designing for tsunami (US, 2001)

QUESTION 1

Is there a risk of tsunami?
(Institutional commitment required to fund research)

STEP 1

Tsunami inundation modelling required
(Four levels available)

STEP 2

Risk assessment of modelling
outcomes (Consequences: social,
economic, environmental, health &
safety, infrastructure etc.)

QUESTION 2

No planning or
CDEM actions
required

YES

Is the risk acceptable?

NO

QUESTION 3

Not recommended,
data not adequate for
CDEM or land use
planning

Level 1

**What level of modelling
was used in STEP 1?**

Level 2

Level 3 - Level 4

LIMS

CDEM evacuation
planning, warning
systems, recovery
planning, public
awareness & education

RMA
Include in planning:
• uncertainties mapped
• objectives, policies,
consent restrictions
• risk-based approach

Pre-event
recovery planning
for land use

Riskscape



- **Joint venture between GNS Science & NIWA**
- **Tool for analysing risks & impacts from hazards**
 - damage and replacement costs, casualties, economic losses, infrastructure and business disruption, number of people affected
 - Earthquakes, flooding (river), tsunami, volcanic ashfall, windstorm
- **<https://riskcape.niwa.co.nz/>**

Issues / Challenges / Opportunities

- Hazard versus risk
- Risk to what? Whom?
- Tsunami – a RMA or CDEM issue?
- RMA reforms – are other changes or guidance needed?
- Multi hazard approach
- Politics ...
- Smarter development NOT no development