

Landslide hazard matrix

overview and controls

agenda items 4 & 5

Agenda item 4 – the hazard matrix

Process for filling out the matrix:

1. Principles
2. Consequence –the future exposure
3. Overview of the matrix tools
4. A method to visualise the types on intervention
5. The Hazard matrix

Agenda item 4 – the hazard matrix

PRINCIPLES

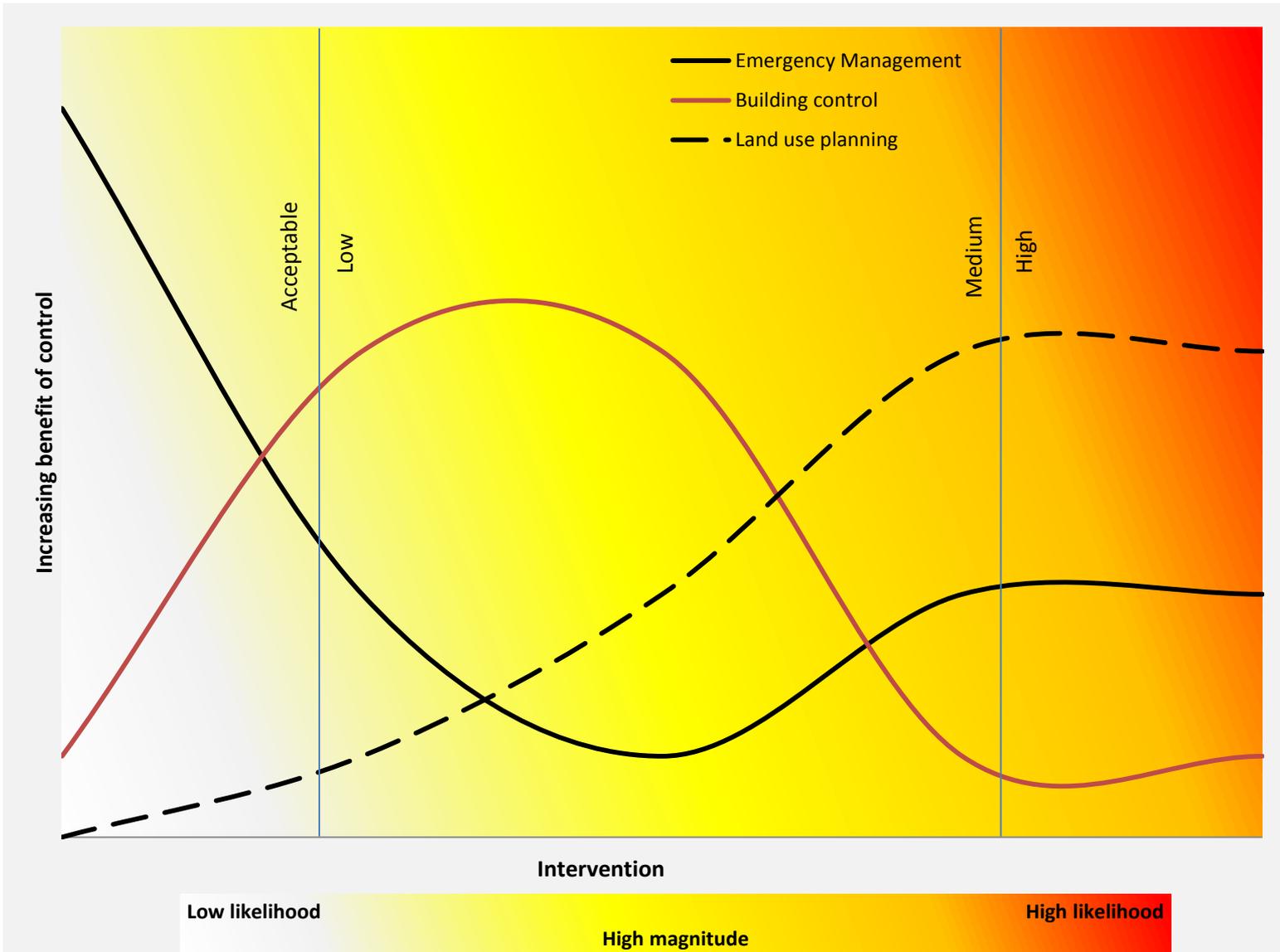
1. Private risks associated with natural hazards are the responsibility of individuals and business.
- 2. Governments should encourage public and private risks to be factored into investment decisions.**
3. Governments can support individuals to understand and manage private risks through the collection of evidence, provision of information, and facilitation of collective action.
- 4. Governments should ensure that private investment minimises unacceptable public risk.**
5. Governments should avoid investment, regulation, zoning, or policy that gives rise to unacceptable public or private risks.
- 6. Government should have regard to, and support individuals or business to consider how relevant risks may change in to the future, including through climate change.**

Agenda item 4 – the hazard matrix

HAZARD MATRIX

- **Hazard bands (likelihood):** regions where it is presumed that landslide hazard will exist at a relative high, medium, low or acceptable level, the hazard band criteria have been filled out for the purpose of this exercise;
- **Control level:** agreement to generalised statements regarding the presumed consequences associated with natural hazard bands;
- **Strategic planning level:** agreed measures that should be employed through the strategic planning stage to determine whether the benefits to the community of allowing consideration of development in certain areas subject or likely to be subject to a natural hazard, outweigh the costs to the community and individuals required to mitigate that natural hazard in the short-, medium- and long-term; and
- **Use or development controls:** agreed measures that should be imposed on use or development for the purpose of reducing risks in each hazard band. (Consequence based on the use and development)

Balancing the Private (principle 1) and Public (principle 4) Risk



Purpose of the bands (Guide p15)

Acceptable: it is presumed that the risk in the area is acceptable as either the natural hazard does not apply at all to the area, or with such low frequency as not to be considered as a matter that needs to be addressed. Normal building controls and emergency management responses are considered adequate to address any residual risk.

Low: the hazard occurs in the area but the frequency is low enough, or the magnitude when it does occur is low enough, that it might be experienced by a significant portion of the community without concern, or where there is reasonable expectation that a natural hazard may be present based on the characteristics of the land and our understanding of the hazard. Precautionary controls that are proportional to the importance of the use and development may be appropriate, including requirements for further site assessment or building standards.

Medium: our knowledge of the hazard demonstrates that the likelihood is such that when it does occur the impact could be regarded as significant. Mitigation measures should be required to discourage vulnerable and hazardous uses from being located in these areas, or impose discretionary planning control on the form of a use or development through assessment against performance standards.

High: the hazard is frequent or severe in that it creates the conditions not normally considered as being manageable or tolerable without exceptional measures to respond to the natural hazard. It is to be presumed that most use and development would be unacceptable in this area and any exceptional development would need to be considered on a case-by-case basis against rigorous tests and through demonstrating a need and community benefit for locating in the area.

Agenda item 4 - thresholds

Feature	Rank (Total columns)	Hazard Band ?	Reason
Landslip A areas	19	High	Legislative control
Landslides Activity known- multiple deep seated slides	1117		
Landslip B areas	1216		
Landslides Activity known	2512		
Shallow slide + flow susceptibility source high	3412		
Debris flow susceptibility Mountain source + runout >30 Q1	3412		
slope 25m and LiDAR > 42	4807		
Landslides Activity unknown	5104		
Debris flow susceptibility Mountain runout 30-26 Q2	5509		
Rockfall susceptibility source + runout area 1	6706		
Deep seated slide susceptibility	6904		
Shallow slide + flow susceptibility source moderate	7903		
slope 25m and LiDAR 14-42	9505		
Debris flow susceptibility Mountain runout 26-22 Q3	9505		
Debris flow susceptibility Mountain runout 22 - 12 Q4a	9703		
slope 25m and LiDAR 9-14	12403		
Rockfall susceptibility runout area 2	12403		
Debris flow susceptibility Mountain runout 12 - 5 Q4b	15103		
Shallow slide + flow susceptibility source low	17101		
Slope 25m and LiDAR 0-9	19000	Acceptable	



Define the thresholds

CONSEQUENCE – FUTURE EXPOSURE

BUILDING IMPORTANCE –AS/NZS 1170

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m ² Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: a) Where more than 300 people can congregate in one area b) Day care facilities with a capacity greater than 150 c) Primary school or secondary school facilities with a capacity greater than 250 d) Colleges or adult education facilities with a capacity greater than 500 e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities f) Airport terminals, principal railway stations with a capacity greater than 250 g) Correctional institutions h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m ² i) Public assembly buildings, theatres and cinemas of greater than 1000 m ² Emergency medical and other emergency facilities not designated as post-disaster Power-generating facilities, water treatment and waste water treatment facilities and other public utilities not designated as post-disaster Buildings and facilities not designated as post-disaster containing hazardous materials capable of causing hazardous conditions that do not extend beyond the property boundaries
4	Structures with special post-disaster functions	Buildings and facilities designated as essential facilities Buildings and facilities with special post-disaster function Medical emergency or surgical facilities Emergency service facilities such as fire, police stations and emergency vehicle garages Utilities or emergency supplies or installations required as backup for buildings and facilities of Importance Level 4 Designated emergency shelters, designated emergency centres and ancillary facilities Buildings and facilities containing hazardous materials capable of causing hazardous conditions that extend beyond the property boundaries
5	Special structures (outside the scope of this Standard—acceptable probability of failure to be determined by special study)	Structures that have special functions or whose failure poses catastrophic risk to a large area (e.g. 100 km ²) or a large number of people (e.g., 100 000). Major dams, extreme hazard facilities

CONSEQUENCE – FUTURE EXPOSURE

BUILDING IMPORTANCE – BUILDING CODE (2009) AND AS/NZS 1170

Importance level	Comment	Examples
	Structures presenting a low degree of hazard to	Structures with a total floor area of <30 m2 Farm buildings, isolated structures, towers in rural situations
Building importance level (Building Code 2009)	Building types	
1	Buildings or structures presenting a low degree of hazard to life and other property in the case of failure.	ment facilities to accommodate more
2	Buildings or structures not included in importance levels 1,2, or 3.	ted as post-disaster conditions that do not
3	Buildings or structures that are designed to contain a large number of people.	
4	Buildings or structures that are essential to post-disaster recovery or associated with hazardous facilities.	e property boundaries number of people (e.g.,
5	be determined by special study)	

CONSEQUENCE – FUTURE EXPOSURE

BUILDING IMPORTANCE – BUILDING CODE (2009) AND AS/NZS 1170

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PLANNING SCHEME TEMPLATE USES CLASSES

Bulky goods sales	use of land for the sale of heavy or bulky goods which require a large area for handling, storage and display. Examples include garden and landscape suppliers, rural suppliers, timber yards, trade suppliers, showrooms for furniture, electrical goods and floor coverings, and motor vehicle, boat or caravan sales.	motor vehicle, boat or caravan sales
Business and professional services	use of land for administration, clerical, technical, professional or similar activities. Examples include a bank, call centre, consulting room, funeral parlour, medical centre, office, post office, real estate agency, travel agency and veterinary centre.	funeral parlour medical centre office veterinary centre
Community meeting & entertainment	use of land for social, religious and cultural activities, entertainment and meetings. Examples include an art and craft centre, church, cinema, civic centre, function centre, library, museum, public art gallery, public hall and theatre.	art and craft centre cinema function centre museum public art gallery
Custodial facility	use of land, other than psychiatric facilities, for detaining or reforming persons committed by the courts or during judicial proceedings. Examples include a prison, remand centre and any other type of detention facility.	remand centre
Crematoria and cemeteries	use of land for the burial or cremation of human or animal remains, and if land is so used, the use includes a funeral chapel.	
Domestic animal breeding, boarding or training	use of land for breeding, boarding or training domestic animals. Examples include an animal pound, cattery and kennel.	animal pound
Educational and occasional care	use of land for educational or short-term care purposes. Examples include a childcare centre, day respite facility, employment training centre, kindergarten, primary school, secondary school and tertiary institution.	day respite facility employment training centre
Emergency services	use of land for police, fire, ambulance and other emergency services including storage and deployment of emergency vehicles and equipment. Examples include ambulance station, fire station and police station.	
Equipment and machinery sales and hire	use of land for displaying, selling, hiring or leasing plant, equipment or machinery, associated with, but not limited to, cargo-handling, construction, earth-moving, farming, industry and mining.	
Extractive industry	use of land for extracting or removing material from the ground, other than Resource development, and includes the treatment or processing of those materials by crushing, grinding, milling or screening on, or adjoining the land from which it is extracted. Examples include mining, quarrying, and sand mining.	
Food services	use of land for preparing or selling food or drink for consumption on or off the premises. Examples include a cafe, restaurant and take-away food premises.	take away food premises
General retail and hire	use of land for selling goods or services, or hiring goods. Examples include an adult sex product shop, amusement parlour, beauty salon, betting agency, commercial art gallery, department store, hairdresser, market, primary produce sales, shop, shop front dry cleaner, supermarket and video shop	adult sex product shop amusement parlour market primary produce sales video shop
Hospital services	use of land to provide health care (including preventative care, diagnosis, medical and surgical treatment, rehabilitation, psychiatric care and counselling) to persons admitted as inpatients. If the land is so used, the use includes the care or treatment of outpatients.	
Hotel industry	use of land to sell liquor for consumption on or off the premises. If the land is so used, the use may include accommodation, food for consumption on the premises, entertainment, dancing, amusement machines and gambling. Examples include a hotel, bar, bottle shop, nightclub and tavern.	
Manufacturing and processing	use of land for manufacturing, assembling or processing products other than Resource processing. Examples include boat building, brick making, cement works, furniture making, glass manufacturing, metal and wood fabrication, mineral	

HYBRID OF IMPORTANCE AND USE CLASS

Use and building category	Definition
Minor use or structures	- Fences, carports, garden sheds
Residential	Means residential uses or structures
Normal use or structure or not classified under other levels	Habitable use or development not classified in other parts of the table.
Vulnerable and hazardous facilities	means uses within the following use classes: <ul style="list-style-type: none"> - educational and occasional care, community meeting and entertainment, custodial facility, crematoria or cemeteries, recycling and waste disposal; or - residential involving day respite centre, residential aged care facility or retirement village; or - manufacturing and processing, research and development, and storage if involving hazardous materials in bulk.
post disaster functions	means uses within the emergency services and hospital services use classes.
catastrophic risk structures	means uses involving large dams, major electrical supply and facilities with a capacity for more than 5,000 people.

OUTCOMES FROM THE WORKSHOPS

Band	Workshop Statement on control level
Acceptable	<ul style="list-style-type: none"> • Development and use is not subject to landslide controls. • Development will be subject to normal building standards. • Emergency management will respond to any event.
Low	<p>The hazard should be treated primarily at the subdivision. General development controls could be used, as an example:</p> <ul style="list-style-type: none"> • Light weight construction, • No excavation below 1 metre, • Drainage design, or • Storm water is connected to the mains. <p>Should include 'acceptable' solutions that consider the form of the development, not if the development should occur.</p>
Medium	<ul style="list-style-type: none"> • A landslide risk assessment could be trigger, for most types of development. • Development envelopes within subdivisions should have a tolerable risk from landslide. • Small use and development including extensions (not including swimming pool) should not be a planning issue. But would require some development assessment.
High	<ul style="list-style-type: none"> • Ideally, identified high landslide hazard areas should not be zoned for residential or industrial uses. • Discourage development. • Require a landslide risk assessment.

Hazard band	Landslide Option 3	Control level (Consequence)	Strategic planning level	Use or development controls (Control)
Acceptable	Rare to almost incredible - a landslide is rare to almost incredible to occur in this area based on current understanding of the hazard, but it may occur in some circumstances. <u>Defined as:</u>	Development and use is not subject to landslide controls.	No impacts on land use strategies or change to zoning required.	No hazard specific controls. No controls are required to bring the development into an acceptable risk level.
Low	Possible to unlikely - this area has no known landslides, and has not been assessed by MRT regional (1:25000 scale) landslide susceptibility mapping, but may be prone to the hazard occurring. <u>Defined as:</u>	Planning controls may be necessary to reduce the risks associated with vulnerable and hazardous uses to ensure that risks are tolerable (as recommended by AGS). No non-construction requirements necessary for residential or minor use or development.	Where broader planning considerations support the development of the area, some use (particularly for vulnerable and hazardous uses) and development controls may be required to qualify the general planning regulations.	Minor use and development (Asset Class 1) (except swimming pools) are permitted. Residential use and development (Asset Class 2) generally permitted in planning regulations but may be subject to additional building controls. Vulnerable and hazardous use and development (Asset Class 3-5) and swimming pools will require a landslide risk assessment and hazard management plan prepared by a geotechnical practitioner with expertise in landslide risk management, to demonstrate that the development can achieve and maintain a tolerable level of risk (as recommended by AGS).

Hazard band	Landslide Option 3	Control level (Consequence)	Strategic planning level	Use or development controls (Control)
Medium	<p>Likely - the area has known landslide features, or is within an identified regional (1:25000 scale) landslide susceptibility zone, or has legislated controls to limit disturbance of adjacent unstable areas.</p> <p><u>Defined as:</u></p>	<p>Planning controls are necessary for all use and development to ensure that risks are tolerable (as recommended by AGS). Any vulnerable or hazardous use, including swimming pools, will only be allowed in exceptional circumstances.</p>	<p>Areas rated as medium should be considered in terms of other planning issues, and where there is no compelling reason for including these in areas earmarked for future development, they should be zoned for rural, open space or environmental purposes.</p> <p>In these circumstances, zoning should be applied which clearly acknowledges the natural hazard in the zone purpose statement.</p>	<p>Development in declared Landslip B areas is controlled under Part 10, Division 1 of the <i>Building Act 2000</i> and by Part 2, Division 1 of the <i>Building Regulations 2004</i>.</p> <p>Minor use and development (Asset Class 1) (except swimming pools) are permitted subject to a site assessment prepared by a geotechnical practitioner with expertise in landslide risk management.</p> <p>Residential and all vulnerable or hazardous use and development (Asset Class 2-4) can be considered on a site specific basis that justifies its location and is subject to a landslide risk assessment and hazard management plan prepared by a geotechnical practitioner with expertise in landslide risk management, demonstrating that a tolerable level of risk (as recommended by AGS) can be achieved and maintained.</p> <p>Asset Class 5 use and developments are generally prohibited; however, if there is an overriding community benefit an exceptional circumstance and performance based solution may be appropriate.</p>
High	<p>Almost certain - the site is within a declared Landslip A area, or there is a potential danger from a recently active or currently active landslide.</p> <p><u>Defined as:</u></p>	<p>All use and development would require significant investigation and an engineered solution to mitigate the natural hazard and enable the development to achieve and maintain a tolerable level of risk, however, the mitigation measures may never achieve comprehensive levels of security and safety..</p>	<p>Strategies should discourage all development except vital community infrastructure in these areas. Strategies must indicate appropriate zoning and overlays to provide a clear message to the public and the drafters of local government planning schemes to ensure use and development is generally prohibited except under special circumstances.</p>	<p>Minor use and development (Asset Class 1) (except swimming pools) are discretionary subject to a landslide risk assessment and a hazard management plan prepared by a geotechnical practitioner with expertise in landslide risk management, demonstrating that a tolerable level of risk (as recommended by AGS) can be achieved and maintained.</p> <p>Other use and development (Asset Classes 2-5) are generally prohibited however; if there is an overriding community benefit an exceptional circumstance and performance based solution may be appropriate.</p> <p>Most development is prohibited in declared Landslip A areas and is controlled under Part 10, Division 1 of the <i>Building Act 2000</i> and by Part 2, Division 1 of the <i>Building Regulations 2004</i>.</p>