THE UNIVERSITY OF MELBOURNE

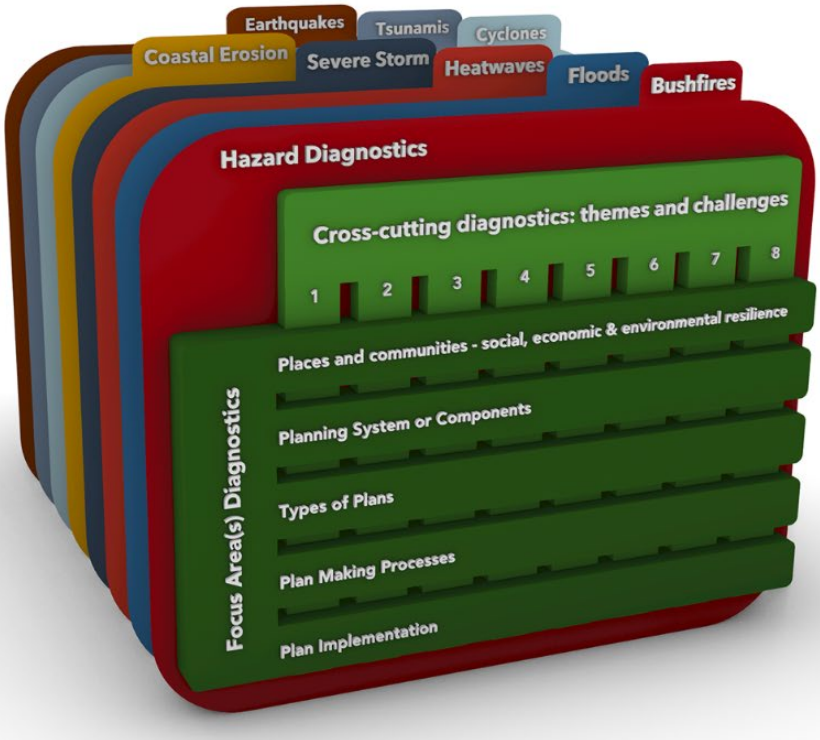
bushfire&natural HAZARDSCRC

bnhcrc.com.au

MULTI-HAZARD REVIEW OF THE COMPREHENSIVENESS OF VICTORIAN URBAN PLANNING FOR DISASTER RISK REDUCTION

Utilisation project final report

Alan March & Leonardo Nogueira de Moraes
University of Melbourne & the Bushfire and Natural Hazards CRC



Version	Release history	Date
1.0	Initial release of document	09/09/2021

Australian Government
Department of Industry, Science, Energy and Resources

AusIndustry
Cooperative Research Centres Program

Publisher:
Bushfire and Natural Hazards CRC

September 2021

Citation: March A & de Moraes L (2021) Multi-hazard review of the comprehensiveness of Victorian urban planning for disaster risk reduction, Bushfire and Natural Hazards CRC, Melbourne.

Cover: Diagnostic tools to assess urban planning and DRR integration by hazard. Source: Alan March

TABLE OF CONTENTS

ACKNOWLEDGMENTS

This project was undertaken with the assistance of utilisation funding provided by the Bushfire and Natural Hazards CRC.

EXECUTIVE SUMMARY

The research undertook a multi-hazard review of the comprehensiveness of Victorian urban planning for natural hazard disaster risk reduction. It compared ideal approaches and outcomes with current processes, treatments, and systems.

The project focussed on the Planning and Environment Act (1987) (The Act) and the Victoria Planning Provisions (VPPs), in parallel with key supporting documents and processes.

At a high level, the VPPs set out some strong underpinnings for action to address natural hazard risks. Certain hazards, notably Bushfire and Flood are dealt with quite comprehensively. However comprehensive integration into the VPPs across various hazards and treatments is incomplete. Key findings are as follows.

- Risk terminology is not consistently and comprehensively used in The Act and the VPP, including compliance with nationally agreed meanings and approaches.
- Risk is not acknowledged in The Act or sufficiently defined and quantified in the VPPs. This undermines decision making being undertaken on the basis of reasonable consideration.
- Strategic planning for risk is not mandatory, nor is it supported by a hierarchy of policy and decision criteria to guide regional and local planning, including scenario testing. What does exist is not applied consistently across all hazards or supported by explicit risk assessment criteria.
- The VPPs do not ensure comprehensive reduction of natural hazard risks across the broad range of potential PPRR disaster cycle actions, particularly including proactive prior actions, policies relating to recovery, and legacy risks in existing settlements.
- Objectives and decision criteria that make explicit the preference for classes of risk treatments in various circumstances are not integrated into the VPPs.
- The VPPs do not sufficiently assess or treat existing and likely community vulnerability.
- A range of hazard-specific actions need to be undertaken.
- An actions roadmap is required to comprehensively integrate disaster risk reduction into The Act, VPPs and associated provisions.
- Additionally, it is recommended that a Planning Practice Note be developed to address Integration of Disaster Risk Reduction across all relevant natural hazards as part of plan making and administration. This PPN should be frequently updated to reflect ongoing advances in the VPPs, broader regulatory contexts and the publication or update of relevant decision guidelines.

INTRODUCTION

The characteristics of the built environment are deeply connected with natural hazard risks. Built environments are now extensive and are the setting in which most human investment and activity occurs (Bartuska 2007; March and Gonzalez-Mathiesen 2020; Wamsler 2014). The built environment, for all its benefits and failings is human conceived and made - the result of human purposes, oriented to human needs - it embodies all its complexities, human values and wants. In parallel, it is dependent on and fundamentally connected with, processes in natural systems, including hazard events.

Amongst its other goals, one potential purpose of the built environment is to protect and mediate the wider environment's impacts, including an orientation to improved standards of living and health, aesthetics, comfort, general well-being, and protection from hazards. However, without due care and planning, built environments themselves can also be one of the biggest contributors to natural hazard risks.

With increased frequency of natural hazards due to climate change and increased exposure to hazards due to population growth pressures in Australia, there are also increased consequences for human settlements and likely exacerbation of the challenges associated with natural hazard impacts (Binskin et al. 2020).

Urban planning systems have considerable potential to manage the impacts of natural hazards upon the built environment, humans, and associated systems (March and Gonzalez-Mathiesen 2020). However, planning systems are complex, and seek many diverse goals across multiple systems that are not always well integrated, particularly between urban planning and emergency management. Accordingly, there is a need to reassess and undertake a wide review in terms of the Victorian planning system's comprehensiveness, integration, and procedural integrity across natural hazards to develop new directions for change and improvement.

The Bushfire and Natural Hazards CRC project *Integrating urban planning and natural hazard mitigation* developed a diagnostic toolkit that can be used to examine planning systems. This is broadly applied here to key aspects of the Victorian planning system to reveal strengths, weaknesses, and opportunities for improvement in terms of the integration of natural hazard emergency management, mitigation, and urban planning. This assessment can inform the development of more detailed projects and actions.

BACKGROUND

Over the last three decades, considerable national and international attention has focused on addressing disaster risk reduction as an effective way to minimise disruption to livelihoods, to protect life, environments, property, investment, and economies and to ensure that disaster response and recovery arrangements are not overwhelmed as a consequence of disaster events.

This logic is underpinned by a risk management rationale that acknowledges the need to assess and treat risks to keep them as low as reasonably possible (ALARP) and the urge to be prepared to respond to and recover from the potential consequences of residual risks in cases they materialise as disaster events.

Australia has been at the forefront of developing risk management standards with current *AS ISO 31000:2018 Risk Management–Principles and Guidelines* tracing its origin to *AS/NZS 4360:1995 Risk Management*. These standards have been formalised as the National Emergency Risk Assessment Guidelines–NERAG (2020), a Handbook in the AIDR collection. NERAG outlines emergency risk management principles, frameworks, and processes with a focus on risk assessment, which it defines as a cornerstone for the design, implementation, and monitoring of risk treatments–or processes to modify risk.

Critical to emergency management decision-making in Australia, risk management terminology and definitions play a significant role in how disaster risk reduction is understood, addressed, and acted upon. In that respect, the National Disaster Risk Reduction Framework

> *"recognises that disaster risk is a product of hazard (a sudden event or shock), exposure (the people and things in the path of potential hazards), vulnerability (the potential for those people and things to be adversely impacted by a hazard) and capacity (the ability for those people and assets and systems to survive and adapt)" (2018, p. 7).*

From a disaster/emergency management perspective, risk management should be integrated across different opportunities to act in relation to disaster events, namely, before, during and after disasters, or across disaster prevention, preparedness, response, and recovery–PPRR[1].

The critical role that land use planning can play in processes targeting disaster risk reduction has been historically highlighted in disaster event inquiries and reviews, there being a growing integration of natural-hazard focused controls in Victorian Planning Schemes over the years. However, despite considerable advances in addressing specific hazards, the challenges ahead are dynamic and many. Anthropogenic climate change adds a layer of complexity to this and calls for the consideration of multi-hazard approaches that can address the consequences of more frequent, intense, and interacting hazards and the wider acknowledgement of projected and emergent risks in the consideration of appropriate treatments.

[1] The AIDR Handbook on Australian Emergency Management Arrangements recognises PPRR as the four phases of the Australian approach to emergency management, acknowledging "some jurisdictions are redefining PPRR to the three phases of 'before', 'during' and 'after' the emergency" (2019, p. 5).

RESEARCH APPROACH

The method used in this multi-hazard review of the comprehensiveness of Victorian urban planning for disaster risk reduction was a qualitative policy analysis and risk assessment approach, utilising secondary quantitative methods as appropriate. The research compares actual processes, treatments and systems used to manage natural hazards against ideal approaches and outcomes. This is operationalised as a series of critical inquiries applied to the range of natural hazard risk situations where urban planning and other risk management approaches are being utilised or are planned. This allows for a critical review of urban planning and related systems that identifies shortcomings and opportunities for change.

RESEARCH STEPS

The following process guided the research enquiry:

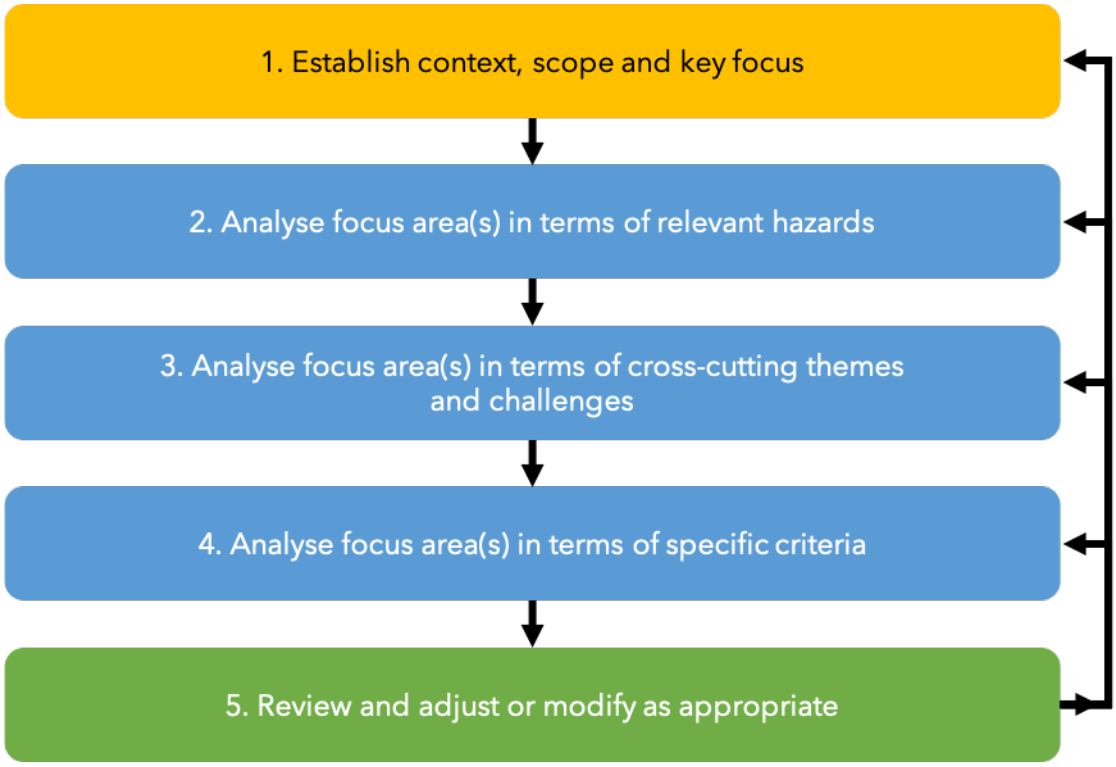


FIGURE 2. DIAGNOSTIC TOOLS TO ASSESS URBAN PLANNING AND DRR INTEGRATION BY HAZARD (ADAPTED FROM MARCH ET AL. 2020, P. 9).

CONTEXT: INTERNATIONAL, NATIONAL AND STATE NATURAL HAZARD AND DISASTER RISK REDUCTION POLICY

The diagnostics carried out as part of this review are framed by the consideration of a set of institutional frameworks, policies, plans, strategies, guidelines, standards, regulations, and legislation in currency both nationally and internationally but also at the Victorian State level in the domains of emergency management, disaster risk reduction, resilience, and environmental change. These include the Sendai Framework for Disaster Risk Reduction and the National Disaster Risk Reduction Framework, but also the National Emergency Risk Management Guidelines and the Victorian Marine and Coastal Act 2018, to

name a few. A comprehensive list of relevant documents providing context to this review is included in Appendix 1. While not exhaustive, the list provided the review with a broad coverage of formalised expressions of expected best practice that were used to interrogate current integration in the Victorian system.

SCOPE: VICTORIAN PLANNING AS ENACTED BY THE PLANNING & ENVIRONMENT ACT 1987 AND VICTORIA PLANNING PROVISIONS

The scope of this broad review is the Planning and Environment Act (1987) and the Victoria Planning Provisions, in parallel with key supporting documents and processes that operate in tandem with the planning system. The main elements of the aspects reviewed in this research are set out below.

Statutory Planning in Victoria is enacted through the Planning and Environment Act 1987 (The Act). The Act outlines the objectives, processes, rights, and responsibilities of planning in Victoria. It establishes the basis of key subsidiary legislation, particularly the Victoria Planning Provisions (VPPs) (Part 1A of the Act). Additionally, the Act sets out the mechanisms by which the VPPs are modified by state governments over time, adapted to local government jurisdictions in the role of Planning Authority (The Act: s12) as Planning Schemes, and periodically amended (The Act: Part 1, 2A & 3).

Victorian "plan making" might be summarised as: state government establishment of a suite of planning provisions; with local government adopting these as maps and texts according to local circumstance. This is undertaken under the supervision of the Minister for Planning and the state government planning agency–the Department of Land, Environment, Water and Planning–alongside Panels Victoria.

The process of preparing planning schemes runs in parallel with their administration by local governments in the statutory role of Responsible Authority (RA) (The Act: s13 & 14). The RA is charged with determining which category any activity and development might fall within:

1. No permit required;
2. Permit required; or
3. Prohibited.

If a permit is required, the RA is required to administer a process by which the proposed use or development is assessed for conformance against the tests and standards of the relevant planning scheme. For example, if a proposal for a dwelling is affected by the Bushfire Management Overlay, it must be assessed according to a series of tests specified by the Planning Scheme, mainly at Clause 53.02 Bushfire Planning. The issuing of a permit is done so under the proviso that due consideration has been given to the Planning Scheme–the permit may include conditions that specify any aspects of the proposed use and development seen as necessary to achieve the purposes of the Planning Scheme. This also raises the question of whether planning schemes include appropriate provisions to facilitate due consideration of natural hazard risks.

KEY FOCUS: ASSESSMENT OF DRR INTEGRATION IN PLANNING SCHEMES PLAN MAKING, AMENDMENT AND IMPLEMENTATION

This multi-hazard review is of the Planning and Environment Act 1987 and the Victoria Planning Provisions. It focuses on identifying whether and how disaster risk reduction is integrated in decision making processes pertaining to Victorian planning scheme plan-making, amendment and implementation through land use and development controls. Its scope is upon natural hazards that are relevant to Victoria.

DIAGNOSTIC TOOLS

The multi-hazard review examined the overall planning system in terms of focus area diagnostics, cross-cutting themes, and challenges, followed by hazard specific enquiries.

It utilised the set of critical frameworks for best practice resulting from the Bushfire and Natural Hazards CRC project *Integrating urban planning for natural hazard mitigation*, which is summarised in the figure below:

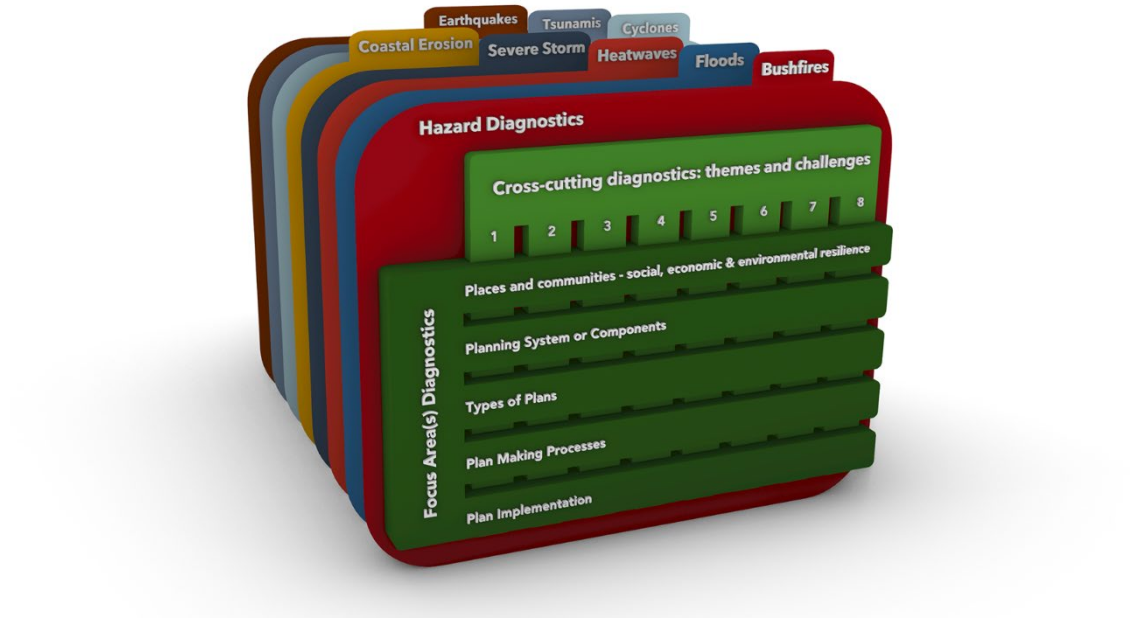


FIGURE 2. DIAGNOSTIC TOOLS TO ASSESS URBAN PLANNING AND DRR INTEGRATION BY HAZARD (MARCH ET AL. 2020, P. 8).

RESEARCH PROCEDURE

A series of iterative critical enquiries were made following the cross-cutting themes, focus diagnostics and relevant natural hazards. These are summarised below, with additional detail provided in Appendix 4.

FOCUSED DIAGNOSTICS

Places and Communities

Physical and functional outcomes in communities achieve the following risk treatment objectives as relevant to the particular hazard:

1. Avoidance of Exposure / Separation from Hazard
2. Reduction of Hazard
3. Reduction of Vulnerability to Hazard
4. Preparedness for, and Facilitation of Appropriate Response
5. Preparedness for, and Facilitation of Appropriate Recovery

The Planning Framework: the enabling regulatory system and its maintenance

- Legislation
- Policy
- Regulation
- Standards and Codes

CROSS-CUTTING DIAGNOSTICS

Q1 - Are potential risk treatments integrated and fully used across Prevention, Preparedness, Response and Recovery?
Q2 - Are the full spectrum of legacy, projected and emergent risks spatially considered on the basis of up-to-date hazard mapping and integrated spatial assessment?
Q3 - Are goals, objectives and other relevant guiding principles and terminology integrated across relevant systems?
Q4 – Are relevant legislative, regulatory, policy and planning provisions integrated across systems?
Q5 – Are relevant local, cultural, social, economic, and ecological matters acknowledged and taken into account?
Q6 – Are relevant processes integrated across relevant systems – vertically and horizontally?
Q7 – Are all relevant stakeholders represented in key processes and activities?

BOX 1. FOCUSED AND CROSS-CUTTING DIAGNOSTICS (MARCH ET AL. 2020).

The multi-hazard review presented here is based on the set of natural hazards targeted by the Bushfire and Natural Hazards CRC[2] for which there are Victorian Emergency Management or Response Plans/Sub-Plans[3]. That includes bushfires, floods, extreme heat, earthquakes, storms, tsunamis, and coastal erosion[4].

Word frequency searches were conducted in each natural hazard plan/sub-plan to identify key terms that are specific to each hazard. The resulting hazard-specific lists of key terms[5] were then used for the preliminary identification of hazard-relevant sections of the Planning and Environment Act 1987–P&E Act 1987, the Planning and Environment Regulations 2015–P&E Regs 2015, the

[2] Bushfires, floods, heatwaves, severe storm, coastal erosion, cyclones, tsunamis, and earthquakes.
[3] See Appendix 2.
[4] Despite no specific plan to respond to coastal erosion emergency events, this is addressed partly in the State Landslide Hazard Plan. Longer-term management of coastal erosion is addressed in the Victoria's Climate Change Adaptation Plan, Victorian Coastal Strategy and Coastal Management Plans.
[5] See Appendix 3.

Victoria Planning Provisions–VPPs), Ministerial Directions–MDs[6] from the Minister for Planning, Planning Practice Notes–PPNs[7] and Planning Advisory Notes–PANs[8]. These were considered the core sets of data within the scope of this review[9].

To help identify relevant sections of this core set of data targeting multi-hazards or all hazards, additional key terms were also compiled through the analysis of documents providing the international, national, and state contexts in which resilience, disaster risk reduction, emergency management and environmental change are addressed. These documents were considered the contextual set of data supporting the review of the core set[10].

To ensure wide coverage of relevant sections, this key term-focused approach was triangulated with hazard and risk-focused functional policy assessment of core documents–based on the function of their specific sections and their interdependence (e.g., definitions of key terms, policy objectives, strategies and mechanisms for their implementation and conditions, performance tests and measures as well as exemptions and alternative measures).

This triangulation was complemented by the analysis of hazard-relevant PPNs and PANs and the subsequent mapping of their references to specific VPPs clauses and decision-making supporting documents such as guidelines produced by DELWP and referral authorities[11]. Analysis of clauses identified as hazard-relevant then allowed mapping of references to external documents within the VPPs, revealing those which are defined as incorporated and background documents to specific policies as well as legislative instruments other than the Planning and Environment Act 1987, which apply to planning decision-making related to specific matters such as water, building, coasts, etc. This mapping revealed the complexity and nuances of the regulatory system involved with integrating disaster risk reduction and planning in Victoria highlighting the different statutory weights given to specific instruments depending on their nature and mode of integration.

Based on this triangulation, specific content in P&E Act 1987 and the VPPs were coded as relevant to each and all hazards in this review, as well as to specific

[6] "The Minister for Planning issues directions to planning authorities about the preparation of planning schemes and amendments to planning schemes. […] Planning authorities must consider all Ministerial directions when preparing a planning scheme or an amendment to a planning scheme" (https://www.planning.vic.gov.au/guide-home/the-role-of-the-minister).

[7] "Planning practice notes provide ongoing advice about the operation of the Victoria Planning Provisions (VPP) and planning schemes as well as a range of planning processes and topics. They may be updated from time to time" (https://www.planning.vic.gov.au/resource-library/planning-practice-notes).

[8] "Planning Advisory notes provide point-in-time information about new initiatives, and changes to specific Victoria Planning Provisions and planning scheme provisions, processes and subjects. Advisory notes are not updated. This page provides a listing of all currently available Planning Advisory Notes. Information in an advisory note should be read and understood in context with the specific planning initiative being implemented, only providing relevant information at the date of the advisory note" (https://www.planning.vic.gov.au/resource-library/planning-advisory-notes).

[9] A full list of these documents can be found in Appendix 4.

[10] A list of these documents can be found in Appendix 1.

[11] An example of these mappings can be found in Appendix 5.

categories of analysis such as Prevention, Preparedness, Response and Recovery and the five approaches to treatments of risk (Avoidance of Exposure, Reduction of Hazard or Exposure to It, Reduction of Vulnerability or Exposure to Hazard, Preparedness for Response and Preparedness for Recovery). Qualitative analysis of the coded material allowed the present review to answer the eight questions comprised in the cross-cutting diagnostics presented earlier. These answers were summarised as key findings and then translated as a set of ten recommendations – nine of which crosscut all hazards and one which is broken-down into hazard specific considerations.

DISCUSSION PAPER – OVERALL FINDINGS

The findings below have been arranged thematically to focus attention on potential actions and change. These themes emerged from a comprehensive review of the Planning and Environment Act (1987), the Victoria Planning Provisions, and other associated policies and regulations.

TERMINOLOGY CONSISTENCY AND COMPREHENSIVENESS

Planning systems rely upon clarity of meaning and focused use of regulation and discretionary decision making to guide settlements and change towards goals. This is often challenged by the sheer scale and multitude of planning instruments, ongoing changes over time, and potentially conflicting aspects of objectives. The primary planning instruments studied in this research, the Planning and Environment Act (1987) and Victoria Planning Provisions, are documents that set out a hierarchy of Purposes, Objectives, and a range of State, Local and other policy, as well as sets of other provisions and definitions.

Key terms that relate to Risk and Natural Hazards (the focus of this research) are used inconsistently, substituted with less appropriate terms, are unclear or absent from key aspects of the Victorian planning system.

The purpose of the Planning and Environment Act 1987 "is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians" (s1). In Part 2—Planning Schemes, the Act outlines that planning schemes

> *may […] regulate or prohibit any use or development in hazardous areas or in areas which are likely to become hazardous" – 6 (2) (e).*

Terms like protect(ion) and safe(ty) are front and centre in the Act, when it outlines the objectives of planning in Victoria (Part 1, Section 4, Paragraph 1), which include:

> *(b) to provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity;*
>
> *(c) to secure a pleasant, efficient, and safe working, living and recreational environment for all Victorians and visitors to Victoria; […]*
>
> *(e) to protect public utilities and other assets and enable the orderly provision and co-ordination of public utilities and other facilities for the benefit of the community.*

Problematically, the terms *safe* and *protection/ protect* are not well defined and are not usually considered part of established risk management and natural hazard risk reduction approaches. Further, the term *Hazard* is used inconsistently in the VPPs, which also do not provide definitions of key risk reduction terms such as *Risk, Hazard, Exposure, Vulnerability* and so forth as defined in the recognised National Emergency Risk Assessment Guide 2020.

One example of inconsistent use of the term Hazard is in the general criteria of Clause 65.01 Approval of an Application or Plan:

> *Before deciding on an application or approval of a plan, the responsible authority must consider, as appropriate:*
>
> …
>
> *The degree of flood, erosion or fire hazard associated with the location of the land and the use, development, or management of the land so as to minimise any such hazard.*

This phrasing and uses of the term hazard are ambiguous and appear to conflate or use interchangeably many key terms. This does not accord with NERAG 2020 meanings of Risk, Hazard, Treatment and Vulnerability (Australian Institute for Disaster Resilience 2020). It is suggested that inconsistent uses of terminology such as this significantly reduce opportunities to effectively manage risk. Many other key terms are absent altogether or implied weakly such as residual risk, response, preparedness, mitigation.

Recommendation 1:

Risk terminology be consistently and comprehensively used in the Planning and Environment Act (1987) and the Victoria Planning Provisions, including compliance with nationally agreed meanings and approaches.

DEPLOYING RISK REDUCTION AS A FUNDAMENTAL OBJECTIVE

Urban planning systems are challenged with resolving multiple, often competing, priorities and objectives. Following from the commentary above, the Planning and Environment Act (1987) provides some overarching directions regarding use and development in hazardous areas. However, it does not include mandatory requirements, tests or standards regarding consideration or treatment of natural hazard risks.

The VPPs *do* however establish some important starting points for the management of risk. Clause 13 Environmental Risks and Amenity states:

> *Planning should strengthen the resilience and safety of communities by adopting a best practice environmental management and risk management approach.*
>
> *Planning should aim to avoid or minimise natural and human-made environmental hazards, environmental degradation, and amenity conflicts.*
>
> *Planning should identify and manage the potential for the environment and environmental changes to impact on the economic, environmental or social wellbeing of society.*
>
> *Planning should ensure development and risk mitigation does not detrimentally interfere with important natural processes.*
>
> *Planning should prepare for and respond to the impacts of climate change.*

Many references to risk are made throughout the planning scheme, notably regarding bushfire and flood. In the 3rd of June 2021 version of the VPPs, the term

risk appears 134 times, and it is variously used to require or encourage avoidance, minimisation, management, identification, consideration, and other matters. However, the term *risk* is undefined and non-quantified in the VPPs, there being no reference to the *AS ISO 31000:2018 Risk Management – Guidelines* definition and notes[12] (which are the basis for NERAG 2020), although treatments of risks associated with some hazards are notionally based upon particular assumptions, inferred, or assumed assessments of acceptable risk.

In the VPPs, some "risks" are prioritised over others, even while they are not quantified. For example, Clause 13.02-1S on Bushfire Planning states as its objective:

> *To strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life.*

This is further supported at Clause 71.02-3 Integrated Decision Making, where it is stipulated that (emphasis added):

> *Planning and responsible authorities should endeavour to integrate the range of planning policies relevant to the issues to be determined and balance conflicting objectives in favour of net community benefit and sustainable development for the benefit of present and future generations. However, in bushfire affected areas, planning and responsible authorities must prioritise the protection of human life over all other policy considerations.*

While the attention to Bushfire risk reduction is ostensibly positive, it raises three main concerns that extend beyond Bushfire to all hazards:

1. Is it appropriate to or even possible to prioritise bushfire risks above all other hazards and other concerns?
2. Are there other hazards that are deserving of "priority", given that currently only bushfire has this treatment?
3. Would setting an acceptable level of residual natural hazard risk be more appropriate, so that a considered appraisal of various goals and consequences be arrived at, including across various hazards.

Recommendation 2:

Risk is acknowledged in the Planning and Environment Act (1987) and defined and quantified in the VPPs so that decisions can be undertaken on the basis of reasonable consideration.

[12] AS ISO 31000:2018 defines risk as "the effect of uncertainty on objectives" and notes that:

- "An effect is a deviation from the expected. It can be positive, negative or both, and can address, create or result in opportunities and threats.
- Objectives can have different aspects and categories, and can be applied at different levels.
- Risk is usually expressed in terms of risk sources[…], potential events […], their consequences […] and their likelihood […].

MAXIMISING THE POTENTIAL OF STRATEGIC PLANNING

Strategic planning is a process whereby a series of contingent actions are taken sequentially in such a way that goals are achieved in the context of changing and sometimes challenging circumstances (Hopkins 2001). Strategic action is commonly understood as the actions undertaken by higher level agencies or functionalities, and this is often true. However, it is more correctly the processes by which long term goals are achieved through adjustment and change over time to integrate and coordinate actions, achieving outcomes that could not be achieved otherwise. This is usually a combination of planning instruments, data, agencies, and actors working together effectively, often as a result of changing routine processes as circumstances change.

In Victoria, strategic planning is often taken to be the process of scheme amendments, where zones and overlays are modified over time in a given planning scheme, or in the VPPs themselves (Rowley 2017). It is also understood to be the process of regional planning, and indeed the processes of policy formulation and direction undertaken by state government in directing government growth, change and investment over time (Eccles and Bryant 2006).

The Victorian planning system generally relies upon strategic direction being managed through ongoing changes to the VPPs by the state government planning agency of the day. In combination, it also relies on policy within the VPPs providing sufficient guidance to planning panels and other agencies. These include referral authorities, the Victorian Planning Authority, and local governments themselves as part of decision-making processes.

We posit here that in disaster risk reduction terms, strategic action by urban planning agencies is the process by which change is managed over time to manage risk to a level considered acceptable to the community. It encompasses the ways that actions across multiple agencies are coordinated by and with the planning system. It also includes improving the ways that rules, regulations, and processes are managed and improved over time, including the ways that changes to zones and overlays occur in planning schemes, particularly as urban areas expand and change in Australia (March and Kornakova 2017).

The VPPs and associated processes, Ministerial Directions, Planning Practice Notes and Planning Advisory Notes are variable in terms of the level of direction provided for risk management during strategic processes, specifically regarding scheme amendments. Bushfire and flood are dealt with quite comprehensively at state policy level in a way that can guide scheme amendments, although bushfire much more comprehensive in terms of subdivision and indeed subdivision design. Considerable guidance is provided in applying the Flood Provisions in Planning Schemes in DELWP's Planning Practice Note 12 - PPN12.

Key findings into maximising the potential of strategic planning are as follows:

- Guidance for strategic change management relating to natural hazards is varied across hazards in the VPPs (including in the Particular, General and Operational Provisions) and associated guidance documents including Technical Guides and Practice Notes, and indeed in extraordinary processes or those conducted by other agencies such as

the Victorian Planning Authority, or Development Boards such as Docklands Authority (now Development Victoria).

- The role of other non-planning agencies is often unclear in strategic processes, particularly in instances where strategic direction decisions rely upon provision of up-to-date data and interpretation of that data. An over-reliance on referral processes that can occur too late in the overall process of planning scheme amendments impedes forward planning. For example, flood mapping and modelling is undertaken in inconsistent ways across different municipalities, by different parties and using different methods.
- Scenario testing of planning operations for change management is not routinely undertaken to assess risks and impacts across different time scales.

There is a need for data management tools and dashboards to be made available to local government to assist decision-making as a reliable and consistent source of information.

Recommendation 3:

Strategic planning for risk be required as mandatory, supported by a hierarchy of policy and decision criteria to guide regional and local planning, including scenario testing, applied consistently across all hazards, and supported by explicit risk assessment criteria.

PRIORITIES ACROSS THE DISASTER CYCLE

The disaster cycle is a shorthand description of the phases through which disasters occur. While sometimes contested and criticised for being overly simplistic, it provides a useful starting point for critical review of actions. A general description typically follows the stages of prevention, preparedness, response, and recovery (AIDR 2019).

In the Victorian planning system, risk treatments are strongly oriented to the prevention phase, emphasising the value of avoiding or significantly reducing risks in the first instance, rather than relying excessively on response and recovery. Table 1 illustrates the translation of PPRR principles into Urban Planning Risk Treatment Approaches.

Prevention			Preparedness for Response	Preparedness for Recovery
Avoidance of exposure	Reduction of hazard or exposure to it	Reduction of Vulnerability or exposure to hazard	Preparedness for and Facilitation of Appropriate Response	Preparedness for and Facilitation of Appropriate Recovery

TABLE 1. TRANSLATION OF PPRR PRINCIPLES TO URBAN PLANNING TREATMENTS CONTEXT

Closer analysis of the Planning and Environment Act (1987) and Victoria Planning provisions indicates a general emphasis upon certain parts of the disaster cycle. Further, this emphasis is skewed to particular hazards, as shown in Table 2 below:

	Prevention	Preparedness	Response	Recovery
Bushfire				
Coastal Erosion				
Earthquake				
Flood				
Heatwave				
Landslip				
Storm				
Tsunami				

Legend

Considerable	
Reasonable	
Low/No Emphasis	

TABLE 2. PLANNING AND ENVIRONMENT ACT 1987 AND VPPS: EMPHASIS ON SPECIFIC PARTS OF THE DISASTER CYCLE[13]

The summary table above is a broad assessment of the attention given to aspects of the disaster cycle by hazard type. More detail is provided in subsequent hazard assessments. The implications of these findings are as follows:

There is limited attention to strategic planning and anticipation of the risks of hazards aside from Flood and Bushfire, and limited scenario testing that harnesses strategic choice to avoid future impacts of hazards such as heatwave.

The lack of attention to integrating actions across PPRR limits the potential for comprehensive risk reduction over various time scales and deployment of a broad range of treatment options.

Recommendation 4:

The VPPs be modified to ensure that comprehensive action to reduce natural hazard risks occur across the broad range of potential PPRR disaster cycle actions, including proactive prior actions and policies relating to recovery.

TREATMENT PRIORITIES

Depending on circumstances, it is generally understood that certain treatment approaches are preferable to others in terms of effectiveness, cost, and socio-political challenge (Land Use Planning and Building Codes Taskforce 2014; March

[13] Applies to new development, generally ignoring existing settlements.

2009). For an example of the deployment of different treatment approaches, see (March et al. 2020).

Accordingly, while comprehensive action and the specifics of a given situation are acknowledged, the General ranking of preferred treatments is as follows. This is particularly the case in terms of greenfield or new-build circumstances, and follows the broad principle of "As Low as Reasonably Possible" (ALARP) and the hierarchy of controls for risk reduction:

1. Avoidance of Exposure / Separation from Hazard
2. Reduction of Hazard
3. Reduction of Vulnerability to Hazard
4. Preparedness for, and Facilitation of Appropriate Response
5. Preparedness for, and Facilitation of Appropriate Recovery

The categorisation and terms used above are considered the most useful ways of understanding treatments occurring in the built environment. However, it is acknowledged that there are other categorisations and approaches. These are mapped out in broad comparative terms of broad equivalency categories to the closely field of Emergency Management (EM) in Table 3 below:

	Built Environment Risk Treatment Approach	Type of Risk Treatment	EM Functions
1	Avoidance of Exposure / Separation from Hazard	Risk Elimination	Prevention
2	Reduction of Hazard or Exposure to It	Treatment/Reduction of Present (Legacy) and Future (Projected and Emerging) Risk to bring it to an Acceptable Level of Residual Risk	
3	Reduction of Vulnerability to Hazard or Exposure to It		
4	Preparedness for and Facilitation of Appropriate Response	Treatment of Residual Risk	Preparedness for Response
5	Preparedness for and Facilitation of Appropriate Recovery	Treatment of Legacy, Present (Temporary) and Future Risk (Projected and Emerging)	Preparedness for Recovery

TABLE 3. RISK TREATMENT EQUIVALENTS BETWEEN URBAN PLANNING AND EMERGENCY MANAGEMENT

It is acknowledged that particular hazards and situations will require different priorities to be pursued to best achieve risk objectives. This may also be balanced against principles such as "As Low as Reasonably Possible" (ALARP) or similar approaches. For example, in existing settlements it is often difficult to achieve separation. The VPPs do include some incomplete or implicit assumptions regarding treatment priorities regarding bushfire and flooding, however the lack of explicit articulation undermines clear decision making.

Recommendation 5:

Objectives and decision criteria that make explicit the preference for classes of risk treatments in various circumstances be developed and integrated into the VPPs.

ACKNOWLEDGING VULNERABILITY

Crichton's risk triangle (1999) highlights the interactions between exposure, vulnerability and hazards that contribute to risk, as shown below. Combined with adaptation, actions that address exposure, vulnerability and hazards in combination are understood to be the most effective mechanisms for long term risk reduction (National Disaster Risk Reduction Framework).

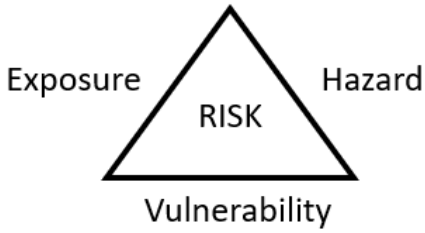


FIGURE 3. RISK TRIANGLE (ADAPTED FROM CRICHTON, 1999).

A key driver of vulnerability is the characteristics of human populations. However, the VPPs and associated documents typically focus upon physical attributes such as building design to achieve resistance as a treatment for vulnerability in the first instance. An exception to this in the VPPs is in Clause 53.02 Bushfire where different treatments of defendable space are stipulated for sensitive uses, or greater caution is encouraged in remote high-risk areas.

While physical resistance is an important part of disaster risk reduction, attention to the vulnerability of communities and population can significantly reduce risk and provide important directions for treatment. Additionally, acknowledgement of the dynamic changes in population vulnerability can aid strategic planning and scenario testing approaches. Further, this may include acknowledgement a diversity of populations in particular locations such as tourists, the infirm or particularly vulnerable groups, now or into the future.

Recommendation 6:

The VPPs include specific criteria assessing existing and likely vulnerability and include this is ongoing risk approaches, including in existing settlements.

ATTENDING TO UNDERLYING CHANGE DRIVERS

Multiple factors drive natural hazard risks over time as part of the dynamic interactions between hazards, settlements and the people that occupy and rely upon them. The VPPs acknowledge some of these, such as climate change. For example, the VPPs state at Clause 13 Environmental Risks and Amenity that:

> *Planning should prepare for and respond to the impacts of climate change.*

And Clause 13.01-1S Natural hazards and climate change state as its objective:

> *To minimise the impacts of natural hazards and adapt to the impacts of climate change through risk-based planning.*

and as strategies, to:

> *Consider the risks associated with climate change in planning and management decision making processes.*
>
> *Identify at risk areas using the best available data and climate change science.*
>
> *Integrate strategic land use planning with emergency management decision making.*
>
> *Direct population growth and development to low-risk locations.*
>
> *Develop adaptation response strategies for existing settlements in risk areas to accommodate change over time.*
>
> *Ensure planning controls allow for risk mitigation or risk adaptation strategies to be implemented.*
>
> *Site and design development to minimise risk to life, property, the natural environment, and community infrastructure from natural hazards.*

Despite these overall directions, the Act and particularly the VPPs are silent or have few mechanisms that directly integrate natural hazard risk decision making with underlying risk drivers, including those other than climate change.

Additionally, drivers are not integrated with scenario planning approaches as mentioned above.

These omissions include the following:

- Population change, growth and distribution is not directly implicated and acknowledged in terms of natural hazard risk.
- The path dependency of risk associated with existing settlements is not acknowledged.
- Urban morphology factors are not directly implicated except in disconnected ways, usually separate to direct consideration of overall urban morphology.
- Climate change is dealt with in some ways, but focusses mainly upon bushfire and flood, and primarily in terms of adaptation (dealing with the effects) and not mitigation (dealing with causes).
- Changes to socio-economic factors that impact upon natural hazard risks (often based upon spatial distribution) are largely ignored, such as increasing inequity of wealth, access to services, education, health, and general socio-political connectivity.
- Wider community attitudes and education are assumed to be homogenous.
- "Brittleness" of continuity of services in communities, infrastructure and distribution of emergency response, and training is not acknowledged.

Recommendation 7:

The VPPs be updated to include specific criteria assessing existing and likely vulnerability. Include in this ongoing risk assessments, including in existing settlements.

Recommendation 8:

A roadmap be developed to comprehensively integrate disaster risk reduction into The Act, VPP and associated provisions.

Recommendation 9:

A Planning Practice Note addressing Integration of Disaster Risk Reduction across all relevant natural hazards as part of plan making and administration is prepared, published, and frequently updated.

DISCUSSION PAPER – HAZARD-SPECIFIC FINDINGS

The previous section summarised findings relating to wider aspects of Disaster Risk Reduction in the Planning and Environment Act 1987 and Victoria Planning Provisions. The following sections reports findings relating to specific hazards. Key themes relating to each hazard are summarised. Broad findings mentioned above are not repeated below except if relevant to a specific point. More detail is provided in the appendices.

Recommendation 10:

In combination with Recommendations 1 – 9, the challenges and opportunities summarised below be addressed across relevant hazards.

BUSHFIRE

With some shortcomings, bushfire risk is managed quite comprehensively in the Victorian planning system. Many provisions exist that directly deal with bushfire in the VPPs state policy, overlays, particular provisions, and other key components of planning schemes. The main findings are as follows.

- In terms of treatments, while bushfire is comprehensive, particularly in the prevention phase, it is noted that existing structures and settlements are not dealt with. Some aspects of response at the settlement scale and many aspects of recovery are not dealt with comprehensively. Maintenance of land and buildings over time is also a concern.
- Mapping is of good quality for the purposes of triggering detailed site assessment, but no real risk assessment occurs across wider settlements, including projected growth and change, including climate change. High risk settlements not targeted.
- Legacy risks associated with existing structures and settlements not acknowledged or dealt with.
- No assessment, acknowledgement, or action at settlement scale to facilitate response and other risk reduction actions. This is assumed as a non-planning activity.
- No direct provisions for actual risk assessment exist to guide decision making, except in the assumptions of AS3959-2028 and Clause 52.03.
- Terminology and meaning of terms inconsistent and include omissions across Act, Schemes and with EM provisions.
- No direct link to EM Act and other relevant provisions and into key decision-making forums exists in P&E Act and VPPs.
- Reconstruction agencies act as "stand-alone" or extraordinary instruments without core guiding principles relating to settlement re-design and reconstruction. Risk avoidance actions and research are inconsistently funded and managed, separately to the planning system which is silent regarding these mechanisms. Recovery funding is uncertain

and variable and is not considered by the planning system. Buy back schemes have followed a range of processes and mechanisms over time.

- Strong emphasis upon EM as response agencies, rather than resilience in roles taken and inputs to processes. No integration exists between local Emergency Management Plans, P& E Act and VPPs.
- Indigenous land management practices are not utilised.
- Fuel reduction and impacts of fuel reduction upon existing or proposed settlements or other activities such as tourism or viticulture are not integrated into assessments. Land management agencies have differing approaches to vegetation management.
- Land release processes have inconsistencies in processes used for zoning change, agency involvement (e.g., VPA) or local government and the mechanisms used to establish risks. Inconsistent involvement of stakeholders in land release processes between Ministerial, local government and VPA processes.
- The role of insurance, local and state investment is not coordinated and is separate to the planning system.

COASTAL EROSION

Coastal erosion is dealt with in an incomplete and somewhat inconsistent way by urban planning in Victoria. This is partly to do with the complex inter-relationships between land and water systems, jurisdictional boundary challenges and a lack of integration. Key challenges include the following main issues.

- State level VPPs policy is not matched with direct statutory triggers to invoke treatments across PPRR spectrum. Further, the Victorian Coastal Strategy and Local Coastal Hazard Assessments (if they exist) are not directly integrated.
- There is limited integration across agencies and allocation of roles to act.
- Data and mapping of coastal erosion and inundation is inconsistent and limited.
- No specific overlays and tools exist to map the hazard as a basis for treatment of risks, somewhat contradictory seal level rise freeboard heights confuse action, in combination with an absence of specific provisions to guide amendment and development control.
- No provisions for planned retreat except the Restructure Overlay.
- The existence of legacy structures, infrastructure, and other assets under threat into the future is not acknowledged.
- Wider mitigation or adaptation actions at settlement or wider scale are not acknowledged.

- It is unclear whether referrals of development applications to Floodplain Managers or other relevant agencies will occur if the land is not within Clause 44.04-7 (Land Subject to Inundation).

HEATWAVE

There is only one high-level policy seeking that heat island effects be minimised, without any strategic tests or decision tools to guide specific actions. Heatwave itself is not dealt with at a higher policy level. Further points are as follows.

- Climate change is not acknowledged in respect of heatwave or heat islands.
- No standards are established to require avoidance heat island or heatwave effects.
- Natural ventilation and other design elements are included to specifically deal with heatwave.
- No strategic planning processes effectively assess potential future or legacy heat island or heatwave risks.
- No acknowledgement of the different vulnerabilities of persons exists.
- There are no links into other systems such as health, responder or building code.
- No specific legacy treatments exist.
- Limited site by site and building by building treatments exist in development control oriented to seeking greater tree retention and improved energy ratings of structures – rather than specific attention to heatwave or heat island.
- No wider design principles such as "neighbourhood" or other approaches are required.

FLOOD

No fundamental basis on a comprehensive risk assessment and treatment approach is included within the VPP, although some high-level state policy points towards this. For example, no real differentiation of vulnerability, consequences or risks acceptance is comprehensively included.

- There is not active guidance for strategic planning, scenario testing and deliberate design to ensure integrated outcomes in concert with risk assessment, including climate change.
- There is a need to integrate other activities such as flood management, levees, dams, flood risk management plans, local government risks management plans etc into planning responses.
- There is excessive focus upon 1:100 flood mapping.
- Uncertainty of roles and responsibilities for keeping mapping up to date.

- Existing overlays are used sometimes used in variable ways without clear reasoning for use of certain mechanisms.
- Role and interactions with stormwater systems unclear.
- No overlay or relevant control exists for coastal inundation and associated processes such as coastal erosion.
- No clear connection to the Building Code in terms of relevant flood elements exists.
- Differences between events are largely ignored: velocity of flows, depth, speed of onset, longevity of flood waters, entrapment.
- No real acknowledgement of differing vulnerabilities of the population is included.
- No real acknowledgement of up-stream and downstream impacts, vegetation change, nor of impacts of ongoing re-development cumulative and long-term effects.
- No active treatment of legacy flood risk except for minimum floor heights in new structures.
- No acknowledgement of other design or building elements that interact with flood, except height above sea level.
- No mechanisms for recovery, planned retreat or land acquisition.

TSUNAMI

While the risks of tsunami in Victoria are considered lower than other parts of Australia and the world, a significant risk exists in a number of coastal areas with potentially extreme consequences, despite low probability (Victoria 2018). Further:

> …vulnerability is heightened during peak holiday seasons, most notably during the spring and summer months, where coastal populations can double or triple in size due to transient populations and short-term stays by tourists and holiday makers (Victoria 2018: 5).

Despite the risks associated with tsunami there is no reference to this hazard in the VPPs, nor its possible consequences. Whether this is a result of a reasoned consideration of the risk, or an historical omission is unclear.

It would seem appropriate to undertake a risk assessment considering the likelihood, exposure, and possible impacts upon communities of a tsunami along vulnerable coastlines.

EARTHQUAKE

High magnitude earthquake is not considered a high probability hazard in Victoria (Victoria 2016). However, the risk does exist and the possibility for severe consequences is considered significant enough to plan for in populated areas.

> Although Australia is popularly considered to have a low earthquake risk, a major earthquake could still occur under a heavily developed and populated area in Victoria. The impact of such an earthquake could have widespread consequences (Victoria 2016: 4).

Earthquake risks are highly spatial in the way they manifest, in combination with the characteristics of built environments' buildings, services and infrastructure. There is no reference to this hazard in the VPPs. While references to geotechnical risk can be found, these are oriented to water-related hazards, or erosion, especially those linked to damns, landslides, and the collapse of cliff formations.

SEVERE STORM

Severe storm risks are highly specific to particular locations and circumstances. Further, they often include a combination of hazard and risk factors that may include strong winds, flooding, stormwater, inundation, tree strike and storm surge. Action to reduce risks may require coordination across building, vegetation, planning and other domains such as coastal or riverine jurisdictions. No reference to these as a combination event is included in the VPPs. Even though flooding, stormwater and inundation are addressed in specific clauses, strong winds and tree strikes are not. The same goes for storm surge, which are not explicitly addressed, but can be partially dealt with through control mechanisms aimed at reducing risk of inundation and erosion.

MULTI-HAZARD

Following from the commentary above discussing severe storms, multi-hazard events occur in complex interactive and sometimes cascading ways. These include a range of possible scenarios depending upon circumstances and characteristics of places. Examples may include heatwave, power outages, bushfires, smoke pollution and telecommunication failure. Another example might be storm surge, coastal erosion, inundation, flood, and severe storm events including strong winds and power outages.

KEY MILESTONES

The final report for the utilisation project presented here refers to the period 01/01/2021 to 30/06/2021. The, even though the work it presents builds on that which was developed by the core CRC research project *Integrated urban planning for natural hazard mitigation* concluded on 31/12/2020, for which a separate final report has already been published. As such, this document reports on the following ten milestones.

Year/ Quarter	Milestone #	Milestone	Submitted
Y1Q3	1.3.1	Fully executed contract	Fully executed by all parties on 05/02/2021
Y1Q3	1.3.2	Initial desktop and remote data collection plan	Submitted on 31/03/2021
Y1Q3	1.3.3	Initial desktop analysis	Submitted on 31/03/2021
Y1Q3	1.3.4	Quarterly report	Submitted on 31/03/2021
Y1Q4	1.3.5	Stakeholder project scope meeting	Note below
Y1Q4	1.4.1	Production of broad discussion paper and focus areas for further investigation	Submitted on 30/06/2021
Y1Q4	1.4.2	Field trip or equivalent and follow-up meetings	Note below
Y1Q4	1.4.3	Utilisation poster	Submitted on 30/06/2021
Y1Q4	1.4.4	CRC Hazard Note	Submitted on 30/06/2021
Y1Q4	**1.4.5**	**Final Report (this report)**	**Submitted on 30/06/2021**

TABLE 4. REPORTING ON KEY MILESTONES

NOTES ON MILESTONES 1.3.5 AND 1.4.2

Varying levels of restrictions to movement and face-to-face meetings continued to apply to Victorians throughout the first semester of 2021 as the state had to respond to its third and fourth waves of community transmission of COVID-19. That has meant that most of the work presented here had to be mandatorily carried out remotely by the two research team members from their respective homes.

This situation has also proved to impact on the ability of the key end-user to respond to several engagement requests attempted by the research team during the course of the project, an issue likely related to the way all those in disaster risk reduction roles experienced increased demands and pressure during these challenging times. This situation was brought to the attention of the Bushfire and Natural Hazards CRC, who were also faced with the same issue when attempting to contact the key end-user. As a result, Milestone 1.3.5 Stakeholder scope meeting was not possible, the same applying to Milestone 1.4.2 Field trip or equivalent and follow up meetings.

UTILISATION AND IMPACT

SUMMARY

The current utilisation project commenced 1st January 2021 and was completed 30th June 2021.

It followed an approach similar to utilisation stemming from the main project for Resilience NSW, through which an inquiry was made into particular aspects of the built environment, resulting in the outputs:

March et al (2021) Heatwave and Building Codes in New South Wales: Issues and Prospects. Report for Resilience NSW.

March et al (2021) A Method for Assessing Building Codes for Natural Hazard Resilience. Report for Resilience NSW

The present project is another utilisation of the project *Integrated urban planning for natural hazard mitigation*, namely the application of its Critical Frameworks for Best Practice to run a series of multi-hazard diagnostics on the Victorian Planning system as enacted by the Planning and Environment Act 1987 and the Victoria Planning Provisions. This application resulted in the development of a discussion paper comprising a set of 10 recommendations, which is presented in this final report.

MULTI-HAZARD REVIEW OF THE COMPREHENSIVENESS OF VICTORIAN URBAN PLANNING FOR DISASTER RISK REDUCTION

Output description

This is a discussion paper aimed at supporting processes of reform of the planning system, so it continues to advance in integrating disaster risk reduction as part of decision-making in strategic and statutory planning in Victoria. It proposes a set of ten recommendations seeking to address the need for an integrated multi-hazard approach to disaster risk reduction through land use planning.

March, A and Nogueira de Moraes, L (2021) Discussion Paper: a multi-hazard review of the comprehensiveness of Victorian urban planning for disaster risk reduction. Report for Bushfire and Natural Hazards CRC and Victorian Department of Environment, Water and Planning.

Extent of use

- The output has applied and tested core diagnostics that were developed as part of the project Integrated Urban Planning for Natural Hazard Mitigation and has translated findings into a discussion paper to inform future reform of the planning system.

Utilisation potential

- There is potential to expand the utilisation of the diagnostics to other Australian jurisdictions through assessment of their own planning systems in relation to the same criteria as that applied in the Victorian case.

- There is also potential for the discussion paper developed for the Victorian case to inform changes to the planning system so it can continue to advance integration of disaster risk reduction into decision-making processes.

Utilisation impact

- The impact of utilisation is yet to occur because the feedback on the discussion paper has not yet been received. However, this is likely to be supported by the Hazard Note and the Bushfire and Natural Hazards CRC Poster for AFAC which are being submitted with this final report.

CONCLUSION

This multi-hazard review of the comprehensiveness of Victorian urban planning for natural hazard disaster risk reduction compared ideal approaches and outcomes with current processes, treatments, and systems. It focussed on the Planning and Environment Act (1987) (The Act) and the Victoria Planning Provisions (VPP), in parallel with key supporting documents and processes.

It is clear that urban planning systems have considerable potential to manage the impacts of natural hazards upon the built environment, humans, and associated systems (March and Gonzalez-Mathiesen 2020). As has been shown, the complexity of urban planning across diverse action faces integration challenges–there is a need to take action to address disaster risk reduction more comprehensively.

It was found that the VPPs do set out strong underpinnings for action to address natural hazard risks. However, it was also apparent that comprehensive integration of Disaster Risk Reduction into The Act and VPPs and across various hazards and treatments is incomplete in some ways.

NEXT STEPS

The recommendations produced as the key deliverable for this project constitute the basis for a potential roadmap for advancing further in the integration of land use planning and disaster risk reduction in Victoria. The necessary processes to guarantee their implementation can also act as a driver for greater integration as it will require the interaction of a diverse set of stakeholders.

This series of ten recommendations that were set out in previous sections will not be repeated here, except for two components that stand out as starting points to further action.

- A roadmap be developed to comprehensively integrate disaster risk reduction into The Act, VPP and associated provisions.
- A Planning Practice Note be developed to address Integration of Disaster Risk Reduction across all relevant natural hazards as part of plan making and administration. This PPN should be frequently updated.

APPENDIX 1. LIST OF DOCUMENTS CLASSIFIED AS CONTEXTUAL DATA

INTERNATIONAL CONTEXT

Frameworks
Sendai Framework for Disaster Risk Reduction 2015 - 2030
Guides
Implementation Guide for Land Use and Urban Planning
Scorecards
Disaster Resilience Scorecard for Cities - Detailed Level Assessment
Terminology
Terminology on Disaster Risk Reduction 2017
UNDRR Terminology - Disaster Risk

NATIONAL CONTEXT

Arrangements
Australian Emergency Management Arrangements
Frameworks
National Disaster Risk Reduction Framework
Guidelines
National Emergency Risk Assessment Guidelines - 2nd edition 2015 (updated 2020)
Standards
AS 3959:2018 Construction in Bushfire-Prone Areas - Incorporating Amendment No. 1
AS ISO 31000:2018 Risk Management - Guidelines
AS/NZS 1547:2012 On-site domestic wastewater management
Strategies
2011 National Strategy for Disaster Resilience - building the resilience of our nation to disasters
National Strategy for Disaster Resilience - Community Engagement Framework
National Strategy for Disaster Resilience - Companion Booklet
National Strategy for Disaster Resilience - Implementation Review - Progress to date
National Strategy for Disaster Resilience - Land use planning
Terminology
Australian Institute for Disaster Resilience Glossary - Definition of Comprehensive Approach (PPRR)
Australian Institute for Disaster Resilience Glossary - Definition of Emergency Management
Australian Institute for Disaster Resilience Glossary - Definition of Mitigation
Australian Institute for Disaster Resilience Glossary - Definition of Preparedness
Australian Institute for Disaster Resilience Glossary - Definition of Prevention
Australian Institute for Disaster Resilience Glossary - Definition of Recovery
Australian Institute for Disaster Resilience Glossary - Definition of Response
Australian Institute for Disaster Resilience Glossary - Definition of Risk Control
Australian Institute for Disaster Resilience Glossary - Definitions of Disaster-Related Terms
Australian Institute for Disaster Resilience Glossary - Definitions of Hazard-Related Terms
Australian Institute for Disaster Resilience Glossary - Definitions of Risk-Related Terms

STATE CONTEXT

Acts
Building Act 1993
Catchment and Land Protection Act 1994
Climate Change Act 2017
Conservation, Forests and Lands Act 1987
Crown Land (Reserves) Act 1978
Cultural and Recreational Lands Act 1963
Development Victoria Act 2003
Fences Act 1968
Environment Effects Act 1978
Environment Protection Act 1970
Environment Protection Act 1970 - State Environment Protection Policy (Waters)
Environment Protection Act 2017
Flora and Fauna Guarantee Act 1988
Forests Act 1958
Land Acquisition and Compensation Act 1986
Land Act 1958
Local Government Act 1989
Local Government Act 2020
Marine and Coastal Act 2018
National Parks Act 1975
Parks Victoria Act 2018
Planning and Environment (Planning Schemes) Act 1996
Project Development and Construction Management Act 1994
Safe Drinking Water Act 2003
Safety on Public Land Act 2004
Sale of Land Act 1962
Settled Land Act 1958
Subdivision Act 1988
Subordinate Legislation Act 1994
Transfer of Land Act 1958
Transport Integration Act 2010
Victorian Planning Authority Act 2017
Water (Commonwealth Powers) Act 2008
Water Act 1989
Assessments
Regional Bushfire Planning Assessments
Datasets
Victorian Climate Change Data and Information for Local Government
Victorian Coastal Inundation Dataset
Frameworks
Integrated Water Management Framework for Victoria: An IWM approach to urban water planning and shared decision making throughout Victoria
Victorian Land Capability Assessment framework
Guidance Notes
Regional Climate Change Adaptation Strategy Guidance Notes

Guides
A Local Government Planning Guide for Dryland Salinity
Australian Rainfall and Runoff - A Guide to Flood Estimation
Victorian Coastal Hazard Guide
Guidelines
Design Guidelines for Settlement Planning at the Bushfire Interface
Environmental Guidelines for Major Construction Sites
Guidelines for Coastal Catchment Management Authorities: Assessing development in relation to sea level rise
Guidelines for Development in Flood Affected Areas
Guidelines for Development in Flood-prone Areas
Guidelines for Environmental Management: Code of Practice - onsite wastewater management
Guidelines for the removal, destruction or lopping of native vegetation
Maribyrnong River Valley: Design Guidelines
Melbourne Water's Guidelines for Approval of Jetties
Municipal Fire Prevention Planning Guidelines
National Emergency Risk Assessment Guidelines - 2nd edition 2015 (updated 2020)
Planning for Sea Level Rise Guidelines 2017: Port Phillip and Westernport Region
Planning Guidelines for the Conversion of Golf Course Land to Other Purposes
Urban stormwater: Best practice environmental management guidelines
Victorian Guideline for Water Recycling
Technical Information for the Victorian Guideline for Water Recycling
Plan
G21 Regional Growth Plan
Gippsland Regional Coastal Plan 2015-2020
Gippsland Regional Growth Plan
Great South Coast Regional Growth Plan
Heat Health Plan for Victoria
Victoria's Climate Change Adaptation Plan 2017-2020
Water for Victoria: Water plan
Regulations
Building Regulations 2018
Forest (Fire Protection) Regulations
Reports
Lower Yarra River corridor study: Recommendations Report
Middle Yarra River corridor study: Recommendations Report
Strategies
Flood Management Strategy - Port Phillip and Westernport
Healthy Waterways Strategy
Stormwater Strategy: A Melbourne water strategy for managing rural and urban runoff
The Victorian Waterway Management Strategy
Victorian Coastal Strategy 2014
Victorian Floodplain Management Strategy
Victorian river health strategy: Healthy rivers, healthy communities & regional growth
Victoria's Climate Change Strategy
Visions
Maribyrnong River: Vision for Recreational and Tourism Development

APPENDIX 2. LIST OF HAZARD-SPECIFIC PLANS AND RELEVANT EMERGENCY MANAGEMENT DOCUMENTS

Acts
Country Fire Authority Act 1958
COVID-19 Omnibus (Emergency Measures) Act 2020
Emergency Management Act 2013
Emergency Management Act 1986
Emergency Services Telecommunications Act 2004
Fire Rescue Victoria Act 1958
Victoria State Emergency Services Act 2005
Guidelines
Guidelines for Preparing State, Regional and Municipal Emergency Management Plans
Guidelines for preparing the State Emergency Management Plan
Manuals
Emergency Management Manual Victoria (EMMV)
Plans
State Emergency Management Plan (SEMP)
State Bushfire Plan 2014
State Emergency Response Plan (SERP*) Earthquake Sub-Plan
SERP* Extreme Heat Sub-Plan
SERP* Flood Sub-Plan
SERP* Storm Sub-Plan
SERP* Tsunami Sub-Plan
State Landslide Hazard Plan

* According to EMV's website, hazard specific state emergency response sub-plans are in the process of being replaced by hazard-specific state emergency management sub-plans.

APPENDIX 3. LISTS OF HAZARD-SPECIFIC KEYTERMS

BUSHFIRE

"bushfire" OR "fire" OR "ember" OR "radiant heat" OR "flame" OR "wildfire" OR "planned burn" OR "defendable space" OR "fire hazard" OR "bushfire hazard" OR "wildfire hazard" OR "WMO" OR "BPA" OR "CFA" OR "BMO" OR "Country Fire Authority" OR "hydrant" OR "extinguish" OR "pyro" OR "arson" OR "arsonist" OR "burn" OR "catastrophic fire" OR "fire station" OR "BAL" OR "Bushfire Attach Level" OR "pyrocumulunimbus" OR "Cumulonimbus flammagenitus" OR "containment line" OR "firefighter" OR "Flame Zone" OR "fire truck" OR "first responders" OR "smoke" OR "fuel reduction" OR "indigenous burn" OR "traditional burning" OR "cultural burning" OR "prescribed burn" OR "MFB" OR "Metropolitan Fire Brigade" OR "Fire Brigade" OR "incident" OR "ignition" OR "lightning" OR "powerline" OR "suppression" OR "fire prone" OR "bushfire prone" OR "Wildfire Prone" OR "Bushfire Prone Area" OR "brigade" OR "evacuation" OR "Leave Early" OR "shelter" OR "shelter in place" OR "fire ban" OR "emergency vehicle" OR "fire season" OR "firebreak" OR "fire ready" OR "flammable" OR "grassfire" OR "blaze" OR "brigade" OR "bulldozer" OR "campfire" OR "cigarette butt" OR "chainsaw" OR "ash" OR "ashes" OR "eucalypt".

COASTAL EROSION

"coastal erosion" OR "coastal inundation" OR "storm surge" OR "coastal flood" OR "sea-level rise" OR "coastal hazard" OR "coastal deluge" OR “erosion” OR “climate” OR “marine” OR “adaptation” OR “Gippsland” OR “sea” OR “foreshore” OR “catchment” OR “lake” OR “wetlands” OR “inundation” OR “beach” OR “flooding” OR “level” OR “CMA” OR “waterway” ” OR “inlet” ” OR “river” OR “ocean” OR “onshore” OR “rainfall” OR “rain” OR “soil” OR “catchment” OR “acid sulphate soil” OR “acid sulfate soil” ” OR “stormwater” OR “coastcare” OR “wave” OR “pest” OR “surge” OR “Wilson’s Promontory” OR “rock” OR “tide” OR “river” OR “Barwon” OR “severe” OR “seagrass” OR “RAMSAR” OR “wind” OR “irrigation” OR “Port Fairy” ” OR “surge” OR “flow” OR “bay” OR “island” OR “maritime” OR “dredging” OR “mangrove” OR “seabed” OR “wastewater” OR “cape” OR “jetty” OR “jetties” OR “storms” OR “saltmarsh” OR “salinity” OR “peninsula”.

EARTHQUAKES

"earthquake" OR "shake" OR "tremor" OR "tremble" OR "shock" OR "microseism" OR "fault" OR "peak ground acceleration" OR "seismic" OR" liquification" OR "peak ground velocity" OR " earthquake ground motion" OR "liquification" OR "ground movement" OR "geotechnical hazard" OR "peak ground acceleration" OR "ground motion" OR "earth shake".

FLOODS

"flood" OR "flooding" OR "floodplain" OR "levee" "flow" OR "velocity" OR "overland" OR "stream" OR "upstream" OR "AEP" OR "Annual Expected Probability" OR "PMF"

OR "Peak Maximum Flood" OR "overflow" OR "water" OR "levels" OR "river" OR "riverine" OR "CMA" OR "rainfall" OR "rain" OR "catchment" OR "floodzoom" OR "canal" OR "dam" OR "flash" OR "heavy" OR "thunderstorm" OR "creek" OR "downstream" OR "Gippsland" OR "forecasts" OR "tsunami" OR "inundation" OR "sandbag" OR "coastal" OR "coast" OR "lake" OR "Niña" OR "overflow" OR "stream" OR "surge" OR "Yarra" OR "Barwon" OR "Ballarat" OR "Bendigo" OR "Corangamite" OR "Dandenong" OR "Cyclone" OR "deluge".

HEATWAVES

"heat" OR "cooling" OR "cool" OR "extreme heat" OR "heatwave" OR "heat stress" OR "shelter" OR "shade" OR "ventilation" OR "temperature" OR "insulation" OR "summer" OR "air conditioning"; OR "dry" OR "humid" OR "heatwaves" OR "dehydration" OR "dehydrated" OR "acclimatised" OR "cooling tower" OR "double glazed" OR "reflective" OR "heat island" OR "urban heat island" OR "hot" OR "sudden".

LANDSLIDE

"landslide" OR "landslip" OR "debris" OR "slope" OR "land movement" OR "ground movement" OR "rock" OR "rainfall" OR "flash" OR "roadblock" OR "road closure" OR "sinkhole" OR "slides" OR "slide" OR "erosion" OR "flow" OR "dam" OR "dams" OR "hole" OR "mine" OR "sink" OR "avalanche" OR "cracks" OR "crack" OR "earth" OR "quarry" OR "well" OR "ground" OR "silt" OR "abrupt" OR "earthquakes" OR "embankments" OR "hill" OR "valley" OR "leaking" OR "levee" OR "soil moisture" OR "collapse" OR "cliff" OR "mountain" OR "snowslide" OR "rockfall" OR "mudslide" OR "earthslip" OR "earthfall" OR "mudflow" OR "deep-seated slope failure" OR "slope gradient" OR "ranges" OR "mountain ranges" OR "coastal cliff" OR "slope stability" OR "slope cut" OR "heavy rainfall".

SEVERE STORM

"storm" OR "severe storm" OR "thunderstorm" OR "cloud burst" OR "heavy rain" OR "strong wind" OR "gust" OR "shower" OR "rain" OR "rainfall" OR "accumulated rainfall" OR "downpour" OR "rainstorm" OR "stormwater" OR "deluge" OR "superstorm" OR "tempest" OR "meteorology" OR "flooding" OR "hail" OR "heavy rain" OR "cyclone" OR "surf" OR "blizzard" OR "hail" OR "tornado" OR "force" OR "hailstones" OR "lightning" OR "squalls" OR "stormsafe" OR "electrical storm".

TSUNAMI

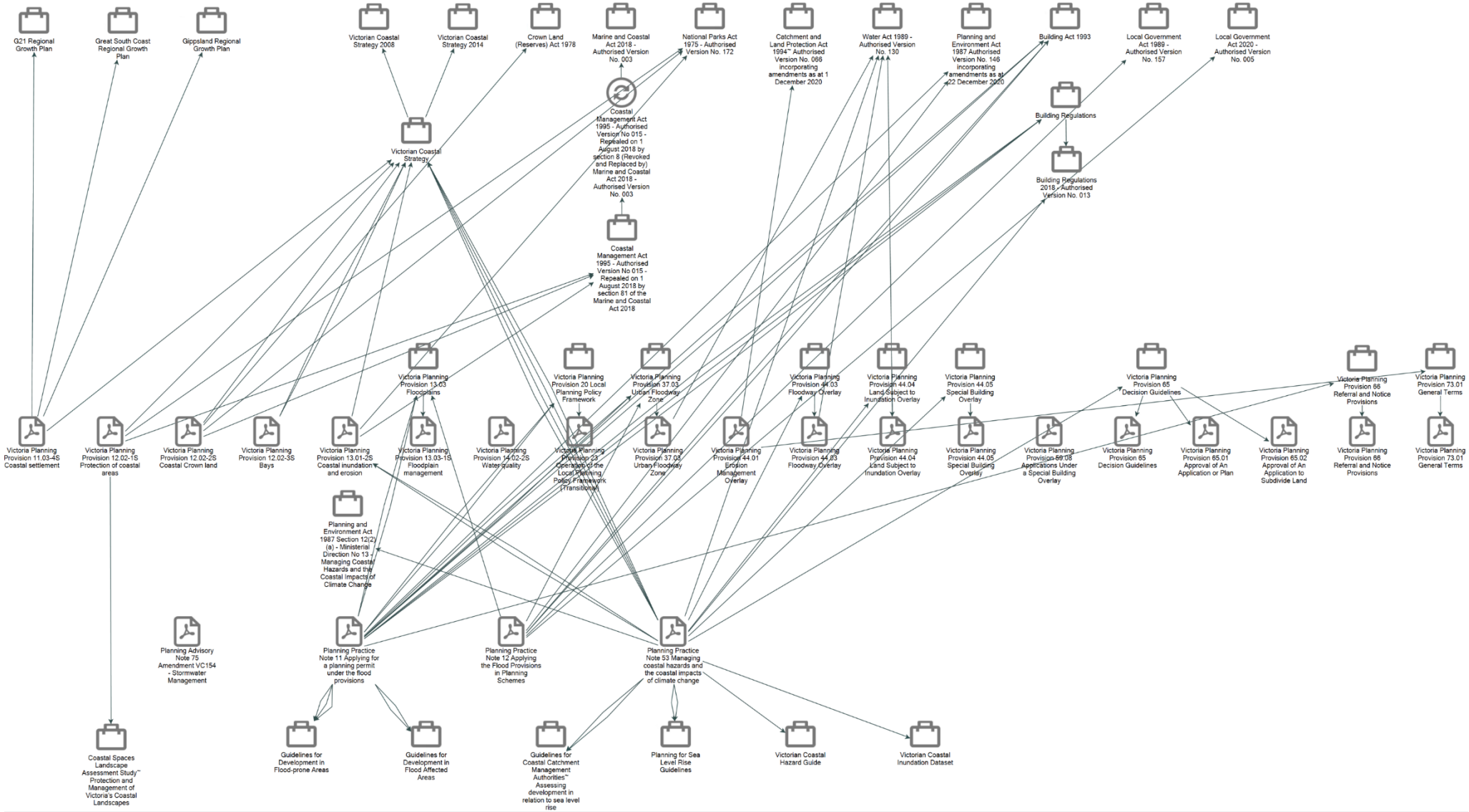
"tsunami" OR "wave" OR "swell" OR "inundation" OR "sea-level rise" OR "coastal inundation" OR "coastline" OR "magnitude" OR "submarine" OR "earthquake" OR "shore" OR "volcanic" OR "foreshore" OR "rip" OR "PTHA" OR "Probabilistic Tsunami Hazard Assessment".

APPENDIX 4. LIST OF DOCUMENTS – CORE DATA

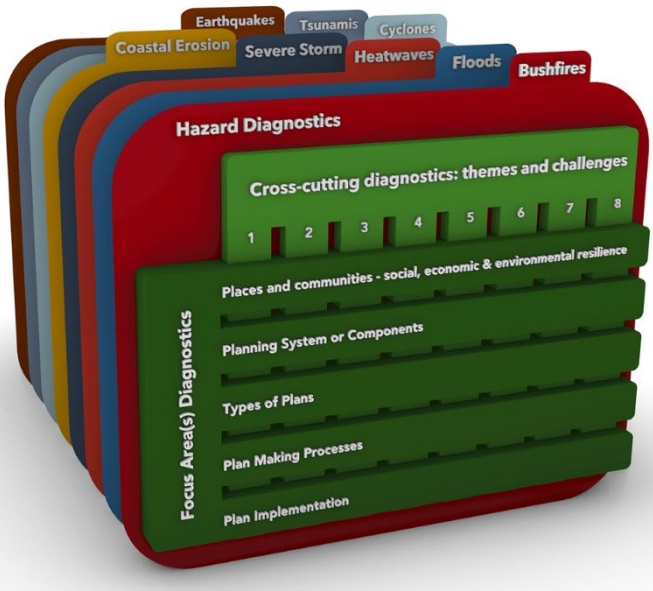
Acts
Planning and Environment Act 1987
Regulations
Planning and Environment Regulations 2015
Subordinate Legislation
Victoria Planning Provisions
Ministerial Directions under the Planning and Environment Act 1987 (Minister for Planning)
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 09 - Metropolitan Planning Strategy
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 11 - Strategic Assessment of Amendments
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 12 - Urban Growth Areas
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 13 - Managing Coastal Hazards and the Coastal Impacts of Climate Change
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 14 Ports Environs
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 15 - The Planning Scheme Amendment Process
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 17 Localised Planning Statements
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 18 Victorian Planning Authority Advice on Planning Scheme Amendments
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 20 Major Hazard Facilities
Planning and Environment Act 1987 Section 12(2)(a) - Ministerial Direction No 21 Golf Course Redevelopment
Planning and Environment Act 1987 Section 12(2)(a) and 12(1)(f) - Ministerial Direction No 19 Preparation and content of amendments that may significantly impact the environment, amenity, and human health
Planning and Environment Act 1987 Section 46GJ and 46GZI - Ministerial Direction on the preparation and content and reporting requirements for Infrastructure Contributions Plans
Planning and Environment Act 1987 Section 46M(1) and 46QD - Ministerial Direction on the preparation and content and reporting requirements for Development Contributions Plans
Planning and Environment Act 1987 Section 7(5) - Ministerial Direction on the Form and Content of Planning Schemes
Planning Practice Notes (DELWP)
Planning Practice Note 03 Applying the Special Use Zone
Planning Practice Note 07 Vegetation Protection in Urban Areas
Planning Practice Note 11 Applying for a planning permit under the flood provisions
Planning Practice Note 12 Applying the Flood Provisions in Planning Schemes
Planning Practice Note 13 Incorporated and reference documents
Planning Practice Note 30 Potentially Contaminated Land
Planning Practice Note 36 Implementing a coastal settlement boundary
Planning Practice Note 39 Using the Integrated Water Management Provisions of Clause 56 - Residential Subdivision
Planning Practice Note 46 Strategic Assessment Guidelines
Planning Practice Note 53 Managing coastal hazards and the coastal impacts of climate change
Planning Practice Note 55 Planning in Open Drinking Water Catchments
Planning Practice Note 64 Local Planning for Bushfire Protection
Planning Practice Note 92 Managing buffers for land use compatibility
Planning Advisory Notes (DELWP)
Planning Advisory Note 30 Amendment VC68 - Delivering Melbourne's Newest Sustainable Communities
Planning Advisory Note 33 Amendment VC83 - Bushfire Protection - Community Fire Refuge and Private Bushfire Shelter Exemptions
Planning Advisory Note 39 Amendment VC83 - Bushfire protection - Vegetation Exemptions
Planning Advisory Note 40 Amendment VC83 - Bushfire Protection - Bushfire Planning Provisions

Planning Advisory Note 46 Bushfire Management Overlay Mapping Methodology and Criteria
Planning Advisory Note 48 Ministerial Direction No 15 - The Planning Scheme Amendment Process
Planning Advisory Note 56 Planning for Ports and their Environs
Planning Advisory Note 62 Amendment VC119 - Bushfire replacement buildings
Planning Advisory Note 64 Transitional arrangements for metropolitan growth area infrastructure contributions
Planning Advisory Note 67 Amendment VC142 - Smart Planning reforms
Planning Advisory Note 68 Amendment VC140 - Bushfire State Planning Policy
Planning Advisory Note 69 Amendment VC143 - Minimum Garden Area
Planning Advisory Note 71 Amendment VC148 - Planning Policy Framework - PPF
Planning Advisory Note 72 Amendment VC148 - Victoria Planning Provisions - VPP and Planning Schemes
Planning Advisory Note 72 Amendment VC152 - Major hazard facilities, Residential aged care facilities, Public and shared housing
Planning Advisory Note 73 Ministerial Direction 19 - New requirements for a planning authority to consult Environment Protection Authority
Planning Advisory Note 75 Amendment VC154 - Stormwater Management

APPENDIX 5. EXAMPLE MAPPING OF REFERENCING BETWEEN PLANNING AND DRR DOCUMENTS – EXTRACT FOR COASTAL EROSION



APPENDIX 6. DIAGNOSTIC QUESTIONS



FOCUSED DIAGNOSTICS

Physical and functional outcomes in communities achieve the following risk treatment objectives as relevant to the particular hazard. It is noted that these outcomes need also to address social, economic, and environmental community resilience:

1. Avoidance of Exposure / Separation from Hazard
2. Reduction of Hazard
3. Reduction of Vulnerability to Hazard
4. Preparedness for, and Facilitation of Appropriate Response
5. Preparedness for, and Facilitation of Appropriate Recovery

Legislation

1. Enable and provide context for land use planning for disaster resilient communities by containing goals for community safety or resilient development.
2. Specify that disaster resilience is to be included in all land use planning levels or tiers.
3. Specify the need to consider natural hazards in land use planning decisions.
4. Establish direct links to risk assessment processes and advice from natural hazard leaders and emergency managers for all planning decisions.
5. Specifies that risk assessments must consider existing and future risks and may include scenario testing of future settlement patterns.

6. Consider other disaster management or emergency legislation that have impact on planning matters.

Policy

1. Policy is aligned with the direction of other overarching national and state policies or international agreements, establishing clear links and hierarchies between them.
2. Clear articulation of how disaster resilience and risk information is considered in land use planning, guiding decision-making processes and selection of future growth patterns.
3. Articulates guidance on the level of risk tolerance that will frame the system and guide decision-making.

Regulation

1. Links planning decisions to advice from natural hazard leaders and emergency managers.
2. Specifies the need to consider natural hazards in land use planning decisions, including in strategic planning decisions, and their implementation.
3. Requires assessment of strategic alternatives when appropriate.
4. Includes guidance on the level of risk tolerance that frames the system and guides more detailed decision-making.
5. Provides clear decision-making criteria relating to risk, based on appropriate data, and understanding of contributory factors.
6. Achieves the objective of disaster risk reduction and processes of resilience processes as appropriate, according to the level of risk tolerance framing the system or sub-system.

Standards and codes

1. Standards, codes, and provisions relevant to natural hazard information and risk assessments are included and utilised.
2. Restrict certain uses, building types, and occupancy density in hazard prone areas where risk is considered to exceed acceptable standards.
3. Restrict certain uses, building types, and occupancy density in hazard prone areas to that compatible with the relevant natural hazard and its constraints.
4. In areas where development is considered acceptable, specify disaster risk reduction treatments that meet the objectives of the policy or regulation and correspond with the wider system's level of risk tolerance.

CROSS-CUTTING DIAGNOSTICS

Q1 - Are potential risk treatments integrated and fully used across prevention, preparedness, response and recovery?

Q2 - Are the full spectrum of legacy, projected and emergent risks spatially considered on the basis of up-to-date hazard mapping and integrated spatial assessment?

Q3 - Are goals, objectives and other relevant guiding principles and terminology integrated across relevant systems?

Q4 – Are relevant legislative, regulatory, policy and planning provisions integrated across systems?

Q5 – Are relevant local, cultural, social, economic, and ecological matters acknowledged and taken into account?

Q6 – Are relevant processes integrated across relevant systems – vertically and horizontally?

Q7 – Are all relevant stakeholders represented in key processes and activities?

Q8 – Are the range of financial and investment mechanisms integrated with other processes, activities, and goals?

APPENDIX 7. HAZARD-SPECIFIC ASSESSMENTS

BUSHFIRE

Q1 – Are potential risk treatments integrated and fully used across prevention, preparedness, response and recovery? Where is integration mostly found and where does it fall short?

With some shortcomings, bushfire is treated quite comprehensively in the Victorian planning system. Many provisions exist that directly deal with bushfire in the VPPs state policy, overlays, particular provisions, and other key components of planning schemes. In terms of treatments, bushfire is comprehensive, although it is noted that existing structures and settlements are not dealt with. Some aspects of response and many aspects of recovery are not dealt with comprehensively.

Treatment	Main Characteristics	Assessment
Avoidance of exposure	Strong emphasis upon avoidance at state and local level. This is primarily via clauses 13.02-1S, 44.06 and 53.02	Good, but uncertainty regarding acceptable risk, particularly at strategic planning and land release level. This is in the context of "priority of human life" cutting across all other provisions.
Reduction of hazard or exposure to it	Comprehensive vegetation removal and landscape-oriented provisions, matched by strong emphasis on siting of settlements and structures away from hazards.	Some uncertainty regarding enforcement and maintenance of defendable space on private land. Varying management of vegetation and fuel reduction by non-planning agencies.
Reduction of vulnerability or exposure to hazard	Comprehensive integrated system of building controls undertaken in tandem with site specific provisions.	While effective, some limitations to the scope of actions included. Some uncertainty regarding enforcement and maintenance of structures and defendable space on private land. Limited acknowledgement of the differences in vulnerability across geographic space.
Preparedness for Response	Comprehensive provisions at the site relating to water, signage and access and roads and hydrants at subdivision scale.	Limited acknowledgement of settlement patterns and design in terms of response. Evacuation, staging of EM assets and logistics, shelter in place and other approaches not included in design and planning requirements
Preparedness for Recovery + Recovery	No provisions relating to recovery or spatial risk assessment except for ad hoc extraordinary	Some limited provision for location specific rebuilding scenarios. Silence in terms of recovery principles or site specific strategic for high-risk locations.

	provisions.	
Other Matters	No identification or treatment of legacy risks of structures and settlements No recognition of variable vulnerability of populations No link to point of sale disclosure or ongoing information regarding BAL of structures or defendable space extents. Imprecise definitions or silence on key concepts, such as risk, hazard priority of life, acceptable risk	

TABLE 5 – SUMMARY ASSESSMENT OF BUSHFIRE RISK TREATMENTS IN VICTORIAN PLANNING ACROSS PPRR

Q2 – Are the full spectrum of legacy, projected and emergent risks spatially considered on the basis of up-to-date hazard mapping and integrated spatial assessment?

Clause 71.02-3 Integrated Planning requires integrated action, but this is not operationalised comprehensively, including the provision of mechanisms to achieve "prioritisation of human life" and action across PPRR.

No future scenario testing of settlement patterns occurs, including of risks.

Mapping is of good quality for the purposes of triggering detailed site assessment, but of actual risks across settlements, including projected forward and including Climate change.

Legacy risks associated with existing structures and settlements not acknowledged or dealt with.

Limited assessment of projected risks, except on a case-by-case basis.

Ongoing change requires ongoing assessment and strategic assessment of risk.

No assessment, acknowledgement, or action at settlement scale to facilitate response and other risk reduction actions.

Q3 – Are goals, objectives and other relevant guiding principles and terminology integrated across relevant systems?

Goals, objectives are not aligned across entire system.

No provisions for actual risk assessment exist to guide decision making, except in the assumptions of AS3959-2028 and Clause 52.03.

Terminology and meaning of terms inconsistent and include omissions across Act, Schemes and with EM provisions.

Q4 – Are relevant legislative, regulatory, policy and planning provisions integrated across systems?

No direct link to EM Act and other relevant provisions and into key decision-making forums exists in P&E Act and VPPs.

Reconstruction agencies act as "stand-alone" or extraordinary instruments without core guiding principles relating to settlement re-design and reconstruction.

Strong emphasis upon EM as response agencies, rather than resilience in roles taken and inputs to processes.

No integration exists between local Emergency Management Plans and P& E Act / VPPs.

Q5 – Are relevant local, cultural, social, economic, and ecological matters acknowledged and taken into account?

No recognition of variable vulnerability of populations is taken into account.

Indigenous land management practices are not utilised.

Fuel reduction and impacts of fuel reduction upon existing or proposed settlements or other activities such as tourism or viticulture are not integrated into assessments.

Q6 – Are relevant processes integrated across relevant systems – vertically and horizontally?

Land release processes have inconsistencies in processes used for zoning change, agency involvement (e.g., VPA) or local government and the mechanisms used to establish risks.

Q7 – Are all relevant stakeholders represented in key processes and activities?

Inconsistent involvement of stakeholders in land release processes between Ministerial, local government and VPA processes.

There is strong involvement at the permitting processes between fire services and local government via s55 of the Act.

Land management agencies have differing approaches to vegetation management.

Reconstruction can be undertaken as an extraordinary process, excluding many parties.

Q8 – Are the range of financial and investment mechanisms integrated with other processes, activities, and goals?

Risk avoidance actions and research are inconsistently funded and managed, separately to the planning system which is silent regarding these mechanisms.

Recovery funding is uncertain and variable and is not considered by the planning system.

Buy back schemes have followed a range of processes and mechanisms over time.

The role of insurance, local and state investment is not coordinated and is separate to the planning system.

COASTAL EROSION

Q1 – Are potential risk treatments integrated and fully used across prevention, preparedness, response and recovery? Where is integration mostly found and where does it fall short?

While there is a State level PPF policy, this is not matched with direct statutory triggers to invoke treatments across PPRR spectrum.

Poor integration across agencies and allocation of roles to act recommending (not determining)

Limited data and spatial plans to guide application of controls (or patchy)

An absence of planning scheme overlays to spatialise potential risks + use of EMO and LSIO not fit for purpose. Attention to Heights above Sea Level alone too narrow. Contradictory use of .2 versus .8m (challenging for existing settlements (legacy)

A lack of decision criteria or particular provisions to guide detailed development control.

No specific tools for planned retreat except RXO which is not fit for purpose.

Treatment	Main Characteristics	Assessment
Avoidance of exposure	13.01-2S - Coastal Inundation and Erosion seeks to avoid development in identified coastal hazard areas susceptible to inundation (both river and coastal), erosion, landslip/landslide, acid sulphate soils, bushfire, and geotechnical risk. It suggests an additional 0.8 metres for climate change. Future development is to avoid areas at risk. Clause 11.03-4S - Coastal settlement seeks to avoid development on primary coastal dune systems and low-lying coastal areas; and to Encourage the restructure of old and inappropriate subdivisions to reduce development impacts on the environment. Clause 12.02-1S Protection of coastal areas seeks to sensitively use coastal areas and to undertake "integrated" coastal planning and to encourage revegetation. Relies on use of Restructure 44.05, Erosion Management 44.01 or Land Subject to Inundation 44.04 Overlays to implement	Generally good mechanisms to avoid exposure via avoidance but rely upon "trigger" mechanisms for assessment of whether structures can be built, rather than predetermined clear cut rules. Allowance for 0.8m seal level rise for climate change is decreased to 0.2 in existing settlements, allowing increased exposure. Reliance upon Local Coastal Hazard Assessments that are currently incomplete or contested.
Reduction of hazard or	Planning systems do not directly undertake works to modify the	The characteristics of coastal erosion and inundation are such

exposure to it	nature of the hazard but may use other related mechanisms such as vegetation controls to modify the hazard.	that it is difficult to directly modify the hazard. Non planning agencies and mechanisms may act on this via Catchment Management Authorities, Under the Coastal Management Act (1995) Victorian Coastal Strategy (2014) and Coastal Management Council.
Reduction of vulnerability or exposure to hazard	Development on land that is in the Land Subject to Inundation overlay 44.04 may allow for works or treatments on private land to minimise vulnerability or exposure. This may include filling land to achieve minimum floor heights to the predicted height.	The characteristics of coastal erosion and inundation are such that it is difficult to directly modify the hazard, despite there being the potential to allow development that is more resistant to erosion or inundation by it being built on fill, or behind barriers. However, this infers exposure of assets, potential saline incursion, potential entrapment during shelter in place and time horizon of 100 years that is less than that normally expected of settlements.
Preparedness for Response	Coastal erosion and inundation are a slow onset hazard, even while storms events may rapidly impact certain locations. Response in this case would be in the form of planned retreat. Currently, the only mechanism offered in the VPPs is the Restructure Overlay 44.05	The Restructure Overlay is an unwieldy mechanism to achieve response.
Preparedness for Recovery + Recovery	No recovery plans or mechanisms exist	Recovery as a result of coastal erosion requires reliance on extra - planning remedial works or relocation. The VPPs are silent in this regard.
Other Matters	No recognition of variable vulnerability of populations. No link to point of sale disclosure or ongoing information regarding risks to structures. Imprecise definitions or silence on key concepts, such as risk, hazard priority of life, acceptable risk.	

TABLE 6 – SUMMARY ASSESSMENT OF COASTAL EROSION RISK TREATMENTS IN VICTORIAN PLANNING ACROSS PPRR

Q2 – Are the full spectrum of legacy, projected and emergent risks spatially considered on the basis of up-to-date hazard mapping and integrated spatial assessment?

Mapping of coastal erosion and inundation is inconsistent, and assessment of new development is reliant upon site-by-site assessments and production of risk assessments unless local plans have been produced. Mapping is largely based upon use of Erosion Management or Land Subject to Erosion Overlays (and to some extent Restructure Overlays) which are not specifically intended for coastal erosion hazard management.

Long term mapping of legacy risks associated with existing structures and settlements not acknowledged or dealt with in planning system.

No assessment, acknowledgement, or action at settlement scale to facilitate response and other risk reduction actions.

Q3 – Are goals, objectives and other relevant guiding principles and terminology integrated across relevant systems?

The overarching goals set out in the Victorian Coastal Strategy and any Local Coastal Hazard Assessments or other studies are not integrated into local planning in a comprehensive manner.

Goals, objectives are not aligned across entire system.

No provisions for actual risk assessment exist to guide decision making.

Terminology and meaning of terms inconsistent and include omissions across Act, Schemes and with EM provisions.

Q4 – Are relevant legislative, regulatory, policy and planning provisions integrated across systems?

Some policy links exist through 13.01-2S - Coastal inundation and erosion of the VPPs to the Victorian Coastal Strategy and Coastal Management Act (1995).

Q5 – Are relevant local, cultural, social, economic, and ecological matters acknowledged and taken into account?

No.

Q6 – Are relevant processes integrated across relevant systems – vertically and horizontally?

Land release processes have inconsistencies in processes used for zoning change, agency involvement (e.g., VPA) or local government and the mechanisms used to establish risks.

Q7 – Are all relevant stakeholders represented in key processes and activities?

Referrals of development applications to Floodplain Managers occur if the land is within Clause 44.04-7 (Land Subject to Inundation).

The planning system does not necessarily require consultation with other parties if there is no trigger to do so.

Q8 – Are the range of financial and investment mechanisms integrated with other processes, activities, and goals?

Risk avoidance actions and research are inconsistently funded and managed, separately to the planning system which is silent regarding these mechanisms.

Recovery funding is uncertain and variable and is not considered by the planning system.

Buy back schemes are unknown.

The role of insurance, local and state investment is not coordinated and is separate to the planning system.

HEATWAVE

Summary

1. There is a single high-level policy seeking that heat island effects be minimised, without any strategic tests or decision tools. Heatwave is not dealt with at a higher policy level.
2. Climate change is not acknowledged in respect of heatwave or heat islands.
3. No standards are established to require avoidance heat island or heatwave effects
4. Natural ventilation and other design elements are included to specifically deal with heatwave.
5. No strategic planning processes effectively assess potential future or legacy heat island or heatwave risks.
6. No acknowledgement of the different vulnerabilities of persons exists.
7. There are no links into other systems such as health, responder or building code
8. No specific legacy treatments exist.
9. Limited site by site and building by building treatments exist in development control oriented to seeking greater tree retention and improved energy ratings of structures – rather than specific attention to heatwave or heat island.
10. No wider design principles such as "neighbourhood" or other approaches are required.

Q1 – Are potential risk treatments integrated and fully used across prevention, preparedness, response and recovery? Where is integration mostly found and where does it fall short?

Treatment	Main Characteristics	Assessment
Avoidance of exposure	15.02-1S seeks to Reduce the urban heat island effect by greening urban areas, buildings, transport corridors and open spaces with vegetation. Encourage retention of existing vegetation and planting of new vegetation as part of development. and subdivision proposals. Limited encouragement on site-by-	No real treatment in this respect. No strategic assessment and forward planning. No standards or benchmarks established.

	site basis to retain or plant trees. E.g., via Clause	
Reduction of hazard or exposure to it	15.02-1S seeks to Reduce the urban heat island effect by greening urban areas, buildings, transport corridors and open spaces with vegetation. Encourage retention of existing vegetation and planting of new vegetation as part of development. and subdivision proposals.	High level policy that does not appear to translate to strategic or site level action at this stage, although it is noted that the policy was introduced only in 2018. Lan release and subdivision design is not assessed in terms of heat island effects.
Reduction of vulnerability or exposure to hazard	Silent, or implicit assumption that structures provide mechanisms for reduction of exposure. 52.20-7.1 Energy efficiency seeks to minimise cooling loads, and 52.20-7.4 Deep soil areas and canopy trees seeks plantings to minimise heat effects.	Pays no real heed to heatwave except via energy standards related mainly to energy efficiency. Differences in vulnerability of persons is ignored.
Preparedness for Response	None	None. No links into or facilitation of response processes, such as provision of "cool spaces" or similar.
Preparedness for Recovery + Recovery	None	None
Other Matters		

TABLE 7 – SUMMARY ASSESSMENT OF HEATWAVE RISK TREATMENTS IN VICTORIAN PLANNING ACROSS PPRR

Q2 – Are the full spectrum of legacy, projected and emergent risks spatially considered on the basis of up-to-date hazard mapping and integrated spatial assessment?

No standards or benchmarks established for heat effects, nor acknowledgement of existing issues, or projected climate change effect in existing or future areas to guide ongoing decisions or treatment of legacy issues.

Q3 – Are goals, objectives and other relevant guiding principles and terminology integrated across relevant systems?

Limited integration. Policy 15.02-1S seeks to Reduce the urban heat island effect by greening urban areas, buildings, transport corridors and open spaces with vegetation – is not integrated with any actual decision criteria or treatment mechanisms.

Other actions for heatwave such as that instigated by Resilient Melbourne is largely unconnected with statutory planning.

Q4 – Are relevant legislative, regulatory, policy and planning provisions integrated across systems?

Limited integration. Health actions, strategies response plans are not connected with statutory processes or mechanisms.

No links with other acts and regulations such as in Building Code exist.

Q5 – Are relevant local, cultural, social, economic, and ecological matters acknowledged and taken into account?

No.

Q6 – Are relevant processes integrated across relevant systems – vertically and horizontally?

Limited integration between systems.

Q7 – Are all relevant stakeholders represented in key processes and activities?

No triggers for assessment or referral exist.

Q8 – Are the range of financial and investment mechanisms integrated with other processes, activities, and goals?

No. External activities such as by health agencies and responders are separate from those of planning.

FLOOD

Summary of issues

1. No fundamental basis on comprehensive risk assessment and treatment approach, although some high-level state policy points towards this. For example, no real differentiation of vulnerability, consequences or risks acceptance is factored in.
2. A need for active strategic planning, scenario testing and deliberate design to ensure integrated outcomes in concert with risk assessment, including climate change.
3. A need to integrate other activities such as flood management, levees, dams, flood risk management plans, local government risks management plans etc into planning responses.
4. Inconsistency of terminology
5. Excessive focus upon 1:100 flood mapping.
6. Uncertainty of roles and responsibilities for keeping mapping up to date.
7. Existing overlays are used sometimes used in variable ways without clear reasoning for use of certain mechanisms.
8. Role and interactions with stormwater systems unclear.

9. No overlay or relevant control exists for coastal inundation and associated processes such as coastal erosion.
10. No connection to the Building Code in terms of relevant flood elements exists
11. Differences between events are largely ignored: velocity of flows, depth, speed of onset, longevity of flood waters, entrapment.
12. No real acknowledgement of differing vulnerabilities of the population.
13. No real acknowledgement of up-stream and downstream impacts, vegetation change, nor of impacts of ongoing re-development cumulative and long-term effects.
14. No active treatment of legacy flood risk except for minimum floor heights in new structures.
15. No acknowledgement of other design or building elements that interact with flood, except height above sea level.
16. No mechanisms for recovery, planned retreat or land acquisition.

Q1 – Are potential risk treatments integrated and fully used across prevention, preparedness, response and recovery? Where is integration mostly found and where does it fall short?

Treatment	Main Characteristics	Assessment
Avoidance of exposure	Avoidance of locating infrastructure and structures in flood areas. Explicit statements and processes for strategic action unclear.	Mapping and strategic processes variable across different agencies and methodologies.
Reduction of hazard or exposure to it	Limited attention to flood mitigation, although some acknowledgement of links between upstream and downstream impacts exists.	Over-reliance on 1:100 based approaches. Ambiguity regarding differences in freeboard required for climate change between existing and new areas.
Reduction of vulnerability or exposure to hazard	While some acknowledgement exists regarding differences in vulnerability across different types of buildings and works this is limited. Use of Special Building Overlay provides some protection.	No real links into building codes in terms of modifying vulnerability.
Preparedness for Response	Little direct attention.	Little direct attention.
Preparedness for Recovery + Recovery	Little direct attention.	Little direct attention.

TABLE 8 – SUMMARY ASSESSMENT OF FLOOD RISK TREATMENTS IN VICTORIAN PLANNING ACROSS PPRR

Q2 – Are the full spectrum of legacy, projected and emergent risks spatially considered on the basis of up-to-date hazard mapping and integrated spatial assessment?

No fundamental basis on comprehensive risk assessment and treatment approach, although some high-level state policy points towards this. For example, no real differentiation of vulnerability, consequences or risks acceptance is factored in.

Limited attention to legacy risks. Some attention to emergent climate change risks but links between upstream and downstream actions re limited, as are links between stormwater systems and overland flow flooding.

Q3 – Are goals, objectives and other relevant guiding principles and terminology integrated across relevant systems?

Inconsistency of terminology exists, such as between hazard, risk, and probability. Links to wider Nationally mandated terminology are not made.

No overlay or relevant control exists for coastal inundation and associated processes such as coastal erosion, and linkages between these responsibilities and systems are unclear.

Q4 – Are relevant legislative, regulatory, policy and planning provisions integrated across systems?

Many aspects of integration are sound, noting the above commentary. However, links between building codes and planning system are not clear.

Q5 – Are relevant local, cultural, social, economic, and ecological matters acknowledged and taken into account?

Many of these processes are dealt with under parallel systems and provisions.

Q6 – Are relevant processes integrated across relevant systems – vertically and horizontally?

Links between and responsibilities for inter-related systems and processes are unclear in many locations, such as: urban development, sea level rise, coastal erosion, inundation, storm surge, vegetation protection, storm water systems, overland flows, and riverine flood.

Q7 – Are all relevant stakeholders represented in key processes and activities?

Note the above.

Q8 – Are the range of financial and investment mechanisms integrated with other processes, activities, and goals?

No real acknowledgement of wider processes of infrastructure protection, wider as flood management, levees, dams, flood risk management plans, local government risks management plans etc into planning responses.

TSUNAMI

Tsunami is not addressed in the Victoria Planning Provisions.

EARTHQUAKE

Earthquake is not addressed in the Victoria Planning Provisions.

SEVERE STORM

Severe Storm is not addressed in the Victoria Planning Provisions, although it is noted that this category is typically linked with one or more of flood, inundation, coastal erosion, and landslip.

MULTI-HAZARD

Multi-hazard events are not addressed in the Victoria Planning Provisions.

TEAM MEMBERS

PROF ALAN MARCH

Alan March is Professor in Urban Planning. Alan has twice won the Global Planning Education Network's prize for "Best Planning Paper" (2007, 2011). His teaching includes urban design, planning law and planning theory subjects, and he was awarded a Faculty teaching prize in 2007. Alan has successfully supervised over 60 students' theses encompassing a range of urban design and planning research topics. He won the Planning Institute of Australia's Victoria division "planner of the Year" prize in 2016 and won a National Commendation in the same category in 2017.

Alan has practised since 1991 in a broad range of private sector and government settings and has had roles in statutory and strategic planning, advocacy, and urban design. He has worked in Western Australia, the UK, New South Wales, and Victoria. Alan's early career included projects as diverse as foreshore protection plans, rural to urban subdivision approval and design, the Mandurah Marina and Urban Design Guidelines for the Joondalup City Centre. In England, he has worked in brownfield and inner-city redevelopment, including land assembly and urban regeneration projects. Alan has extensive experience in inner city redevelopment projects in Melbourne since 1996.

Alan's publications and research include examination of the practical governance mechanisms of planning and urban design, in particular the ways that planning systems can successfully manage change and transition as circumstances change. He is particularly interested in the ways that planning and design can modify disaster risks, and researches urban design principles for bushfire. His current work also considers the ways that urban planning is seeking to establish new ways to spatialise urban management.

DR LEONARDO NOGUEIRA DE MORAES

Leonardo Nogueira de Moraes is a postdoctoral research fellow in tourism, resilience, and urban planning at the Faculty of Architecture, Building and Planning of the University of Melbourne. He is part of the research team for the *Integrated urban planning for natural hazard mitigation* project, funded by the Bushfire and Natural Hazards CRC.

His background includes a Bachelor of Tourism (Planning) degree and a Specialisation in Tourism and Hospitality Marketing Management from the University of São Paulo, Brazil. His PhD in Architecture and Planning at The University of Melbourne focused on the effects of tourism development and the implementation of protected areas on the resilience of small oceanic islands, from a social-ecological complex adaptive systems perspective.

His current research on resilience and urban planning also includes the effects of tourism development to the resilience of local communities to natural hazards.

REFERENCES

1 AIDR. (2019). *Australian Emergency Management Arrangements*. Australian Institute of Disaster Resilience, Melbourne.

2 Australian Institute for Disaster Resilience. (2020). *National Emergency Risk Assessment Guidelines: Handbook 10*. Australian Institute for Disaster Resilience, Canberra.

3 Bartuska, G. (2007). "The built environment: definition and scope", in G. Bartuska, (ed.), *The Built Environment: A Creative Inquiry into Design and Planning*. Menlo Park, CA: Crisp Productions.

4 Binskin, M., Bennett, A., and Macintosh, A. (2020). *Royal Commission into National Natural Disaster Arrangements*. Commonwealth of Australia, Canberra.

5 Crichton, D. (1999). "The risk triangle", in J. Ingleton, (ed.), *Natural Disaster Management*. London: Tudor Rose, pp. 102-103.

6 Eccles, D., and Bryant, T. (2006). *Statutory Planning in Victoria*, Sydney: The Federation Press.

7 Hopkins, L. D. (2001). *Urban Development: The logic of making plans*, Washington: Island Press.

8 Land Use Planning and Building Codes Taskforce. (2014). *Enhancing Disaster Resilience in the Built Environment*. Planning Institute of Australia: National Emergency Management Committee Land Use Planning and Building Codes Taskforce, Canberra.

9 March, A., and Gonzalez-Mathiesen, C. (2020). *Land Use Planning for Disaster Resilient Communities*. Australian Institute for Disaster Resilience, Melbourne.

10 March, A., and Kornakova, M. (2017). "Urban Planning for Disaster Recovery", in A. March and M. Kornakova, (eds.), *Urban Planning for Disaster Recovery*. London: Elsevier.

11 March, A., Nogueira de Moraes, L., Riddell, G., Stanley, J., van Delden, H., Beilin, R., Dovers, S., and Maier, H. (2020). *Urban Planning and Natural Hazard Risk Reduction: Critical Frameworks for Best Practice*. Bushfire and Natural Hazards CRC: https://www.bnhcrc.com.au/sites/default/files/managed/downloads/urban_planning_and_natural_hazard_risk_reduction_-_critical_frameworks_for_best_practice.pdf.

12 March, A., Riddell, G., Nogueira de Moraes, L., Stanley, J., van Delden, H., Beilin, R., Dovers, S., and Maier, H. (2020). "Urban planning capabilities for bushfire: treatment categories and scenario testing." *Australian Journal of Emergency Management*, 35(3), 32-40.

13 March, A. C. (2009). *Submission to the 2009 Victorian Bushfires Royal Commission*. Planning Institute of Australia, Canberra.

14 Rowley, S. (2017). *The Victorian Planning System: Practice, Problems and Prospects*, Melbourne: Federation Press.

15 Victoria, E. M. (2016). *State Emergency Response Plan: Earthquake Sub-Plan*. Emergency Management Victoria, Melbourne.

16 Victoria, E. M. (2018). *State Emergency Response Plan Tsunami Sub-Plan*. Emergency Management Victoria, Melbourne.

17 Wamsler, C. (2014). *Cities, Disaster Risk and Adaptation*, Abdingdon: Routledge.