

Managing the Uncertainty and Risks of Climate Change

Legal, Information and Insurance Issues

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Contents

| | |
|---|----|
| Contents..... | 1 |
| Objective of the paper | 2 |
| Legal tools, mechanisms and principles for risk management..... | 3 |
| The precautionary principle: a legal tool for managing uncertainty | 3 |
| Precautionary and risk management principles under the Climate Change Act..... | 4 |
| Applying the precautionary principle in climate change contexts..... | 5 |
| Adaptive management : a mechanism to deal with information deficits..... | 8 |
| Integrated decision-making: a mechanism to deal with complexity..... | 8 |
| Technology and law interface: legal considerations and mechanisms for providing information | 10 |
| The role of government as an information provider | 10 |
| Data governance..... | 11 |
| Technology and information quality..... | 13 |
| Spatial Data Directories..... | 14 |
| Information integration..... | 14 |
| Legal models for providing information..... | 16 |
| Barriers to the use of information instruments | 16 |
| Disclosure requirements | 17 |
| Incorporation of hazard mapping in local strategic planning..... | 17 |
| Risk appetite..... | 19 |
| Responsibility for hazard mapping | 20 |
| Insurance, information and interconnectivity | 20 |
| Insurance and climate change..... | 20 |
| National insurance arrangements | 21 |
| Insurance and information | 22 |
| Information cost recovery | 23 |
| Legislative division of responsibility for information sharing and monitoring of insurance companies | 24 |
| Overview of duties and potential liability associated with the use and communication of climate risk information by public authorities..... | 24 |
| Climate impacts/risks and government information provision: risk management tools | 24 |
| The Crown and its agencies are not immune from suit | 25 |
| Liability for negligent information or advice..... | 25 |
| Hazard risk mapping | 29 |
| Conclusion | 32 |

Objective of the paper

The purpose of this paper is to explore legal, information and insurance issues that arise in the context of managing the inherent uncertainty and risks of climate change and its impacts. The focus of the paper is the use of data that informs adaptation – how it can be collated, updated and disseminated, and how it can be incorporated into instruments to affect adaptation by governments, communities and individuals. The paper examines legal tools, mechanisms and principles for risk management, including the precautionary principle, adaptive management and integrated decision making. It then explores the interface between information and technology, including the use of integrating multiple datasets to provide tools to manage emergencies such as fire and flood. Insurance is examined as an example of a sector which is able to utilise climate and hazard data to drive adaptation by governments as well as individuals. Finally, the paper explores potential liability issues that may arise for government authorities from the use, or non-use, of climate information.

Making decisions in a context of uncertainty about the magnitude, timing and distribution of climate impacts is a key challenge for governments and the private sector in undertaking adaptation planning. Uncertainties and information deficits might arise because of gaps in our knowledge about the impacts of climate change on local environments. Alternatively it may be lack of knowledge about the likely responses of ecological and socio-economic systems to climatic changes that are the source of uncertainty.

Uncertainties are also not uniform in nature. In some cases we know a fair amount about the risks we face. In the case of sea level rise, for instance, reasonably robust predictions can be made, on the basis of existing scientific information, about levels and timeframes of impact. By contrast, much less is known about the implications of climate change for rainfall patterns at the regional and local scale.

As climate change alters the intensity, frequency and location of natural hazards, it will be increasingly important for governments, businesses and individuals to have access to regularly updated and reviewed information. Climate change will reduce the reliability of information based on historical experience alone.¹

Risk management has become increasingly applied to climate change adaptation, given the significant uncertainty about future impacts and the inability to rely on historic data as a basis for current action.² The Victorian *Climate Change Act 2010* requires the preparation of a four-yearly Adaptation Plan that must be underpinned by the principle of risk management, and include a risk assessment.³ Risk management is a mechanism that enables the identification of risks, followed by an assessment of their consequences and the likelihood of those consequences occurring. An evaluation of the risks can then be formed and decisions made about how to treat or manage those risks.

¹ Productivity Commission, *Barriers to Effective Climate Change Adaptation: Productivity Commission Inquiry Report No. 59* (19 September 2012) 136.

² Lee Godden, Francine Rochford, Jacqueline Peel, Lisa Caripis and Rachel Carter, 'Law, Governance and Risk: Deconstructing the Public-Private Divide in Climate Change Adaptation', 36(1) *UNSW Law Journal*, 224, 235.

³ *Climate Change Act 2010* (Vic) ss 10 and 16.

However, another feature of climate change risks and associated uncertainties is the potential for complex interactions between various impacts and adaptation responses. For example, measures taken to reduce bushfire risk through vegetation clearing may exacerbate threats to wildlife and water availability. Complex linkages and uncertainties arise not just between adaptation threats and responses but also with measures taken with the aim of climate change mitigation. Finally the complexity of the ecosystems impacted, and their interplay with socio-economic systems, give rise to what might be called ‘the law of unintended consequences’: the potential for surprises, perverse outcomes and maladaptation.

These interactions create new risks – such as triggering ecological tipping points – as well as exacerbating or transforming risks of extreme weather and climatic events such as bushfires, floods, heatwaves and droughts. The impacts of climate change may give rise to cascading risks of potentially unforeseeable magnitude. Therefore our current understanding and application of narrow technical risk management needs to be broadened to facilitate a more contextual approach to promote resilience.⁴ The processes involved in charting adaptation pathways rely heavily on the nature, quality and relevance of climate information, and requires decisions to be taken by government, the private sector and the community about their respective roles and responsibilities for providing, analysing and applying information to assist adaptation.

Legal tools, mechanisms and principles for risk management

The precautionary principle: a legal tool for managing uncertainty

The principal tool the law offers for dealing with uncertainties and information gaps in relevant scientific knowledge regarding risks is the precautionary principle. The precautionary principle is well-entrenched in Australian and international environmental law. In Victoria it is found in legislation such as the *Environment Protection Act 1970* and the *Climate Change Act 2010*, as well as in regulatory instruments such as State Environment Protection Policies. More broadly, application of the precautionary principle is considered a matter of ‘common-sense’ in situations ‘where uncertainty or ignorance exists concerning the nature or scope of environmental harm’.⁵

In essence, the precautionary principle calls for actions to address serious or irreversible threats of damage to be implemented without delay, despite the absence of conclusive scientific proof of harm. Case law in Australia has articulated a two-part threshold test for application of the precautionary principle, both elements of which must be satisfied: (1) the existence of a threat of serious or irreversible environmental damage; and (2) scientific uncertainty as to the environmental damage.⁶ Where these tests are met and the precautionary principle is activated the evidentiary burden of proof

⁴ Godden, above n 2.

⁵ *Leatch v National Parks and Wildlife Service and Shoalhaven City Council* (1993) 81 LGERA 270, at 282. The *Leatch* decision was endorsed by Justice Osborn in *Western Water v Rozen & Ors* [2008] VSC 382. See also Charmian Barton, ‘The Status of the Precautionary Principle in Australia: its emergence in legislation and as a common law doctrine’ (1998) 22 *Harv. Envtl. L. Rev.* 509.

⁶ *Telstra Corporation Ltd v Hornsby Shire Council* (2006) 146 LGERA 10, at 38. These tests have been endorsed by the Victorian Supreme Court in *Environment East Gippsland v VicForests* [2010] VSC 335 and applied by VCAT in cases such as *Alanvale v Southern Rural Water* [2010] VCAT 480 and *Dual Gas v Environment Protection Authority* [2012] VCAT 308.

shifts. In other words '[a] decision-maker must assume that the threat of serious or irreversible environmental damage is no longer uncertain but is a reality'.⁷ In effect, an unknown threat is treated as a known risk and proportionate risk management measures are to be adopted accordingly.

Precautionary and risk management principles under the Climate Change Act

The *Climate Change Act 2010* sets out a number of 'guiding principles' in Part 2, Division 3 of the Act. Section 7(2) of the Act provides the Minister must have regard to each of these principles 'in making a decision in the course of preparing a Climate Change Adaptation Plan under section 16'. The relevant principles with respect to questions of information, uncertainty and risk management are the following:

8 Principle of informed decision-making

A decision should be based on:

- (a) a comprehensive analysis of the best practically available information about the potential impacts of climate change that are relevant to the decision under consideration.

10 Principle of risk management

(1) A decision should be based on:

- (a) careful evaluation of the best practically available information about the potential impacts of climate change to avoid, wherever practicable, serious or irreversible damage arising from climate change
- (b) an assessment of the consequences of each of the options in making a decision having regard to the risks of each of those options
- (c) managing and allocating the risks associated with the potential impacts of climate change in a manner that is easily seen and understood and endeavoring to achieve best practice.

(2) A decision should not rely on a lack of full scientific certainty as a reason to postpone appropriate measures to prevent serious or irreversible loss or damage as a result of climate change.

These principles largely reiterate and rearticulate the precautionary principle as it is expressed in the 1992 *Intergovernmental Agreement on the Environment* (IGAE). Pursuant to this policy document, all Australian governments agreed that several environmental principles, including the precautionary principle, 'should inform policy making and program implementation'.⁸ The precautionary principle in the IGAE is stated as follows:

Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental

⁷ Ibid, at 43.

⁸ IGAE, section 3.5.

degradation. In the application of the precautionary principle, public and private decisions should be guided by:

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment
- (ii) an assessment of the risk-weighted consequences of various options.

The hallmarks of precautionary decision-making according to the IGAE and guiding principles articulated in the *Climate Change Act* are:

- reliance on the best practically available information about the potential impacts of climate change relevant to the decision under consideration
- careful evaluation of that information to avoid, wherever practicable, serious or irreversible damage arising from climate change
- an assessment of alternative decision-making options having regard to the risks associated with each of those options
- not postponing appropriate measures to prevent serious or irreversible loss or damage as a result of climate change because scientific uncertainty exists regarding the nature or scope of harm.

The principle of risk management articulated in the *Climate Change Act* adds further requirements of transparency, comprehensibility and striving for best practice when managing and allocating climate change risks.

Applying the precautionary principle in climate change contexts

General principles regarding precautionary decision-making are easily articulated but less readily applied in practice. One source of guidance for understanding what the precautionary principle might require of decision-makers dealing with adaptation risks is climate change case law decided by Australian courts and tribunals. In many instances, courts or tribunals addressing climate change issues have done so in merits review.⁹

In Victoria, the Victorian Civil and Administrative Tribunal (VCAT) has dealt with several cases that explicitly raised the potential for climate change-exacerbated impacts and the role of the precautionary principle in addressing uncertainties and information gaps. The cases demonstrate how courts try to apply principles to actual facts. Court judgments can then be used to inform policy and guidance documents at a government level to shape future directions. The cases and their principal findings regarding application of the precautionary principle are summarized in the table below.

⁹ Merits review, where permitted by legislation, enables courts or tribunals to review a government decision by 'standing in the shoes' of the original decision maker and considering if the decision was 'preferable' on the merits. The court or tribunal is faced with much the same information, policy and legal context as the original decision-maker and must determine 'the correct or preferable decision' on that basis. Merits review focuses on the quality of the original decision, rather than its legality (which is the focus of judicial review).

| VCAT decision | Adaptation risk | Guidance on application of the precautionary principle |
|--|---------------------------------------|--|
| <i>Alanvale v Southern Rural Water</i> (2010) | Groundwater scarcity | <ul style="list-style-type: none"> • Climate change gives rise to ‘some fundamental uncertainties about key assumptions, which influence a proper assessment of the long term availability of the groundwater resource’. • Refusal to grant licenses on the basis of ‘a lack of certainty about the existing and future projected availability of groundwater’ within the relevant GMA. • Serious and potentially irreversible environmental damage that depletion of the resource may cause ‘means that the long term sustainability of the resource needs to be established with more certainty before additional licenses are granted’. • Precautionary principle triggered by: (1) risk that over allocation of groundwater resources could significantly deplete the aquifer, with climate change as the biggest factor potentially influencing that risk and (2) scientific uncertainty about the nature and scope of the threat – at best there were only theoretical calculations and conceptual understandings. • Until the implications of the effects of climate change on rainfall recharge for the aquifer are better understood, the precautionary principle should be applied and we should be cautious in making decisions about the allocation of groundwater resources now. |
| <i>Carey v Murrindindi SC</i> (2011) | Bushfire | <ul style="list-style-type: none"> • VCAT ‘conscious that a prudent approach is needed and that climate change predictions at this point suggest that Victoria will get more extreme fire danger days as time goes on, not less’. |
| <i>Adamson v Yarra Ranges</i> (2013) | Bushfire | <ul style="list-style-type: none"> • Application of the precautionary principle was appropriate in cases where human behaviour is uncertain (e.g. commitment to ongoing maintenance of buffers), fire science is uncertain and the risk is exceptionally high (people die, property is destroyed and the environment is damaged for years). • Appropriate that decision makers exercise considerable caution and only press the ‘go’ button when satisfied that it is highly likely that people and property will survive the worst expected conditions. |
| <i>Gippsland Coastal Board v South Gippsland SC</i> (2008) | Sea level rise and coastal inundation | <ul style="list-style-type: none"> • ‘The precautionary principle requires, amongst other matters, a gauging of the consequences and extent of intergenerational liability arising from a development or proposal and if found to be warranted, appropriate courses of action to be adopted to manage severe or irreversible harm’. |

| VCAT decision | Adaptation risk | Guidance on application of the precautionary principle |
|--|---|--|
| | | <ul style="list-style-type: none"> • Growing evidence of sea level rises and risks of coastal inundation, with uncertainty as to the magnitude of sea level rise and a range of impacts that may well be beyond the predictive capability of current assessment techniques. ‘In the face of such evidence, a course of action is warranted to prevent serious or irreversible harm’. • Existence of ‘a longer term risk of intergenerational liability that can and should be avoided in the absence of no imperative or higher need for the development that overrides these potential liabilities’. • VCAT considered that ‘increases in the severity of storm events coupled with rising sea levels create a reasonably foreseeable risk of inundation’ that was ‘unacceptable’. |
| <i>Taip v East Gippsland SC (2010)</i> | Sea level rise and coastal inundation | <ul style="list-style-type: none"> • The overall approach in applying the precautionary principle requires: (1) the planning decision to be made in the face of acknowledged climate change impacts and not to be deferred; (2) assessment of how the risks from climate change can be minimized to an acceptable level; and (3) any uncertainty surrounding the potential impacts from climate change should not be a reason to defer decision making. |
| <i>Stewart v Moyne SC (2014)</i> | Sea level rise, coastal inundation and high value biodiversity site | <ul style="list-style-type: none"> • Scenarios assessed in local coastal hazard survey are to be relied upon instead of the <i>Victorian Coastal Study</i>, as the local survey is most pertinent to the future planning of coastal issues for the shire. Planning should avoid or at least minimize significant impacts, including cumulative impacts from land use and development. Need to balance the intended planning purposes of residential zoned land and policy support for infill development in coastal towns to reduce pressure from developments along coastal strip and rural land, against the susceptibility of land to future inundation scenarios, stormwater management and habitat value. |

The case law suggests a number of themes relevant to precautionary decision-making:

- the need for a cautious assessment of the available evidence where there are acknowledged climate change risks and uncertainties
- a prudent approach to decision-making that refuses proposals if risks of harm are high
- consideration of long term risks and intergenerational liabilities that arise if a proposal is approved
- a proportionate decision making response that evaluates whether risks can be minimized to an acceptable level.

Adaptive management: A mechanism to deal with information deficits

Another tool that exists to deal with information deficits and uncertainty is adaptive management. Adaptive management is often described as an approach of ‘learning while doing’ or ‘policy experimentalism’.¹⁰ An activity with uncertain impacts is allowed to proceed, but with systematic monitoring of results and feedback processes in place that allow ongoing decision adjustments.¹¹ While application of the precautionary principle is suitable in situations of threats of serious or irreversible harm, adaptive management is most appropriate in circumstances where risks or predicted impacts are perceived as minimal or readily manageable and reversible. For adaptive management to be effective, it is also critical that the regulatory framework under which decisions are made allows opportunities for adjustment. Laws that call for a single decision, not open to later reconsideration, will not provide a suitable institutional environment for adaptive management.¹²

Adaptive management approaches have most commonly been applied in the context of natural resource management e.g. fisheries and forestry. Particularly where little is known about the response of a species to climate change impacts, adaptive management techniques offer a way of improving the available information while minimizing the likelihood of serious or irreversible harm occurring, through continuous monitoring and adjustment of the management response.

Another way in which adaptive management might be put into practice is through the use of limited approvals for activities likely to be exposed to climate change risks over the long term. For example, approval for coastal development facing risks of sea level rise and inundation might be issued on the basis that buildings are capable of relocation at a future point in time. This allows the potential for reassessment of the sustainability of the activity at regular intervals, in light of emerging information regarding climate change risks.

Integrated decision-making: A mechanism to deal with complexity

The complexity of potential adaptation risks and the possibility for their interaction emphasizes the need for integrated decision-making processes to deal with this complexity. Integrated forms of

¹⁰ Carl J. Walters and C.S. Holling, 'Large-Scale Management Experiments and Learning by Doing' (1990) 71(6) *Ecology* 2060; Holly Doremus, 'Precaution, Science and Learning While Doing in Natural Resource Management' (2007) 82 *Washington Law Review* 547.

¹¹ Holly Doremus et al, 'Making Good Use of Adaptive Management' (Center for Progressive Reform, 2011).

¹² Jacqueline Peel, *The Precautionary Principle in Practice: Environmental Decision-making and Scientific Uncertainty* (2005, Federation Press, Sydney).

environmental planning and natural resource management have long been advocated in environmental law and policy.¹³In some cases these mechanisms have been implemented with a reasonable level of success, most notably in integrated catchment (or water resources) management.¹⁴

Different models and tools are available for improving the level of integration of climate change considerations into broader decision making exercises. One such tool is the specification of climate change or specific adaptation risks as a matter to be taken into account in decisions made under legislation dealing with other sectors. The *Climate Change Act* contains an example of this approach. Section 15 of the Act requires decision-making under other specified statutes to 'have regard to' the potential impacts of climate change relevant to the decision. This decision-making requirement could usefully be extended to other legislation, including the *Planning and Environment Act 1987*, which is the principal Victorian statute relevant for land use planning, the *Environment Effects Act 1978* and other selected acts. Extending the range of Acts scheduled in the *Climate Change Act* would be useful as a mechanism to give a legal underpinning to embed climate change considerations in decision making processes.

Other potential tools for improving integrated decision-making in a climate change context are processes of environmental impact assessment and strategic environmental assessment. While environmental impact assessment is project-focused, it can serve a more integrative function through directions in terms of reference to consider and evaluate the indirect and cumulative effects of a project. Strategic environmental assessment enables higher-level evaluation of a range of impacts associated with plans, policies or programs. This tool can be particularly effective in evaluating the interaction of different risks over a large scale or longer time frame. Intergovernmental strategic assessments undertaken by the Commonwealth and Victorian governments in relation to expansion of Melbourne's urban growth boundary offer a model in this regard. Strategic assessments are easier to undertake in relation to the development of greenfield sites, rather than retrofitting existing developments.

¹³Bruce M. Campbell and Jeffrey A. Sayer (eds), *Integrated Natural Resource Management: Linking Productivity, the Environment and Development* (2003, CABI Publishing, Wallingford); Stephen Dovers and Robin Connor, 'Institutional and Policy Change for Sustainability' in Benjamin J. Richardson and Stepan Wood (eds), *Environmental Law for Sustainability* (2006, Hart Publishing, Portland) 21; David Farrier, 'Fragmented Law in Fragmented Landscapes: the Slow Evolution of Integrated Natural Resource Management Legislation in NSW' (2002) 19(2) *Environmental And Planning Law Journal* 89; Lakshman Guruswamy, 'The Case for Integrated Pollution Control' (1991) 54 *Law and Contemporary Problems* 41; Kevin S. Hanna and D. Scott Slocombe (eds), *Integrated Resource and Environmental Management: Concepts and Practice* (2007, Oxford University Press, Toronto); John Cairns Jr, 'The Need for Integrated Environmental Systems Management' in John Cairns Jr and Todd V. Crawford (eds), *Integrated Environmental Management* (1991, Lewis Publishers Inc, Chelsea, Michigan) 5; David Jones, 'The Kyoto Protocol, Carbon Sinks and Integrated Environmental Regulation: An Australian Perspective' (2002) 19(2) *Environmental & Planning Law Journal* 109; Resource Assessment Commission, 'Coastal Zone Inquiry: Integrated Resource Management in Australia' (RAC Information Paper, No. 6, Resource Assessment Commission, 1993).

¹⁴Jan Hassing et al, 'Integrated Water Resources Management in Action' (UNEP, 2009); Bruce Mitchell and Malcolm Hollick, 'Integrated Catchment Management in Western Australia: Transition from Concept to Implementation' (1993) 17(6) *Environmental Management* 735; Rebecca Nelson, 'Legislation for ICM: Advancing Water Resources Sustainability?' (2005) 22(2) *Environmental And Planning Law Journal* 96; Barton H. Thompson, 'A Federal Act to Promote Integrated Water Management: Is the CZMA a Useful Model?' (2012) 42 *Environmental Law* 201.

Technology and law interface: legal considerations and mechanisms for providing information

The role of government as an information provider

The Council of Australian Governments Select Committee on Climate Change endorsed a statement on the roles and responsibilities for climate change adaptation in Australia in November 2012.¹⁵ This statement emphasises the importance of spreading the allocation of roles and responsibilities between the three levels of government and private parties. The statement recognises that the Commonwealth government has a role to play in providing information which has broad public benefit (such as high quality, regionally specific climate projections) to build understanding and better inform decision making and the development of resilience across both the public and private sectors.¹⁶ Effective adaptation action cannot be taken in a vacuum of information about climate change impacts, risks and opportunities. The Commonwealth government is best placed to generate and coordinate most of the important climate change science and related information as it would be too costly for individual businesses or local governments to generate the required information.¹⁷

The Victorian government has built upon the COAG agreed roles and responsibilities in its *Victorian Climate Change Adaptation Plan* by agreeing to partner with the Commonwealth, other state and local governments to develop reliable information and analytical tools, particularly where this can be done most efficiently at the national level.¹⁸ The general approach is stated in the Victorian Climate Change Adaptation Plan:

‘Governments should manage risks to public assets and services and make efficient investment decisions. Governments also provide information and help to build the ‘adaptive capacity’ of individuals, businesses and groups to manage climate risks. The Victorian Government is committed to creating the right conditions and incentives for private parties to manage their climate risks, recognising that risk management is generally best undertaken by those who are directly affected, and who are in a position to manage the risks [emphasis added].’¹⁹

Information instruments are one of the key mechanisms which can be implemented by governments to encourage private parties to undertake adaptation measures.

These include broad community education programs and publicly available hazard mapping, which are common practice in all hazard contexts around Australia, including Victoria. Yet combining more targeted site-specific hazard information with a regulatory requirement to provide this information to relevant stakeholders offers a potentially more effective mechanism to influence private decision-making and encourage private adaptation. Such targeted information instruments can also be used to manage legal risks.

¹⁵ Council of Australian Governments Select Committee on Climate Change, *Roles and Responsibilities for Climate Change Adaptation in Australia* (November 2012).

¹⁶ Ibid 3.

¹⁷ Ibid 4.

¹⁸ Victorian Government, *Victorian Climate Change Adaptation Plan* (March 2013) 10.

¹⁹ Ibid 9.

The Victorian government is improving access to research and information for decision making, to assist businesses and communities better understand and manage their climate risks and to inform government planning and decision making on responsibilities for disaster resilience, risk management for service delivery and asset maintenance and planning.²⁰ Sharing climate change adaptation research information is an important part of developing adaptive capacity in Victoria.

The Victorian *Constitution* provides that there is always to be in force an Act which promotes the disclosure of information by creating a general right of access to information in documentary form in the possession of Ministers and agencies, subject to exceptions and exemptions necessary to protect essential public interests and the private and business affairs of people about whom information is collected and held by government agencies.²¹ The Act that meets this constitutional requirement is the *Freedom of Information Act 1982*.

Data governance

The collection, use and communication of climate risk information by public authorities involves issues of accuracy, interoperability, reliability, accountability and liability. These issues are exacerbated by the fact that information is produced by multiple authorities in multiple jurisdictions to meet internal needs and functions that cut across processes and services. Furthermore, there is a wide variety of audiences and applications for climate change information. It is not possible to produce and collate the volume of information that may be relevant to assessing climate risks using consistent metrics, unless that information is required to be produced in a particular format by an overarching power, for example, legislation and/or Australian or international standards (whose application is not mandatory unless incorporated into legislation). Alternatively, specific projects can require information to be generated by multiple stakeholders in a particular manner so that data integration can be optimised, facilitating better project outputs and outcomes. Standardised data collection procedures would also enable assessments and comparisons to be made across projects utilising such datasets.

To provide greater clarity to the governance of climate change information, consideration might be given to establishing a state government agency with the purpose of collecting, managing and disseminating such information across the public and private sectors. One entity (or a dedicated division of an existing department) could provide a focussed and streamlined data service. It could ensure that climate change information is distributed to those departments, agencies, local governments, businesses and communities where the information will be most relevant. The entity would be the clear ‘go to’ authority for current climate change data, modelling and mapping. Information distributed by the entity could reasonably be treated as being authoritative and could be relied upon in decision making processes, as the entity would only disseminate information from credible sources, such as the Intergovernmental Panel on Climate Change (IPCC), the Bureau of Meteorology (BOM) and the CSIRO.

The stages of information governance, which could form the work program for an information agency, can be summarised in the following manner:

²⁰ Ibid 31.

²¹ *Constitution Act 1975 (Vic)*, s 94H.

- collection
- compilation
- communication
- access
- maintenance
- distribution.

Legislation (and/or policies) can be a tool to help identify who is responsible for each stage of information governance. Standards and codes of practice also have a role to play in information governance, particularly in relation to the quality and accuracy of data at the time it is collected and compiled, as well as when updating and maintaining the data to ensure its currency and relevance.

Emerging trends in information governance include:

- obtaining and merging non-authoritative and non-verified crowd sourced information with high quality information, a trend in risk management and disaster mitigation
- obtaining and effectively utilizing local knowledge (e.g. flood history, experience of waves overtopping cliffs²²)
- identification of information sets of Triple A quality: assured, accurate and authoritative. Accuracy standards focus on fitness for purpose, not accuracy for its own sake
- implementation of core data sets that must be used by all agencies (legal entities, citizens, businesses); following the trend in the European Union to create key data sets for multiple uses throughout government and business.

The technical capacity to organise and deliver information develops faster than institutional and legal responses. Within this reality many initiatives taken in information policy and implementation strive to offer community and business information. The Victorian government operates under the relatively new *DataVic Access Policy* (the Policy) which provides that government data in the areas of environment, society and the economy will be made available unless access is restricted for reasons of privacy, public safety, security and law enforcement, public health, and compliance with the law.²³

The Policy provides public access to Victorian government generated or owned data through the publication of datasets, which includes demographic and geospatial data, on the Victorian government Data Directory website, www.data.vic.gov.au. The accompanying *DataVic Access Policy: Standards and Guidelines for the Victorian Public Sector* notes that the Policy is expected to achieve a range of benefits including several that are particularly pertinent to the issue of accessing information to assist in dealing with the inherent uncertainty of adapting to climate change:

- improving personal and business decision making based on improved access to data

²² In *Stewart v Moyne SC* [2014] VCAT 360 (31 March 2014), VCAT heard evidence from the applicants, who were local residents, about observed overtopping of coastal dunes.

²³ Department of Treasury and Finance, *DataVic Access Policy: Intent and Principles* (August 2012) 3.

- improving research outcomes by enabling access to primary data to researchers in a range of disciplines.²⁴

The Policy provides that datasets will not be commercialised unless an agency has a statutory function to do so, or Ministerial approval is granted.²⁵ As government can fund other organisations and businesses to produce information on its behalf, the Policy recommends that government agencies include a term in contracts with third parties to facilitate making datasets available to the public.²⁶

The Policy also provides that datasets be made available under Creative Commons licences, to the extent they are protected by copyright. Creative Commons licences are non-exclusive licences that are worldwide, royalty free and enable datasets to be distributed without permission or payment.²⁷ These licences are a response to the difficulties that would otherwise exist if governments tried to implement and enforce a myriad of commercial, fee-paying licence regimes to provide access to increasingly voluminous information. Creative Commons licences deal with the issue of data accuracy by clarifying that the data is provided ‘as is’. These licences are legal tools that facilitate public access to government data.

In relation to emergency management information, a project is being developed by the Commonwealth Attorney-General’s Department and RMIT to provide guidelines on consistent datasets to support risk assessments under the National Emergency Risk Assessment Guidelines. Anticipated outcomes of the project include:

- greater momentum in progressing the nationally and intra-jurisdictionally comparable hazards and risk assessments
- consistent methodologies and data frameworks for risk and disaster impact assessments to enable information sharing and accurate information
- greater certainty in confidence levels in hazard and risk assessments and increased ability to prioritise investment in the collection of data in areas considered to be of greatest risk.²⁸

Technology and information quality

There is a significant amount of climate change information produced by government departments and agencies including information on climate change trends and projections, impacts and vulnerability assessments and natural hazard risk information. The complexity of data raises issues about the quality and currency of information. As observed by the Productivity Commission:

Just as better weather forecasting could improve the ability of governments and the community to manage current climate risks, better projections of climate change and

²⁴ Department of Treasury and Finance, *DataVic Access Policy Standards and Guidelines for the Victorian Public Sector* (April 2013) 1.

²⁵ *Ibid* 16.

²⁶ *Ibid* 6.

²⁷ *Ibid* 20.

²⁸ Information provided at the Disaster Mitigation Workshop, Melbourne 23 May 2014, convened by the CSIRO and Attorney-General’s Department.

assessments of expected impacts could improve the ability of governments and the wider community to plan for future climate risks.²⁹

Spatial Data Directories

Various tools are available which provide access to spatial information. Several of these are outlined here.

The Australian Spatial Data Directory (ASDD) is a national initiative supported by all governments under the auspices of the Australia New Zealand Land Information Council (ANZLIC). The ASDD enables a user to simultaneously search spatial directories maintained by Commonwealth agencies, States and Territories, and commercial organisations.

The Geocentric Datum of Australia (GDA) is the nation's official spatial datum. GDA provides a single standard for collecting, storing and applying spatial data at all levels – local, regional, national and international.

Vicmap Address is Victoria's authoritative geocoded database of property address points. The data includes predominately, but not exclusively, locational property address identifiers assigned by local government, considered to be the primary creator and custodian of property address information. Content includes:

- unit type and number
- floor/level type and number
- house number
- road name
- locality.³⁰

Information integration

Data gains in utility and functionality when it is made interoperable and integrated into new applications.

An example of a project that relies on the integration of multiple data sets and tools is the collaboration between the University of Melbourne (School of Engineering) and IBM to develop the Australian Disaster Management Platform (ADMP) to improve disaster management and protect communities.³¹ The ADMP is being developed in collaboration with emergency services (including the Office of the Victorian Fire Services Commissioner).

The integrated, open standards based platform will enable all those involved in planning for, responding to and recovering from multi-hazard disasters to make swift, effective decisions, based on comprehensive, accurate, real-time information.

²⁹ Productivity Commission, above n 1, 125.

³⁰ See www.data.vic.gov.au.

³¹ See www.admp.org.au.

The ADMP draws on vast amounts of geo-spatial and infrastructure information from multiple data sets (including many sets already in existence), bringing these together and then integrating and analysing the data to create real-time, practical information streams on disaster events and to develop simulation and optimisation models.

The ADMP can, for example, provide tools to facilitate data integration and use of information about a bushfire scenario including temperature, ignition ‘hot spots’, topography, vegetation, soil moisture content, shelter, location of roads and exit routes and the numbers and locations of communities exposed to the threat. Evacuation movements can then be simulated³²

This practical information can then be communicated at appropriate levels of detail, to the wide spectrum of people involved making emergency decisions – from central coordinating agencies to on-ground emergency services personnel, through to local community members trying to decide whether to evacuate and if so how. This project enlivens the strategic priority in the Victorian Climate Change Adaptation Plan for building disaster resilience and integrated emergency management, in particular the need to embed cooperation across all agencies and enhance capability through greater interoperability and networked arrangements³³

The information provided by platforms such as the ADMP relies on the custodians of the multiple data sets to ensure the reliability and currency of the data. As an emergency management platform, it is essential that the data is up to date so that real-time streams are most effective. Specific projects can incorporate requirements into their systems that, for example, the custodians of particular datasets provide written assurance that data remains current, or if not, that updated data is provided as and when it becomes available. Time frames at which such assurance should be given can be set as appropriate to the needs of the project.

The ADMP can also utilise Building Information Management/Modelling software (BIM), which can include overall height, floor height, three dimensional representations, coordinates of internal spaces, components, defects, prices and visualisation capacity. BIM is increasingly compulsory in public building construction in America and Europe, but is not recognised by Australian law. BIM enables coverage of the building life, from conception and design and deformation and destruction.

Data sourced through BIM systems is an untapped resource in risk mitigation and emergency response management. Building scale information is relevant to inundation risk about floor heights. Information about infrastructure, for example the location and capacity of drains and sewers, is also highly pertinent to flood modelling at a scalable level. The information provided by BIM can be used by the insurance industry to model the costs involved in repairing or replacing damaged buildings in flood or bushfire prone areas.

Another platform to enable information interoperability is the Victorian Information Network for Emergencies (VINE) which is being developed by the Office of the Fire Services Commissioner. The objective of VINE is to provide an information network for all stakeholders before, during and

³² *Australia Disaster Management Platform Update*, seminar, Melbourne University, 11 December 2013.

³³ Victorian Government, above n 18, 26.

after emergencies, including the community and private sector, to assist decision making.³⁴ VINE is to provide a single platform for all information relevant to emergency management to be gathered and integrated. A significant challenge for the project will be to develop a data governance framework to manage issues such as agreeing to standards for data representation and data exchange. VINE is intended to facilitate the acquisition of structured and unstructured (e.g. social media) real time data from multiple sources, including the community,³⁵ so there are issues raised about what standards, if any, should apply to data provided by the community, and whether the nature of such data should be highlighted so that a user can distinguish that material from information provided by 'official' sources (e.g. government and emergency management agencies).

A long-term project which is a collaboration between Geoscience Australia, the Commonwealth Departments of the Environment and Attorney-General and states and territories is the National Exposure Information System (NEXIS). This is a national capability aimed at providing reliable information about residential, commercial and industrial exposure to climate change and natural hazards. NEXIS collects, collates, manages and provides this information to enable assessments of community exposure, impacts and risk. The information derives from the best available datasets and over time is transitioning to more specific information in collaboration with a range of data custodians.³⁶

Legal models for providing information

Models for providing information sit within a spectrum of other issues that relate to the collection and distribution of information, including privacy, public records management and consumer protection legislative regimes. The discussion here focuses on instruments that can be used to provide information about hazards associated with climate change. Such information can come in different forms, including statutory (planning law) and non-statutory instruments. They can also be categorised according to their scope. Broad information instruments convey general information about hazards, mitigation strategies and/or management options. Narrow information instruments are designed to provide information at a property-scale and directly influence decision-making surrounding its purchase and/or management (e.g. planning certificates provided at the point of sale). Irrespective of the type of information instrument involved, they serve to encourage and support autonomous adaptation and help manage liability risks for government.³⁷

Barriers to the use of information instruments

There are several challenges to the use of information instruments, particularly site-specific instruments:

³⁴ Fire Services Commissioner Victoria, *Reference Architecture: Victorian Information Network for Emergencies (VINE)* (version 1.2), May 2013, 5.

³⁵ *Ibid* 12.

³⁶ Information provided at the Disaster Mitigation Workshop, Melbourne 23 May 2014, convened by the CSIRO and Attorney-General's Department.

³⁷ Andrew McIntosh, Anita Foerster and Jan McDonald, *Limp, leap or learn? Developing Legal Frameworks for Climate Change Adaptation Planning in Australia*, National Climate Change Adaptation Research Facility (2013) 74-5.

- *False and misleading information*: planning agencies have a duty to act reasonably when providing information in relation to planning processes. The provision of false or misleading information in a planning instrument may result in liability.³⁸ Whilst this does not mean that all information must be 100% accurate, the potential legal exposure can lead to reticence to voluntarily disclose information on hazards. This is exacerbated by the uncertainties surrounding climate change projections.³⁹ Issues around potential liability and climate information are discussed later in this paper.
- *Impacts on property values and insurance premiums*: information instruments are intended to alter behaviour and changes in property values are one manifestation of this (decreases in property values represent an efficient market response to new information). Adverse public reaction to information instruments can act as a barrier to their use. To manage this it is important to ensure that all uncertainties associated with hazard projection are fully disclosed and that information is released in advance of the hazards materializing.⁴⁰ The potential for insurance premiums to increase in areas that have experienced, or are projected to experience, increased flooding or other hazards may be another focus on opposition to the use of information instruments.

Disclosure requirements

Planning certificates under the *Planning and Environment Act 1987* are used to satisfy the requirements of the *Sale of Land Act 1962* which requires vendors to issue a vendor's statement (s 32 statement) to purchasers before they sign a contract for the sale of land. Following the 2009 Victorian bushfires, amendments were made to these laws to explicitly disclose potential bushfire hazard exposure. If land is in a bushfire zone within the meaning of regulations made under the *Building Act 1993*, the vendor's statement must include a specific statement that the land is in such an area.⁴¹

Such statements are not required for other climate related hazards, for example, in a coastal zone, as there is no standard planning overlay for coastal hazards in Victoria. Planning certificates will therefore only contain information about coastal hazards where particular local governments have either employed other available overlays as de facto coastal hazard overlays; or where they have developed applicable planning controls and decide to include this additional information.⁴² This project's technical paper on spatial planning provides more details about these issues.

Incorporation of hazard mapping in local strategic planning

The *Victorian Coastal Strategy 2008* sets out the policy and strategic direction for responding to coastal hazard risks in the context of climate change. A new draft Strategy was released for public comment in September 2013. The Strategy is prepared under the *Coastal Management Act 1995*,

³⁸ *Port Stephens Shire Council v Booth and Gibson* [2005] NSWCA 323.

³⁹ McIntosh, above n 37, 77.

⁴⁰ *Ibid.*

⁴¹ *Ibid* 240.

⁴² *Ibid* 233.

which operates in tandem with the principal planning legislation to regulate coastal climate hazards within the planning framework. The Strategy reflects the policy that decision makers should ‘apply the precautionary principle to planning and management decision-making when considering the risks associated with climate change’.⁴³ The Strategy implements the principle by setting a sea level rise benchmark of not less than 0.8m by 2100, and requires planners to allow for the combined effects of tides, storm surges, coastal processes and local conditions.⁴⁴The *State Planning Policy Framework* (‘SPPF’) *Clause 13: Environmental Risks* operationalizes the Strategy and it was amended in 2012 to apply a differentiated benchmark depending on the nature of the land being developed.⁴⁵ Responsible authorities and planning authorities are now required to plan for and manage the potential coastal impacts of climate change by:

- in planning for possible sea level rise, an increase of 0.2 metres over current 1 in 100 year flood levels by 2040 may be used for new development in close proximity to existing development (urban infill)
- plan for possible sea level rise of 0.8 metres by 2100, and allow for the combined effects of tides, storm surges, coastal processes and local conditions such as topography and geology when assessing risks and coastal impacts associated with climate change
- consider the risks associated with climate change in planning and management decision-making processes
- for new greenfield development outside of town boundaries, plan for not less than 0.8 metre sea level rise by 2100
- ensure that land subject to coastal hazards are identified and appropriately managed to ensure that future development is not at risk
- ensure that development or protective works seeking to respond to coastal hazard risks avoids detrimental impacts on coastal processes
- avoid development in identified coastal hazard areas susceptible to inundation (both river and coastal), erosion, landslip/landslide, acid sulfate soils, bushfire and geotechnical risk.⁴⁶

In March 2014 the Victorian Government released a draft for a new *State Planning Policy Framework*. Draft clause 5 provides the following guidelines for decision makers concerning flooding and coastal inundation:

1. Development should anticipate:
 - (a) A sea level rise of 0.2 metres over current 1 in 100 year flood levels by 2040 for new development in close proximity to existing development (urban infill)
 - (b) A sea level rise of 0.8 metres by 2100 elsewhere, including new greenfield development outside of town boundaries
2. Works seeking to respond to coastal hazard risks should avoid detrimental impacts on coastal processes.

⁴³ Victorian Coastal Council, *Victorian Coastal Strategy* (2008) 38.

⁴⁴ *Ibid.*

⁴⁵ Note that the *State Planning Policy Framework* is currently under review by the Department of Transport, Planning and Local Infrastructure.

⁴⁶ State Planning Policy Framework cl 13, as amended, July 2012.

Consider as relevant:

1. Victorian Climate Change Adaptation Plan (State Government of Victoria, 2013)
2. Any relevant coastal action plan or management plan approved under the Coastal Management Act 1995 or National Parks Act 1975
3. Victorian Coastal Strategy (Victorian Coastal Council, 2008).⁴⁷

Under the terms of the current clause 13 and draft clause 5, planning bodies are required to have regard to the Strategy. The final version of the new Strategy has not been released but it is worth noting that adapting to climate change and increased coastal hazards is listed as a key issue.⁴⁸

One of the principles of *SPPF Clause 11: Settlement* is to respond to the impacts of climate change and natural hazards, and promote community safety by:

- siting and designing new dwellings, subdivisions and other development to minimise risk to life, property, the natural environment and community infrastructure from natural hazards, such as bushfire and flooding
- developing adaptation response strategies for existing settlements in hazardous and high risk areas to accommodate change over time.

To enable these hazard areas to be embedded within municipal planning schemes (e.g. as an overlay) they will need to be comprehensively mapped. Embedding hazard data into spatially-based planning instruments has advantages:

- provides a clear trigger for development assessment processes
- ensures that regulatory measures are targeted at, and tailored to, areas most likely to be affected by the hazards
- communicates hazard information to decision makers and the general public, which promotes adaptation.

There are challenges associated with the implementation of spatial instruments:

- relating hazard information to development controls
- the availability of quality downscaled local data
- information costs.

Risk appetite

Linking information with development controls requires decisions to be made about what level of risk aversion should be implemented by planning authorities. A business-as-usual approach sees new developments allowed to proceed in hazard prone areas with minimal or no mandatory mitigation measures. At the other extreme, a highly risk averse approach prohibits development in high risk areas. Given the inherent uncertainties associated with climate change impacts, there is an argument for the use of flexible measures including time-limited and/or event dependent

⁴⁷ www.dpcd.vic.gov.au/planning/panelsandcommittees/current/state-planning-policy-framework-sppf/draft-planning-policy-framework-master-version.

⁴⁸ Victorian Coastal Council, *Draft Victorian Coastal Strategy*, 2013, 15.

development controls (for example, that a building be designed to enable relocation in the future if coastal erosion requires this). These measures are more appropriate to coastal zones, where the hazards are likely to develop incrementally over time and the resulting changes will be irreversible. By way of contrast, in the bushfire planning context, the timing and extent of the hazard depends on numerous variables and is difficult to predict.⁴⁹

Responsibility for hazard mapping

Nationwide projections do not necessarily provide sufficient detail to inform adaptation decisions. There is a need for projections and impact assessments at finer scales. Inconsistencies in methods and data outputs can be caused by requiring local government to take the lead in generating local hazard mapping. Local government may not have the resources and expertise to undertake sufficiently detailed mapping. Work has been undertaken at regional areas to downscale high level climate projections to generate locally relevant data, including flood inundation maps and assessing the potential impacts of climate change on infrastructure for local governments.⁵⁰ The Department of Environment and Primary Industries is working with councils on local coastal hazard assessments.⁵¹

It is pertinent to consider which level of government should have the role of hazard mapping, and providing resourcing accordingly. Ideally, it would be desirable for a commonwealth agency to perform the task of detailed mapping, such as the Bureau of Meteorology, CSIRO or Geoscience Australia. These agencies have the necessary skill sets to undertake mapping and climate projections and their involvement would promote a consistent approach across all Australian jurisdictions. This would enable meaningful comparisons of data about hazards and risks across the country, which could feed into decision making processes about prioritising adaptation measures at national, state, regional and local levels.

However, even where hazard mapping is provided by state government agencies – e.g. Melbourne Water provides flood mapping data - local government may choose not to utilise that information due to concern about the impacts the information may have on property values. This is why it is important that the state government clarify when and how climate hazard information is applied by local governments. A consistent approach to the use of climate information is as important as consistent data collection processes.

Insurance, information and interconnectivity

Insurance and climate change

The insurance sector is an important adaptation driver by being ‘the point of pressure ... to engage in adaptive behaviour’.⁵² It is able to exert pressure on individuals and governments to take mitigation actions to reduce the impact of climate related risks. The capacity to adapt is linked to whether an

⁴⁹ McIntosh, above n 37, 80-4.

⁵⁰ Productivity Commission, above n 1, 126-8.

⁵¹ Department of Planning and Community Development, *Managing Coastal Hazards and the Coastal Impacts of Climate Change: Practice Note 53* (July 2012) 4.

⁵² Godden, above n 2, 249.

appropriate insurance product is available and affordable. Insurance is a way of collating risk which generally works on probability whereby if you pool together a large proportion of independent risks then you are spreading the losses. If the pool is large enough it is quite likely that this will mean that the losses which the pool suffers are lower generally. Climate change challenges traditional insurance concepts. The uncertainty posed by future climate variability renders traditional insurance modelling methods for calculating risk inappropriate when determining the price of insurance policies.

Climate change is likely to lead to more frequent and more severe natural catastrophes. The damage resulting from a natural catastrophe is concentrated within a relatively confined geographical area. Insurance losses will thus be concurrent, with the volume of claims being made in a confined timeframe threatening the workability of the insurance regime. Climate change thus sets a new series of challenges for the insurance industry.

National insurance arrangements

Insurance for household building and contents is governed at a national level under the *Insurance Contracts Act 1984* (Cth). However, state based infrastructure is dealt with separately under the operational regimes in each state.

An overarching mechanism is the National Disaster Relief and Recovery Arrangements ('NDRRA').⁵³ Whilst the NDRRA arrangements are not a form of insurance, they can be categorised as a de facto pooling arrangement that operates such that the tax payer is the insurer of last resort for states that have seen commercial insurance as inappropriate or not financially viable. Following the 2011 Queensland floods, the NDRRA arrangements resulted in the Commonwealth government paying 75% of the total damages incurred.⁵⁴

The Commonwealth has spent approximately \$12 billion reimbursing state and territory natural disaster costs since 2009 and has now requested that the Productivity Commission undertake an inquiry into the efficacy of national natural disaster funding arrangements.⁵⁵ The terms of reference emphasise that current funding arrangements are weighted towards disaster recovery, which reduces the economic incentive for state and local governments to mitigate risk.⁵⁶ The Commission has been asked to develop findings on a number of matters, including:

- risk management measures available to and being taken by asset owners, including the purchase of insurance
- options to achieve an effective and sustainable balance of natural disaster recovery and mitigation expenditure to build the resilience of communities, including through improved

⁵³ Australian Government (Attorney- General's Department), National Disaster Relief and Recovery Arrangements, (Australian Parliament, Canberra, 2011) as accessed at <http://www.em.gov.au/Fundinginitiatives/Naturaldisasterreliefandrecoveryarrangements/Pages/NDRRANaturaldisasters.aspx>

⁵⁴ World Bank and Queensland Reconstruction Authority, *Queensland: Recovery and Reconstruction in the Aftermath of the 2010/2011 Flood Events and Cyclone Yasi* (World Bank, Washington, June 2011) 21.

⁵⁵ J B Hockey, *Natural Disaster Funding: Public Inquiry – Terms of Reference*, 28 April 2014, 2.

⁵⁶ *Ibid* 1.

risk assessment, which need to assess the relationship between improved mitigation and the cost of general insurance

- options for urban planning, land use policy and infrastructure investment that support cost-effective risk management and understanding the changes to the risk profile.⁵⁷

Insurance and information

Insurance firms are encouraged to price risks using actuarially sound economic mechanisms both as an indicator of risk and as part of insurance customary practices. Insurance firms can decide if they want to accept a risk and the cost and conditions upon which they accept a risk. Theoretically given Australia is a market based economy, competition within the insurance market should ensure that prices are competitive and insurance services are offered to a wide range of consumers. A properly operating market should encourage adaptation to climate change through pricing mechanisms, but a market needs all relevant information in order to operate efficiently. Reliable estimates of the frequency of natural hazards and the damage caused by them are essential for accurately assessing and pricing risks.

Insurers behave in a commercial manner in order to comply with their legal responsibilities to shareholders. Therefore if insurers have insufficient information regarding a particular risk they will inflate the price to ensure they have a sufficient asset base should the risk eventuate and an insurance payout is sought by the policyholder.

Insurers utilise their own models and their own information, however to provide the most 'accurate' prices it is desirable that they have access to all of the available information about each risk. Information is currently fragmented, duplicated and the degree of detail varies greatly depending upon whether the source of the information is the Commonwealth Government, a state government, a local council, or from a commercial entity. There are different standards for collecting information and different levels of detail required by the relevant law governing the information collection bodies for the Commonwealth government, the state governments, local councils and commercial entities. These differences plus the fragmentation of information accentuates the difficulty for insurers of accurately assessing their risks and providing appropriate cover.

Insurance firms talk about this difficulty and the need for a more streamlined way of collating the information that is available from within the public realm or from public entities/ government departments. One example of this can be seen with flood mapping whereby due to no uniform requirements on how to map flood risk or what to map, there is a difference in the level of detail collected by each state government. In some instances this information is collected at the local level by local councils who have different agendas which also impacts upon the information they record. The Insurance Council of Australia noted that this was a big problem when piecing together existing flood maps to create the National Flood Information Portal whereby some areas are very extensively mapped and other areas have very little information. The Insurance Council of Australia subsequently invested in the development and enhancement of flood maps so that insurers are able to

⁵⁷ Ibid 2.

utilise these for pricing insurance products. One problem that was experienced when putting this information together was the inconsistencies and the difference in the information.

In March 2013, the former Australian Government announced the National Affordability Scheme (worth \$100 million), designed to ensure affordable insurance products through mitigation projects.⁵⁸The mitigation aspects of the project include the need for more information collecting and better information sharing. Karl Sullivan, the General Manager on Policy Risk and Disaster from the Insurance Council of Australia, has indicated that one of the biggest problems for the insurance industry in providing cheaper insurance is the implementation of the scheme - providing the industry with sufficient information about the risk, and taking actions to reduce the risk, which will diminish the risk of a weather related event affecting a certain area.⁵⁹No aspect of the scheme has been implemented to date. Clearer, more transparent and consistent information will enable consumers to be offered more tailored insurance products with prices more accurately reflecting the risks posed by climate change to individual properties.

Information cost recovery

Where insurers collect information for analysing climate change risks, the cost of obtaining this information will be incorporated into the cost of insurance and thus have potentially detrimental effects upon consumers (if this leads to price increases in insurance policies). Governments have an enhanced ability to spread the cost of such measures across the population through tools such as taxation, welfare and cross subsidisation.

Insurance companies are encouraging greater government intervention in resolving the inadequacies within the current legal and regulatory regime in dealing with climate change. One example of insurers taking a stand and requiring government intervention was in the case of the towns of Roma and Emerald in Queensland in the aftermath of the floods in 2011. In an unprecedented move, insurers refused to offer insurance coverage to consumers living in these areas in the absence of the government taking measures to mitigate the risk. The insurance firms recognised that although it would be expensive for the government to implement flood mitigation measures, this would greatly reduce the risk exposure and alleviate any potential property damage. The economic value of a future reduction in property losses would far outweigh the cost of implementing such measures.

Climate change is a multifaceted issue with implications for many sectors who are unable to collect their own climate change information given the costs involved. Even if large private entities are encouraged by government to obtain their own information, it will be within the parameters of their own geographic interests. Inconsistent information will be obtained if different entities act as collecting agencies as they will use their own methodologies, standards and data sets. There are greater synergies to be obtained if government collects and distributes consistent data. Efficiencies of scale enable overall government costs to be lower, than would be the case if multiple private organisations sought similar information separately.

⁵⁸ Under the proposed regime there would be a contribution of \$50 million towards improving the Warragamba Dam in Western Sydney, \$7 million towards assisting in building a flood levee in Roma Queensland, \$10 million to upgrade flood defences in Ipswich Queensland and the remainder to be spent on targeted flood mitigation programs.

⁵⁹ Interview between Rachel Carter and Karl Sullivan, 4/3/2013.

Legislative division of responsibility for information sharing and monitoring of insurance companies

The fire services levy that Victorians previously paid as a component of their building and contents insurance premiums became an amount collected through council rates in 2013. The fire services levy funds services provided by the Country Fire Authority and the Metropolitan Fire Brigade. As an insurance based system, everyone received assistance by the fire services, even if their property was not insured or was underinsured. The Victorian Bushfires Royal Commission found this was an inequitable situation that, in addition, lacked transparency as people with similar properties were often charged different amounts depending on their insurance policies.⁶⁰ The insurance based levy is now a property based levy, legislatively based in the *Fire Services Property Levy Act 2012*. The levy is calculated on the capital improved value of a property, and varies for commercial, residential, industrial and primary production properties.

The new scheme included the creation of a Fire Services Levy Monitor to protect consumers during the transition and to make sure insurers passed on the savings.⁶¹ As part of the transition arrangements, the Fire Services Levy Monitor issued a notice to insurers to obtain information on flood and bushfire pricing for residential buildings insurance premiums. Insurers were asked to indicate if flood and bushfire perils were priced separately or as part of a larger group of perils, and to explain the methodologies used to rate each peril, including rating factors, key assumptions and technical pricing models.⁶²

The fire services levy arrangements provide a model that might be expanded upon in the future to require details of climate change risks as they relate to particular properties. This would require information to be collated by state and/or local governments to identify climate change risks that apply to geographical areas and then allocate risk ratings to those risks. The costs incurred by fire services/broader emergency response services in responding to events caused by the materialisation of these risks could be transparently allocated to the risks in modelling undertaken to fix the quantum of the levy (which would need to move away from the current capital improved value basis for fixing the levy). The effect would be that properties in areas at greater risk of flood, bushfire or coastal inundation would be charged a higher levy. This would provide further price signalling to promote relevant and appropriate mitigation and adaptation strategies.

Overview of duties and potential liability associated with the use and communication of climate risk information by public authorities

Climate impacts/risks and government information provision: risk management tools

Information or advice provided negligently may potentially give rise to liability in tort. It is possible,

⁶⁰ Victorian Government, *2009 Victorian Bushfires Royal Commission, Final Report, Volume 2* (July 2010) 382-5.

⁶¹ See the *Fire Services Levy Monitor Act 2012*.

⁶² Fire Services Levy Monitor, *Section 30 Notice: Schedule Flood and Bushfire Pricing – Residential Buildings* (Ref: CD/13/347362), 2013.

therefore, that information or advice given by the Crown, its agents or employees may give rise to liability in tort if it results in personal injury, property damage or purely economic loss. Advice can vary from guidance which is voluntary, to codes or standards that may be mandatory to follow.

Information and advice relating to risk of adverse climate change effects have the potential to give rise to liability. Legal uncertainty arises in particular in relation to the following issues:

- policy decisions (as opposed to operational decisions) which will not generally give rise to liability;
- a range of factors, including the status of the Crown, will be relevant to establish if a duty of care arises in a novel case;
- courts will balance a range of factors, including the value of the activity being performed, in determining whether there has been a breach of the standard of care; and
- damage will be difficult to determine in many cases, particularly where pure economic loss is asserted due to information or advice. Courts will distinguish between temporary and permanent economic loss.

The Crown and its agencies are not immune from suit

In a tortious case involving the Crown, the rights of the parties are to be as similar as in an ordinary case between subject and subject. However, occasionally the public status of the Crown and its instrumentalities will be relevant to the question of liability.

The Crown could also be liable in tort as a consequence of the application of principles of vicarious liability. A Crown servant is personally liable for the torts he or she has committed or authorised. The personal liability of servants is not diminished by the imposition of vicarious liability. The personal liability of servants is alleviated to some extent in some jurisdictions by statutory measures requiring insurance or indemnification of the employee.

Governmental bodies may also be subject to the law of negligence by reason of the relationship between the body and members of the public where that relationship gives rise to a duty to take steps to avoid a foreseeable risk. The common law applies unless excluded. The Act creating the statutory authority and conferring its powers may either expressly or impliedly exclude the operation of the common law in relation to that body's exercise or failure to exercise its powers or functions.

Liability for negligent information or advice

The provision of information or advice by government authorities can give rise to liability in tort if it is provided negligently. An expectation that a service will be performed or that information will be provided may, in some circumstances, give rise to a duty of care. Negligence operates on the basis of whether due diligence is exercised in light of the information available at that point in time and provided in good faith. Governments make decisions by balancing and weighting multiple information sources. For climate change risks, particularly sea level rise, there is good knowledge that the risk will manifest over time so arguably a negligence action may arise if governments act without having regard to this information as provided by reputable sources such as the CSIRO and the IPCC.

The imprecise boundaries of liability for the Crown and statutory authorities can be demonstrated by the examples in Table 1.

Table 1 Potential risks in information transmission

| | Planning | Oversight | Operations |
|---------------------------------------|---|--|--|
| Inundation risk | <ul style="list-style-type: none"> • Floodplain mapping • Zoning • Overlays | <ul style="list-style-type: none"> • Permitting • Inappropriate planning decisions • Conditions on building • Inspection • Supervision of agencies | <ul style="list-style-type: none"> • Levee construction and maintenance • Habitation flood warning • Emergency service mobilisation • Ingress/egress • Safe havens • Road condition information • Advice on floodwater contamination |
| Fire | <ul style="list-style-type: none"> • Building regulation • Vegetation clearing regulations | <ul style="list-style-type: none"> • Permitting • Conditions on building • Inspection • Emergency services planning and management • Safe haven certification | <ul style="list-style-type: none"> • Fire condition information • Emergency services information • Evacuation warnings • Road ingress and egress information • Road detour and road closed advice • Safe haven signage • Representations arising from expectation of service delivery |
| Water quality and availability | <ul style="list-style-type: none"> • Water quality regulation • Water infrastructure planning and resourcing • Water reticulation service development • Pricing oversight | | |
| Extreme weather events | <ul style="list-style-type: none"> • Infrastructure planning • Emergency service planning | <ul style="list-style-type: none"> • Infrastructure approval (e.g. levees, dams, channels, | <ul style="list-style-type: none"> • Infrastructure construction, maintenance and inspection (e.g. bridge |

| | Planning | Oversight | Operations |
|-------------------|---|---|--|
| | and resourcing | stormwater drains, road and rail bridge design) <ul style="list-style-type: none"> • Emergency service agency oversight (e.g. SES, CFA, third party contractors) • Emergency communication agency oversight (e.g. 000, GPS operations, mobile phone coverage, emergency app design) | inspection, road culvert maintenance, stormwater pipe inspection, dam stability inspection) <ul style="list-style-type: none"> • Emergency service provision (first response agencies, communication with residents, evacuation implementation and advice, road closure information) • Emergency communication operation |
| Built environment | <ul style="list-style-type: none"> • Road, bridge and public transport planning • Sewerage and stormwater planning | <ul style="list-style-type: none"> • Road design • Bridge design • Sewerage design • Connections approvals • Third party operations oversight (e.g. stormwater harvesting) | <ul style="list-style-type: none"> • Road maintenance and inspection • Bridge maintenance and inspection • Sewerage maintenance and inspection. |
| Power outages | <ul style="list-style-type: none"> • Electricity generation and distribution planning | <ul style="list-style-type: none"> • Electricity infrastructure design • Oversight of private infrastructure operators • Inspection of infrastructure | <ul style="list-style-type: none"> • Advice on power outages • Communication breakdown • Emergency facility breakdown |
| Health risks | <ul style="list-style-type: none"> • Hospital infrastructure and resource planning • Ambulance infrastructure and resource planning • Air pollution regulation | <ul style="list-style-type: none"> • Building design permitting (air conditioning, air filtration, passive design) • Agency inspection and permitting of private operations • Agency oversight | <ul style="list-style-type: none"> • Air pollution information promulgation • Water quality information • Ambulance scheduling and availability • Emergency medical availability • Heat risk management |

| | Planning | Oversight | Operations |
|--|--|-----------|----------------------------|
| | <ul style="list-style-type: none"> • Water pollution regulation • Building design regulation | | in public buildings |

Generally, activities in the first column in Table 1 will not attract a duty of care when carried out by a government instrumentality. They have a policy aspect, and a number of court judgments have held that public authorities could not be liable for damage arising out of a policy decision.⁶³ However, the scope of matters excluded in this manner is narrow. The activities in the second column could give rise to liability depending on the relationships between the parties and the surrounding circumstances. In this category, liability for oversight of other agencies, such as councils, may also arise. The third column involves matters which could attract liability when carried out (or omitted to be carried out)⁶⁴ in a negligent fashion.

Liability may be managed in a range of ways, depending on the structure of service delivery. Table 2 demonstrates the typical mechanisms for managing liability. Some of these equate to the devices used in the private sector – insurance, contractual disclaimers and scope of service provisions, and some devices are peculiarly available to public sector agencies. Statutory immunities and clear articulation of statutory powers and duties enable those authorities to more effectively manage risk. The technique for risk management, however, depends on the source of the liability. Primary and vicarious liability is conceptually simpler. Peripheral liability, arising from the failure to control a third party, for instance, or a failure to effectively regulate a third party, is more unpredictable. This type of liability is best managed by clarification of statutory powers and duties, and by management of responsibilities undertaken in service delivery.

⁶³ *Sutherland Shire Council v Heyman* (1985) 157 CLR 424 and *Parramatta City Council v Lutz* (1988) 12 NSWLR 293. Counsel for the State of New South Wales argued this in *Prisoners* (1994) 75 Crim R 205, 212. See Ian Malkin, 'Tort Law's Role in Preventing Prisoners' Exposure to HIV Infection while in Her Majesty's Custody' (1995) 20 *Melbourne University Law Review* 423, 442.

⁶⁴ *Ghantous v Hawkesbury City Council* and its companion case *Brodie v Singleton Shire Council* (2001) 206 CLR 512; [2001] HCA 29.

Table 2 Examples of Management of liability

| | Primary | Vicarious | Peripheral |
|----------------------|--|-----------|--|
| Prevent duty arising | 'Scope of service' statement (managing expectation and preventing duty arising) | | Statutory immunity |
| | Clarify statutory authority (particularly ensuring that there is no duty to act) | | No oversight (no duty undertaken) |
| | Statutory Immunity | | |
| | No representation of service provision (preventing inadvertent undertaking of duty to act) | | |
| | Privatisation (outsourcing liability) | | |
| | Risk statement (e.g., signage) | | Devolution of authority to third party |
| Proactive Defences | Disclaimer | | |
| Risk management | Insurance | Insurance | Insurance |
| | | Indemnity | Indemnity |

Hazard risk mapping

Hazard risk mapping has consequences for those relying on the risk maps to make decisions either to do or not to do something. Those decisions may be made by public or private bodies and there may be actions taken on the basis of the mapping that give rise to other risks; for instance, the construction of infrastructure or the management of dams. Another consideration will be whether the decision maker was required to take the maps into account as part of the decision making process.

There are several principles underlying liability in negligence which will have an impact on potential liability for production or use of this instrument:

- A distinction must be drawn between operational/implementation decisions, which will traditionally attract liability if they are negligent, and policy decisions, which traditionally will *not* attract liability in negligence. This distinction is difficult to draw, but it would ordinarily mean that policy matters based on a balancing of risk against public cost will typically not attract liability.

- Implementation of policy properly based on the state of knowledge at the time of implementation will typically not attract liability in negligence, but failure to appropriately update risk assessment might.
- Hazard risk mapping will frequently be carried out by private suppliers, in which case typical risk management strategies for the public authority using the mapping would be around contractual indemnity.
- The liability risks of mapping which is incorporated into planning or decision instruments could be ameliorated to some extent by building in review systems which, if they are themselves sufficient to the risk of changing circumstances, could provide some buffer for liability due to failure to assess changing risks. In some jurisdictions within Australia some form of statutory immunity is provided for statutory decision-makers.
- In the management of the risks of using or making available hazard risk mapping, clear articulation of:
 - the assumptions underlying the hazard risks
 - the ‘degree of certainty’ in predictions
 - the limits to reasonable use
 - statement indicating the ‘life’ of the prediction of risks

may be useful in managing risk, but it depends upon the clarity and rigour of the statement, the end use and the end user.

- A decision *not* to undertake hazard mapping, if a policy decision, may be difficult to attack in a negligence action. However, hazard mapping is context-based (e.g. is mapping partial or comprehensive?) and will frequently be an implementation decision.
- A decision not to undertake hazard mapping in the context of particular projects (e.g. road construction, bridge construction) is likely to be an implementation matter but will depend on circumstances and outcomes.
- A decision not to use or release hazard mapping once a map has been created could attract various forms of liability.

Without intending to be exhaustive, Table 3 illustrates a *range of potential liabilities* and the different outcomes that could apply. It is stressed that these analyses are general and should not be regarded as definitive as the particular facts of each situation need to be taken into account before any liability is determined.

Table 3 Examples of potential liabilities and outcomes

| | Risk of damage | Potential action | Potential loss | Potential defendant |
|---------------------------------|---|---|--|--|
| Mapping incorrectly carried out | Reliance on mapping in construction of public assets which then fail as a result of mapping | Negligence on the basis of the negligent mapping, negligence for failure to oversee the mapping, negligent reliance on the mapping, negligent construction. | Property loss, personal injury or economic loss as a result of the failure of the infrastructure | Authority adopting the mapping, body undertaking risk mapping, authority maintaining assets, construction company. |
| | Reliance on publicly available mapping in construction of private assets which suffer damage (e.g., house construction) | Negligence (of the mapper, possibly mediated by contract), limited by scope of duty and remoteness principles | Property loss, personal injury or economic loss as a result of the damage to the assets | Authority adopting the mapping, body undertaking risk mapping, construction company. |
| | Use of mapping to formulate planning rules which result in lowered property values | Potential claims in negligence C very close to the policy/operational distinction | Pure economic loss | Local council, state government |
| | Use of mapping to make planning decisions | Administrative action | Economic loss | Local Council |
| Mapping incorrectly used | Risk to public infrastructure or to private infrastructure constructed in reliance on mapping | Potential claim in negligence either for the construction or for the information leading to construction of private infrastructure | Property loss, personal injury or economic loss as a result of the damage to the assets | Authority using the mapping, authority giving mapping advice, construction company. |
| Failure to undertake | Risk to private or public infrastructure | Negligence on the basis of failure to use commonly used | Property loss, personal injury or economic loss | Authority responsible for construction, |

| | Risk of damage | Potential action | Potential loss | Potential defendant |
|---------|----------------|--|---|---|
| mapping | | instruments, negligence for failure to adopt normal risk management, construction of assets without appropriate risk assessment. | as a result of the damage to the assets | authority responsible for overseeing construction, authority giving advice, construction company. |

Conclusion

Information is a critical tool to enable adaptation. It is a platform for understanding the range and magnitude of climate related risks and for managing them into the future. Laws and institutions can be shaped to facilitate or require the collection and distribution of information. They can also require information about climate change risks to be embedded in policies and practices to enhance the level of adaptation decision making by individuals, businesses and governments.

There is a role for government to perform in collating and disseminating climate related data to the private sector and other levels of government. This would provide consistent and current information across sectors. This paper has provided examples of projects that are endeavouring to integrate information in a manner that provides effective input into decision making processes. Furthermore, state government could provide legislative and policy frameworks to facilitate the application of such information in decision making processes.

The provision of reputable, up-to-date information by government is important to enable public, private and community sectors to assess a range of climate related risks and liabilities and then take informed adaptation decisions. It is also a prudent step for government to ensure that information it provides is as accurate as possible at any given point in time, timely, specific, consistent and explicit about uncertainties.⁶⁵

The risk management assessments that must be undertaken as part of adaptation development and implementation cannot be done in an information vacuum, or on the basis of poor, inaccessible and unreliable datasets. The development of data standards, and the sharing of climate information, are therefore essential elements of adaptation.

As knowledge accumulates, risk management approaches can become more sophisticated and responsive to specific climate risks in particular regions. Geo-coding of information, and mapping of climate related risks at a detailed geographical level enable a more functional use of information.

⁶⁵ Productivity Commission, above n 1, 140.

If information provision encourages greater adaptation efforts by individuals, the costs of providing emergency services may be reduced in the event of a natural disaster. If property owners are informed of the risks they face upon the purchase of a property, claims for government compensation after a natural disaster may be weakened.⁶⁶ Similarly, insurance companies can price risk more precisely where they have access to detailed climate risk and natural hazard information.

Principles that arise from this paper in relation to the preparation, collation, distribution and use of climate risk information are as follows:

- Information is the fundamental tool required to assess climate risks, assess exposure to those risks and develop adaptation actions that can be taken to foster resilience
- Information is a mechanism to help shape a culture of taking proactive steps to manage the impacts of a changing climate
- Decision and policy making frameworks should be transparent and publicly available
- Government funded climate information should be freely available and widely distributed to the public, unless there are overriding reasons for non-disclosure, to inform the risk management and adaptation processes of public, private and community organisations
- climate information should be provided in a consistent and clear manner
- Information governance arrangements should be clear about the respective roles and responsibilities of the Commonwealth, state and local governments, the private sector and civil society
- Information governance arrangements should require ongoing updating and reviewing of climate change projections and impacts
- Ensure integration of the precautionary principle in information governance arrangements impacting adaptation
- Inter-generational impacts of adaptation legislation and governance tools and arrangements should be considered in the production and use of climate information.

As climate change alters the frequency, intensity and likely location of natural hazards, it is important that information governance arrangements have the fluidity to respond to new data and inject that clearly into the public arena. The law offers various tools and mechanisms which employ flexibility in their approaches to the use of climate information, as highlighted in this paper. These include the precautionary principle, which addresses the inherent scientific uncertainties of climate change, and adaptive management, which requires decision making regulatory frameworks to incorporate adjustments over time. Integrated decision making, as demonstrated in the *Climate Change Act*, addresses the complexity of adaptation risks. The impact of that Act could be broadened by extending the range of Acts within its Schedule.

The need for flexibility to address the uncertainties of climate information does, however, need to be tempered with a need for consistency in decision making. There is therefore a significant role for government to play in establishing policies, guidelines and standards to direct how climate change hazard information is to be incorporated into adaptation decision making processes.

⁶⁶ Ibid.

It is preferable to take steps now to ensure that climate change considerations are embedded in a wide range of government and corporate decision making and risk management processes. These processes may be driven by legislative, regulatory or institutional requirements. In the absence of demonstrated consideration of climate change impacts in decisions affecting issues ranging from planning, to the development and maintenance of infrastructure, there is a risk that litigation will act as the tool to drive and shape adaptation. Taking action now allows pro-active, overarching and consistent adaptation strategies to be developed and implemented instead of reacting to court judgments.