

[VCCCAR Project: Framing Adaptation in the Victorian Context](#)

# The Adaptation Navigator

Rationale, design and options for further development of the web-based application

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# 1 Purpose of this document

This document explains and outlines the concept and design of an intuitive, interactive planning and decision-making framework for local government climate change adaptation, called the 'Adaptation Navigator'. The Adaptation Navigator is a key deliverable of the VCCCAR Framing Adaptation project Work Package 1 (see *Background* below). The Adaptation Navigator has been developed as a proof-of-concept from April 2011 to April 2012. It will be launched in June 2012.

This document:

- Explains the scientific basis, the objectives and the purpose of the Adaptation Navigator application
- Provides a snapshot of the development process to date
- Summarises feedback received on the design, structure and functionality from project stakeholders
- Discusses the options for implementing the application in a government context

Covering the above points, this document is intended primarily for those interested in the Adaptation Navigator's application and further development.

## 2 Background

'Framing multi-level and multi-actor adaptation responses in the Victorian context' (Framing Adaptation) was an 18-month research project funded by the Victorian Government through the Victorian Centre for Climate Change Adaptation Research (VCCCAR). The project formally ended in March 2012 and was led by Professor Darryn McEvoy at RMIT University's Climate Change Adaptation Program.

The project was divided into four work packages which aimed to:

*'develop and test an operational framing of adaptation which will act as a decision-making 'roadmap' to better inform adaptation policy and practice by Victorian authorities at the local and regional levels'.*

Work Package (WP) 1 explored the framing of, and existing frameworks for local adaptation, while WP2 investigated the methodological boundaries for the economic analysis of climate change impacts using Victorian natural disasters as examples. WP3 conducted empirical research on climate change adaptation barriers and opportunities in three local government organisations (the City of Melbourne, the City of Greater Bendigo and the City of Greater Geelong) to inform the conceptual research (WP1) and the development of a local government adaptation framework. WP4 consisted of social research into how individuals and communities frame climate change adaptation, using a local narratives approach based on empirical research in two locations (Melbourne and Port Fairy).

The Adaptation Navigator web-based application discussed in this document is a research outcome of WP1. This work package had four objectives:

- 1) To review and critically analyse national and international adaptation guidance initiatives (and their constituent parts);
- 2) To identify the key transferable lessons and knowledge which can be used to inform the development of an adaptation framework, ensuring that it is grounded on sound scientific principles;
- 3) To test and iteratively reframe the structure and content of the adaptation framework in collaboration with decision-makers at different scales to ensure that the framing is 'fit for purpose';
- 4) To use the knowledge gained to contribute to the development of adaptation frameworks tailored to the chosen case study areas.

Objectives 2 to 4 refer to the development of an 'operational framework' for climate change adaptation planning at the local and regional scale. The parameters of such an operational framework were to be determined as part the research.

All members of the project team were actively involved in the conceptual development of the Adaptation Navigator. Research conducted in the four work packages supported the development of the application, and some of the content to be included draws directly on research outputs.

Research team:

- RMIT Climate Change Adaptation Program (Professor Darryn McEvoy, Dr Hartmut Fuenfgeld, Sophie Millin)
- Monash Sustainability Institute (Professor Ray Ison, Dr Jana-Axinja Paschen, Dr Philip Wallis)
- RMIT Centre for Risk and Community Safety (Professor John Handmer, Adriana Keating, Dr Joshua Whittaker)
- Victorian Centre for Climate Change Adaptation Research (Professor Rod Keenan)

### 3 Rationale

This section provides detail on the scientific background and research findings that led to the conceptualisation of the Adaptation Navigator.

#### 3.1 Local Government and adaptation

It is widely recognised that local governments can play a key role in the practical planning and implementation of climate change adaptation (Fünfgeld, 2010; Kennedy, Stocker, & Burke, 2010; T. Measham, Preston, et al., 2011). This is not only because they are the tier of government closest to the people and therefore have a more direct ability to access and influence local residents and communities. Local governments also provide a range of services to the community, many of which are impacted by climate variability and change. Municipal governments therefore have an immediate responsibility to act on the grounds of a duty of care and ensuring that services can continue to be provided in the face of climate change.

In addition, the way climate change impacts are experienced differs substantially from one place to another. What climate impacts occur where and when depends on complex interactions of the climate with socio-ecological systems in a given area. The severity of climate impacts is not only conditioned by physical changes in atmospheric, terrestrial and

marine conditions, but also to a significant degree by the socio-economic, environmental, and political and institutional context in which physical changes occur.

Climate change adaptation therefore requires a holistic approach where contextual factors are given similar weight and concern as are physical climatic variability and change. Examples of contextual factors that may hinder or support effective adaptation at a local government level are:

- The local government's organisational capacity to identify and respond to climate change impacts at the local and regional scale
- The socio-economic profile of a local government area, e.g. the character of its local economy, demographic trends, and cultural and linguistic diversity
- The degree of environmental degradation already occurring in an area and the measures
- The effectiveness of disaster risk management and emergency management processes in the area.

Adaptation is a highly place-based endeavour that requires responses tailored to the local situation. Resource constraints aside, local government is the level of government best placed to work with communities to identify adaptation needs and implement effective adaptation measures.

### **3.2 Guidance on adaptation for local government**

For the above reasons, adaptation has been termed a 'wicked problem' that involves a complex problem structure and a large range of stakeholders with different understandings of the meaning and purpose of adaptation. Adaptation also tends to be a non-linear, 'messy' process that cuts across disciplines, departments and business units in public and private sector organisations. Uncertainty is a significant constraint in adaptation planning that requires innovative planning and decision-making processes. Because adaptation is a relatively recent area of work for most organisations, and one that, in Australia, is entrenched in the public discourse on climate change, it competes with other organisational priorities and runs the risk of becoming politicised.

These observations on the nature of adaptation create a unique problem for those who seek to provide policy and decision-making guidance on local climate change adaptation. How can one provide clear and systematic guidance on adaptation processes without risk of promoting a one-size-fits-all approach that is unable to take the abovementioned complexity into account?

Many adaptation toolkits and step-by-step guides have been developed over the past five years, most of which are based on a rigid linear or cyclical planning process. These frameworks often draw heavily on traditional project cycle management approaches. This is not surprising, considering how well project cycle management is embedded in public and private sector organisations. However, as recent research into effective adaptation practice suggests (Measham, Preston et al., 2011; Preston, Danese & Yuen, 2011; Webb & McKellar, forthcoming), actual adaptation planning is much less one-directional and systematic than most adaptation toolkits suggest. Much of what can be considered effective adaptation planning (i.e. where adaptation has been progressed from planning through to implementation) is based on learning by doing, on continuously rescoping adaptation, and on leveraging windows of opportunities as they arise.

Step-by-step toolkits and guides have their place in the adaptation literature, because they provide a much needed starting point for understanding and conceptualising local adaptation planning. They have also been instrumental in raising awareness on the challenges and opportunities of adaptation planning. However, as local context parameters differ vastly from one local government to the next, such blue-prints of adaptation will always be difficult to implement in practice, because adaptation planning as an ongoing process of learning and change needs to be tailored to local situations.

The majority of local governments in Australia and abroad that are considered leaders on climate change adaptation have opted for developing their own, tailor-made adaptation process to ensure effective adaptation. Each of the three local governments that participate in the VCCCAR Framing Adaptation project has adopted such a tailor-made approach. This however, is not an option for resource poor local governments with limited capacity.

## 4 Research process

In light of these research findings, the VCCCAR Framing Adaptation project conducted research into what type of guidance on climate change adaptation was most needed by local government. This was carried out through a process of literature review and empirical research with case study local governments, key informants from these organisations, and experts working in the field of climate change adaptation at the local and regional scale.

The concept, design and development of the Adaptation Navigator were determined by this research, as well as by formal and informal consultations with a range of project stakeholders.

### 4.1 Framing Adaptation Stakeholder Workshop

The project team held a stakeholder workshop in February 2011, in which project partners and interested individuals from over 20 organisations participated, including Victorian state government departments, regional government alliances, local authorities, industry representatives, and research groups:

- Northern Alliance for Greenhouse Action
- South East Councils Climate Change Alliance
- Victorian Department of Health
- Victorian Department of Human Services
- Victorian Department of Innovation, Industry and Regional Development
- Victorian Department of Justice
- Victorian Department of Planning and Community Development
- Victorian Department of Premier and Cabinet
- Victorian Department of Primary Industries
- Victorian Department of Sustainability and Environment
- Victorian Department of Transport
- Victorian Managed Insurance Authority (VMIA)
- Victorian Office of the Emergency Services Commissioner
- Western Alliance for Greenhouse Action

The workshop explored the challenges and opportunities of establishing the meaning and purpose of climate change adaptation in various contexts, from the individual scale to the scale of state government.

The intention of the workshop was to give participants an opportunity to share their own experiences with different approaches to planning and the implementation of adaptation processes and how these are influenced by different framings. Conversation mapping techniques were used to elicit participants' experiences with climate change adaptation approaches in policy and practice; followed by a panel discussion involving representatives of three key stakeholder groups (researchers, state government policy developers, and local government practitioners). The conversation maps were an important input into the development of various components of the Adaptation Navigator. A summary of key discussion points, as well as advice given by workshop participants to the research team, is available on the VCCCAR website: <http://www.vcccar.org.au/content/pages/framing-project>

## 4.2 Case study research

Focus group discussions, semi-structured interviews, and informal discussions were conducted with members of three case study partners throughout 2011:

- City of Melbourne
- City of Greater Bendigo
- City of Greater Geelong

Some of the interviews and discussions focused specifically on the design and functionality of the Adaptation Navigator, while other discussions explored existing barriers and opportunities of climate change adaptation at the local scale. Findings from this body of empirical research have been incorporated and considered in the design of the Adaptation Navigator.

As part of Work Package 4 of the project, in-depth case study research on local narratives of climate change was conducted in two locations in Victoria: Port Fairy and Melbourne. The findings of this qualitative social research have informed key parts of the content of the Adaptation Navigator.

## 4.3 Research partners

The following organisations were actively involved in the development of the Adaptation Navigator concept and design:

- Victorian Department of Sustainability and Environment (DSE), Environmental Policy and Climate Change Division
- Victorian Office of the Commissioner for Environmental Sustainability
- Municipal Association of Victoria (MAV)
- Victorian Office of the Emergency Services Commissioner
- Pang & Haig Design

## 4.4 Additional consultations with project stakeholders

Additional formal and informal consultations were held with a number of individual stakeholders from various organisations listed in section 4.1, to determine the scope and design of the adaptation planning and decision support tool.

## 5 Research findings

The consultation process generated a large amount of qualitative information, reflecting a broad range of perspectives on the framing of adaptation in policy and practice and on how local and regional level adaptation processes can best be supported by additional guidance.

Drawing on the preliminary findings of the qualitative research, the outcomes of the consultation process were that the adaptation planning and decision support framework:

- Should be able to show the essential components of a local adaptation planning process
- Should not be a step-by-step tool but rather a flexible framework for devising tailored adaptation planning processes
- Should respond to a wide range of interests in adaptation and different framings to adaptation planning, depending on individual knowledge and preference
- Should incorporate and display local and regional case studies/ examples
- Should ideally be interactive and accessible online rather than ‘a guidebook sitting on a shelf’
- Should be easy to use
- Should avoid using specialist academic language where possible, or explain the use of important terminology in plain terms.

These findings led the research team to explore options for a *guidance framework* rather than a step-by-step guide for adaptation, with the main difference being that a guidance framework is designed to enable users to ‘find their way’ through adaptation planning from a local government perspective, by:

- Providing different options for approaching adaptation,
- Providing a wide range of background information,
- Providing links to existing tools, toolkits and methods for specific aspects of adaptation, rather than duplicating existing tools available on the internet, such as the UKCIP Adaptation Wizard.

It was then decided that a web-based application was most likely to cater for the identified needs. Early concept drafts of a web-based application (now called the Adaptation Navigator) were designed with the abovementioned criteria in mind. Various design options were explored through further consultations with case study partners, key experts, graphic designers and web developers.

The following sections provide an overview of the structure, content and functionality of the application.

## 6 Design of the Adaptation Navigator

The overall design objective for the Adaptation Navigator was that it be a user-friendly and accessible web-based application, with full functionality across all common internet browsers.

The web-based application was designed to meet the following specific criteria:

1. Informative for a range of local government users
2. Quick for the user to access the information they want
3. Intuitive and logical in structure
4. Eye-catching and appealing
5. Easy to use for those who are not internet savvy

In order to achieve these criteria, the project team decided to use the familiar metaphor of maps and present the adaptation guidance content as a series of conceptual maps in a layered structure. It was expected that most local government users will find it easy to relate to a map-based approach because they have to use some form of digital map on a daily basis, from simple Google Maps or tourist maps to more complex topographic and thematic maps used for urban planning.

Digital maps such as the ones used in Geographical Information Systems (GIS) involve a layered system. This concept was adopted for the Adaptation Navigator. The map layers system allows the user to view an increasing level of detail, similar to zooming into an online map or using a road atlas key map to first locate an area, then referring to a more detailed map with major arterial roads etc., before going to a map of a particular precinct that includes all relevant detail, at the finest possible resolution.

### 6.1 Structure

The structure of the web-based application is a three-layer conceptual map (see Figure 1 below):

1. The **first (top) layer** is the 'key map', which provides a high-level overview of all the content contained in the Adaptation Navigator. The content areas are depicted as ten distinct 'regions' on the map, similar to actual regional names in a topographical map. This layer provides an entry point and broad reference for the entire adaptation planning process mapped out in the Adaptation Navigator. The ten regions are:
  - Knowing the climate science
  - Determining the purpose and scope
  - Understanding the policy context
  - Establishing effective governance
  - Setting objectives
  - Engaging and communicating
  - Assessing the effects of climate change
  - Identifying and prioritising options
  - Deciding and implementing measures
  - Monitoring and evaluating

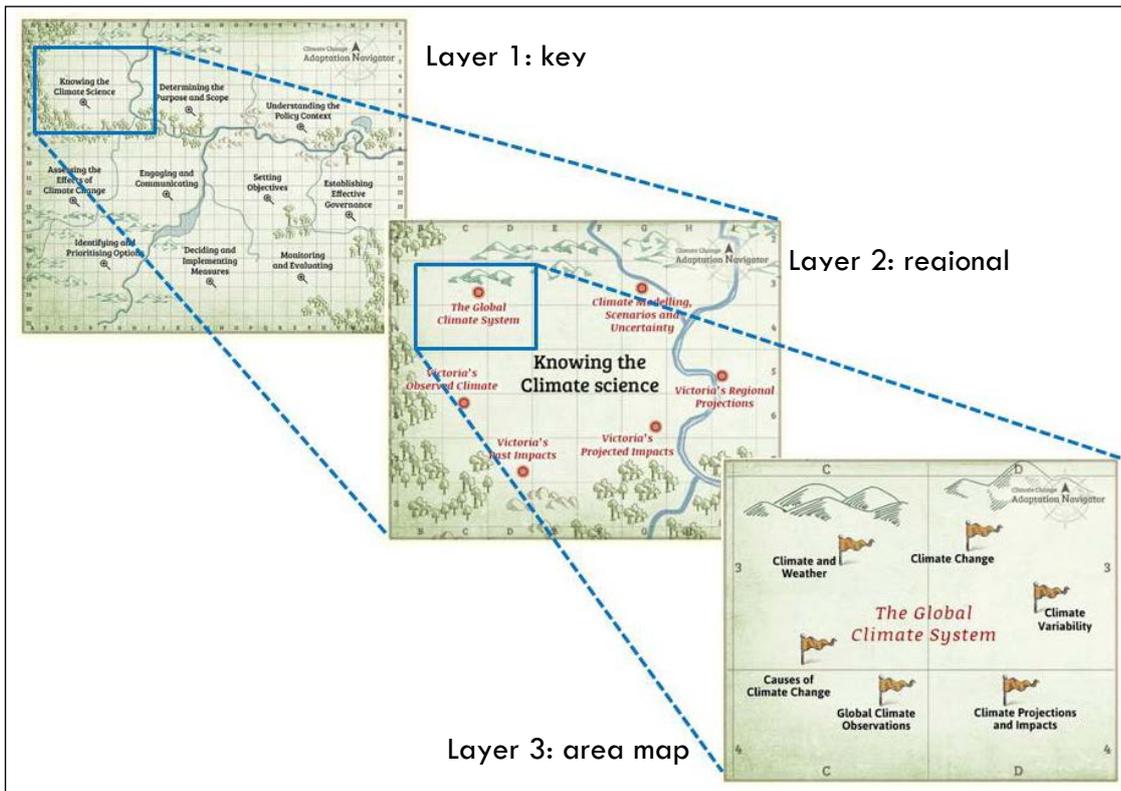


Figure 1: The Adaptation Navigator's layering of conceptual maps

2. The **second layer** provides an overview on a particular topic and its subtopics (i.e. one 'region'). It includes one or several related map nodes, or 'areas' contained within a region. At this layer, the user can get a high-level idea of what considerations may be relevant for that aspect of adaptation planning. For example, the region 'knowing the climate science' explains why climate information is important in the context of adaptation planning and what its different dimensions are. It includes six different areas:

- The global climate system
- Climate modelling, scenarios and uncertainty
- Victoria's observed climate
- Victoria's past impacts
- Victoria's projected impacts
- Victoria's regional projections

3. The **third layer** depicts only one 'area', including all of the 'places' that belong to that area. Each of the places are explained and discussed in detail. This layer is the heart of the product where most of the text-based content and graphs are placed. Here the user can access all relevant information on a particular content element, including case studies (where applicable), examples and references for further reading. For example, the area called 'the global climate system' includes six places:

- Climate and weather
- Climate change
- Climate variability
- Causes of climate change
- Global climate observations
- Climate projections and impacts

## 6.2 Website layout and functions

The layout of the web-based application includes (Figure 2):

- the Adaptation Navigator 'tool' as the focal point of the page (bottom left of Figure 2),
- a 'welcome banner' to inform the user of the purpose of the website during their first visit
- a menu bar which will include drop-down lists,
- a 'breadcrumb trail' line to show the user where they are in the web-site,
- a summary box of text-based information on the right hand side of the page.

Internal hyperlinks to Adaptation Navigator content are included where possible, as are external links (e.g. to local government websites, adaptation information portals etc.).

The screenshot displays the homepage of the Climate Change Adaptation Navigator. At the top, there is a navigation menu with links for Home, How to Use, Impacts, Sectors, Case Studies, Downloads, and Glossary. The main header features the 'Climate Change Adaptation Navigator' logo on the left and the 'VCCCAR' logo on the right. A prominent 'Welcome' banner with a blue sky background and a 'CLOSE X' button is positioned below the menu. The central area is dominated by a large conceptual map titled 'The Adaptation Journey', which is overlaid on a grid. The map shows a winding path through various stages of adaptation, including: Knowing the Climate Science, Determining the Purpose and Scope, Understanding the Policy Context, Assessing the Effects of Climate Change, Engaging and Communicating, Setting Objectives, Establishing Effective Governance, Identifying and Prioritising Options, Deciding and Implementing Measures, and Monitoring and Evaluating. To the right of the map, a text box titled 'The Adaptation Journey' provides a welcome message and lists key features of the application. At the bottom of the page, there is a search bar, a copyright notice for RMIT/VCCCAR 2012, and links for contact, site map, and terms and conditions.

Figure 2: The Adaptation Navigator's layering of conceptual maps

The menu bar at the top of the website contains various easy-access options. Table 1 describes their functions and key content.

<i>Home</i>	<p>Takes the user to the front page of the web application, from any location on the website.</p> <p>The purpose and content of the Adaptation Navigator is explained in the summary text box on the right hand side.</p>
<i>How to use</i>	<p>The 'How to Use' tab produces instructions to help the user navigate through the website.</p>
<i>Impacts</i>	<p>Produces a drop down list of climate change impacts. This list enables direct access to the content of the Adaptation Navigator devoted to specific climate change impacts. This may be more intuitive for some users.</p> <p>Clicking on one of the options on the impacts drop-down menu (e.g. <i>bushfire</i>) takes the user to the respective locations within the Adaptation Navigator content.</p>
<i>Sectors</i>	<p>Produces a drop down lists of local government sectoral areas, such as urban planning, assets and infrastructure, and community services. This list enables direct access to the content of the Adaptation Navigator containing information of particular relevance to specific sectors. This may be more intuitive for some users.</p> <p>Clicking on one of the options on the impacts drop-down menu (e.g. <i>urban planning</i>) takes the user to the respective locations within the Adaptation Navigator content.</p>
<i>Case studies</i>	<p>Produces a list offering case study examples on local government climate change adaptation.</p> <p>Initially, case studies about the City of Melbourne, the City of Bendigo, and the City of Greater Geelong are included.</p> <p>Selecting one of these options produce a summary text of the work the specific local authority has undertaken and a graphical representation of their adaptation pathway, shown on layer 1 of the Adaptation Navigator.</p> <p><b>This function is explained in more detail below.</b></p>
<i>Downloads</i>	<p>Takes the user to a list of key adaptation documents relevant for Victoria, shown in the summary box, with hyperlinks attached.</p>
<i>Glossary</i>	<p>Explains key terminology used throughout the website.</p>

Table 1: Overview of the Adaptation Navigator's menu bar buttons and their functions

### 6.3 Case study pathway

One of the most innovative features of the Adaptation Navigator is its ability to depict the adaptation process that an organisation has taken (or plans to take). This is done by sequentially connecting regions on the top layer of the map and showing which areas an organisation has covered as part of its adaptation efforts (Figure 3). For each case study pathway, the following components are displayed on the map:

- A starting point (indicated by an 'S' on the map)

- A pathway of adaptation to date (orange line), including arrows indicating the sequencing of the planning process
- A pathway showing future adaptation efforts (dotted blue line).

The visual representation of an organisation's pathway is supported by downloadable case study profile that outlines what specific activities an organisation has undertaken.

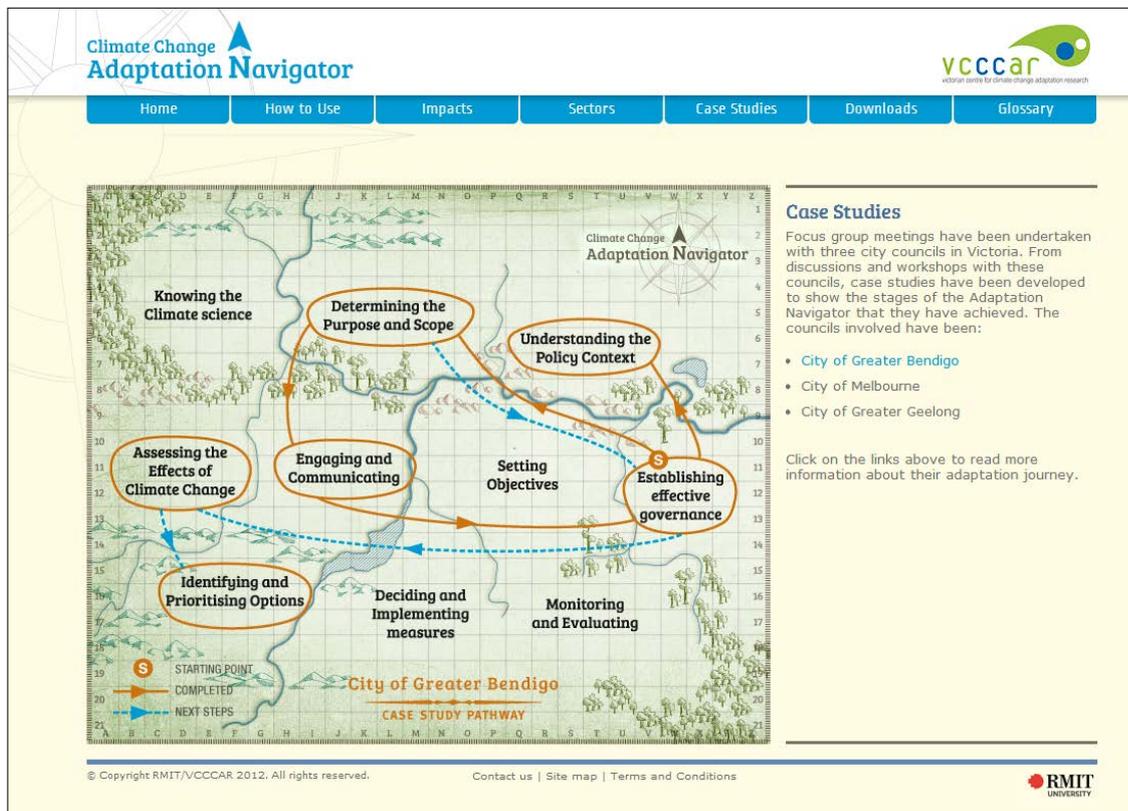


Figure 3: Adaptation Navigator - case study pathway

Illustrating an organisation's adaptation process using this pathway approach has a number of benefits, including:

- Easy comparison of different organisational adaptation pathways
- Visualisation of the highly context-specific nature of adaptation planning process, showing different starting points and adaptation pathways

The pathways feature has a lot of potential for further development and expansion. The project team will put together an options paper outlining the development potential of the Adaptation Navigator and its features.

## 7 Application of the Adaptation Navigator within government

The Adaptation Navigator serves multiple purposes and provides a range of opportunities for application and implementation within a local government context. The main uses that have been identified through the testing process are outlined below. These can broadly be described as capacity-building functions (7.1, 7.2 and 7.5 below) and communicative functions (7.3, 7.4 and 7.5).

## 7.1 Learning about adaptation

The Adaptation Navigator is a one-stop website for information about climate change adaptation. It provides access to a high-quality research and verified external sources in simple language and 'bite-size' amounts. Some of the information has been tailored to the Victorian and broader Australian contexts.

One of its main applications lies in enabling government staff and decision-makers to deepen their knowledge and understanding of adaptation concepts, policy and practice.

## 7.2 Exploring adaptation processes

In taking a process perspective on climate change adaptation, the Adaptation Navigator provides an opportunity for government staff to explore the breadth of what characterises adaptation – through ten different 'map regions' that may all be of relevance to an organisation. It is the first website of its kind that encompasses a 360-degree view of what constitutes adaptation. It assists in cutting through the complexity of adaptation without risking oversimplification.

The multi-layered map-based design allows users to explore adaptation by 'dipping in' and 'dipping out' of different content areas without getting lost in too much detail. A small number of links to external resources allows for further exploration on a topic once the content provided in the Adaptation Navigator is exhausted.

## 7.3 Tracking adaptation progress

The case study pathways element of the Adaptation Navigator provides an opportunity for organisations to track their own progress with adaptation, by mapping their individual adaptation pathway onto the three-layer maps. This can include recording adaptation decisions, monitoring progress with specific aspects of adaptation, and evaluating what worked and what didn't in a retrospective fashion.

Having a visualised record of the adaptation process to date can help communicate successes, learn from unsuccessful activities, and maintain continuity and coherence across different business units and during times of high staff turnover.

## 7.4 Facilitating internal discussion

The interactive design of the Adaptation Navigator allows for discussion among government staff on either their existing adaptation journey or on future priorities for adaptation. The Adaptation Navigator can form the basis of an adaptation workshop or focussed discussion on adaptation, involving staff from different departments and professional backgrounds. Depending on group size, a professional facilitator may use the Adaptation Navigator as a basis for discussing different adaptation concepts and pathways. In smaller groups, the Adaptation Navigator can be used as a live online resource that helps structure the discussion, e.g. by exploring various aspects of adaptation in a group setting.

Considering that cross-organisational communication has been identified as one of the key success criteria for effective climate change adaptation, the contribution the Adaptation Navigator can make in this regard is significant.

## 7.5 Peer-to-peer sharing and learning

The case study pathways element of the Adaptation Navigator provides an opportunity for organisations to share their adaptation pathways with other organisations and contribute to peer-to-peer learning within the local government sector and beyond.

This aspect of the Adaptation Navigator's functionality was considered particularly innovative and useful by the local governments participating in the development and testing.

## 7.6 Accessing research outputs

Climate change adaptation is an emerging policy area with increasing research coverage. Over the past years, VCCCAR, state government departments and other research organisations in Victoria and elsewhere have produced a large body of knowledge on adaptation. Many of these research outputs are not readily available to policy makers outside the information loop of the organisations that produce the research. The Adaptation Navigator provides a central outlet through which research outputs, such as reports, datasets and methodologies, can be made accessible for a wider range of end users. It is anticipated that, over time, the Adaptation Navigator evolves into a first port of call for latest research findings on climate change adaptation.

## 8 Maintenance needs

To ensure the Adaptation Navigator can provide a valuable user experience, the following minimum maintenance will be required on an ongoing basis:

- **Technical bug fixes** to ensure all functions of the website work without problems across various platforms and browsers.

*Estimated minimum time requirement: initially 2-3 person days per month, then 1 person-day per month.*

- **Adding content:** the development of the proof-of-concept version of the Adaptation Navigator has focused on providing in-depth content for just four sections of the application, while the other six content areas provide much less detail. Over the first six to twelve months, effort will need to be made to add additional content, in particular operational level information relevant to local government users. However, even after this initial period, the value of the Adaptation Navigator will continue to grow if additional content is uploaded on a regular basis and it is kept up-to-date and relevant.

*Estimated minimum time requirement: initially 1 person-day per week, then 1-2 person-days per month.*

- **Updating content:** the usefulness of the Adaptation Navigator will partly depend on the currency of the content. Updating the content will include ensuring that the latest scientific data is included in a timely manner, that any outdated information is removed, and checking for broken hyperlinks (can be semi-automated).

*Estimated minimum time requirement: 1-2 person-days per month.*

- **Updating content:** the case studies will need regular updating. This involves contacting the respective organisations, summarising any new developments, and getting the case study profiles and pathways modified and approved for publication.

*Estimated minimum time requirement: 1 person-day every six months, per case study.*

## 9 Future development options for the Adaptation Navigator

Comments and feedback received during the research process point to a wide range of development options, to enhance the value and user-friendliness of the Adaptation Navigator.

To date, the Adaptation Navigator has been developed as a proof-of-concept, to demonstrate the value and various potential uses of the application. Investment into further development will be necessary to turn the Adaptation Navigator into a world-leading resource for adaptation planning at the local and regional scales.

Four broad areas for additional development can be identified:

1. Enhancing the quality and depth of the content
2. Enhancing user-friendliness and user experience
3. Enabling collaboration among users
4. Improving the case study pathways feature of the application.

For each of these areas, several development options have been identified, which will require different resource commitments. These are listed in Table 2 below. Relative resource requirement and priority ratings are provided for each of these options, based on feedback received from project stakeholders.

Table 2: Options for future development

#	<i>Development option</i>	<i>Description</i>	<i>Priority</i>	<i>Resource requirements</i>
<b>1</b>	<b>Enhancing content</b>			
1.1	Guiding questions on goals	Incorporate a set of guiding questions to help users identify a starting point for their adaptation pathway, based on what they want to achieve (e.g. managing organisational risks, reducing vulnerability, understanding climate change impacts)	Medium	Medium
1.2	Multi-media content	Include multi-media content, such as podcasts, videos, presentations in the AN content. This can include recorded interviews with local government staff, presentations given by researchers, or scientific documentaries.	Low	Low
1.3	Database with additional meta-data	Currently, the content for the AN is managed through a custom-built online content management system (CMS), with limited options. Instead, the entire content of the website could be stored in a relational database, where more searchable meta-data could be included. Database-based storage would enhance the back-end management of the AN system and reduce the time needed for updating content etc.	Medium	High
1.4	Incorporating standards and other sectoral guidance	Industry standards (e.g. the ISO31000: Risk Management), and other sectoral guidelines such as process planning frameworks could be incorporated as a 'pathways', i.e. the process suggested by these guides could be depicted as a route through the AN, as another form of providing concrete guidance.	High	Low
1.5	Peer review of content	The content presented in the AN would benefit from undergoing a peer review process, where	High	Medium

#	Development option	Description	Priority	Resource requirements
		national and international experts in particular fields review sections of the AN and provide feedback on gaps, errors and other ideas for improvement.		
<b>2</b>	<b>Enhancing user friendliness</b>			
2.1	Subscription service	Users could sign up for an email subscription on additions made to the AN. They could select which nodes they would like to receive updates for, and how often they receive these.	High	Medium
2.2	User log in & dashboard	Users could be enabled to log in to the website and view their customised dashboard, where they could store bookmarks ('My AN nodes') etc. for those sections of the AN most useful to them. Through the dashboard, users could manage a range of settings, including subscription (see above) and their organisation's adaptation pathway (see below).	Medium	High
2.3	Improved appearance	It can be expected that the testing of the AN will result in a number of suggestions for changing the appearance of the current AN website to make it clearer and more user friendly.	High	Varied
2.4	Improved functionality	It can be expected that the testing of the AN will result in a number of suggestions for changing or adding to the functionality of the current AN website to make it clearer and more user friendly.	High	Varied
<b>3</b>	<b>Enabling collaboration</b>			
3.1	Web form: 'suggest a node'	Users can suggest additional nodes to be included in the AN via a short web form they fill in and submit.	High	Low
3.2	Comment and discussion board function	Users are able to leave comments on various parts of the AN website, which can be accessed through a central discussion board.	Medium	Medium

#	<i>Development option</i>	<i>Description</i>	<i>Priority</i>	<i>Resource requirements</i>
3.3	Share function	Users can share any part of the AN website and content by one mouse click ('Share button') across existing social media.	Medium	Low
3.4	Map your own pathway	Users can log in to the website and map their own organisation's adaptation pathway. They can then download the headings of the nodes they have selected in an editable report format (e.g. as a MS Word file).	High	Medium
3.5	Develop alternative pathways	As above, except users can develop several alternative pathway and display these on the AN website for discussion with their colleagues.	High	Medium
3.6	Track your own pathway progress	Building on the 'map your own pathway' function above, users can track their organisation's progress in covering each of the nodes selected as part of their pathway. This would support adaptation monitoring.	Medium	High
3.7	Blog	A moderated blog could supplement the AN with opinion-based information from different contributors (e.g. users). For example, government staff could post an opinion piece, or re-post short pieces written by third parties. The blog would be the home of any non-scientific contributions that aren't suitable for inclusion in the AN core content.	Low	Medium
<b>4</b>	<b>Improving case study pathways</b>			
4.1	Develop additional case studies	Additional local government and state government case studies , including their adaptation pathways, would greatly enhance the value of the AN. Different models could be used for generating new case studies, e.g.: (1) inviting voluntary contributions from leading organisations; (2) providing a fee-for-service case study process	High	Medium

#	<i>Development option</i>	<i>Description</i>	<i>Priority</i>	<i>Resource requirements</i>
		where researchers are deployed to collect case study information and prepare it for publication; (3) modifying well-documented case studies published on other websites to suit the AN format.		
4.2	Develop hypothetical cases	'Ideal world' hypothetical cases could be added to the AN, to illustrate best practice for various adaptation goals, e.g. reducing vulnerability, managing climate change risks, raising awareness of climate change.	High	Medium
4.3	Facility to compare case studies	Being able to directly compare case studies, e.g. by displaying several case study pathways at the same time, would allow users to explore the diversity of approaches to adaptation in a visual way. This could be achieved by allowing several 'layers' of case studies to be switched on/off by the user.	High	Medium
4.4	Granting different levels of access to case study details	Using a log in, user groups could be specified that have access to different levels of sensitive information included in the case studies. For example, registered government staff would get access to additional details, such as financial information, that is not suitable for the public domain. A user group could also be formed for sharing internal information within an organisation. These options would require a high level of data security.	Medium	High

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