Scenarios *for* climate adaptation

Guidebook for practitioners

Understanding and managing complexity and uncertainty is one of the greatest challenges facing climate adaptation policy makers and practitioners.

Scenario planning – the development and use of plausible and compelling stories about how the future will unfold – can provide a valuable tool to help meet this challenge.

This guidebook provides a practical step-by-step guide to developing and using scenario planning for climate adaptation, informed by recent experiences of policy makers and practitioners in Victoria.

vcccar
victorian centre for climate change adaptation research

Scenarios for Climate Adaptation Guidebook for Practitioners

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The Victorian Centre for Climate Change Adaptation Research (VCCCAR) is a consortium of Victorian universities supported by the Victorian Government to undertake multi-disciplinary research about state-specific climate change impacts and adaptation options. Its brief is to:

1. *Increase Government decision-making capacity about state-specific climate change impacts;*
2. *Encourage the inclusion of adaptation needs in Government strategic planning; and*
3. *Bring together expertise to work on the provision of multi-disciplinary advice to government, industry and the community.*

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About this guidebook

About the project

This guidebook has been produced as part of the *Scenarios for Climate Adaptation* project funded by the Victorian Centre for Climate Change Adaptation Research (VCCCAR). The project was led by the University of Melbourne in collaboration with researchers from the CSIRO, Victoria University, Monash University, RMIT University and EPA Victoria.

The project was undertaken to strengthen knowledge about the most effective ways to develop and use scenario based strategies to improve climate change adaptation decision making and planning. The research draws particularly on the recent experience of Victorian climate adaptation policy makers and practitioners. It involved a variety of data collection methods including: review of national and international literature; case study inventory; online survey of 100 climate change adaptation policy makers and practitioners; interviews with key informants from the Victorian Government, climate adaptation experts and scenario planning practitioners; commissioning and presentation of four critical perspectives papers; stakeholder workshops and further consultation on drafts.

Together with the Scenarios for *Climate Adaptation Report* this guidebook communicates valuable information and makes a contribution to the limited empirical research into the key emerging lessons about using scenario planning to assist with climate change adaptation.

Who should use this guidebook?

The intended audience for this guidebook is anyone involved in climate change adaptation planning and policy making. It was created with an Australian, and particularly Victorian, context in mind but the content is also likely to have broader relevance. The guidebook has been designed to be useful to people working in a wide variety of organisational settings including: state and local government; regional planning bodies or agencies; non-government organisations; businesses and industry bodies, community sector organisations and community groups.

How to use this guidebook?

The guidebook accompanies the *Scenarios for Climate Adaptation Report* – a more detailed background document – which can be accessed at: www.vcccar.org.au/content/pages/scenarios-climate-adaptation.

It provides a concise summary of key messages from the research including key concepts, the value of scenario planning and approaches to doing it. It also lays out a step-by-step methodology for undertaking a scenario planning process, pointing to the choices and challenges faced at different steps and providing practical guidance and tips. It outlines three hypothetical case studies and provides links to real world case studies, more detailed 'how to' guidance, and other interesting websites and resources.

The guidebook can be read from start to finish or you can jump to different sections using the sidebar and contents pages to navigate.

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Section 1: Definitions and key concepts

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Section 1:
→ Climate change adaptation
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This section introduces the two central themes of climate change adaptation and scenario planning.

Look here for... basic definitions and a series of key messages about each.

Climate change adaptation

Definition

Adaptation involves changes in social-ecological systems in response to actual and expected impacts of climate change in the context of interacting non-climatic changes. Adaptation strategies and actions can range from short-term coping to longer-term, deeper transformations, aim to meet more than climate change goals alone, and may or may not succeed in moderating harm or exploiting beneficial opportunities.[i]

Key messages

Climate change adaptation policy and practice is about making complex value-laden decisions with far reaching, path dependent consequences in the context of highly uncertain knowledge about future climate trends and impacts.

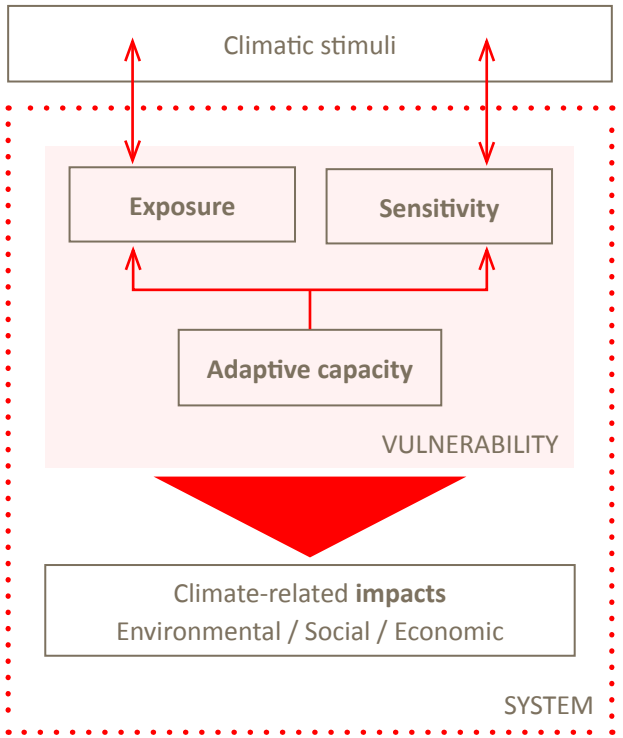
The way climate change adaptation is interpreted is heavily shaped by our pre-existing values, knowledge, experiences, as well as institutional structures, norms and processes. These different 'frames' are often implicit[ii]. Identifying and examining our different assumptions about adaptation is an important step towards shared understanding and effective action.

There are many different types of adaptation, determined by factors like scale, timing, and who is involved. Given the multifaceted nature of adaptation, numerous types of adaptation actions or approaches are possible and are needed to cater for differences in impacts, adaptors, goals and context.

A common understanding of adaptation is the process of reducing vulnerability to climate change impacts, where vulnerability is specific to a certain subject (e.g. a system or part of a system, such as an individual, organisation, or place).

Vulnerability is a function of how exposed and sensitive to a given climate change impact a given subject is at a particular point in time, in the context of their adaptive capacity and interaction with other impacts and processes (Figure 1).

Figure 1. Schematic diagram of vulnerability, its components and climate change impacts *(Fünfgeld and McEvoy, 2011)* [iii]**.**



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Key questions climate adaptation decision makers need to address include:

- → *What do we need to adapt to?*
- → *What is good adaptation?*
- → *Who or what needs to adapt?*
- → *How does adaptation occur?*[iv]

What do we need to adapt to?

Climate change adaptation is needed in reaction to, and in anticipation of, an ever-shifting cascade of complex, interacting impacts and feedbacks, including our response actions. They vary according to whether they will affect all or some of society and the level of certainty by which they can be predicted. They are simplified below as three orders of impacts.

Order of impacts	Examples
Direct climatic and biophysical impacts	Lower and less predictable rainfall Flood damage to infrastructure Heat stress in animals
Indirect economic, political and social impacts	More expensive food, utilities, insurance New planning restrictions Increased anxiety amongst population New research and education needs
Effects (desirable and undesirable) of adaptation responses	Stronger relationship with community Dependence on insurance sector Increased greenhouse gas emissions

What is good adaptation?

The goal of adaptation is often implicit. A common goal is to protect the *status quo* from disruption. But climate change forces us to face difficult value-laden decisions about what we want to try to protect/maintain and what we are willing and able to change. Adaptation can also be used as an opportunity to improve the situation for those for whom the *status quo* is not desirable. The alignment of adaptation with existing goals, such as improving education or ecosystem management, reflects 'win-win' or 'low cost' adaptation options.

Good adaptation involves avoiding *maladaptation*: efforts that fail to reduce one's own vulnerability or carry unacceptable costs for oneself or others, including nature[v].

How adaptation is assessed is a question of time frame. Actions taken in the short term may seem adaptive or maladaptive, but prove not to be in the long-term. Monitoring is needed to make such evaluations and prompt necessary adjustments.

Who or what needs to adapt?

All individuals, organisations, institutions and sectors needs to adapt and have different roles to play. Adaptation by others will change the context we live in substantially. Awareness of the potential positive and negative effects of one's adaptation actions on others is a crucial part of selecting adaptation options and fostering collaborative action.

Adaptation action is shaped by three dynamic factors and their interaction: what one needs to adapt to; one's capacity to adapt; and one's willingness to adapt.

Adaptive capacity emerges from the different types and levels of 'capital' that one, and one's society, has at a given time:

- → *Financial capital (e.g. investments, assets);*
- → *Human capital (e.g. health, knowledge, capacity to learn);*
- → *Social capital (e.g. relationships, understanding of others),*
- → *Physical capital (e.g. safe buildings, reliable utilities); and*
- → *Natural capital (e.g. quality soil, shade trees, pollinating insects)*[vi].

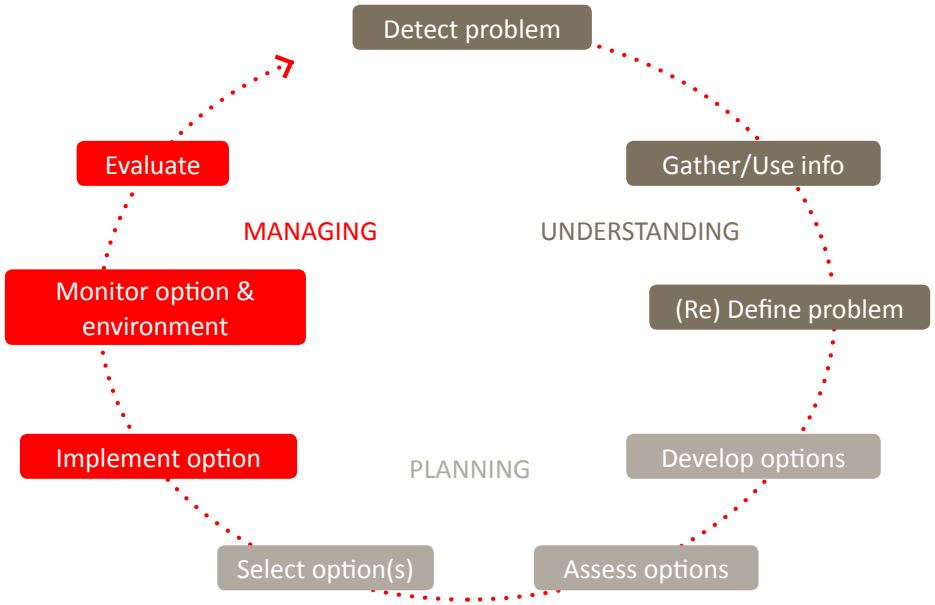
These are shaped by one's position in existing structures and the adaptation actions of others. Adaptive capacity may grow or decline over time as adaptation (or maladaptation) occurs.

The role of government in adaptation is critical. It needs to not only manage its own adaptation needs, but facilitate enabling and impact-specific forms of adaptation for others. Government especially has a role in proactive or 'planned' adaptation, which can involve decisions with long lead times and far-reaching consequences. It also has a key role in transformational adaptation: that which fundamentally alters existing institutions or structures to improve our ability to manage climate change.

How does adaptation occur?

Adaptation is a continuous, ever-changing process. It involves iterative cycles of decision making, action, observation and learning (expressed as understanding, planning, and managing in Figure 2 below).

***Figure 2. A generalised adaptation process** (Moser and Ekstrom, 2010)* [vii]



The complex and unprecedented way in which climate change impacts will manifest and our adaptation responses will alter vulnerability mean that adaptation is above all about learning. This learning needs to be rapid, reflective, and shared. Approaching adaptation as a social learning process requires changes in the way we normally operate. Diverse forms of knowledge and flexible ways of operating are needed.

Adaptation requires that we consider long-term threats and implications. At the same time, uncertainty about the detailed characteristics, timing and interactions of climate change impacts and the effects of our adaptation responses means that conventional "observe, predict, respond" management approaches are ill-equipped to inform adaptation strategy[viii]. Alternative ways of preparing ourselves for the future – such as the scenario planning discussed below - are needed, as is a responsive and flexible ('adaptive') way of managing.

Core to adaptation planning is the notion of 'robust decision making' in which strategies are selected for their ability to work in a range of possible future conditions or their ability to flexibly switch between modes as needed[ix]. This differs significantly from focusing on one possible future and selecting a strategy that is optimal in those predicted conditions.

Constraints on adaptation are numerous and emerge from multiple sources and at each stage of adaptation. Part of the adaptation project is to identify and address these barriers and limitations. Some are in the form of gaps (e.g. in knowledge, communication, technologies, policy coverage) and others are in form of obstructive or perverse structures and processes. These require more transformational change and will become more pressing as climate change progresses. They include the need to integrate mitigation of greenhouse gas emissions into our adaptation responses and way of life.

See Chapter 2 of the Scenarios for Climate Adaptation Report.

See VCCCAR Framing Adaptation in the Victorian Context – Working Paper 1: Framing Climate Change Adaptation in Policy and Practice

Scenario planning

Definitions

*A **scenario** is a plausible, often simplified description of how the future may unfold, based on a coherent and internally consistent set of assumptions about driving forces and key relationships*[x].

Scenario planning involves the development and use of plausible futures to inform strategic decision making and planning in a wide range of organisational and policy making contexts.

Key messages

What is scenario planning?
What are scenarios?

Scenario planning methods were developed and popularised throughout the second half of the 20th century to assist with strategy development in corporate settings. They are designed for situations in which there is high uncertainty and the decision maker has low control over the outcome. In contrast to techniques that attempt to predict the future, such as forecasting, scenario planning emphasises the need to maintain awareness of uncertainty and aims to inform good decisions and strategies in that context. This idea of managing rather than reducing uncertainty is particularly pertinent to climate change adaptation, where there is a high degree of complexity and a particular amount of irreducible uncertainty, including about the specific manifestation of climate change impacts. As Roger Jones (2010) puts it:

'While people have a strong desire for prediction, the capacity to predict in complex systems is limited – hence the need for scenarios. If an outcome was simple to predict, then one would use a prediction'[xi].

More than being a scientific product or second cousin to prediction, however, scenario processes also provide a critical opportunity to interrogate our assumptions. Many scenario practitioners agree that the main purpose of scenarios is to help us *'move away from the "one future" mentality and expose the inherent and sometimes irrational assumptions that lie behind our vision of the future'.*[xii] To achieve this purpose, scientific climate change scenarios are complemented by searching discussion and analysis of other influences on and ideas about the future, including ethical questions about what futures are desirable. Overall, it is important to note that scenarios are not silver bullets which can be used to form definitive judgements on how the future will unfold or to determine the optimal set of decisions to achieve an optimal outcome, but are learning processes dependent on the quality of interaction, inputs and follow up.

Reflecting the different perspectives of scenarios above, three broad approaches to building scenarios can be identified, each of which addresses a different key question. They point to a continuum from more predictive to more exploratory approaches.

4. Predictive scenarios: What is *likely* to happen?
5. Exploratory scenarios: What *could* happen?
6. Normative scenarios: What *should* happen?

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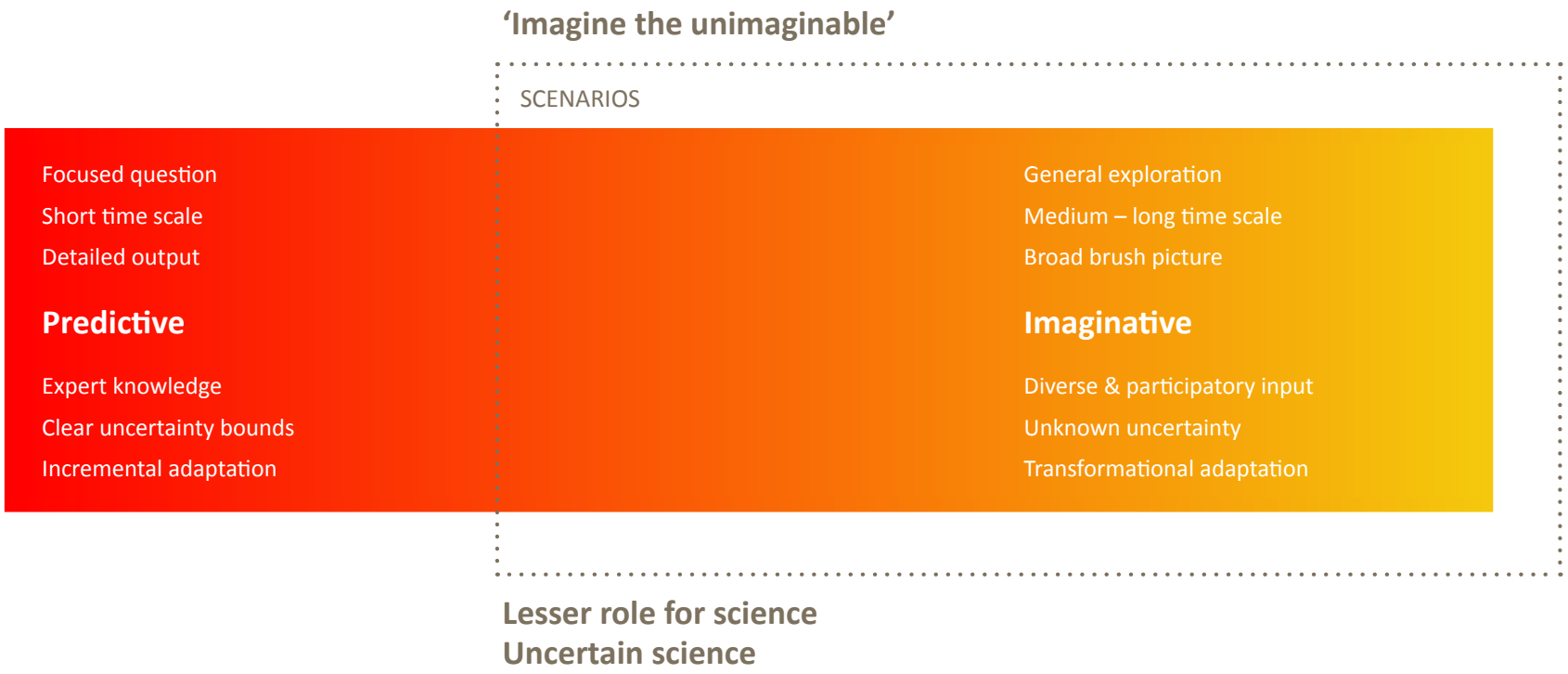
Figure 3. Scenarios on a continuum from predictive to imaginative approaches to the future



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Top-down and bottom-up approaches to adaptation planning and scenario development

There are broadly 'top-down' and 'bottom-up' approaches to adaptation planning (Figure 4). Different processes are drawn upon for each. The role of scenarios – the types of scenarios that are relevant, the methods used to develop them, the scale at which they are developed and applied – differs significantly depending on the orientation.

The 'top-down' development of global assessments generates scenarios derived from global trends, while the 'bottom-up' development of local and regional assessments is focused on understanding place-based vulnerability and adaptation needs, for which scenario planning techniques are one set of tools that can be employed.

Relatively simple scenarios about future climate change may be all that is needed when considering implications for the local context, as more detailed simulations of the climate are often less important than developing a deeper understanding of local vulnerability and opportunities to reduce it[xiii].

For adaptation planning that draws out the implications and possible responses in local and regional settings, tailored, context-specific scenario planning processes are increasingly being used. These 'do-it-yourself' approaches provide a forum for combining input and advice from experts and stakeholders with experience and knowledge relevant to specific areas, population groups or issues.

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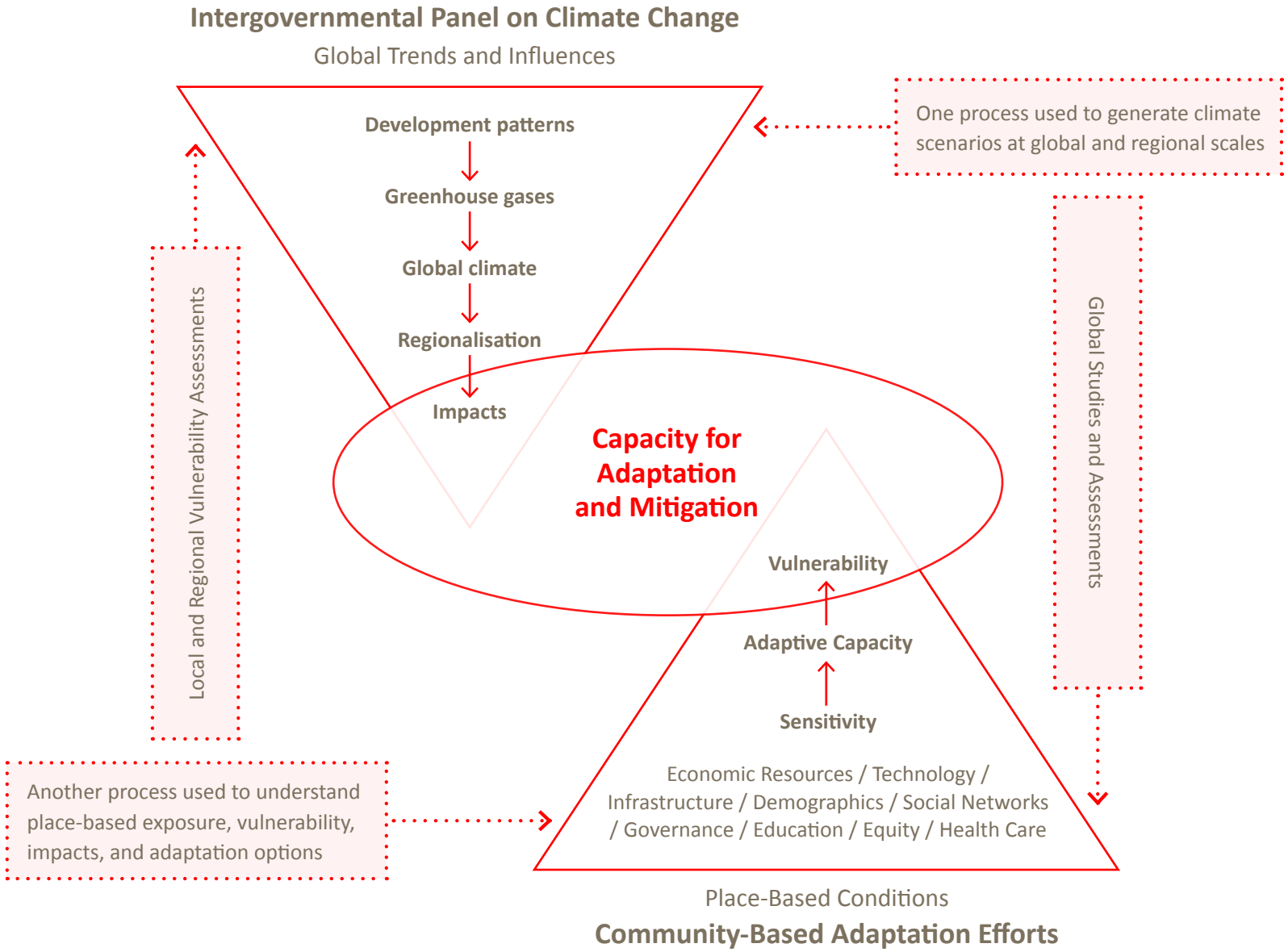
Figure 4. Top-down and bottom-up approaches to climate change planning (Moss (2010) after Dessai and Hulme (2003) as cited in Preston (2010)) [xiv]



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Scenario planning stages

Typical stages in a scenario planning process include:

- → *problem framing and definition*
- → *tracking or exploring key related issues*
- → *analysing and prioritising critical and highly uncertain issues*
- → *imagining plausible scenarios*
- → *identifying a range of possible strategies and testing them against the scenarios leading to strategic decisions*
- → *going beyond the scenario planning process to implement these decisions.*

Benefits and limitations of scenario planning processes

Benefits of scenario planning processes identified in the literature include:

- → *Fostering improved learning and imagination at both individual and organisational levels arising from the exchange of perspectives and expertise during the process of future exploration and scenario creation*[xv].
- → *Providing a framework for decision makers to systematically identify and analyse complex, interconnected variables and drivers.*
- → *Enabling deep shifts in the way organisations operate and help embed a culture of strategic 'future-oriented' thinking and discussion into everyday operation.*
- → *Helping to build a common understanding of issues and visions*[xvi].
- → *Creating powerful stories to communicate alternative futures to stakeholders outside the planning process*[xvii].
- → *Helping organisations reduce the risk of 'groupthink' and allow more open acceptance of ideas.*
- → *Building awareness that the future is not pre-determined and more than one possible course of action exists.*[xviii]
- → *Improving decision making through testing and rehearsing strategic choices and plans.*

However, there remain gaps in understanding about scenario planning, particularly how to optimise its use by policy makers. As the European Environment Agency notes:

> *'The shortage of research on scenario planning and its influence means that there is limited guidance on how to optimise scenarios, in terms of both outputs and uptake by policy-makers'.*[xix]

A set of criteria commonly used to assess the value of a given scenario process is: saliency, credibility and legitimacy[xx]. This means asking:

- → *Are the scenarios relevant to information and decision making needs? (saliency)*
- → *Are the scenarios scientifically sound? (credibility)*
- → *Who developed the scenarios and how? (legitimacy)*

See Chapter 3 of the Scenarios for Climate Adaptation Report.

Section 2: Value of scenario planning for climate adaptation and three typical approaches

This section presents the basic case for using scenario planning to help meet climate change adaptation objectives and introduces a framework for understanding how applications differ.

Look here for... an explanation of how scenario planning can help at different stages of an adaptation process; an introduction to three different approaches typically taken to applying scenario planning to climate change adaptation; and an outline of some of the main process variables.

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Why use scenario planning for climate adaptation?

There are many ways in which using scenario planning techniques can lead to valuable outcomes in relation to climate change adaptation. The table below lists some of these along with factors which can limit the realisation of benefits from a scenario planning process.

Value gained	Limiting factors
Greater awareness and understanding of climate change trends, its extensive impacts and its implications for different groups	Shared understanding of the aims and scope of climate change adaptation, including agreement on the need for adaptation and distribution of responsibilities
Exploration and integration of the many different issues and forms of knowledge that are pertinent to climate change adaptation	Shared understanding of what scenarios are, the aims and scope of scenario planning, and their relationship to climate change adaptation
Exposure and exploration of different worldviews, assumptions, and framings of climate change and adaptation	Engaging relevant decision makers and stakeholders in the scenario planning process
Consideration of a broader, more holistic range of approaches and options in responding to the climate change issue	Including a genuinely broad range of inputs, issues and pathways in the scenario planning process
Greater awareness of the role of human choices and actions in shaping the future	Accessing, analysing and integrating relevant data for input into the development of scenarios, including downscaled climate change scenarios

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Value gained	Limiting factors
Greater awareness of the ethical and political issues that climate change adaptation raises about organisational and societal goals and priorities	Relating high level issues and changes to an organisation's or individual's narrower sphere of influence and options for action
Greater awareness of the potential for and need to avoid maladaptive responses	Acceptance of the results of a scenario planning process as credible, legitimate and salient by management, colleagues and other stakeholders
Greater awareness of the relationships between the potential adaptation responses of different levels of government, organisations and sectors	Integrating tangible and intangible results of a scenario planning process into subsequent adaptation planning and action
Understanding of the need for, and steps towards, greater collaboration within and between organisations	Addressing the need for repeated and cross-organisational scenario planning

The next three pages summarise a variety of ways in which scenario planning is being used, looking at key policy and research questions, types of scenarios and their use and examples for each of Moser and Ekstrom's (2010)[xxi] three climate adaptation phases of *Understanding*, *Planning* and *Implementing*.

See Chapter 4 of the Scenarios for Climate Adaptation Report

See Moser and Ekstrom (2010) http://www.pnas.org/content/early/2010/11/29/1007887107.full.pdf+html

Key climate adaptation challenge: *Understanding*

The challenge of *Understanding* climate adaptation involves tasks of: detecting the need for adaptation in the first place; gathering and using information; and defining and redefining the problem.

Some of the challenges that can arise in this phase include: the existence and detection of a signal (for example that climate change is a concern and requires a response), the availability, relevance and credibility of information necessary to make response decisions, and the level of agreement among relevant decision makers and stakeholders.

Key policy and research questions	Types of scenarios and ways in which they can be used to answer questions and meet challenges	Example scenarios or scenario planning projects
Do we need to adapt to climate change? What climate trends and impacts do we need to adapt to? What climate risks do we face? How do these climatic change risks interact with other non climatic trends, drivers, stressors and risks? Who or what needs to adapt? Who is most vulnerable? How do we raise awareness about climate adaptation risks? How do we engage key stakeholders?	Using down-scaled global and national climate change scenarios to identify range of possible local and regional climatic changes. Using climate change scenarios as inputs to social and economic impact, risk and vulnerability assessments. Developing 'tailored' local and regional scenarios to explore interactions between climate change and other local and regional drivers. Developing local impact scenarios to identify vulnerable people and places. Using or developing local impact scenarios to strengthen shared understanding of need for adaptation. Developing local impact scenarios as a means of engaging citizens and stakeholders in consideration of risks and current vulnerabilities.	**CSIRO: Ozclim: Scenario generation tool for Australia** http://www.csiro.au/ozclim/home.do **IPCC SRES: Global emissions scenarios** http://www.grida.no/publications/other/ipcc_sr/?src=/climate/ipcc/emission/ **Climate Change Adaptation in New Zealand: Future scenarios and some sectoral perspectives** http://www.nzclimatechangecentre.org/sites/nzclimatechangecentre.org/files/images/research/Climate%20change%20adaptation%20in%20New%20Zealand%20%28NZCCC%29%20%28A4%20low%29.pdf **Broadmeadows 2032:** http://www.ecoinnovationlab.com/revisioning-broadmeadows

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Key climate adaptation challenge: *Planning*

The challenge of *Planning* for climate change adaptation involves important tasks of: developing response options; and assessing and selecting the best options to take in a given situation.

There are a range of barriers that can arise at this phase including: a lack of leadership to guide the process; ability to identify and agree on goals, criteria and appropriate options, degree of control over the process and options available; information constraints and a lack of agreement on goals, criteria and options.

Key policy and research questions	Types of scenarios and ways in which they can be used to answer questions and meet challenges	Example scenarios or scenario planning projects
What kind of future do we want to create? What actions are needed to create this future? What climate adaptation options are available? What criteria should we use to assess various climate change options? What climate adaptation options should we take to improve climate adaptation outcomes? How do we engage key stakeholders in identifying, assessing and selecting climate adaptation options?	Using local impact scenarios to stimulate creative thinking about possible adaptation options. Developing and using local impact or climate adaptation response scenarios to assist communities and stakeholders identify possible and desirable futures. Development of climate adaptation scenarios to show what might happen if different adaptation options are enacted. Using climate adaptation scenarios to test the robustness of different policy options or adaptation measures under different plausible futures. Developing impact or climate adaptation scenarios with a range of stakeholders to build shared understanding of adaptation priorities.	**Scenarios for climate change adaptation in the Hamilton region of Victoria** ***RMIT Global Cities Research Institute and Hamilton critical reference group*** http://prodmams.rmit.edu.au/cyb31c4gyjn2.pdf **Victorian Climate Change Adaptation Program (VCCAP) South West Region scenario project** ***Department of Primary Industries, Victorian Government*** http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/climate_vccap **Thames Estuary 2100** ***UK Environment Agency*** http://www.environment-agency.gov.uk/homeandleisure/floods/104695.aspx **Towards a Post-Carbon Gippsland** ***Gippsland Climate Change Network***

See Chapter 5 and Appendix A of the Scenarios for Climate Adaptation Report

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Key climate adaptation challenge: *Implementing*

Finally, there is the challenge of *Implementing* the adaptation measures which involves tasks of: implementing chosen options; monitoring outcomes; and evaluating the effectiveness of the options.

Key barriers that can arise at this stage include: lack of authorisation to implement options; insufficient resources, clarity or legal and procedural feasibility; lack of agreement on targets and goals; unavailability or unsustainability of technology, resources and storage and retrieval systems for monitoring outcomes; lack of willingness to learn or authority to revisit previous decisions.

Key policy and research questions	Types of scenarios and ways in which they can be used to answer questions and meet challenges	Example scenarios or scenario planning projects
What is the most effective way of implementing the chosen climate adaptation option? What actions can be taken to improve the capability of organisations and communities to implement climate adaptation policies and programs?	Using scenarios to test and evaluate the ongoing effectiveness and robustness of climate adaptation policies and plans. Using scenarios to improve social learning/ reflexive organisations.	**The Future Climate for Development** ***UK Department of International Development / Forum for the Future*** Project encouraging member agencies to use scenarios in their ongoing strategic planning. http://www.dfid.gov.uk/Media-Room/News-Stories/2010/How-will-the-world-look-in-2030/ **Irrigation Futures** ***Department of Primary Industries, Victorian Government*** Project involving the demonstration of scenario planning methods, sharing the lessons learnt and encouraging use of scenario techniques through development of a suite of resources. http://www.land.vic.gov.au/DPI/Vro/gbbregn.nsf/pages/gb_lwm_fwm_irrig_futures

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Three broad approaches to scenario planning for climate adaptation

One useful way of understanding different ways in which scenarios are being used to assist climate adaptation decision making is to consider the following three broad approaches:

A. ***Off-the-Shelf:*** *Applying pre-existing, down-scaled scenarios to specific locations, population groups and policy challenges*

B. ***Tailored Exploration:*** *Building and using context-specific scenarios to explore possible climate futures, impacts and adaptation policy options*

C. ***Tailored Visioning:*** *Building and using context-specific scenarios to envisage desirable futures and pathways*

Taking an Off-the-Shelf approach involves the adaptation practitioner or planner simply accessing scenarios (e.g. global climate change scenarios or global socio-economic scenarios) that have been developed by others, often using sophisticated quantitative methodologies that require scientific or modelling expertise. These scenarios form one input into the particular adaptation planning process being employed.

Tailored Exploration and Tailored Visioning approaches both encompass much wider variation in application, as they represent approaches through which context-specific scenarios (e.g. local climate impact scenarios or adaptation response scenarios) are developed and used as part of the adaptation planning process.

Each of these approaches is explained in greater detail and represented diagrammatically in the following pages.

It is important to note that, in reality, applications of scenario planning can involve the combination of more than one of these simplified approaches. The distinction is, however, helpful in understanding the different steps taken and the strengths and weaknesses of each approach. These are also highlighted in the three hypothetical case studies presented in Section 4 of this guidebook.

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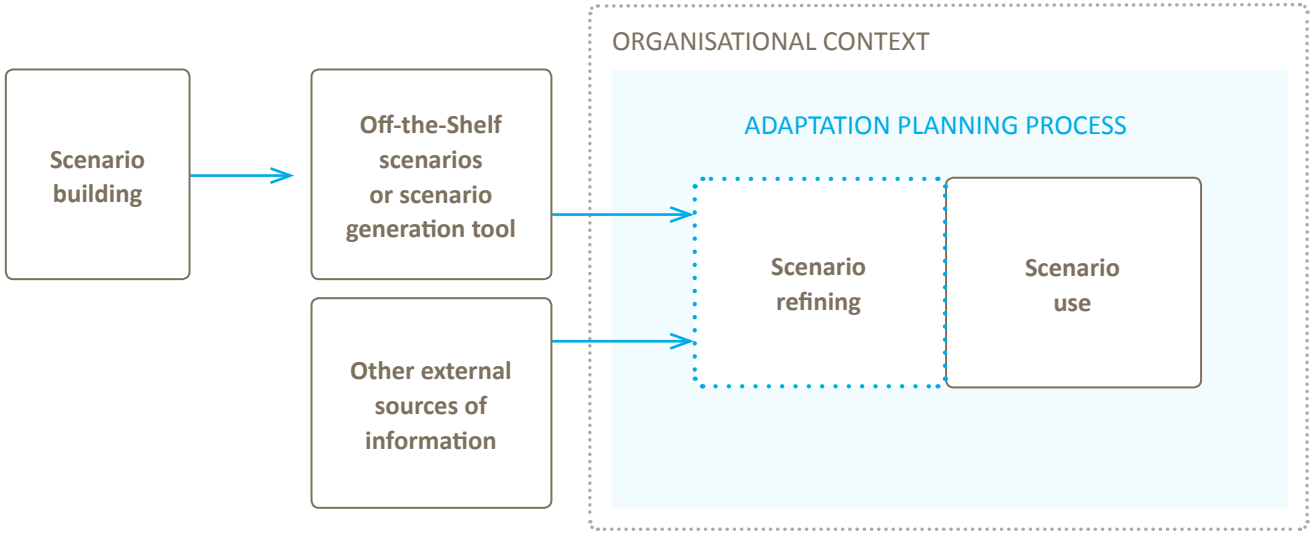
A: Off-the-Shelf

In the Off-the-Shelf approach, scenarios are built externally and made available to organisations and individuals as finished products (e.g. graphs, datasets, storylines) or scenario generation tools (e.g. web-based interfaces, ready-to-use data, detailed guidelines) to be used as inputs into localised adaptation decision making processes. In this approach, scenarios are typically built by 'experts' (e.g. scientists, data modellers etc) at large scales (e.g. global, national) and go through a process of being down-scaled in order to be accessed by local level users.

Figure 5. Off-the-Shelf: Using pre-existing scenarios as inputs into adaptation planning



Potential strengths	Potential weaknesses
→ Pre-existing scenarios are often convenient to access and require few resources by the user.	→ Scenarios created at large-scale do not always provide relevant information at lower scales (e.g. local towns, regions) and require down-scaling or refining to match the particular area or population group of interest, which can present methodological challenges.
→ Scenarios created by 'experts' (e.g. national scientific bodies) and built on sophisticated methodologies are considered highly credible to a wide range of audiences.	→ Layers of assumptions have been built into pre-existing scenarios, but they are not always fully understood or appreciated by users.
	→ Not always seen as legitimate to users and their audiences. Requires understanding and/or trust in methods employed to build the scenarios.
	→ Risk that scenarios will be used in unintended ways or without due consideration of caveats (e.g. where one scenario is chosen out of a set intended to be considered as a full set). NB. Important distinction between plausible futures (scenarios) and probable futures.
	→ Can neglect 'extreme' cases.

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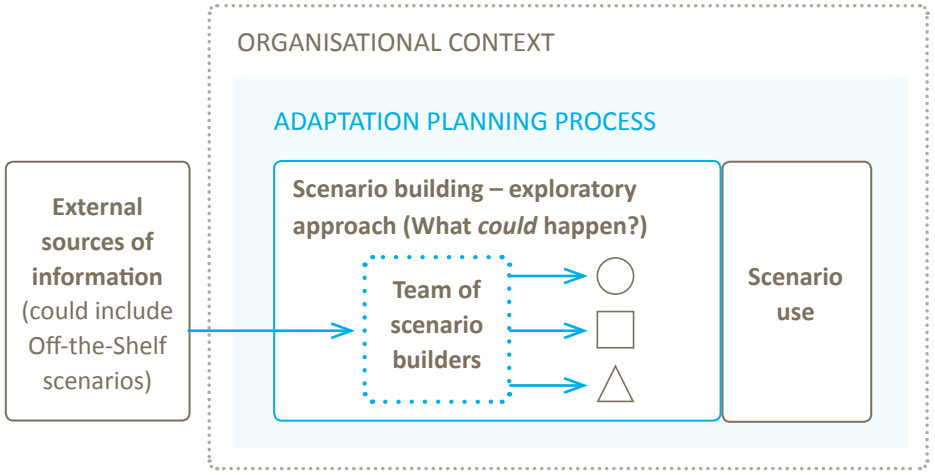
B: Tailored Exploration

The Tailored Exploration approach involves both building and using scenarios tailored to specific geographical locations and/or population groups. The scenario building process can be more or less participatory or expert-driven. The key steps typically involve mapping and prioritising key trends and drivers leading to agreement on a small number of plausible scenarios. In most instances identification of climate change drivers (often informed by the use of down-scaled global climate trend scenarios) is complemented by consideration of other relevant social, economic, environmental and cultural trends and drivers. The suite of climate adaptation scenarios generated are then frequently used to explore and test potential policy and practice responses leading to the identification of robust – rather than optimal – climate adaptation decisions and strategies.

Figure 6. Tailored Exploration: Building and using context-specific scenarios to explore possible climate futures, impacts and adaptation policy options



Potential strengths	Potential weaknesses
→ Recognises and promotes the value of understanding systemic drivers of change and dynamic relationships between them as a foundation for better planning under uncertainty.	→ For a given scale, it can be difficult to determine boundaries and ways of factoring in drivers at scales beyond the sphere of influence of those building the scenarios.
→ Scenarios can be built at many different scales and tailor-made to suit the problem of interest.	→ Possibility for confusion between descriptive and normative approaches (i.e. describing possible as compared to desirable futures).
→ Value in learning through the scenario building process, exploring assumptions and diverse perspectives (including different sources of information).	→ Challenges in establishing the credibility of scenarios from the point of view of those not involved in building them, especially getting buy-in from decision makers.
→ Capacity to consider broad range of futures, including surprises and shocks.	
→ Tailor-made scenarios can be made more explicitly relevant to key audiences.	

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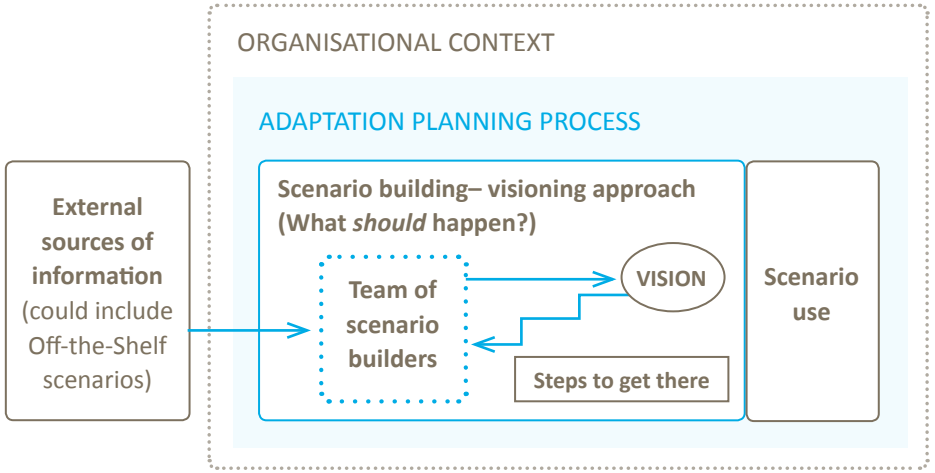
C: Tailored Visioning

The Tailored Visioning approach is similar to Tailored Exploration in that scenarios are both built and used in the context of particular localities and/or population groups. However in this approach there is a more explicit emphasis on using the scenario planning process to identify and agree on the most desirable scenarios and future outcomes. Here stakeholders seek to define a common future they wish to see and then define strategies, pathways and decisions to achieve this. The envisaged future may present an ideal state of adaptability or resilience or a post-climate change condition. Often there is a strong blurring between achieving objectives relating to climate change adaptation and sustainability.

Figure 7: Tailored Visioning: Building and using context-specific scenarios to envisage desirable futures and pathways



Potential strengths	Potential weaknesses
→ Particularly well-suited to designing proactive strategies and/or discussing transformative adaptation.	→ Raises questions about whose idea of the future is being articulated.
→ Value in learning through the scenario/future vision building process, exploring assumptions and diverse perspectives (including different sources of information).	→ Can build expectations and fail to deliver.
→ Creating desirable visions can promote common goals and shared objectives.	→ If done poorly, may leave people overwhelmed by the enormity of the challenge and lack of agency.
→ Visions for the future are typically solutions-oriented and can paint a powerful and inspiring picture for key audiences.	

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How do different scenario planning processes vary?

Recognising that there are major contextual differences relating to the organisational setting and adaptation challenge being addressed, this section introduces some of the important variables of any scenario planning process. These variables provide a useful framework for understanding the nature and extent of variation in applications of scenario planning to climate change adaptation. They include[xxii]:

Key considerations	Examples of possible responses
Purpose of scenario planning	→ Explore issues, raise awareness, set agenda for change, educate others, build relationships, identify and select options, test strategies, develop evidence
Purpose of adaptation efforts	→ Manage discrete climate risks, build general adaptive capacity and resilience, empower others, build relationships, question or justify existing policies
Types of knowledge to be included	→ Formal knowledge: climate science, economics, environmental and social science models and data; predictive or possibilities → Informal knowledge: organisational knowledge, community-based knowledge, imagination
Breadth of issues considered	**Extent to which the following are incorporated:** → pervasive indirect climate change impacts (economic, social etc) as well as direct biophysical impacts → possible positive and negative effects of different adaptation responses → present day vulnerabilities, including the existing 'adaptation deficit' and other needs of different groups → barriers and limitations to adaptation (for example, research and development needs, political will)

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Key considerations	Examples of possible responses
Scale(s) to be considered	**Extent to which the following are incorporated:** → Long and/or short time periods, both in terms of climate change and the decisions considered → Changes at the global, national, regional and/or local geographic levels → Existing and future developments at higher and lower levels of government and society → The influence of other organisations and sectors → The influence of one's own adaptation actions on the above
Who participates in scenario development	→ Internal to the organisation (which departments, levels of management) → External to the organisation (which partners, stakeholders, community members, or climate change, adaptation and scenario experts)
Who scenario outputs are shared with and how	→ Internal to the organisation (which departments, levels of management) → External to the organisation (which partners, stakeholders, community members, general public) → Publication of scenarios as report or website, static or interactive
How the results of the process are used to support adaptation decision making	→ Used in early stages only or used throughout adaptation planning process → Used as prompt and heuristic only, or used as evidence in selection and justification of adaptation options

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Section 3: Key steps in a scenario planning for climate adaptation process

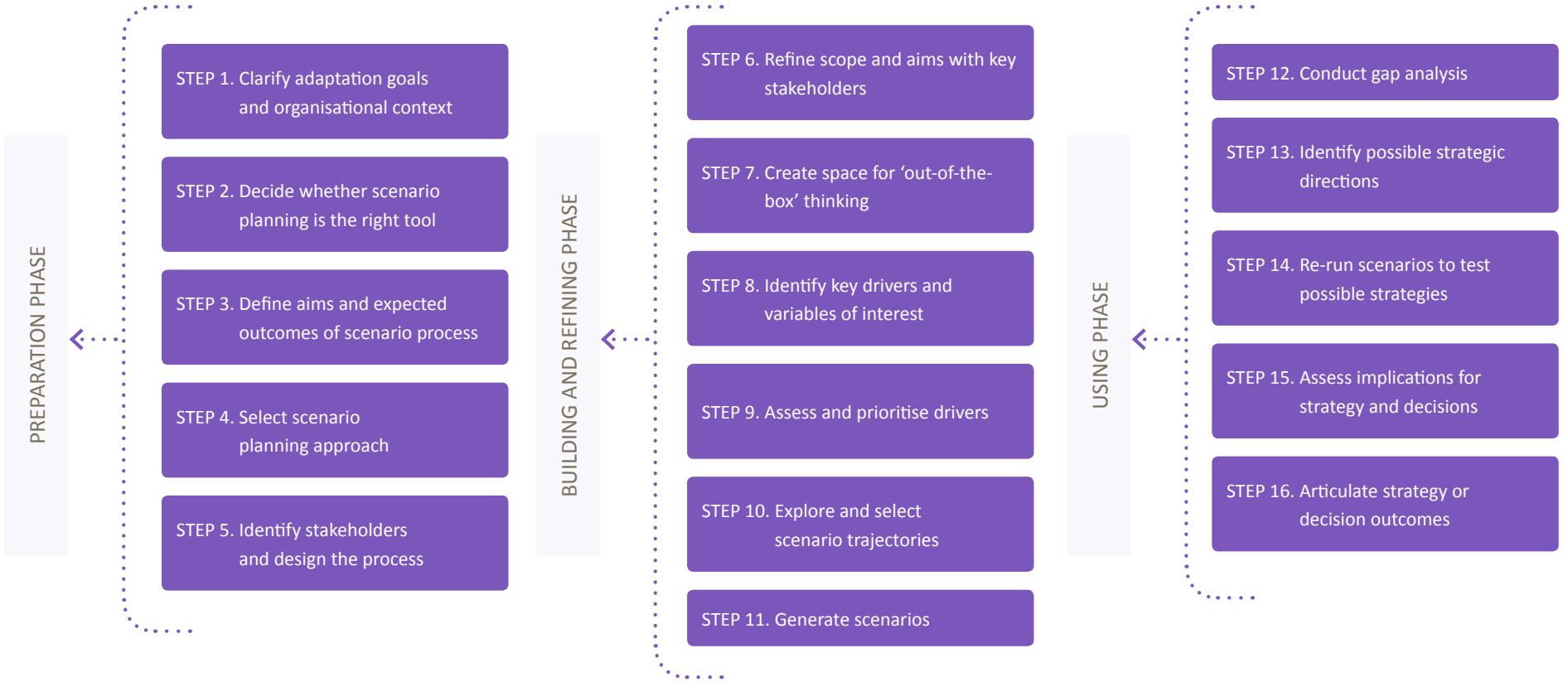
This section outlines the steps involved in an integrated methodology for applying scenario planning to climate change adaptation, providing basic guidance to help with the choices and challenges faced along the way.

Look here for... an explanation of the critical phases and steps involved in a generic scenario planning for climate adaptation process; tips and links to help address decisions and challenges that may arise; a summary of overarching principles for maximising the potential of the particular scenario planning process; and suggestions for discrete scenario exercises that can be applied relatively informally.

Introduction to an integrated methodology

This section outlines an integrated, generalised methodology for applying scenario planning to climate change adaptation, drawing on well-established scenario methods and lessons from practice. It is a suggested process to be followed by what we refer to as a core planning group or 'guiding team' – which could be comprised of individuals within one organisation or across multiple organisations. It involves three stages and 16 sequential steps. The steps are indicative only and are designed to point to important choices and challenges that can arise in a range of different applications. Depending on the context, different steps will be more or less relevant.

Each of these steps are outlined in the following pages. There are also **three hypothetical case studies** with each step worked through in Section 4. Shortcut links to these fictional case studies are included in the right-hand sidebar in this section.



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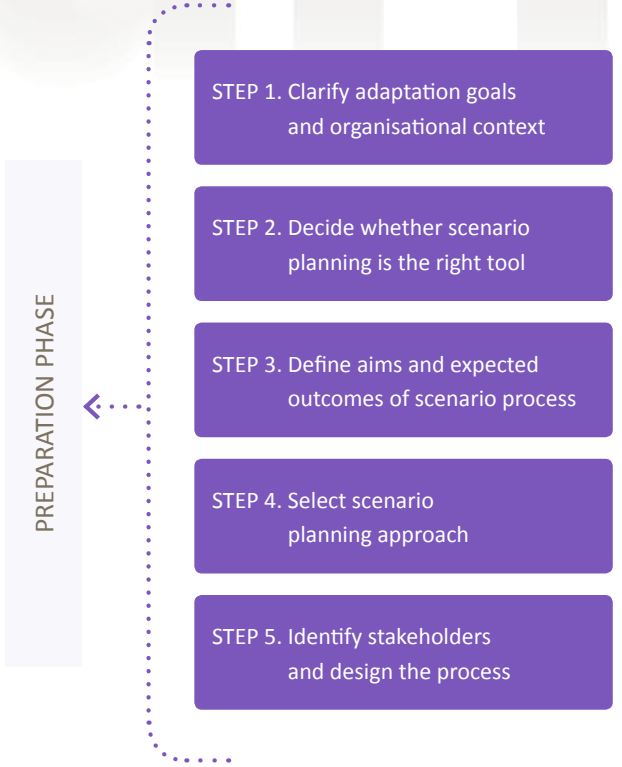
Phase 1 – Preparation

The Preparation phase lays the groundwork for successful use of scenario planning for climate change adaptation.

Here, the 'guiding team' clarifies the adaptation challenge and goals, determines whether scenario planning can assist and what is expected from the scenario planning process, selects an approach that will best match peoples' objectives and designs the process.

See Chapter 7 of the Scenarios for Climate Adaptation Report for more detailed information.



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Preparation: Step 1

Clarify adaptation goals and issues relevant to your organisational context

Climate change adaptation is complex and understood differently by different people. Before embarking on a scenario planning process it is important to be aware of the way in which adaptation is framed in your organisational context. For example, it could be viewed predominantly as: a risk management issue; a threat to your particular community or industry; an opportunity for change; a learning process and so on.

This first step requires the 'guiding team' to recognise and have a general understanding about why climate change (along with other drivers of change) may require an adaptation in activity, strategy or operational priority. This step can simply involve key personnel in an organisation or network defining a need, dilemma or critical threat characterised by uncertainty. Detailed knowledge about climate change and its impacts is not required. An organisation may suspect that climate change will affect its operations and may require a change in overall strategic direction or a particular policy or investment decision. In other cases, climate change may appear as a significant, but unknown change factor posing potential risks and opportunities that need to be explored in detail.

See Chapter 2 of the Scenarios for Climate Adaptation Report

See VCCCAR Framing Adaptation in the Victorian Context – Working Paper 1: Framing Climate Change Adaptation in Policy and Practice

Preparation: Step 2

Decide whether scenario planning is the right tool

The second step requires making an assessment of whether scenario planning techniques are well suited to the situation as framed and understood by the 'guiding team'.

Scenario planning is probably the right tool where:

- → *The focus issue involves many complex variables and uncertainties*
- → *Relevant information is lacking*
- → *There is a strong possibility that key variables are not known or unforeseen events may occur*
- → *Decisions made may have major implications for decision makers in 10 years or more*
- → *There are many conflicting views on what should be done about a strategic challenge*
- → *There is a lack of confidence in the value of other decision making tools to help*

If most of the above statements do not apply, other tools and methods such as forecasting or risk assessment frameworks should be considered.

Figure 8: **When is scenario planning most appropriate?**

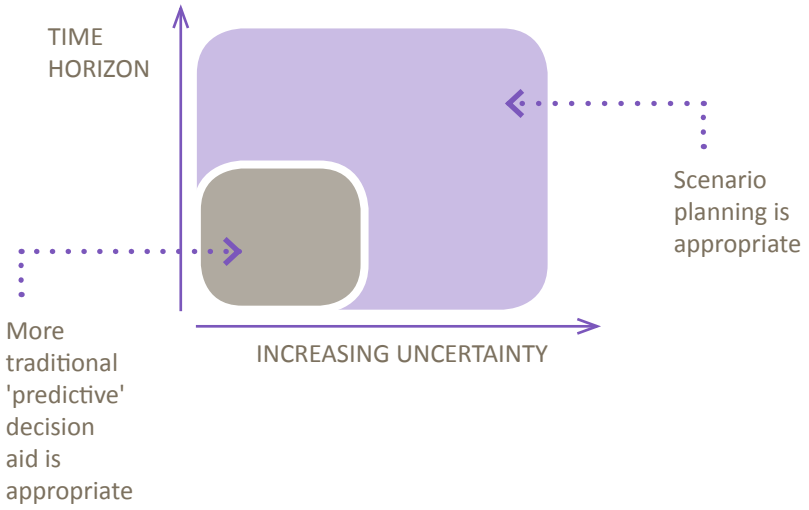

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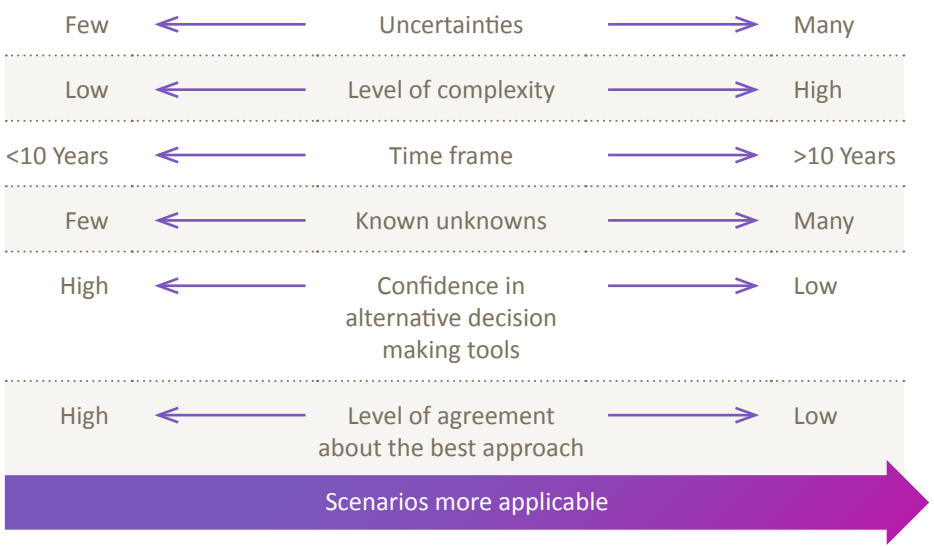
Figure 9: **Factors affecting the appropriateness of scenario planning**



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Preparation: Step 3

Define aims and expected outcomes of the scenario planning process

Once a 'guiding team' accepts that a scenario-based approach is the best way forward, the next step involves defining what can be achieved from using scenario planning for climate change adaptation. The aims and expected outcomes defined at this step will determine the most appropriate approach and help design the subsequent steps. Aims and outcomes should be defined with an understanding of the adaptation challenge being explored, the level of commitment and resources that can be used to address that challenge and the particular needs of the organisations involved.

Some aims relevant to climate change adaptation that may be achieved through scenario planning include:

- → *Development of tools such as visualisations and narratives useful for communicating the case for adaptation*
- → *Deepening or building a shared understanding of context-specific climate change impacts*
- → *Stimulating new ideas and new ways of thinking about climate change and possible adaptations*
- → *Informing and shaping strategic planning for adaptation*
- → *Informing and shaping adaptation decisions*
- → *Testing the efficacy of existing strategies and decisions against potential impacts of climate change*
- → *Building the culture and organisational capacity for continual learning, adaptation and openness to new future possibilities.*

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Aims and expected outcomes for the hypothetical case studies

Longwater Bay Coastal Protection Strategy	City of Hollum Strategic Plan	Cocklebiddy Vision 2040
The CEO and council managers responsible for coastal protection and asset management at Longwater Bay were clear that the current Coastal Protection Strategy needed an upgrade to factor in the increased frequency and intensity of coastal erosion… At the end of the day, the asset manager wanted clarity on the implications of sea level rise and associated impacts for infrastructure located on or near the cliffs, a set of guidelines on what actions were needed to deal with these impacts and enough detail to begin costing any adaptation measures.	Strategic planners at both local and state government level were well aware of the many challenges that the Hollum region faced. A key problem was prioritising the challenges and figuring out how they could be tackled... While there was agreement that the strategic plan should be the main outcome of the process, there was a strong desire that all departments and key stakeholders involved should gain from the process of creating it. In particular, increasing their understanding about emerging risks and challenges posed by issues such as peak oil, climate change and an ageing population and, where possible, building a more adaptive approach to governance.	Leaders within the Cocklebiddy community wanted to foster new ideas and replace the current pessimistic view of the future for the area with a positive one... there was strong agreement that any process should involve the community and be grounded in locals' understanding, values and skills… The conclusion reached at this stage was to create a community-led vision that could inspire people across the shire but also provide guidance on a collective path of positive action.

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Preparation: Step 4

Select a suitable approach – *Off-the-Shelf, Tailored Exploration or Tailored Visioning*

This step sees the 'guiding team' assess and select the best approach to achieve the aims and expected outcomes defined in Step 3. The three broad approaches introduced in Section 2 of this guidebook – Off-the-Shelf, Tailored Exploration and Tailored Visioning – are each suitable in different organisational contexts and for different types of desired outcomes. They also reflect different perspectives on how change and adaptation can or should occur. Despite their differences, the three approaches are not mutually exclusive. They require some steps to be conducted differently but in general, share similar processes.

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The following table provides some guidance on the applicability of each approach for a range of different intentions.

Matching the approach to the objectives

APPLICABLE? Definitely ● Maybe ◐ Rarely ○

Is your intention…	Off-the-Shelf	Tailored Exploration	Tailored Visioning
To define an ideal future and a pathway to get there?	○	○	●
To produce scenarios that will act as communication tools?	○	◐	●
To explore highly uncertain, catastrophic and non-linear events?	○	●	○
That outputs be quantitative and ‘definitive’?	●	◐	○
To assign a level of probability to output scenarios?	●	○	○
To use a process that relies on publically accessible data?	●	◐	◐
That the process be expert driven?	●	◐	○
That the process be participatory?	○	◐	●
To communicate the potential impacts of climate change?	●	●	○
To incorporate diverse knowledge and opinions?	○	●	◐
To emphasise learning from the scenario process?	◐	●	◐
To develop a clear strategic direction or decision recommendations?	◐	◐	◐
To avoid criticism for being ‘unscientific’?	●	○	○
To get buy-in from traditional decision makers?	●	○	○

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Preparation: Step 5

Identify stakeholders and design the process

Once decisions have been made about the aims and approach of the scenario planning process the more detailed questions around who needs to be involved and how the process should unfold can be considered. Some of the key questions that will need to be answered in this stakeholder identification and process design step include:

Who should participate in the scenario development?	Internal to the organisation - which departments, levels of management? External to the organisation - which partners, stakeholders, community members, or climate change, adaptation and scenario experts?
How many participants?	Successful scenario planning exercises have been conducted with as few as six and as many as 50 or more participants[xxiii]. In most cases, a small core group of participants will be involved throughout the process.
What types of information / knowledge do we need?	Formal knowledge: climate science, economics, environmental and social science models and data Informal knowledge: organisational knowledge, community-based knowledge, imagination
How will we get a diversity of opinion and knowledge?	Diversity of knowledge and perspectives helps challenge narrow understanding of the future and avoid 'group-think' among participants in scenario development. Diversity should be promoted early in the process by ensuring participants reflect a range of world-views, roles, ages and cultures.
Who do the scenario outputs need to be shared with and how?	Internal to the organisation - departments, levels of management? External to the organisation - partners, stakeholders, community members, general public? Publication of scenarios as report or website, static or interactive?

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How will we get 'buy-in' from key stakeholders – both within and outside our organisations?	Understanding who key stakeholders are and where they need to be involved is an important part of laying the groundwork. For example, if scenario planning is intended to inform and shape an organisation's strategies or decisions, people with responsibility to advocate, sign-off or implement outcomes must be involved in, or highly supportive of, the process.
Who will facilitate the process?	Unless your organisation has strong in-house skills in leading scenario planning, engaging a professional facilitator is recommended. Scenario planning processes need to be led by people who have well-honed skills, including in: keeping people on track without shaping opinions; fostering new ideas; managing debate; ensuring outcomes are achieved and adequate records are kept.
How will the results of the process be used to support decision making?	Will they be used in early stages only or used throughout the adaptation planning process? Used simply as a prompt or learning tool, or as evidence in the selection and justification of adaptation options?
How can we measure our success and maximise organisational learning?	Consider how you will evaluate the success of the process relative to your aims. What institutional mechanisms are there which could be used to help communicate and share information learnt during the process? E.g. Reporting back or communicating lessons to other members of the organisation or broader groups; participating in or starting communities of practice or new networks.

See 'Scenario planning 'how-to' links' in Section 4 of this guidebook for further guidance on process design.

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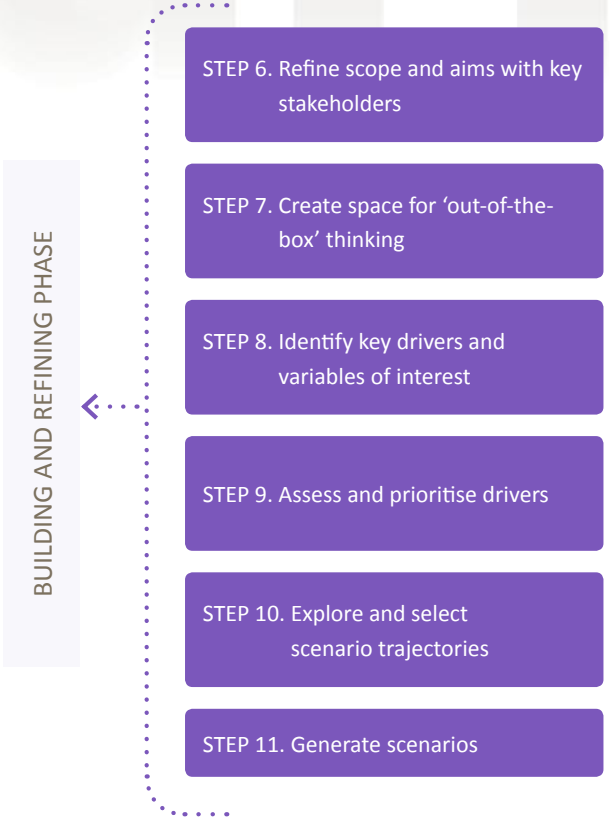
Phase 2 – Building and refining scenarios

The Scenario Building and Refining phase is where scenario narratives are created. This phase involves the most widely recognised, practiced and described stages of scenario planning. Here, key issues are explored and information is gathered, integrated and synthesised into coherent descriptions of the future.

While this phase does not involve the synthesis of adaptation strategies or provide information directly applicable to decision making, it can deliver critical outcomes – participants' understanding about the future and climate change can be fundamentally challenged and important learning occurs.

The six steps involved in building and refining scenarios are presented in the diagram and explained in the following pages.

See Chapter 7 of the Scenarios for Climate Adaptation Report for more detailed information.



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Building and refining scenarios: Step 6

Refine scope and aims with key stakeholders

The aim of this step is to distil the general need or concern clarified in Step 1 of the Preparation phase into an aim or decision question to be explored. The aim defined here must be understood and agreed on by all key stakeholders and participants. It helps set the boundaries for the process by clarifying the contextual environment, geographical setting and the timeframe over which Issues need to be explored. If the aim is too narrow it can mean some contextual factors are not taken into account and important issues may be missed. If it is too general it can mean outcomes from the Building and Refining phase have little relevance to decision making.

One exercise that can be useful at this step is creating an 'Issue Tree' to explore and refine the critical issue that should become the focus of exploration.

ISSUE TREE

Purpose: Helps at the start of a project to clarify the overarching question needing to be answered and where it sits within a set of broader issues.

Participants: Best to involve topic experts and external stakeholders, but could also be carried out by a project team alone

Time taken: Approximately 1 – 3 hours

Process:

1. *Write an opening question that relates to the project's aims – this is layer 1*
2. *Set out the key questions that need to be answered in order to answer the opening question (layer 2)*
3. *Repeat stage 2 for each of the questions in layer 2*
4. *Carry on with this process until the group is satisfied that the fundamental questions at the heart of the project have all been captured.*

An advantage of this process is that it helps identify issues 'above' and 'below' the ideal scoping question. Doing this gives participants a way of tracking how closely they are sticking to the main issue of concern.

Source: Waverley Management Consultants for UK Department for Transport (2007): http://www.dft.gov.uk/pgr/scienceresearch/futures/secsceniss/

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Building and refining scenarios: Step 7

Create space for 'out-of-the-box' thinking

Much of the value in scenario-based adaptation lies in the exploration of 'new territory' and the fostering of new thinking and ideas. Tailored Exploration and Tailored Visioning approaches are particularly dependent on participants' creativity and their ability to step beyond 'normal' bounds of thinking. Novel thinking is important but not vital in the Off-the-Shelf approach because scenario conditions and assumptions are largely pre-defined.

Because people find it difficult to 'think the unthinkable', eliciting fresh ideas and perspectives requires preparation. People need to be coaxed out of their typical modes of thinking and acting. While involving diverse participants will increase the potential for an exchange of diverse opinions and ideas, specific exercises can be used to break people out of familiar thinking frameworks.

Example methods used during the Irrigation Futures project – a participatory scenario development process exploring the future for irrigation communities in the Goulburn Broken Catchment region of Victoria:

- **History Wall** – *to explore important events in the history of the region and understand how change had been managed in the past. Participants added information to a chart on the wall with a timeline stretching back 3o years.*
- **Values Checklist –** *to explore the personal values of the participants, they filled in a 'Values Checklist' choosing their top 10 personal values then narrowing down to one or two. These were shared and commonality of values in the group was exposed.*
- **Letter to self in 2035 –** *to explore community aspirations participants were asked to place themselves in 2035 and write a letter to their current self describing what they were seeing, hearing and feeling. These were shared and developed into a list of community aspirations for the region.*
- **Future Wall –** *reviewing the history wall, participants identify which drivers of past change remain relevant and what additional ones are missing. They then reflect on which drivers they think will be most important in shaping the future.*

For further information about the use of these techniques in the Irrigation Futures project see: http://www.dpi.vic.gov.au/dpi/vro/gbbregn.nsf/0d08cd6930912d1e4a2567d2002579cb/c6bae80f536f8646ca257520001cca25/$FILE/irrig_insights2.pdf

Building and refining scenarios: Step 8

Identify key drivers and variables of interest

Step 8 is required to identify all variables relevant to the objective or question of concern defined in the previous step. The question that needs to be answered for all methods here is 'what forces and contextual drivers of change could influence the problem, issue or vision in focus?' These can come from: climate, ecosystems, economy, society, culture, psychology, politics and so on. It is critical at this step for participants to be uninhibited in their exploration of important factors. These should be identified at different scales and both within and outside stakeholders' influence.

There are many techniques for exploring the contextual environment. Some begin by exploring historical conditions which can help to show how events had an impact and how they were responded to. Others begin with the question of concern and then explore factors of influence at ever increasing scales. The key is to not get trapped into thinking issues identified from the past will be the same as in the future or by missing influential issues that exist at a higher or lower scale.

One exercise that can be useful at this step is to brainstorm different drivers of change through a STEEP analysis.

STEEP Analysis

Purpose: Helps to structure initial brainstorming sessions and to allow groups to focus on what is driving change in the external environment. This is done by considering a range of drivers, categorised as Societal, Technological, Environmental, Economic and Political (STEEP), which may not seem to have immediate relevance to the groups or organisations involved but are shaping future trends.

Participants: Any team or group of people

Time taken: Approximately 1 – 1.5 hours

Process:

1. *Introduce the STEEP concept, discuss what is driving change*
2. *Participants each write approximately 5 drivers on post-it notes*
3. *In groups of two or three, participants discuss and group post-it notes into clusters*
4. *Identify names for the clusters*
5. *Identify the most significant or highest impact driver in each cluster*
6. *Discuss the likely impact or implications of the cluster and key drivers on the organisations' activities*

Source: Waverley Management Consultants for UK Department for Transport (2007): http://www.dft.gov.uk/pgr/scienceresearch/futures/secsceniss/

Building and refining scenarios: Step 9

Assess and prioritise drivers

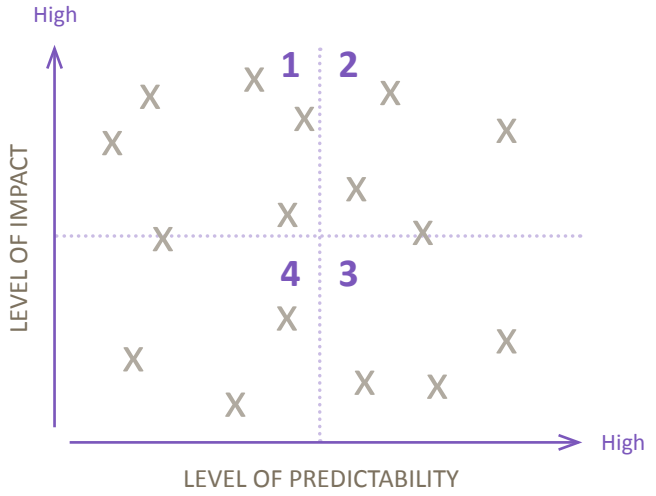
At this stage the drivers defined in Step 8 are ordered based on their level of influence on the issue of concern and their degree of uncertainty. Because scenarios are built on a small number of variables distilled and chosen in this step, the process of prioritisation strongly influences the rest of the scenario planning process.

For the Tailored Exploration and Off-the-Shelf approaches, this step is concerned with identifying the variables and drivers of change that will most likely determine the success or failure of any climate change adaptation decision. The main choice here is how many variables to focus on and whether to select and explore those high impact variables considered most predictable or most uncertain i.e. a focus on factors in quadrant 1 or quadrant 2 in the figure to the right.

The advantage of prioritising variables of high predictability is that scenarios developed from them are easier to justify to external audiences and they provide greater certainty to decision makers. However, the predictability of any single climate change impact is highly contested - particularly as you begin to explore 'secondary' and 'tertiary' impacts.

Developing scenarios based on high predictability/high impact variables (quadrant 2) runs the risk of strategic decisions failing to account for possible high impact developments characterised by greater uncertainty. In contrast, a focus on the low predictability/high impact variables (quadrant 1) will allow scenarios to present a greater range of uncertain conditions that may prompt greater awareness of risks and adaptation measures. The downside of this approach is that the process of scenario generation can take longer and decision implications may be more difficult to identify and justify.

Too many critical variables will make subsequent steps long and difficult. Some well-known scenario planning methods distil just two variables. While this can help make the process simpler, it can also leave out critical issues. A suggested range is two to seven.



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Building and refining scenarios: Step 10

Explore and select scenario trajectories

The next step involves exploring different combinations of the key drivers identified in Step 9 in order to create a set of scenario trajectories. The objective here is to create and test different scenario 'skeletons' and ultimately to decide on a limited number that will be developed further in Step 11. The number of scenario trajectories selected will depend on the time available, the range and number of drivers under consideration and the original aims of the scenario planning process. A Tailored Visioning approach will usually only pursue one scenario. Tailored Exploration and Off-the-Shelf methods typically aim for between three and five scenario trajectories.

There are different ways that this set of scenario trajectories can be created. One way is to plot the key drivers previously identified against each other in a matrix or set of axes spanning the extremes of possibility for each driver (see the example scenario logic diagram to the right). Another technique that can be useful at this step is **cross-impact analysis.**

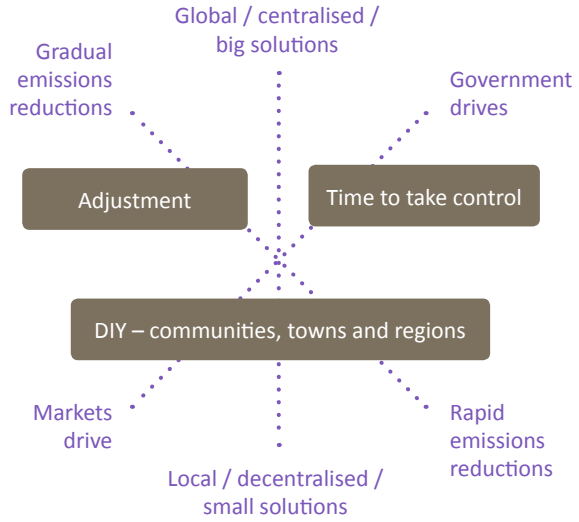
See the resources available here:
http://en.wikipedia.org/wiki/Cross_Impact_Analysis

This is the step where interactions between the identified key drivers can be explored. At this point it will be clear that some drivers contradict each other. Scenarios that are not internally consistent or plausible will not make it past this stage.

It is also important to keep in mind that:

- → *the set of scenario trajectories selected should span the widest possible range of contrasting futures*
- → *particularly unsavoury or difficult-to-imagine possibilities should not be ignored or dismissed*
- → *the process of creating and identifying trajectories for further exploration is likely to be influenced by participants' assumptions about the world*

VEIL/VicHealth Food Supply Scenarios - scenario logic diagram
http://www.ecoinnovationlab.com/uploads/attachments/article/420/Food%20Supply%20Scenarios%20-%20Summary.pdf



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Building and refining scenarios: Step 11

Generate scenarios

Now that the 'skeletons' for a number of scenarios have been created, Step 11 involves exploring these and filling in the gaps. The first task is to develop story lines. Here, the idea is to describe the meaning and reasoning behind the combination of drivers used in each scenario and what their implications are. Creative exercises, involving roleplays, visual stimuli and input from artists for example, can help to stimulate deeper understanding and connection to the implications of the particular storyline of the future. It can help to think about what kinds of stakeholder groups or community members might be affected under different trajectories, how they would be affected and what this might trigger.

The second task is to build and test the internal logic within each scenario. Key questions here include: How did they come about? Is the story feasible? For the scenarios to eventuate, what other external factors would need to have happened? What effect would these have had on other parts of the scenario? Is it coherent and interesting enough that decision makers or members of the community can remember it (or even tell it to others)?

Narrative style, detail and quality of the scenarios developed should be shaped by the objective set in Step 6 and in particular, who is considered to be the key audience for the scenario outputs.

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Seven key characteristics of a good scenario[xxiv]

What constitutes a good scenario depends on how it will be used. To inform strategy they should have the following characteristics:

- → **Decision making power** – *they must provide insights into the question or issue being considered*
- → **Plausibility** – *all must be possible*
- → **Alternatives** – *all scenarios must cover the widest range of possibilities while still being relatively equal in probability*
- → **Consistency** – *The stories, processes and events must all fit an internal logic*
- → **Differentiation** – *they must be structurally diverse, not deviations around a common base*
- → **Memorability** – *scenarios must be easily represented, communicated and stick in peoples' minds after they have been heard*
- → **Challenging** – *They must challenge peoples' perception of the future and how the world works*

Different ways to present scenario storylines - examples

1. **Scenario animations**
   'The future climate for development'
   Forum for the Future / Department of International Development (UK)
   http://www.forumforthefuture.org/projects/climate-for-development-animations
2. **Scenarios presented in one schematic**
   'KNMI Climate Scenarios '06'
   Royal Netherlands Meteorological Institute
   http://www.knmi.nl/climatescenarios/knmi06/index.php
3. **Showcasing visions in a community exhibition**
   'Vision Broadmeadows 2032'
   Victorian Eco-Innovation Lab
   http://www.ecoinnovationlab.com/exhibitions/354-exhibition-vision-broadmeadows-2032

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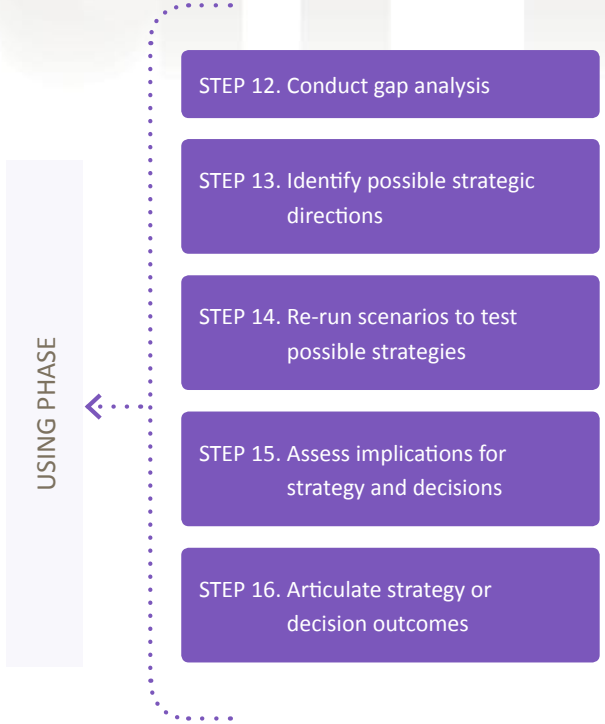
Phase 3 – Using scenarios

Once a set of scenarios have been built and refined, they can then be used in a variety of ways. The third phase in this integrated methodology includes several steps for using scenarios in the context of informing strategic planning and decision making. It is important to highlight, however, that scenario planning processes in practice do not necessarily use the scenarios to inform decision making, at least not in a formalised way. It is common for a scenario planning process to end with the publication and communication of a set of scenarios that have been built, without a commitment or intention to undertake a structured method of analysis and integration into organisational strategic planning.

Explaining and disseminating a tailor-made set of scenarios can be useful in and of itself. The communication of results from a scenario building exercise can also be a primary aim in some situations. However, in many cases it is desirable that the set of scenarios created be used to influence strategic planning and decision making.

Phase 3 of our methodology is concerned with translating insights gained from the Scenario Building and Refining phase into 'decision-ready' strategies and recommendations. Here, the scenarios created in Phase 2 are used to test existing strategies, define new ones and develop adaptation pathways, decision trigger-points and new areas for exploration.

See Chapter 7 of the Scenarios for Climate Adaptation Report for more detailed information.



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Using scenarios: Step 12

Conduct gap analysis

This step involves a comparison between current organisational conditions and the areas of adaptation required for each scenario. As a result of this step, the 'guiding team' should have identified key issues, risks and success factors that participating organisations and their stakeholders need to be aware of, plan for, and potentially address as a result of climate change. Participants should also have a clear understanding of the scale and nature of adaptation required for each scenario.

Because this step is the first to directly interrogate scenario implications, it is likely to raise significant 'unknowns' within those scenarios. Some of these may pose important and tricky questions for the organisations involved. These questions may in turn trigger other new issues which are uncertain. To minimise getting distracted by new concerns arising throughout the process, this step should focus on the bounded objective identified in step 6. All relevant 'unknowns' can be recorded and earmarked for further analysis and research. It is possible, in a worst case situation, that this step could prompt the 'guiding team' to have to revisit its original objectives and review the process that has been undertaken to this point.

There are specific techniques such as SWOT or TOWS analysis (both of which explore Strengths, Weaknesses, Opportunities and Threats for a given organisation and context) that can be used to structure this gap analysis in a formal way. The TOWS process[xxv] is certainly more rigorous but also time consuming.

For guidance on creating a TOWS matrix see:
http://www.mindtools.com/pages/article/newSTR_89.htm

One example of a template for undertaking a gap analysis was created for the Irrigation Futures project as a tool to help individuals and businesses consider the implications of the four different scenarios created during the project and adjust their plans accordingly:
http://www.dpi.vic.gov.au/dpi/vro/gbbregn.nsf/0d08cd6930912d1e4a2567d2002579cb/c6bae80f536f8646ca257520001cca25/$FILE/irrig_fut_att6.pdf

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Using the scenarios: Step 13

Identify possible strategic directions

Step 13 requires participants to propose and develop suitable strategies in response to risks, trade-offs and opportunities – rehearsing for future conditions. It involves systematically answering, for each scenario:

- → *What does the organisation need to do to minimise the risks and take advantages of the opportunities it will face in each future scenario?*
- → *What decisions would need to be taken and who would be responsible for those decisions?*
- → *What conditions would trigger those decisions?*

Strategic responses will depend on the range of climate change threats and opportunities in any context. While there are an infinite number of issues requiring adaptation, there are just a few main approaches for successfully dealing with strategic challenges. These approaches are neither specific to climate change, nor mutually exclusive. Strategic options can overlap and change over time. The following five approaches are taken from work on scenario planning[xxvi].

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Strategic options:

Best bet options	Robust strategies	Delay and assess	Commit with fallbacks	Shape the future
→ Decision makers take a punt on a particular set of future conditions occurring. → High risk approach to be considered where confidence in future conditions is overwhelming (i.e. short-term, low complexity problems). → Can be legitimate but should raise questions about whether group-think has influenced the process or if scenario planning was the wrong tool for the job. → In some cases, 'best bet' options may simply relate to a minor decision positioned within a range of broader strategic decisions.	→ An approach or decision is selected that provides the best outcome across all future contingencies. → Robust strategies are ideal but can be difficult to identify and often expensive. → Can involve a high level of risk if something has been overlooked and all contingencies have not been analysed.	→ Where too much uncertainty exists, an organisation may seek to clarify unknowns or decide to wait to see what occurs. → In the context of climate change, this will always be tempting. → If this path is taken, the organisation will need to be honest about why. → If reasons relate to a hesitancy to take an unpopular decision, or an unwillingness to face uncomfortable truths, this option is likely to exacerbate the risks an organisation already faces from climate change. → May be the best choice in some situations, provided it is coupled with steps to actively fill whatever knowledge gap inhibits commitment, and to monitor external conditions that would force a decision.	→ Organisations may commit to one path but have the ability to change tack if required. → Perhaps the best pathway in uncertain and changing conditions. Downside is that commitments often create path-dependencies that make subsequent changes difficult. → May make most sense if coupled with awareness about possible resistance to change at later stages and where decisions do not involve large financial investments.	→ Organisations may feel that the only secure way to address climate change is to 'take the bull by the horns' and commit to a path of radical climate change adaptation. → This approach may be taken when all alternatives seem equally uncertain and a decision needs to be made, or when the momentum of change is seen as an important ingredient in generating further adaptation. → This approach is what the Tailored Visioning approach to scenario planning does from the beginning but it can also arise from an Off-the-Shelf or Tailored Exploration process.

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Using the scenarios: Step 14

Re-run scenarios to test possible strategies

Step 14 looks at how the proposed strategies and decisions identified will affect the scenario trajectories. This is a critical iterative step often skipped in scenario planning processes. It acts to test the effects of proposed adaptation strategies and explore how well they stack up against the conditions in each scenario. The first time the scenarios were created, they did not factor in how key stakeholders might adapt. With possible adaptations defined, a new layer of uncertainty is added that can interact with other drivers in the scenarios. At this step, for Off-the-Shelf and Tailored Exploration approaches, the 'guiding team' needs to incorporate the proposed decisions and strategies back into the original scenarios. Under a Tailored Visioning approach, this step is not applicable. However, it can help to re-look at the pathways to achieving the future vision in chronological order. This may identify key gaps missed so far. By re-running the scenario process with decisions as new inputs, participants should be able to ask:

- → *Are the scenarios feasible?*
- → *Will they work in the way we expect?*
- → *Could they have unintended consequences?*

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Hypothetical examples – Re-running scenarios to test possible strategies

Longwater Bay Coastal Protection Strategy

The scenario team went back to their original scenarios and drew a short chronology for each against which they plotted possible adaptation options. This helped demonstrate how some of the decisions might impact the evolution of different scenarios.

The decision to use riprap (rubble) as a sea wall, for example, seemed a no-brainer as an interim step. But when included in the exploration of what could happen, some in the scenario team saw a possibility that this action, taken early, could give residents the misleading impression that the council was largely responsible for preventing coastal cliff erosion – something they wanted to avoid unless guaranteed funding could be found. Thinking about what impact a re-zoning might have also raised a lot of questions: *What was the role of state government? Would they challenge such a decision? Could the retirement home owners put up a legal challenge?*

With these new questions raised, the scenario team recognised they needed to review their original strategies and decisions.

City of Hollum Strategic Plan

When the core scenario team reviewed the scenarios in light of the strategies proposed it was clear that key assumptions had been glossed over. For example, in one scenario, problems with food security were addressed through major projects to promote local food production. However, little thought had gone into how this might work when, in the same scenario, population growth was quite high and urban space was therefore scarce. Furthermore, no one was clear on the amount of food that would need to be grown to address the level of food shortages imagined. The scenario team felt that the proposed strategy had merit but needed more careful consideration – particularly how to balance competing demand for urban space.

A range of similar concerns made the scenario team realise how much relevant knowledge and capacity the council and state government lacked. Considerable resources were needed to plan the response strategies under different scenarios.

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Using the scenarios: Step 15

Assess implications for strategy and decisions

At this step, participants need to evaluate the findings from Step 14 and consider whether proposed adaptation strategies are as effective as they need to be or if some need to be dropped, re-worked or prioritised. This can be done by systematically exploring:

- **The long-term consequences of each strategy:** *How do the outcomes of the adaptation strategy developed stack up against the objectives defined in Step 6? If they do not, why is this? Perhaps the objectives were wrong or perhaps key stakeholders have made a political decision to ignore those objectives. What does this mean?*
- **The strategies more likely to deliver the types of outcomes desired across a broad range of climate change scenarios:** *Strategies that pose a win-win are obviously more attractive than those containing inherent risks. Consider which strategies are more robust against multiple contingencies.*
- **The strategies and decisions least likely to put the organisation and its stakeholders at risk:** *Issues to consider here include negative impacts that may arise from an adaptation strategy. High political risks, large debts and path-dependencies may all pose a problem.*
- **The strategies and decisions that best match the long-term goals and aspirations of the stakeholders:** *Even where a strategy may meet the objectives of adapting to climate change, there may be unwanted consequences for the organisations or region involved. Are there ongoing management challenges created by a strategy? Do people want the proposed future?*

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Using the scenarios: Step 16

Articulate strategy or decision outcomes

This final step involves adjusting the proposed strategy based on lessons from Step 15, and ensuring final outcomes from the whole scenario planning process become meaningful and can be acted upon. Where considerable changes to decisions or strategies have been made in Step 15, the organisation may wish to repeat Steps 14 and 15 before focusing on this step.

It is important that sufficient time gets dedicated to conducting Step 16. The results may have been produced on paper but the critical test is how they get used. It is vital that all the important stakeholders that have been involved during various stages of the process are also involved in deciding how best to use the material produced and how to build on the momentum generated. Ensuring the scenario planning outcomes do not become a dust-collector will depend heavily on context. At this step, the scenario team should be trying to build on the insights developed in the process, ensure recommendations are acknowledged and acted on and any areas of continued uncertainty are given further attention. As emphasised in the preparation phase, integrating learning and outcomes into current decision making processes and getting senior position and decision makers on board is critical. The more preparation leading up to this step, the more likely it is that the scenario process and outcomes will be able to be integrated into existing organisational processes.

Articulating the outcomes and implications from the process to people not involved is also vital. Communicating the vision, strategy or decisions created in the scenario process can take many different forms, depending on the intended audience, process aims and level of detail achieved. It could take the form of an adaptation strategy or action plan such as the one produced for the City of Melbourne below.

Climate change adaptation strategy and action plan

City of Melbourne

Scenarios used as input to internal development of City of Melbourne's climate change adaptation strategy and action plan. Four potential extreme event scenarios were identified, which together embody a range of climate change risks for Melbourne, and were used as a basis for considering adaptation options and responses in the plan.

City of Melbourne Climate Change Adaptation Strategy, June 2009:

http://www.melbourne.vic.gov.au/AboutCouncil/PlansandPublications/strategies/Documents/climate_change_adaptation_strategy.PDf

Ideally, key decision makers and stakeholders will be able to identify and communicate what they will do with the outcomes generated and commit to action. Planning regular meetings could help ensure people remain engaged with the learning and findings from the scenario planning process and can support each other through the stages of implementation.

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Summary of overarching principles

The following principles for developing and using scenario planning for climate adaptation are informed by the learning from recent Victorian policy and practice experience as well as relevant research literature on the use of scenario planning in other Australian and international jurisdictions.

1. *Clear, shared framing of climate change adaptation challenges and aims*
2. *Clear, shared understanding of the strengths – and limitations – of scenario planning*
3. *Clear, shared understanding of the primary goals of the specific scenario planning process*
4. *High level support for the scenario planning process from key internal and external stakeholders and champions*
5. *Time and resources invested in planning, preparing and ensuring the right mix of skills and knowledge*
6. *Broad range of relevant experience, expertise and evidence drawn on*
7. *Identification and consideration of the full range of plausible drivers and pathways deliberately encouraged*
8. *Scenarios sharply defined and capable of effective communication to key audiences*
9. *Careful consideration given to ways in which outcomes of scenario planning process are to be integrated with strategic planning and decision making*
10. *Scenario planning embedded as an ongoing driver of organisational culture and decision making processes*

See Chapter 6 of the Scenarios for Climate Adaptation Report.

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Discrete scenario-based exercise options

This section has described an integrated methodology for using scenario planning to inform climate change adaptation decision making, relevant to a variety of different organisational settings. Clearly, in the real world, there will be situations where the full methodology cannot be carried out due to constraints which could include a lack of organisational support or resources.

It is possible to use scenario planning techniques in ways that are less formal or less comprehensive than the step-by-step process described in this section.

Some of the best places to find discrete scenario planning exercises that can be used to augment other planning processes and introduce some of the benefits of scenario 'thinking' are listed with their links in the table to the right.

Trialling some of these exercises or adapting them to suit the particular adaptation planning methods being utilised in your organisation may also help to demonstrate to those who are not familiar with scenario planning processes how they can add value and best be developed to help improve decision making capacity.

Top links to look for discrete scenario-based exercises

Futureamb - Scenario planning resources	http://www.well.com/~mb/scenario_planning/
UK Department for Transport - Scenario Planning Toolkit	http://www.dft.gov.uk/pgr/scienceresearch/futures/secsceniss/
JISC Infonet – Scenario Planning Tools and Techniques	http://www.jiscinfonet.ac.uk/tools/scenario-planning
Victorian Department of Sustainability and Environment – Effective Engagement Toolkit	http://www.dse.vic.gov.au/CA256F310024B628/0/5BEE8070970CF42ACA257085001FEF94/$File/Book+3+-+The+Engagement+Toolkit.pdf
Scenarios for Sustainability - Resources, recipes and guidelines	http://scenariosforsustainability.org/index.php

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Section 4: Case studies and links

This section provides examples – both real and hypothetical – of scenario planning for climate adaptation in action and brings together some of the best resources containing more detailed guidance.

Look here for... full worked examples of hypothetical case studies following the scenario planning for climate adaptation methodology presented in Section 3; a selection of real world case studies; links to a range of scenario planning handbooks and 'how-to' guides, scenario generation tools and other useful resources.

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Introduction to hypothetical case studies

The following pages have information about three hypothetical case studies describing different approaches to scenario planning for climate change adaptation – one each for Off-the-Shelf, Tailored Exploration and Tailored Visioning approaches.

These case studies are purely fictional and are included as a learning tool to help illustrate different pathways and decisions that may be taken in different hypothetical contexts.

Hypothetical case study 1:

Longwater Bay Coastal Protection Strategy

Longwater Bay is a small fishing port-cum-holiday and retirement town with a seasonal population ranging from 5,000 to 20,000. The local council has been worried for some time about multiple environmental pressures it attributes to climate change. In particular, over the last 15 years there has been an increase in the frequency and height of storm-surges. These surges are linked to the premature undermining and collapse of low sandstone cliffs on which a number of homes and a retirement village have been built. The council is concerned about what it should do and is seeking guidance on its options.

Hypothetical case study 2:

City of Hollum Strategic Plan

Predicted to house a population in excess of 300,000 in 2035, the City of Hollum is seen as a litmus test by the State Government and other local councils. How Hollum handles the multiple pressures it faces will set the standard for other councils and provide valuable lessons on how to embed climate change adaptation within the council operations across the broader region. Planners and policy makers understand climate change to be one of a handful of major stress factors that need to be prepared for.

Hypothetical case study 3:

Cocklebiddy Vision 2040

Cocklebiddy is a town on the Murray River with a district population of around 5,000. The idea of using scenario planning to help Cocklebiddy better adapt to climate change came after a record drought and back-to-back one-in-100 year floods. Members of the local irrigators' association had met with the local mayor and suggested that the community take stock and consider how it might best respond to the damage done. It was also concluded that there would need to be some thought put into how the community might adapt if the recent extreme events were indicative of more permanent changes in weather patterns.

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Hypothetical case study 1

Longwater Bay Coastal Protection Strategy

Phase 1: Preparation

The CEO and council managers responsible for coastal protection and asset management at Longwater Bay were clear that the current Coastal Protection Strategy needed an upgrade to factor in changing incidence of storm surges and coastal erosion and, in particular, to understand how this would be affected by climate change. However, the CEO and key councillors were hesitant to make plans too far into the future as it was strongly felt that the State Government was ultimately responsible for any long-term changes in coastal planning that might stem from climate change.

An internal planning exercise was proposed to help the council better understand their options for Longwater Bay. At the end of the day, the asset manager wanted clarity on the implications of sea level rise and associated impacts for infrastructure located on or near the cliffs, a set of guidelines on what actions were needed to deal with these impacts, and enough detail to begin costing any adaptation measures.

A core group of four people was chosen to take direct responsibility for the project – the asset manager, a project officer in the asset management group, the manager for Coastal Protection and an environmental planner. In addition, the council CEO, the secretary of the local Coast Care group, the head of the regional development board (a local resident) and two councillors would participate at key stages of the project.

It was initially unclear whether scenario planning was necessary to address sea level rise concerns at the council and there were mixed ideas about what a scenario-based approach would involve. Some saw a scenario development process as an indulgence that wouldn't add anything to the straightforward problem of managing risks of coastal erosion. For others, who were more familiar with climate change science, it was clear that using scenarios about the future was almost unavoidable given that information about sea level rise was uncertain. The CEO thought that building a more thorough exploration of the risks through considering different scenarios was a form of insurance – an investment in risk management that would build new skills in thinking about the future.

After initial discussions the core team decided that the starting point for their planning would be the existing information available from the scientific community about climate change and sea level rise. They decided to pursue an Off-the-Shelf approach to scenario-based adaptation. This meant they would take information from CSIRO projections about sea level rise scenarios and refine this to be as relevant and detailed as possible for Longwater Bay. They would then use those scenarios to build in further information about possible implications and other key trends affecting the council's response options.

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Longwater Bay Coastal Protection Strategy

Phase 2: Building and refining scenarios

The core team decided that a narrower definition of aims was needed to frame the investigation and ensure that outcomes were relevant and detailed enough to shape council decisions. They decided on: *How can we best protect council and residents' assets from flooding, storm surges and coastal erosion over the next 15 years*?

The explicit need for out-of-the-box thinking was not considered by the group at Longwater Bay. However, the asset manager had been looking at other examples of scenario processes and suggested the idea of stimulating thinking about the future by gathering a number of older residents who had grown up in the community to come and talk about their experiences of major storms and floods in the past.

The scenario team accessed CSIRO reports and climate projection data focussing on rates of sea level rise and storm surges. With the help of an external climate change specialist they refined this information to better understand the range of possibilities for sea level rise in their region over the timeframe they were concerned with. They derived two main scenarios of what they considered 'high' and 'low' sea level rise in their region over the next 15 years that they thought would be useful to help them understand the decisions and options they should consider. Through the climate change specialist they became aware of emerging studies about more extreme sea level rise scenarios than the 'high' scenario, but they felt unable to base their investigation on those reports given they were based on 70 year projections and also quite alarming. Some group members also felt these particular reports were difficult to translate specifically to Longwater Bay for the year 2025 – just 15 years away.

The team then began collecting additional information about implications for flooding and storm surges looking at local historical records and topographical maps of the area. They considered other main drivers they felt would interact with the sea level rise scenarios which they refined to two: population growth (mainly due to migration), and the degree of council responsibility for coastal, land and asset management. They saw the latter issue as incorporating community expectations of the council and the appropriate role of local government, compared to higher levels of government, in protecting residents and infrastructure near the coast. Other drivers were considered less important, too uncertain or did not fall under the responsibility of the council. When discussing possible interactions between drivers it became clear that the team was very confident the future population would be high no matter what. They therefore decided to build a matrix of four scenarios considering high and low sea level rise scenarios alongside high and low levels of council responsibility.

Fleshing out scenario descriptions was left to the asset management officer who drew on input from other members of team to bring together short future storylines with GIS-based projection of coastal flood risk for each of the four scenarios. The maps showed key council assets and a set of potential council decisions were also identified. Each scenario was given a name which made it easier for team members to talk in shorthand about the different combinations: *Rough waters*: High sea level rise (SLR)/High council responsibility, *Sink or Swim:* High SLR/Low council responsibility, *Control the flow:* Low SLR/High council responsibility and *Smooth Sailing* Low SLR/Low council responsibility. Given that the scenarios were intended to help inform internal discussions about strategic options, they were not published but left in a raw form with the maps and other collected information able to be analysed further during discussions by the council planning team and managers.

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Longwater Bay Coastal Protection Strategy

Phase 3: Using the scenarios

The team found that across all four scenarios the main changes required in the council's operations related to the nature, cost and extent of coastal maintenance and the level of community understanding of climate change implications along the coast. Furthermore, some form of change to planning zones would be required within the two high sea level rise scenarios.

They decided that the best option would be to recommend that council combine a 'commit and fallback' strategy with regard to securing the coastal cliffs, and a 'robust approach' to defining planning zones for new development. In the first case the council decided that using riprap (rubble) to shore up the coastal cliffs was a reasonably low cost option but one that would not be totally effective over time. The next option would have to involve council assisting residents gradually re-locate inland. This would have serious feasibility problems and require a long period of preparation. In order to reduce future costs of relocation, the council would also have to limit additional building and reduce investment in high-cost infrastructure (mainly roads) within a 400m coastal zone.

The scenario team then went back to their original four scenarios and drew a short chronology for each against which they plotted possible adaptation options. This helped demonstrate how some of the decisions might impact the evolution of the different scenarios. For example, the decision to use riprap as a sea wall seemed a 'no-brainer' as an interim step. But when included in the exploration of what could happen, some in the scenario team thought this action, taken early, could give residents a misleading impression that the council was largely responsible for preventing coastal cliff erosion – something they wanted to avoid unless guaranteed funding could be found. Thinking about what impact a re-zoning might have also raised a lot of questions. What was the role of state government? Would they challenge such a decision? Could the retirement home owners put up a legal challenge?

Upon review of their initial recommendations, the scenario team still decided that stone riprap was the best short-term option to protect the coast, but that it should be used sparingly and combined with a strong emphasis on community engagement. Some saw the riprap as an opportunity to raise awareness and educate the community about the risks posed by climate change and also highlight the fact the coast was constantly changing due to natural erosion. This message could be presented in a way that emphasised that the council would take necessary steps to slow this process but that it could not hold full responsibility for stopping coastal erosion.

The scenario team presented the findings including the maps and storylines at a series of internal meetings with council managers and councillors. The CEO and asset manager agreed to a list of steps that could be taken within the following financial year. Changes were made to the way coastal erosion was monitored and additional time was given to the planning team to identify areas where development should be encouraged and discouraged over the coming years. The scenario team made it clear that a lot of questions had been raised during the process that would be ongoing challenges for the council including how to incorporate longer-term climate change projections into decisions about bigger infrastructure projects with long time horizons, and the need for council to be advocating for clear guidance from other levels of government.

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Hypothetical case study 2

City of Hollum Strategic Plan

Phase 1: Preparation

Among key decision makers at the City of Hollum there were many different perspectives on what the adaptation challenge was. However, overriding issues related to how the council and relevant state government agencies could cope with providing services to a much larger Hollum population when also facing pressures from climate change, rising oil prices and economic uncertainty. It was decided that scenario planning should be used to enable a holistic exploration of the future challenges and adaptation options. Furthermore, key personnel saw the benefits of undertaking a scenario planning exercise in-house as a way of building and retaining knowledge.

Strategic planners at both local and state government levels were well aware of the many challenges that the Hollum region faced. A key problem was prioritising the challenges and figuring out how they could be tackled. After discussions across different departments, it was soon realised a new strategic plan was needed, incorporating climate change adaptation actions and going further than previous plans in developing a coherent response to multiple stressors and contingencies. While there was agreement the strategic plan should be the main outcome of the process, there was a strong desire that all departments and key stakeholders involved should gain from the process of creating it. In particular, increasing their understanding about emerging risks and challenges posed by issues such as peak oil, climate change and an ageing population, and, where possible, building a more adaptive approach to governance. While there were differing perspectives on the degree to which the strategic plan should consider the possibility of radical change and 'left-field' events, it was widely accepted that any process would require a broad approach, take time, and need to challenge the status quo in planning and decision making.

A Tailored Exploration approach was seen as the only method that would allow the organisations to synthesise the complex and interconnecting factors shaping the region and do it with enough rigour to result in a plan with a clear set of directions for planning and action.

It became clear early on that a chief problem would be to manage all the organisations which believed they should be involved. Given the potential that the outcomes would be of great significance, a number of discussions were needed to clarify responsibility for the project and who would lead the process. A core team was identified, headed by a strategic planner at the City of Hollum with scenario planning experience. Four others from across the council's planning, environment and community development areas were also involved, as were three state government representatives from planning, environment and industry development. External input would be sought from a scenario planning facilitator and other specialists in areas of climate change and strategic foresight. Key organisational stakeholders and influential individuals were also identified, including at least one councillor notorious for their dismissal of climate change issues. The core team also mapped relevant key decision makers within their respective departments and from these identified twelve people who would need to be involved at different stages of the process.

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City of Hollum Strategic Plan

Phase 2: Building and refining scenarios

The team began by conducting an 'Issues Tree' exercise to identify strategic concerns that key personnel felt were not being addressed. It became clear that decision makers saw climate change, population growth, urban sprawl, and resource and economic insecurity as building into a 'perfect storm' that people struggled to understand. From this exploration, the core scenario team identified two objectives:

1. *To ensure all relevant department heads and strategic planners were aware of the issues and implications posed by this 'perfect storm'.*
2. *To develop a strategic plan that would include an orientation strategy for the City of Hollum, long-term objectives and a recommended actions list.*

Most participants in the scenario process were professionals with strong opinions. The scenario team saw this as both a strength and risk. On the one hand, these participants brought a high level of knowledge to the table. On the other, there was a risk that 'expert' opinions would be the only perspectives valued. To reduce this risk, a series of exercises were used to try to bring in new perspectives and encourage novel thinking. One exercise included a role-play where people swapped their professional roles for a different character with a contrasting perspective.

Participants identified a series of drivers that could influence the council operations over the next 20 years. They began by analysing historical drivers of change then used a STEEP analysis to draw out Societal, Technological, Environmental, Economic and Political areas of influence. A form of layered analysis was used to understand and help order the 15 or so drivers identified so far (and identify new ones). Drivers were then prioritised and reduced down focusing on high impact, high uncertainty issues. While it added to the time involved, the scenario team found it very valuable to have the council CEO and a number of councillors involved at this step. At the end, participants felt confident that the short list of drivers was based on a strong consensus as well as solid analysis. The five final drivers were: the degree of climate change; the rate of population growth; the rate at which oil production declined; the level of community services demanded; and the state of economic conditions.

The scenario team used a matrix to plot the drivers against each other and systematically consider how the drivers worked together. Doing so highlighted that some driver combinations were not compatible. These scenarios were eliminated. For example, participants agreed that a high rate of decline in oil production was incompatible with high economic growth. The team then plotted the drivers on three intersecting axes and chose five broad scenario trajectories that fell near the extreme margins defined by these drivers. A qualitative Cross-Impact Analysis was then conducted to consider how each driver would affect one another and if the five skeletons were internally consistent over time.

The team developed five narratives and asked the CSIRO and the state planning authority to provide a quantitative assessment for each:

- **Big brother** –*significant economic and climate disruption leave the area isolated, crime-ridden and with high rates of depression.*
- **Big family** –*growing bottom-up climate change responses sees reduced role for state government and growth in informal economy.*
- **Winner takes all** –*growing population outstrips faltering economic growth leaving growing inequality and deficit in services delivered.*
- **Swiss army local government** –*communities increasingly demand assistance from local government in response to growing crises.*
- **Arakis Hollum** –*highly sophisticated development of local hi-tech industrial 'enclaves' with economic deserts in between.*

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City of Hollum Strategic Plan

Phase 3: Using the scenarios

The scenario team realised that it would face significant challenges no matter what scenario eventuated. In some scenarios, the resources needed to provide the current level and breadth of services would not exist. An overarching challenge was how the council would successfully educate the community about the challenges faced and manage expectations. This highlighted the need to identify and monitor conditions indicating if particular scenarios were unfolding.

Due to the high level of uncertainty and complexity faced, the broader scenario team agreed that the council, relevant state government agencies and the Hollum community needed to develop a system of processes (leading to a culture) of ongoing adaptation. It was apparent that decision-paralysis or waiting to identify clear trends was going to be the worst approach the City of Hollum and other stakeholders could take. It was recommended the council develop a highly pro-active 'shape the future' type strategy as an overall orientation. Objectives included committing to the development of local energy, food and water production capabilities and active lobbying for changes to state and federal government policy. In practice, all five types of strategic options would be needed at different time and spatial scales within the organisation. The next steps involved drilling down into tasks, identifying additional relevant stakeholders and mapping out specific 'decision triggers' or points at which decisions would need to be made.

When the core scenario team reviewed the scenarios in light of the strategies proposed it was clear that key assumptions had been glossed over. For example, in one scenario, problems with food security were addressed through major projects to promote local food production. However, little thought had gone into how this might work when, in the same scenario, population growth was quite high and urban space was therefore scarce. The scenario team felt the proposed strategy had merit but needed careful consideration – particularly how to balance competing demands for urban space. A range of similar concerns made the scenario team realise how much relevant knowledge and capacity the council and state government lacked. Considerable resources were needed to plan the response strategies under different scenarios.

While it had become clear that adaptation options considered for each of the five scenarios were even more complex than initially conceived and involved difficult (and potentially controversial) shifts in council operations, few changes to the overarching strategies were considered necessary. If anything, the review of adaptation responses relative to the original scenarios at this point made the scenario team more committed to implementing change early rather than waiting for the future to dictate a response.

After a full briefing on the scenario review process, the CEO of the City of Hollum and several senior managers decided to instigate strategic planning exercises for departments identified as key players within the scenarios. This worked relatively smoothly because key department personnel had been involved throughout the scenario process. Due to a lack of funding, the main challenges lay in identifying where existing activities could be adjusted in ways that best aligned with the scenario planning recommendations and identifying new sources of revenue that would support the greater monitoring, capacity building and community engagement needed.

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Hypothetical case study 3

Cocklebiddy Vision 2040

Phase 1: Preparation

Members of the Cocklebiddy Irrigators' Association and the local council saw the challenge as a community-wide crisis of identity brought on by multiple environmental and economic shocks. The broad feeling was one of uncertainty – what do we do from here?

Community members that had initiated discussions with the mayor were strongly of the opinion that they wanted a vision to guide community development – created through some form of consultation process. They were also clear that any external assistance should be minimal and restricted to guiding the process, not the content. This was to ensure any vision had wide community support. A scenario-based approach was seen as offering a systematic way of doing this – one that could be managed by a number of appropriately skilled people in the district.

People leading the discussion around using scenario planning methods were eager to foster new ideas and replace the current pessimistic view of the future for the area with a positive one. At the same time, there was strong agreement that any process should involve the community and be grounded in locals' understanding, values and skills. It was clear from recent experiences that ideas coming from external consultants were not likely to be appreciated or listened to. The conclusion reached at this stage was to create a community-led vision that could inspire people across the shire, but also provide guidance on a collective path of positive action.

The Tailored Visioning approach was clearly the most appropriate since it would deliver a positive future vision – one of the initial proposals. It was also seen as a process that could explore community needs and provide for a bottom-up approach resulting in an inspiring picture of the future.

While finding enthusiastic supporters was not a problem, identifying people with the necessary time and skills was. Of those who initiated the discussions, most felt they did not have the knowledge or skills to do what they wanted. However, through a number of discussions at community group meetings, five people were identified with the skills and willingness to coordinate the process. A few members of the initial group were also willing to provide in-kind support. The mayor ensured public facilities would be free for the group to use and any communication required would also be paid for by the council. While people involved felt a sense of urgency, no clear deadline was set. It was believed the quality of the outcome would depend on the widest possible discussion within the community and this would take time to build.

Cocklebiddy Vision 2040

Phase 2: Building and refining scenarios

At Cocklebiddy, the five project members decided that the objective of the exercise should be as broad as possible and decided on a simple open-ended question to shape their work and trigger community discussions:

"In 2040 I want Cocklebiddy to be ..."

A 30-year period was chosen specifically because it allowed people to think openly about the future but was close enough to ensure most suggestions would be based on a sense of reality.

The scenario team took the perspective that there was little risk of ideas lacking imagination provided participation involved the whole community and that people were clear on the types of ideas needed. To garner interest and provoke discussion, a few in the team photo-shopped an image of the town to include a number of space-age floating buildings and stuck posters of these around the district with contact details and the question "How do you see Cocklebiddy in 2040?"

Participants in the Cocklebiddy Vision 2040 project used brainstorming sessions with groups of community members to identify characteristics of a desired future. These became a diverse collage of key words, ("resilient", "vibrant", "drought-proof"), small descriptions ("a growing population of under 25-year olds", "a regional centre for excellence in agriculture") and even pictures that people thought best represented the Cocklebiddy they wanted to see

Once a wide range of desirable characteristics were identified, these notes and pictures were placed on a wall in an art gallery housed at the Cocklebiddy Mechanics Hall. Participants in the project encouraged other locals to have a look and score the issues they saw as the most important. Those with the highest scores were sorted into themes. In total five were identified relating to community, economy, environment, identity and security.

Participants in the story-building process collected all the themes and began to play with ideas about how they could be brought together. At the end of a three-hour session, the group had identified two story possibilities. These differed mainly in the degree to which the community depended on agriculture in the future. Both of these futures were briefly defined in a series of short dot points that could communicate the key ingredients.

A single storyline was prepared by a local journalist with support from the scenario team. This came to several pages. The story was widely circulated and a competition set up to encourage people in the community to prepare visual images representing what they liked in the story. Some of these ideas were taken and further developed by a local artist and graphic designer to become a final suite of images that accompanied the story.

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Cocklebiddy Vision 2040

Phase 3: Using the scenarios

The scenario team spent considerable time identifying a series of steps and enabling factors for the future vision to be reached. These were ranked in order of preference and impact and then colour-coded to indicate which of the factors were inside or outside the influence of the community. In some cases, multiple factors had the potential to bring about a desired outcome. The scenario team then went to a broader group of local people to hear their perspectives on the factors identified and find out whether they agreed with the way these had been categorised. As a result of this process a number of factors that had been considered completely outside the community's influence were shown to lie within the sphere of influence of a number of people and businesses in Cocklebiddy. The discussion with the stakeholders also considered a number of barriers to progress that lay outside their sphere of influence to see if alternative enablers could be identified.

The team mapped out all the steps between the future state and the present on a long roll of paper. Key enabling factors were marked at each step. Where alternative steps existed, these were also noted. Links were then made between consecutive steps and important processes occurring between steps were briefly described. Major decisions points were highlighted. The story was then again checked with people in the wider community. More details were filled in, with special attention given to critical events and key people who held decision making power or might be able to capitalise on opportunities. This then enabled the stakeholder team to begin to see how their different local organisations and businesses might begin to work together (or work together differently) at different stages in the future.

When the scenario team went through the process of vision creation in chronological order they identified a number of assumptions and gaps in thinking. At this step, the team also asked a few external stakeholders to review the process. This helped identify two stages where significant and rapid change in the community had been brushed over and needed further thinking through and better articulation. This exercise was also valuable in identifying steps in the story that were less attractive and would need to be communicated carefully and with additional explanation.

The process of going backward and forward to different community members to discuss the community vision and necessary actions required had given the scenario team confidence that the vision could now be 'exposed' to a wider audience. By that point, many community members were aware of the project and were keen to see what would come of it. The scenario team had to keep reminding themselves that the vision was necessarily incomplete and needed to be widely discussed and seen as relevant in the broader community in order to be of any significance.

The vision and suggested strategies were presented to the Cocklebiddy community through a series of community presentations and discussions hosted by the local school, church, leisure centre and other community groups. These were advertised by the local newspaper and partly funded through public fundraising, business and council donations. From these meetings, an enthusiastic group of committee members were identified to continue the work of promoting the vision and coordinating the development of business and community linkages necessary for the vision to succeed.

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Victorian examples

Title *Organisation (Region)*	Short description	Reference
VEIL/VicHealth Food Supply Scenarios project *Victorian Eco-Innovation Lab (Victoria)*	Research project investigating the impact of challenges to food production and distribution, under climate change and resource constraints, on access to healthy diets in Victoria. A set of exploratory or 'what if' scenarios developed by the research team, informed by a workshop of key stakeholders. Scenarios were designed to illuminate different relationships and system interactions, as well as potential shocks, affecting secure and sustainable food availability in Victoria.	Resources from the project: http://www.ecoinnovationlab.com/research/food-supply-scenarios
Future Wimmera Mallee: Wimmera Mallee Sustainability Alliance Strategic Foresight Program *Wimmera Mallee Sustainability Alliance (Wimmera and Southern Mallee region)*	Scenario development process undertaken by members of the Wimmera Mallee Sustainability Alliance, local, state and regional authorities to consider the future of the Wimmera Mallee region in 20 to 50 years time based on different levels of resource utilisation. The three scenarios, one of which presents a vision for a 'post-carbon' society, were intended to inform regional strategic planning, stimulate discussion and help lead thinking in the region about sustainability issues and potential actions. The scenarios form part of WMSA's Sustainability strategy as narrative illustrations of the future to help inform options and future decisions.	"Wimmera Mallee Sustainability Green Paper" October 2010: http://www.wmsa.org.au/downloads/Wimmera_Mallee_Sustainability_Green_Paper_Oct2010.pdf
Scenarios for climate change adaptation in the Hamilton region *RMIT Global Cities Research Institute and Hamilton critical reference group (Hamilton region)*	Two scenario planning workshops were held in 2008 with a diverse range of representatives from the community and local authorities in the Hamilton region. The intention was to tease out possibilities for what the future of the region might look like under climate change and to consider ways to better engage the regional community in planning for the future. After the workshops a report was sent to all participants and local writers worked with workshop participants to create four plausible yet challenging 'future stories' that were later published and distributed in the community.	Nadarajah et al, "Unexpected sources of hope: Climate change, community and the future" June 2009: http://prodmams.rmit.edu.au/cyb31c4gyjn2.pdf

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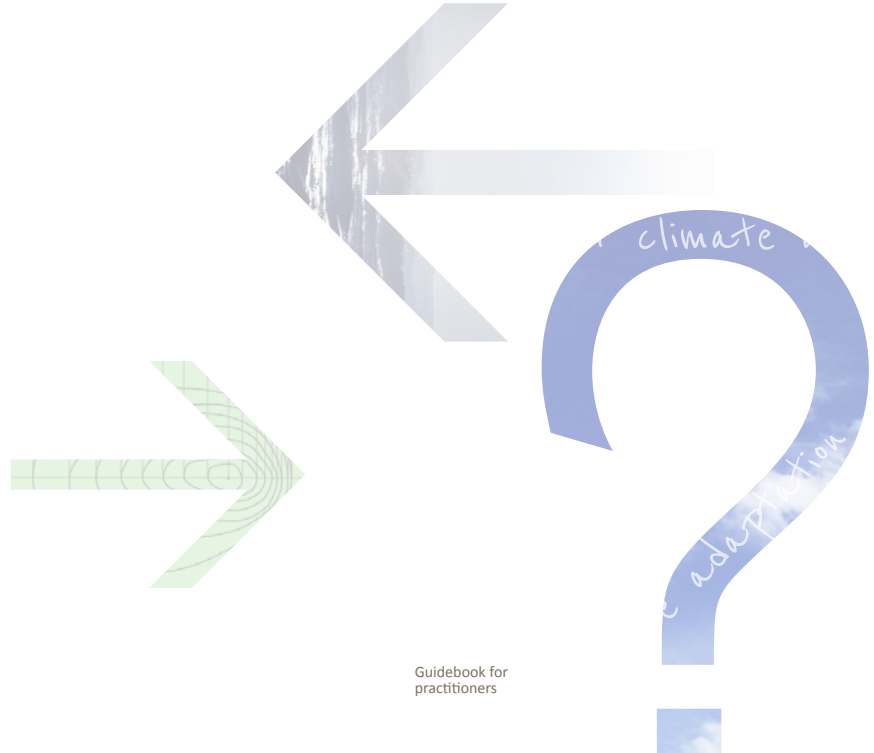
Title *Organisation (Region)*	Short description	Reference
Irrigation Futures *Department of Primary Industries (Goulburn Broken Catchment, Northern Victoria)*	Long term, comprehensive scenario planning project with aim of preparing for changing water availability and exploring irrigation issues and opportunities in the Goulburn Broken Catchment until 2035. A wide range of people affected by and involved in bulk water use in the region took part. Four scenario stories were developed and have been used as inputs into planning by state government (e.g. for the Food bowl Modernisation Project) and local authorities (CMA, local governments), and into curriculum by education providers. The project had a strong emphasis on development of methodological tools and resources so that the project could be understood and replicated.	Wide range of reports available at: http://www.land.vic.gov.au/DPI/Vro/gbbregn.nsf/pages/gb_lwm_fwm_irrig_futures

For more case study examples see Scenarios for Climate Adaptation Report: Appendix A - Case studies



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Real world case studies

International examples

Title *Organisation (Region)*	Short description	Reference
Future makers or future takers? *CSIRO and Great Barrier Reef Marine Park Authority (Great Barrier Reef region, Queensland)*	Using existing data, models and scientific knowledge of the region, CSIRO researchers undertook a scenario analysis to understand implications of global and national development pathways on climate change impacts on the Great Barrier Reef region. The analysis highlighted the importance of cross-scale processes for management of the GBR region and pointed out that the future of the region depends largely on choices (by individuals as well as national or regional decision makers) to be active future 'makers' or passive future 'takers' in responding to global drivers of change.	*Future Makers or Future Takers? A scenario analysis of climate change and the Great Barrier Reef:* http://www.nccarf.edu.au/conference2010/wp-content/uploads/Butler-GBR-Scenarios-Session-131-Scenarios-for-the-future.pdf
Local Climate Change Visioning for Delta, British Columbia *Collaborative for Advanced Landscape Planning, University of British Columbia (Canada)*	A local climate change visioning process undertaken for the Corporation of Delta, a municipality in Canada facing sea level rise impacts. The two main components of the project were: 1. *The construction of frameworks and methods for downscaling climate change impact information and visualising alternative climate futures at the local scale.* 2. *Testing the influence of these visualisations on the awareness, emotional responses and motivation for behaviour change of the participants.*	*Technical Report on Local Climate Change Visioning for Delta: Findings and Recommendations* http://www.calp.forestry.ubc.ca/wp-content/uploads/2010/02/Delta-Technical-Report_V1-0.pdf
CLIMAR *Management Unit of the North Sea Mathematical Models (MUMM) (Belgian coastal zone)*	Evaluation of climate change impacts and adaptation responses for marine activities (CLIMAR) is a research project which aims to identify adaptation scenarios and measures for several case studies in the North Sea region. The project also aims to produce an evaluation framework to help assess the effectiveness of different adaptation measures and consider their practical implementation and integration into current policy structures.	http://services.arcadisbelgium.be/climar/ http://www.ilvo.vlaanderen.be/EN/Research/Fisheries/Technisch/CLIMAR/tabid/5007/language/en-US/Default.aspx

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Title *Organisation (Region)*	Short description	Reference
Developing local and regional scenarios for climate change mitigation and adaptation. *Tyndall Centre for Climate Change Research, United Kingdom*	Three scenarios developed to examine how the East of England region might look in 2050 having achieved 60% emission reductions. Each scenario description indicates a different pathway for reaching the 2050 emissions reduction target. Researchers worked with Norfolk County Council, and the East of England Sustainable Development Round Table through joint workshops which contributed particular knowledge of the Eastern Region and helped enhance the scenarios' legitimacy with the users. The scenarios are intended for a wide range of audiences, but primarily regional and local government officers. The storylines represent sectors important to regional policymakers, addressing economy, societal values, the role of energy efficiency, the scale and strength of regional governance, the type and scale of the energy supply system and the balance and location of economic activity.	Part 1: A framing of the East of England http://www.tyndall.ac.uk/sites/default/files/wp54.pdf Part 2: Scenario Creation http://www.tyndall.ac.uk/sites/default/files/wp67.pdf

For more case study examples see Scenarios for Climate Adaptation Report: Appendix A - Case studies

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Scenario planning ‘how to’ links

Resource name	Short description	Reference/link
Futureamb - Scenario planning resources	Webpage with many articles, links and suggested books for working with scenario planning.	http://www.well.com/~mb/scenario_planning/
Nautilus Institute’s ‘Scenario references’ page	List of scenario planning resources and examples many of which are related to sustainability or climate change issues.	http://www.nautilus.org/partners/gci/scenarios/scenario-references/
UK Department for Transport - Scenario Planning Toolkit	Instructive information on scenario planning processes and activities to run.	http://www.dft.gov.uk/pgr/scienceresearch/futures/secsceniss/
Scenarios: An Explorer’s Guide	Downloadable scenario guidebook produced by Shell International Limited. Gives a useful overview of the approach used by Shell. May be a useful reference when having to justify the value of a scenario-based approach.	http://www-static.shell.com/static/public/downloads/brochures/corporate_pkg/scenarios/explorers_guide.pdf
Scenarios: The art of strategic conversation	Book by a respected practitioner in this field including useful guides on process and activities that organisations can use to improve strategy through scenario planning.	van der Heijden, K. (1996). Scenarios: the art of strategic conversation. Chichester, John Wiley.
Scenario planning: Managing for the future	Another classic text on scenario planning for strategy recommended by scenario practitioners.	Ringland, G. (1998). Scenario planning: Managing for the future. New York, John Wiley.
Framework for developing climate change adaptation strategies and action plans for agriculture in Western Australia	Document providing useful advice on how to run scoping, risk assessment and scenario-type exercises for developing climate change adaptation strategies.	http://www.agric.wa.gov.au/objtwr/imported_assets/content/lwe/cli/climatechangeframework_no%20cover_web.pdf

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Resource name	Short description	Reference/link
Local climate change visioning and landscape visualizations: Guidance Manual	Resource for people considering the use of visual material as a way of understanding and conveying climate change impacts and adaptation.	http://www.calp.forestry.ubc.ca/wp-content/uploads/2010/02/CALP-Visioning-Guidance-Manual-Version-1.1.pdf See also: Working Papers – visualisation, visioning http://www.calp.forestry.ubc.ca/publications/

For further resources see Scenarios for Climate Adaptation Report: Appendix B - Links and resources

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Scenario generation tools and other useful links

Tool name	Short description	Link
OzClim ***CSIRO***	Scenario generation tool produced by the CSIRO which provides step-by-step options to create and explore different rainfall and temperature scenarios for Australia over different time periods. There is also an advanced section designed for the scientific research community and policy makers.	http://www.csiro.au/ozclim
Climate Futures Industry Tool ***CSIRO and Tourism Queensland***	Tool designed to help make climate change information accessible and simplify the adaptation planning process for tourism businesses in Queensland.	http://www.tq.com.au/tqcorp_06/fms/tq_corporate/industrydevelopment/Climate%20Futures%20Industry%20Tool.PDF
Climate change and scenario planning tool for Alice Springs ***Charles Darwin University and Natural Resource Management Board, NT***	Online scenario modelling tool which shows different possible futures for Alice Springs and explores how climate change may affect these futures.	http://www.users.on.net/~treehugger/ser/stella.html
Climate Kelpie ***Grains Research and Development Corporation***	Collection of information, decision support tools and farmers' experiences.	http://www.climatekelpie.com.au/
Irrigation Futures Scenario Planning resources ***Department of Primary Industries, Victorian Government***	Range of in-depth reports covering all aspects of the scenario planning work undertaken in the Goulburn-Murray catchment area.	http://www.dpi.vic.gov.au/dpi/vro/gbbregn.nsf/pages/gb_lwm_fwm_irrig_futures

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Tool name	Short description	Link
Innovative Management for Europe's Changing Coastal Resource (IMCORE) ***University of Cork, North-West Europe***	Online database of Northern European initiatives to manage coastal risks linked to climate change including links to decision support tools and case studies, many of which have utilised a form of scenario planning.	http://www.imcore.eu/tagazan/index.php http://imcore.eu/
UK Climate Impacts Programme (UKCIP) ***UK Department for Environment, Food and Rural Affairs (Defra) and Environmental Change Institute, Oxford University***	Range of tools and resources to support adaptation planning and policy in the UK, including information on socio-economic scenarios and the use of the most recent UK climate projections (UKCP09).	http://www.ukcip.org.uk/ http://www.ukcip.org.uk/ses/ http://www.ukcip.org.uk/ukcp09/

For further resources see Scenarios for Climate Adaptation Report: Appendix B - Links and resources

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vcccar
victorian centre for climate change adaptation research

The Victorian Centre for Climate Change Adaptation Research (VCCCAR) is a consortium of Victorian universities supported by the Victorian Government to undertake multi-disciplinary research about state-specific climate change impacts and adaptation options. Its brief is to:

1. *Increase Government decision-making capacity about state-specific climate change impacts;*
2. *Encourage the inclusion of adaptation needs in Government strategic planning; and*
3. *Bring together expertise to work on the provision of multi-disciplinary advice to government, industry and the community.*

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