WEST GIPPSLAND CATCHMENT MANAGEMENT AUTHORITY

West Gippsland Regional NRM
Climate Change Strategy

West Gippsland
Catchment Management Authority

Australian Government

ISBN 978-0-9944023-2-5 (Print)

ISBN 978-0-9944023-3-2 (PDF)

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ACKNOWLEDGMENTS

This project is supported by the West Gippsland Catchment Management Authority through funding from the Australian Government.

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- Spatial climate change impact and vulnerability assessment undertaken by Spatial Vision
- GIS support provided by Ecosystems Management (Aust) Pty Ltd, Bairnsdale
- Technical input and expert opinion provided by representatives from the WGCMA and its partner organisations

ACKNOWLEDGEMENT OF COUNTRY

We would like to acknowledge and pay our respects to the Traditional Land Owners and other indigenous people within the catchment area: the Gunaikurnai, the Bunurong and Boon Wurrung, and the Wurundjeri people. We also recognise the contribution of Aboriginal and Torres Strait Islander people and organisations in Land and Natural Resource Management.

Cover: Lower Franklin River, above: Tarra Bulga by Jonathon Stevenson

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Executive summary

The West Gippsland region has been exposed to major climate related events, including wildfire, flood and drought in recent times. These events have had a significant impact on the natural environment, including native habitat and biodiversity, waterways, coastal ecosystems and soils; all of which already face pressures from existing threatening processes.

The CSIRO and the Bureau of Meteorology have released climate change projections that provide updated information on how the climate may change to the end of the 21st century. The latest projections indicate that these major climate related events are not isolated. In the future the region will be subject to a warmer, drier and more variable climate. The frequency and magnitude of flood, fire and drought is projected to increase and there will be additional impacts from rising sea levels and increased storm surge.

While future climate projections suggest modest climate effects in the short-term, the longer term outlook is of greater concern with significant temperature increases and an overall reduction in average rainfall and seasonality for the West Gippsland region. For this reason a 2070 time frame has been used to inform the adaptation and mitigation options within this Strategy.

An effective regional climate change response requires both adaptation and mitigation actions across public and private land. This Strategy identifies a suite of feasible and robust adaptation options that encompass incentives, capacity building, planning and research initiatives to improve the adaptive capacity of highly valued natural assets across five climate change planning areas. These areas were identified as sharing similar landscape and socio-demographic features, as well as clusters of high value natural assets that are vulnerable to climate change.

The region is well placed to support mitigation activities, including the establishment of large scale biodiversity plantings that will improve landscape connectivity and sequester carbon, as well as exploring emerging opportunities to store blue carbon through the protection and restoration of coastal ecosystems such as saltmarsh, mangrove and seagrass communities. In many cases these mitigation actions will complement appropriate adaptation responses for land, water and biodiversity.

As a sub-strategy of the West Gippsland Regional Catchment Strategy (RCS), this Strategy seeks to acknowledge and build on the actions already being undertaken by natural resource managers, and identifies how actions in the RCS can be augmented and refined to ensure that natural resource management programs in the region are climate ready.

1. Purpose and context

1.1 Introduction

Climate change is a significant issue for the future of regional communities and the landscapes in which they exist. In West Gippsland, natural resource managers have been at the forefront of adapting to a variable and changing climate, responding with agility to major climate related events, including wildfire, flood and drought in recent times.

Future projected changes in climate are predicted to have substantial effects on natural assets and the broader landscape. These changes are likely to amplify the current challenges, making it imperative to better understand future risks from climate change and to develop flexible, robust options that can be incorporated into natural resource management (NRM) programs.

The West Gippsland Catchment Management Authority (WGCMA) has developed this West Gippsland Regional NRM Climate Change Strategy (the Strategy) to help natural resource managers and land and water managers make informed decisions that consider uncertainty, risk and feasibility of options for climate change adaptation and mitigation.

The Strategy was developed through a process that aimed to answer the following questions:

- What will the likely climatic conditions be for the WGCMA region between now and 2070?
- How might these climatic conditions impact the region's natural environment?
- What parts of the region are more vulnerable to climate change?
- How can NRM planners, land and water managers best prepare to mitigate or adapt to the potential impacts?
- Where should adaptation take place within the region and what types of adaptation action are the most appropriate and feasible?
- Where are the most appropriate locations for biodiverse carbon sequestration plantings, which can both offset greenhouse gas emissions and build landscape resilience?

The Strategy draws on recent climate change projections from the CSIRO and Bureau of Meteorology (BoM), a detailed climate change impact and vulnerability assessment, as well as published literature, research from the Southern Slopes Climate Change Adaptation Research Partnership (SCARP), and input from regional stakeholders.

The Strategy recognises that climate change impacts are not viewed in isolation from existing threatening processes (such as weed invasion, habitat fragmentation, erosion and sedimentation) and that they may be intensified or in some cases ameliorated by climate change.

It is a strategic document that considers the likely impacts on natural assets from climate change at the regional scale.

1.2 Purpose and scope

The purpose of the Strategy is to help NRM planners and land and water managers to understand and consider the potential impacts of climate change on natural assets within the WGCMA region, and to inform the development and implementation of other regional scale strategies and plans. It therefore does not intend to provide details for on-ground action at a site specific or local scale.

The Strategy does:

- identify landscapes within the region that are the most vulnerable to potential climate change impacts and strategies to build landscape integrity,
- guide adaptation and mitigation options to address climate change impacts on natural ecosystems,
- help guide the selection of locations at a landscape scale within the region that are suitable for future biodiverse carbon plantings and related sequestration options (e.g. aquatic bio sequestration or 'blue carbon'),
- use the best available research, information and specialist opinion, and was developed in collaboration with regional stakeholders.

The Strategy does not:

- examine climate change impacts on the built environment or infrastructure,
- examine issues at a property or farm scale,
- examine fauna species in detail – the focus is rather on the provision of habitat that supports fauna,
- examine flora species – the focus is at the regional scale and therefore at the scale of ecological communities,
- provide direction to industry on proposed future land use change, or
- provide direction on consumptive water supply and demand management, as this is the responsibility of the Department of Environment, Land, Water and Planning (DELWP) and the relevant Water Authorities.

Whilst the focus of the Strategy is on the natural environment, consideration has be given to how agencies responsible for coastal and built environments, agricultural land managers and forestry are planning to adapt in the face of climate change, and examined the interaction between future land management approaches and any potential impacts on the natural environment.

This Strategy is amongst a suite of initiatives examining the implications of climate change in the region and therefore is not intended to be the definitive answer to the issue of climate change.

New information on climate change will continue to become available in coming years, and new tools and frameworks for vulnerability assessment are likely to emerge.

Considering how climate may change, assessing subsequent vulnerabilities, and determining what to do next, will be ongoing needs and are likely to become further embedded into NRM planning and program design in the future.

This Strategy aims to assist in establishing an ongoing dialogue between NRM planners and land and water managers on how together; we can continue to adapt and respond to the impacts of climate change, using a growing array of practical options.

2 Legislation, policy and strategic context

2.1 Federal policy context

In November 2014, an amended Carbon Farming Initiative Amendment Bill 2014 was passed by Parliament, which established the Emissions Reduction Fund (ERF).

The ERF is the centrepiece of the Australian Government's policy suite to reduce Australia's greenhouse gas emissions.[1] Businesses and communities are being contracted through a competitive process to implement projects that will lead to a reduction in emissions. Project activities must be in accordance with approved emissions reduction methods under the ERF. Natural resource management activities including reforestation, revegetation and agricultural soil improvement are eligible where appropriate methodologies have been developed and approved.[2]

The ERF operates alongside existing programs designed to reduce emissions and builds on the previously established Carbon Farming Initiative (CFI). The CFI is a legislated, Australian voluntary carbon offsets scheme administered by the Clean Energy Regulator.[3] The CFI allows land managers to earn Australian carbon credit units (ACCUs) by reducing greenhouse gas emissions and increasing carbon sequestration in vegetation and soils through changes to agricultural and land management practices. ACCUs can be sold either to the Government through a carbon abatement contract, or on the secondary market to people and businesses wishing to offset their emissions.[4]

2.2 State policy context

The *Climate Change Act 2010* (the Act) provides guidance on the Victorian Government's roles and responsibilities in responding strategically to climate change in the context of national climate change policy settings. The Act requires decision makers to take climate change into account when making decisions under key pieces of legislation including the *Catchment and Land Protection Act 1994*, *Coastal Management Act 1995*, *Environment Protection Act 1970*, *Flora and Fauna Guarantee Act 1988*, and *Water Act 1989*. The Climate Change Act requires the Victorian Government to develop a Climate Change Adaptation Plan every four years and to outline the potential impacts and risks associated with a changing climate. The first Victorian Climate Change Adaptation Plan released in 2013 provides the framework for managing climate risks to critical Victorian Government assets and services. It aims to help position the Victorian Government to prepare for future climate challenges and to adapt to change.[5]

2.3 Regional strategic context

The West Gippsland Regional Catchment Strategy (RCS) is the overarching strategic planning document that identifies priorities for natural resource management in the region for the period 2013-2019. The RCS sets the direction for how the region's land, water and biodiversity resources should be managed in order to maintain or improve the condition of priority natural assets over time. The aim of the RCS is to provide a framework for the integrated management of catchments, which will maintain long term sustainable land productivity, while also conserving the environment.

Climate variability has been acknowledged as a potential threat to the condition of significant, highly valued natural assets within the RCS, however analysis of the impacts of climate change and identification of potential adaptation and mitigation responses were not in scope when developing the RCS.

As a sub-strategy to the RCS, the West Gippsland Regional NRM Climate Change Strategy aims to support the integration of climate change knowledge into the current RCS and to further inform the implementation program, future strategies, sub-strategies and planning tools. Figure 1 below describes the relationships between this strategy, the West Gippsland RCS and the broader state and federal policy context.

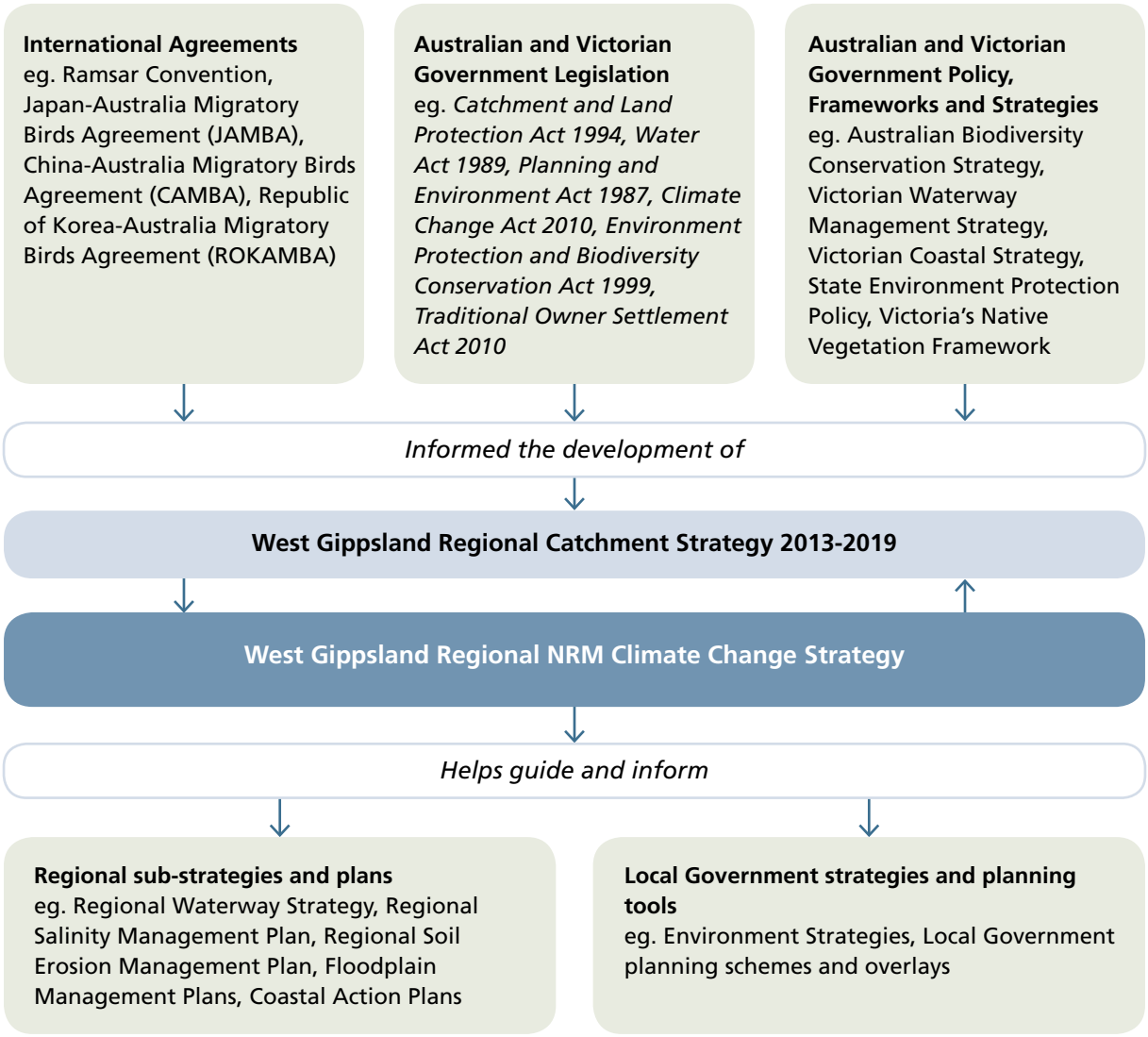

Figure 1: Strategic Framework

3. Strategy development

In 2012, the Australian Government launched the Regional Natural Resource Management Planning for Climate Change Fund (NRM Fund). The aim of the NRM Fund is to improve regional NRM planning through the use of the latest climate change science, information and scenarios to help plan for the potential impacts of climate change. The NRM Fund is comprised of two streams depicted in Figure 2 below:

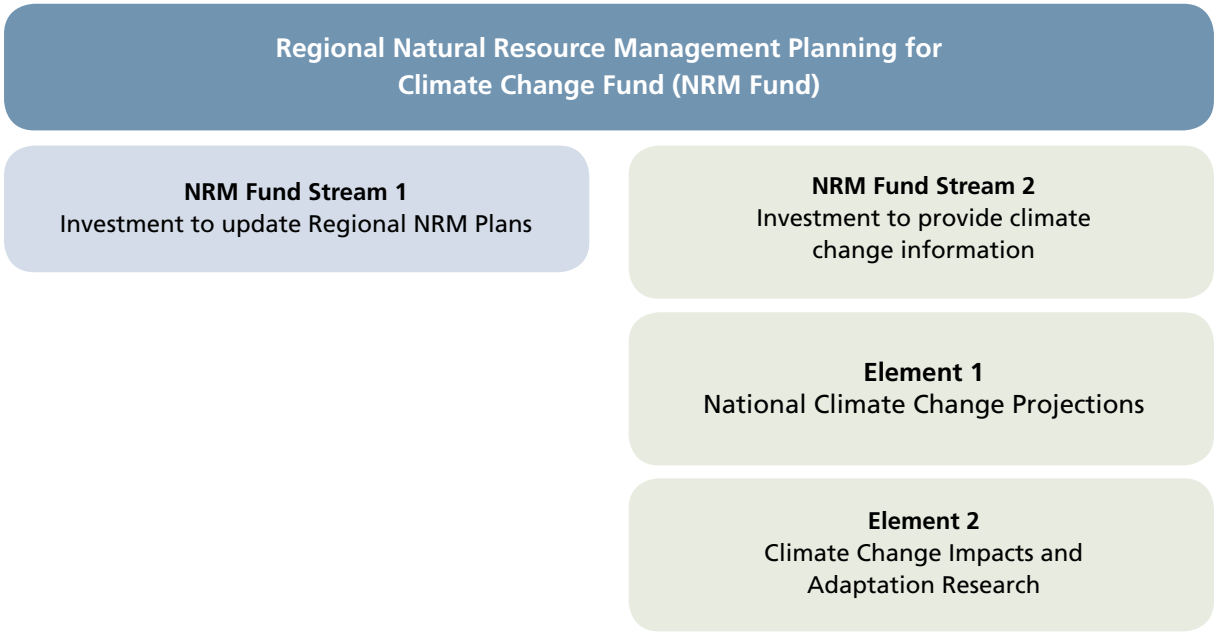

Figure 2: Regional NRM Planning for Climate Change Funding Streams

Stream 1 provided investment to develop the Strategy in accordance with the following guiding principles as specified by the Australian Government:

- Plans identify priority landscapes for carbon plantings and strategies to build landscape integrity and guide adaptation and mitigation actions to address climate change impacts on natural ecosystems
- Planning process is logical, comprehensive, and transparent
- Plans use best available information and are based on collaboration

Stream 2 provided investment to research bodies to produce information, products and tools to help inform the development of this Strategy through two separate elements.

- **Element 1:** National downscaled climate projections were produced by CSIRO and the Bureau of Meteorology. Projections were based on sophisticated global climate modelling data, which underpins the 2013 Fifth International Panel on Climate Change (IPCC) Assessment Report.
- **Element 2:** Researchers from universities and State agencies involved in the Southern Slopes Climate Change Adaptation Research Partnership (SCARP) synthesised research and relevant information to produce fit-for-purpose approaches in conjunction with CMAs for use in developing their climate change strategies.

3.1 Development framework

Figure 3 below demonstrates the framework that was applied to develop the Strategy. It shows the three main phases and summarises the key activities involved in assessing the regional vulnerability of natural assets to climate change, and in developing possible options for adaptation and mitigation. The process is described in more detail in the following sections.

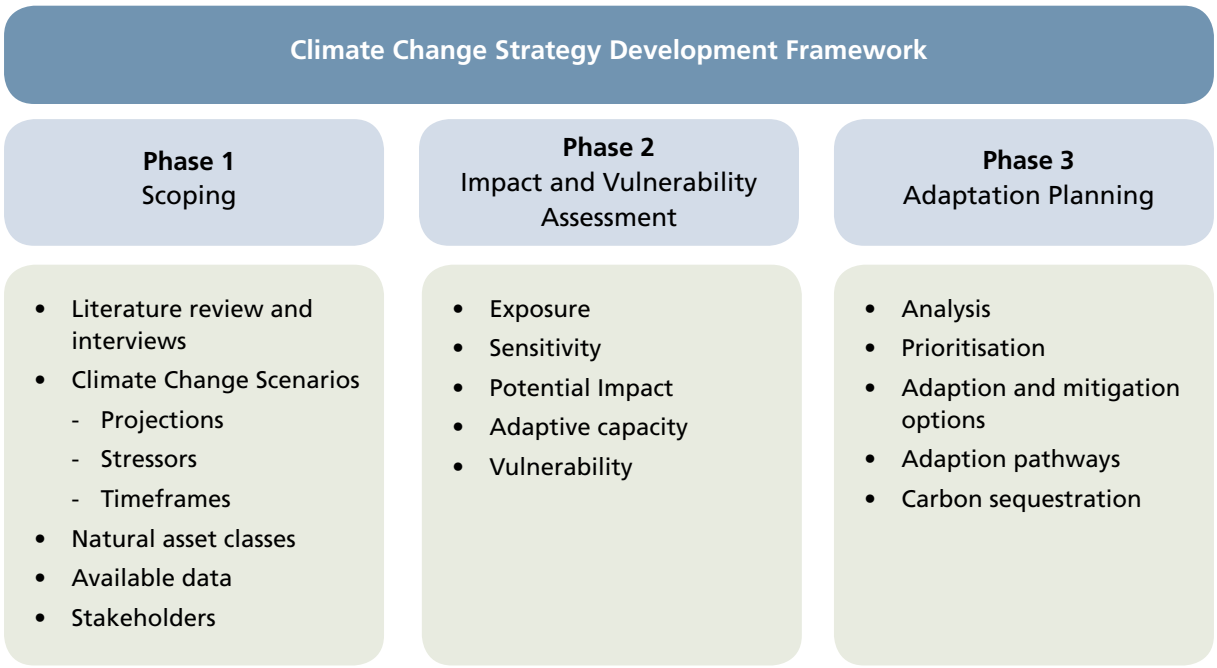

Figure 3: Framework for Strategy Development

3.1.1 Scoping

The scoping phase lays the foundations for subsequent analysis and planning and involved the following activities:

- **Literature review and interviews.** A review of Australian and international literature on climate change impacts and adaptation options, in conjunction with targeted interviews with regional stakeholders, was undertaken to understand potential implications for the region's natural assets as the result of climate change.
- **Climate variables and projections.** Determining which climate models, emission scenarios, climate stressors and timeframes to use to represent possible climate futures.
- **Natural asset classes.** Natural assets were grouped into broad asset classes to support the vulnerability assessment process. These were consistent with those used in the RCS development process and included: native vegetation, rivers and streams, wetlands, estuaries and soil.
- **Available data.** The most applicable statewide spatial datasets were identified and sourced to use in the vulnerability assessment process.
- **Stakeholders.** Key people and organisations were identified to involve in interviews and workshops, to bring necessary information and knowledge to the table, and optimise the range of decision makers and planners able to share the experience and develop shared understandings of regional climate vulnerability, mitigation and adaptation options.

3.1.2 Impact and Vulnerability Assessment

The first step in the process involved identifying the natural assets that are most vulnerable to climate change. A spatial impact and vulnerability assessment was completed to inform NRM planning for climate change at the regional scale.[6] The assessment was completed for multiple natural asset classes and included the use of available data on the characteristics, values and condition of the assets. The assets considered in the assessment were consistent with those used in the RCS process. The assessment incorporated multiple projections of future climate over different timeframes and considered the potential climate change impact and vulnerability using the assessment framework presented in Figure 4 below. The assessment covered the whole of the state of Victoria.

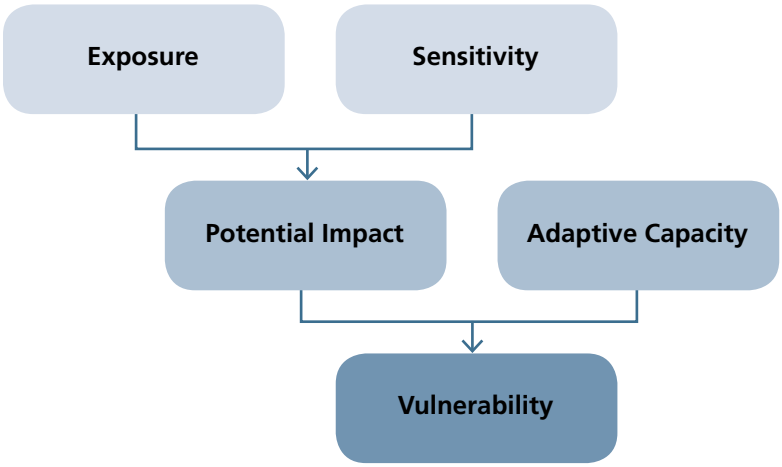

Figure 4: Climate change impact and vulnerability assessment framework

The latest climate change projections for Australia released by the CSIRO and the Bureau of Meteorology, which provide updated national and regional information on how the climate may change to the end of the 21st century, were used in the impact and vulnerability assessment. The projections are relative to the IPCC reference period 1986-2005 and are based on the outputs of sophisticated global climate models (GCMs) used in the Coupled Model Inter-comparison Project phase 5 (CMIP5) judged to perform well over Australia. Climate scenarios considered in the assessment in terms of carbon emission projections based on the CMIP5 model results provided by CSIRO were:

- Representative Concentration Pathways 4.5 – Moderate future carbon emissions scenario.
- Representative Concentration Pathways 8.5 – High future carbon emissions scenario.

Representative Concentration Pathways (RCPs) are four greenhouse gas (GHG) concentration trajectories adopted by the IPCC for its fifth assessment report. RCPs describe four possible climate futures, all of which are considered plausible, depending upon the level of GHG emissions in years to come. RCP 4.5 represents a pathway where emissions peak around 2040, then decline. RCP 8.5 represents a pathway where emissions continue to rise throughout the 21st century.

The elements of the assessment framework are further explained below.

Exposure. Relates to the climate stressors that affect natural assets. Exposure is a measure of the predicted changes in the climate for the future scenario assessed. It included an examination of two direct stressors (change in temperature and rainfall), and two indirect stressors (sea level rise and storm surge).

Sensitivity. Reflects the inherent responsiveness of assets to climatic stressors or influences, and the degree to which changes in climate might affect the assets in their current form. Sensitive assets are highly responsive to climate and can be significantly affected by small climate changes (e.g. changes in temperature and rainfall).

Potential impact. The combination of exposure and sensitivity to climate change reflects its potential impact.

Adaptive capacity. The ability of natural assets, in their current state, to adjust to climate change, to take advantage of opportunities, or to cope with the consequences. The adaptive capacity of a system describes its ability to modify its characteristics or behaviour so as to cope better with changes in external conditions.

Vulnerability. The degree to which an asset is susceptible to or unable to cope with adverse effects of climate change. Vulnerability is a function of the character, magnitude and rate of climate change to which an asset is exposed, its sensitivity and its adaptive capacity.[6]

3.1.3 Adaptation and Mitigation Planning

The final phase of the Strategy drew upon the results of the scoping and assessment phases to help formulate possible mitigation and adaptation options and explore pathways for adaptation under changing climatic and socio-economic conditions over time. This phase involved a series of workshops and consultation that involved:

- **Analysis.** Analysing the results of the impact and vulnerability assessment and literature review to assist in identifying the most vulnerable natural assets within the region (including RCS priorities and non-priorities) and then gaining a conceptual understanding of the interaction between climate change and existing threats to natural asset condition. The results from the vulnerability assessment using the RCP 4.5 scenario indicated that there may only be moderate levels of impact on natural assets in the West Gippsland region until the 2090 time period. Whereas the RCP 8.5 emission scenario (where emissions continue to rise throughout the 21st century) indicated moderate to high levels of impact on natural assets from 2070 onward. Taking into account the results of the impact and vulnerability assessment, it was decided that the RCP 8.5 emission scenario for the 2070 time period would be used to inform this Strategy. This scenario has been chosen because it provides a longer planning horizon than the Regional Catchment Strategy (55 years compared with 20 years), and has been judged to provide a plausible picture of possible moderate to high level impacts, under specific changes in climate factors, particularly changes in temperature and rainfall.
- **Prioritisation.** Filtering and prioritising the most vulnerable natural assets and proposing areas of focus for adaptation planning within the region, with the assistance of regional stakeholders.
- **Adaptation and mitigation options.** Formulating preferred options to mitigate and adapt to climate change, with the assistance of regional stakeholders.
- **Adaptation pathways.** Considering the range of possible adaptation options and how robust and flexible these may be across a range of potential futures, with the assistance of regional stakeholders.

- **Carbon sequestration.** Understanding the possibilities for increased plantings to sequester carbon, which will help to mitigate rising concentrations of atmospheric carbon dioxide (CO^2) and contribute to habitat linkages across the region. Evaluating the feasibility, risk and cost implications to help identify preferred locations for carbon sequestration and habitat linkage plantings, with the assistance of regional stakeholders.

Section 5 introduces a set of planning areas that were used for the identification of strategies for adaptation and mitigation drawing on the results of the vulnerability assessment. These areas share similar patterns of biophysical and socio-economic characteristics and are coherent with the priority areas identified in the West Gippsland RCS.

Section 6 describes the adaptation and mitigation strategies for the respective planning areas and outlines the range of options that have been identified to increase the adaptive capacity of vulnerable assets. A range of important contextual factors such as landscape characteristics, land use and socio-demographic differences have been considered in the development of these options. Each of the strategies and options were assessed for their adaptation or mitigation benefit; social, technical and economic feasibility; potential for maladaptation and relevance over time (i.e. 2030, 2050, 2070 and 2090). It should be noted that in many cases mitigation actions, such as biodiverse planting or 'blue carbon' sequestration performs both an adaptation and mitigation response.