NRM PLANNING FOR CLIMATE CHANGE

Final Project Report 2 - Decision making Frameworks and Integration of Socio-economic Data

Prepared for Victorian Catchment Management Authorities (on behalf of seven Victorian CMAs)

Final Report

July 2014

Natural Decisions

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Contents

1. Introduction

Document Purpose

The purpose of this document is to support the integration of the results of the vulnerability assessment, derived from NRM Planning for Climate Change – Stage 1 project, with CMA decision making processes to identify priority landscapes for climate change adaptation and mitigation.

This paper has been prepared as part of the NRM Planning for Climate Change – Stage 1: Spatial Identification of Climate Change Impacts project. This project is being undertaken to support seven Victorian Catchment Management Authorities plan for likely climate change related impacts on natural assets and land resources within their respective areas of operation.

Companion Documents

This document should be read in conjunction with Project Report 1 which outlines the findings and approach used to assess the likely impact of climate change on a range of natural asset types and values

Report 1 also provides an overview of the spatial data outputs generated by the project for use by CMAs to plan for likely climate change related impacts on natural assets and land resources within their respective areas of operation.

2. Background

This project involves assisting seven Victorian Catchment Management Authorities to:

- Undertake a comprehensive spatial climate change impact assessment that considers multiple asset classes and values, where the assessment will include the use of currently available data to reflect the outcomes being pursued, coupled with the addition of new data resulting from research; and
- Develop recommendations on an appropriate framework and decision support process aimed at assisting CMAs in identifying priority locations in the landscape for adaption and mitigation activities.

A discussion paper was developed to assist with Objective 3 of the project … *Develop recommendations for identifying priority locations in the landscape for adaption and mitigation, as well as determining a best recommended practice for developing appropriate management actions.*

More specifically it provides background for the development of an approach for CMAs to develop a decision planning tool that identifies priority landscapes for climate change adaptation and mitigation. Determining a best practice approach for developing management actions that will lead to improved landscape resilience is also required.

It should be noted that this objective provides guidance on appropriate tools, but does not develop these tools as part of the consultancy. All CMAs will consider how the planning stage of the project will be delivered once the Impact and Vulnerability Assessment is completed.

3. CMA Decision making - current decision making tools and approaches

Catchment Management Authorities (CMAs) and other environmental agencies face the challenge of deciding which of the many possible environmental projects they should support with their limited resources. Projects vary greatly in environmental benefits and costs, so selecting the best projects can make a major difference to the level of environmental benefits that can be generated for a given budget.

To support CMA consideration of decision making approaches a series of questions were posed in the aforementioned discussion paper. These questions included:

1. In the context of the current project what general approaches do CMAs use to support strategic planning and decision making for environmental assets?

2. What types of decisions are made? Can you provide some examples of NRM decisions and how these were made?

3. What other tools, currently used by CMAs, should be considered in relation to climate change planning and decision-making?

4. To what extent, if at all, were climate change threats considered in the development of Regional Catchment Strategies?

5. Is it reasonable to equate vulnerability and threat within the context of the current project?

6. How do CMAs currently assess the feasibility and cost-effectiveness of projects designed to protect threatened/vulnerable assets?

7. What level of rigour and analysis do you think is appropriate for further consideration of potential adaptation projects?

8. How do CMAs wish to tackle the identification and analysis of potential mitigation projects?

9. How do CMAs currently access and use socio-economic data for planning and decision making?

10. What types of data do you think may be useful in relation to this project?

It is our understanding that a range of tools and approaches are being used by CMAs to aid decision making, in particular for the selection and implementation of projects that protect high value assets identified in Regional Catchment Strategies.

A brief assessment of a number of these tools; AVIRA, NaturePrint, EnSym and INFFER, is provided in Appendix 1 as context regarding the current decision-making environment in Victorian CMAs.

4. Socio-economic considerations

Environmental assets sit within a social, economic and political landscape.

Improving our understanding of how socio-economic and political factors can be integrated into NRM decision-making is an important matter – it relates to NRM planning and investment more generally, and needs to be considered specifically within the context of the current project.

To do this we need to:

- Identify what types of socio-economic data is relevant to the planning and decision-making context. For example this may include:
  o data collected by organisations such as the Australian Bureau of Statistics http://www.abs.gov.au/ and the Australian Bureau of Agriculture and Resource Economics (ABARES) on http://www.daff.gov.au/abares on a wide range of indicators including demographics and land use/land management practices,
  o specific studies, such as that undertaken by Curtis et al (2012) in the Wimmera CMA region, that describes trends in social and farming structure (property size, property turnover, property subdivision/ amalgamation, occupational identity of landholders, extent of absentee ownership). In this case the data is presented for the region and for each local government area.
- Assess how this data is in a form that can be analysed and incorporated into the planning and decision making cycle in a meaningful, robust and efficient manner.

Data on socio-economic indicators and trends is useful. This information, along with environmental data and scenarios, is important for characterizing the vulnerability and adaptive capacity of social and economic systems in relation to climate change in different regions. For

many exposed systems, the impacts of climate change could be strongly moderated by future socio-economic and technological developments, so these need to be taken into account in any assessment.

The key socio-economic parameters for a region that are likely to be relevant for NRM planning and decision making relate to recent past, present and expected future (next 20 years) socio-economic contexts for a region in terms of:

- population trends,
- changes in ownership of rural land,
- trends in reasons for people owning rural land,
- relative importance of agriculture as a source of employment and wealth,
- price of rural land in $ per hectare,
- profitability of major agricultural enterprises.

Based on a review of readily available socio-economic data from the Australian Bureau of Statistics and several other sources, the following socio-economic information was obtained and prepared as spatial data to support Victorian CMAs in their NRM planning work, including application of the decision framework described in this report. These key indicators are presented in Appendix 2, and included:

- Trends in the total population and rural balance for each LGA in the region across 1986-2011.
- Comparison of the % of the total population in the 15 years to 34 years; 35 years to 54 years; and post 55 years by LGA across 1986-2011
- % of population employed in agriculture (and related primary industries) compared to other industry sectors across 1986-2011
- Change in median property size by either the LGA or region 1990-2010 (perhaps by key agricultural industry)
- Trends in the median value (per hectare) of rural property sold either by LGA or region (1995-2010)
- % of rural landholders who identify as a farmer by occupation 1990-2010
- % of new (<10 years) and longer-term owners who are absentee (live at another address).

5. The Conceptual framework

The conceptual framework outlined below is designed to link the vulnerability assessment element of the project with the application of appropriate decision making approaches that integrate socio-economic and biophysical information.

This framework proposes a 5-step process that can be summarised as:
- Step 1 – Identification and selection of natural assets/landscape areas
- Step 2 – Vulnerability assessment
- Step 3 – Assignment of project type/response (Adaptation, Mitigation or Hybrid)
- Step 4 – Assessment of feasibility and/or cost-effectiveness
- Step 5 – Option evaluation and strategic response

The following sections outline each of these steps.

A simple spreadsheet tool has been developed to support the application of these steps with capacity for adaptation by CMA users as required. Appendix 3 provides a screen view of this spreadsheet tool.

Figure 1.   Conceptual framework for NRM climate change assets/projects
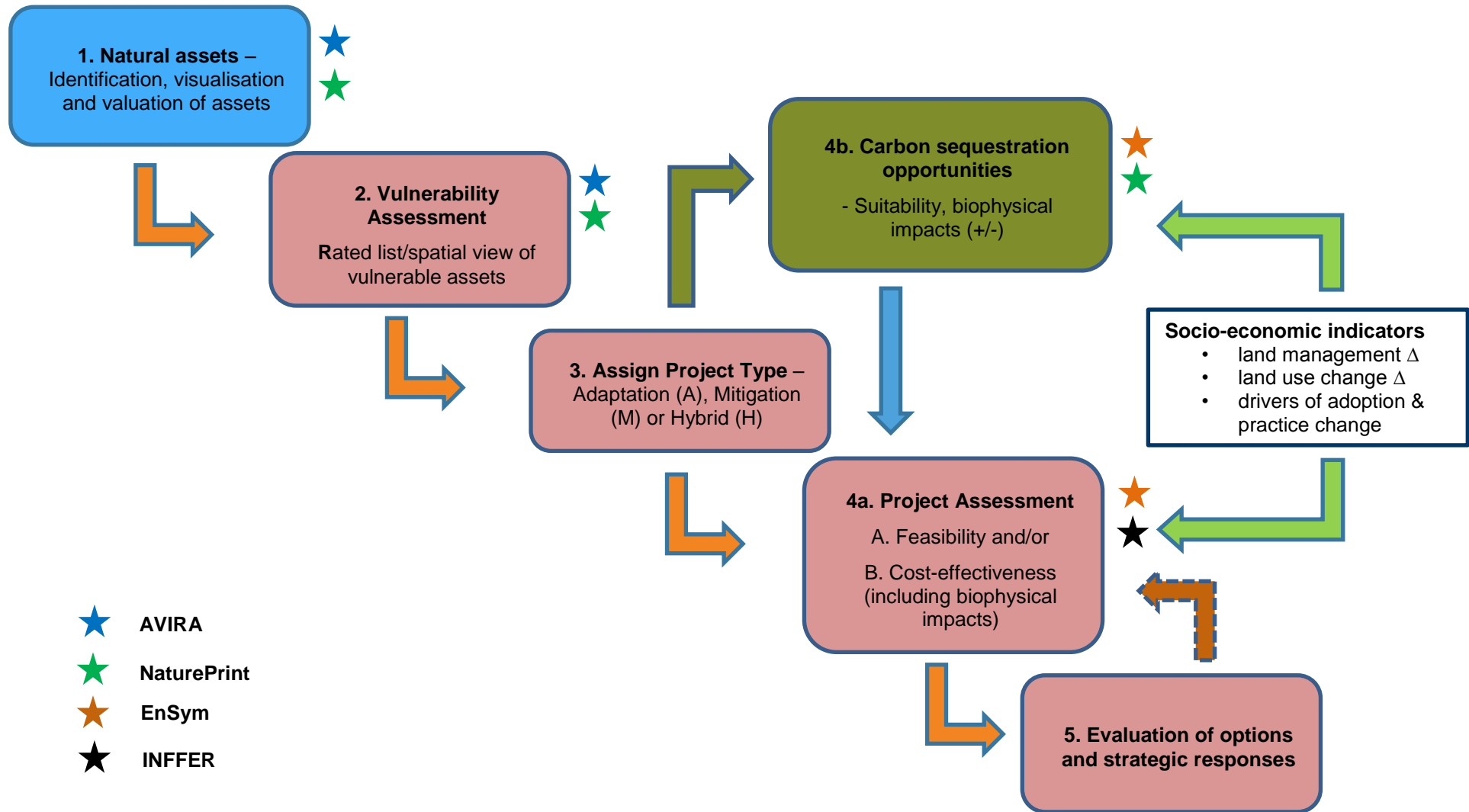
6. Assessing threats and vulnerability of assets (Step 1 & 2)

The first phase of the project undertook a vulnerability assessment of selected assets across each of the seven CMA regions. The outcome of this assessment is complementary with the asset-based approach (ABA), which underpins strategic regional NRM planning in Victoria, in that it provides a structured and systematic approach to determining priorities for action and investment.

While the application of the ABA has been interpreted in slightly different ways by the various CMAs, a common element is an assessment of threat to significant assets.

With reference to the DSE Advisory Note for CMAs (DSE, 2011) - Applying the Asset-Based Approach for the development of Regional Catchment Strategies, the following approach is recommend when considering threats to environmental assets.

As we know, prioritising areas for intervention requires strategic foresight to a large degree. It depends on trying to predict changes that are likely to occur in coming decades. An asset may or may not already be degraded, and it may or may not be expected to degrade in the future. Examples of degradation processes include drought, fire, erosion, weed invasion, pest predation, over grazing, dryland salinity, fragmentation etc. Both current and future degradation patterns need to be considered when assessing the priority level of the asset, as either or both may potentially be reduced through intervention. The recommended timeframe is 20 years.

Furthermore, the following criterion is proposed for estimating the level of threat:

Criterion A: In the absence of public or private intervention to protect or enhance the asset, what is the likely loss of value in 20 years' time (high, medium, low)? In responding, include loss of value due to degradation that has already occurred and additional degradation that would occur in the coming 20 years. As an example, 'high likelihood' implies an irreversible loss in the value, 'medium' implies partial irreversible/partial recoverable loss in value and 'low' means recoverable loss in value.

Climate change can have primary direct effects on assets, through changes in rainfall and temperature, and secondary effects such as sea level rise, droughts, floods, and other extreme weather events. Changes in climate may also manifest by altering the intensity of threats, such as weed invasion or dryland salinity in either positive or negative directions.

For the purposes of the current project it is useful to assume that the current assessment of threat (as per the RCSs) to assets has not factored in climate change, and therefore the priority projects and actions in the various strategies have been determined without a deliberative analysis of climate change effects.

Currently CMAs are undertaking a range of activities, which can broadly be categorised as direct works and actions, capacity building and research and development. Some of these activities are directed at protecting assets or addressing threats to assets, while others are focused more generally across regions. The framework we propose is focused on vulnerable assets, while acknowledging opportunities to inform other regional programs, such as capacity building and R & D.

The key outputs of the vulnerability assessment are a spatial view of priority assets, according to the themes identified in the respective Regional Catchment Strategies. Where CMAs have developed separate spatial view of assets in their RCS, this will need to be considered as an overlay to assess the correspondence. For example, when identifying priority native vegetation assets, some CMAs have highlighted geographic areas comprising a cluster of EVC groups, whereas the vulnerability assessment in this project has assessed vulnerability of EVC groups as distinct entities.

Current activities, as described above, may be considered as the baseline, or 'business-as-usual' approach. What we need to understand as a result of the vulnerability assessment is how these proposed activities will change in response to new information on the relative vulnerability of assets.

7. Adaptation or mitigation … or both? (Step 3)

The first two steps have generated a short list of priority assets, that is, those assets of higher value and greater vulnerability to climate change. At this stage we it is recommended to analyse selected assets from the perspective of a project (set of actions), that will be most important and valuable response to asset vulnerability.

There are two classes of projects:

- adaptation projects which aim to improve the capacity of the environment and/or people to adapt to future effects of climate change.

- mitigation projects which aim to directly mitigate the effects of climate change by increasing sequestration of carbon or reducing emissions of greenhouse gases (GHGs)

Different projects will have different level of feasibility and consequently different costs and benefits that are related to the nature and scale of proposed actions.

Step 3 is designed to determine for each of the priority assets (identified at Step 2), whether an adaptation or mitigation response is required. In some cases (e.g. a wildlife corridor of new habitat to protect a threatened species) an asset may require both adaptation and mitigation responses.

8. Adaptation projects

The process for analysing adaptation projects is detailed below in Figure 2. This step begins by determining whether the asset being considered has already been identified as a priority in the RCS or sub strategy ('already in plan'), or whether the vulnerability assessment has revealed a new asset or project that is worthy of further investigation ('not in plan already').
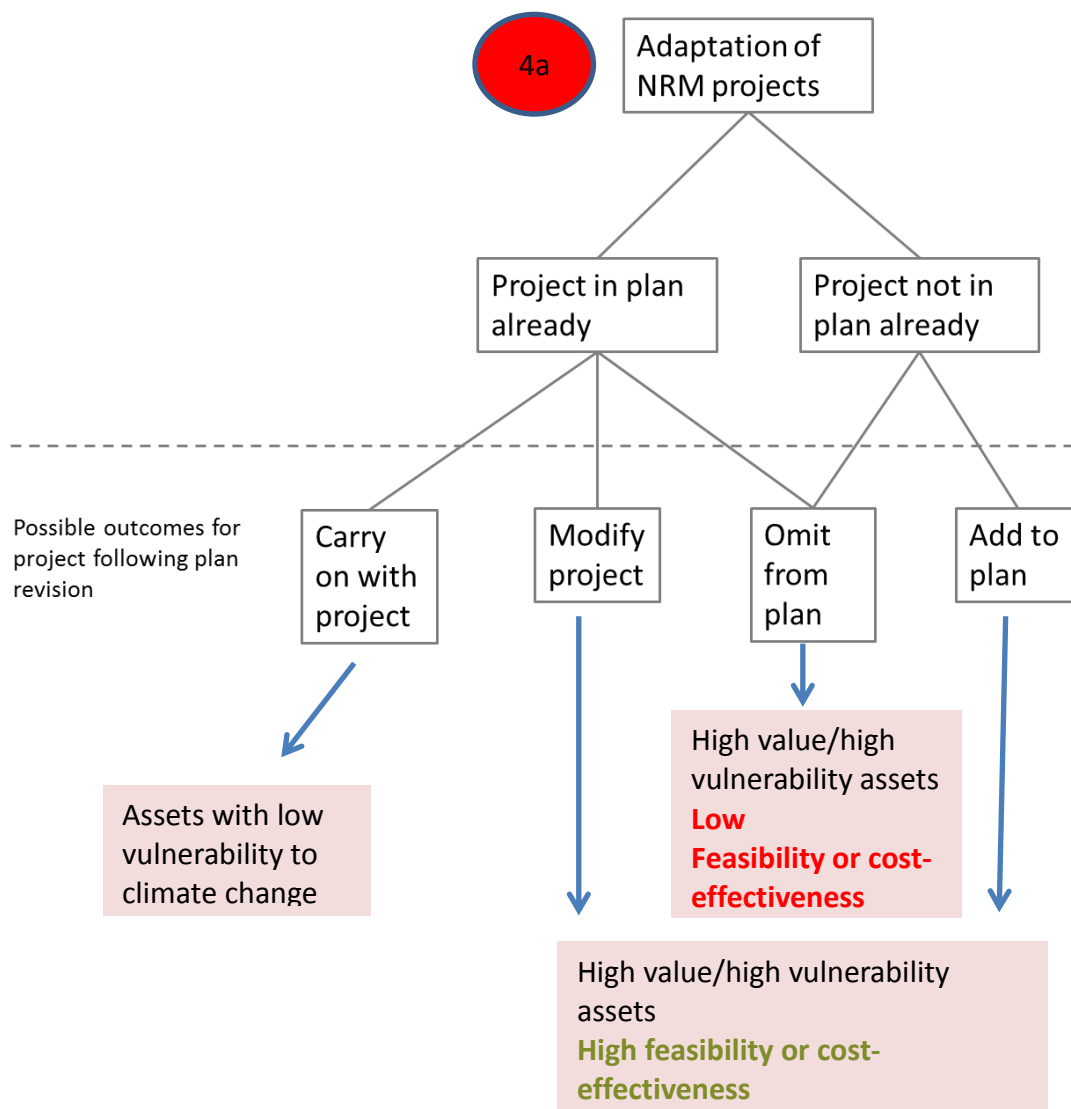

Figure 2.   Process for high-level assessment of possible adaptation projects

A number of responses are possible in relation to these projects, based on an assessment of their feasibility and/or cost-effectiveness. These are depicted in Figure 2 above and may result in some projects previously identified as high priorities having their ranking reduced, due to low feasibility for intervention, while other projects may be considered for elevated priority, where there is highly valued assets are deemed to be highly vulnerable to climate change and the feasibility of intervention is high and cost-effective.

The framework proposes two options for further assessment. The first option involves a simple filtering process, designed to assess the relative feasibility of intervention for vulnerable, priority assets, while the second option involves a quantitative assessment, which considers a broader range of factors, and produces a ranked set of intervention priorities in terms of their relative cost-effectiveness.

9. Assessing feasibility

Experience shows that feasibility is a particularly important criterion to consider when prioritising intervention, especially on private land. As per the ABA introduced earlier, feasibility is considered in two parts: technical feasibility and social feasibility. Like with threats, we need to consider the likely future feasibility, not only current feasibility. To achieve this requires trying to predict future resources available including funding, technology and information advances. It is suggested from a funding perspective that this be based on historic levels of funding.

For technical feasibility, the criterion is:

• Criterion B: If appropriate works and actions were implemented, to what extent could the degradation identified in Criterion A be reduced (high, medium, low)? High implies a reduction of more than 50% in degradation, medium implies 25-50% reduction and low means less than 25% reduction.

For social feasibility, the criterion is:

• Criterion C: If a project for the asset is funded, what is the likely extent of implementation of the works and actions needed to protect or enhance the asset (high, medium, low)? High means that more than 70% of the required works would be implemented, medium means that 40 – 70% would be implemented, and low means that less than 40% would be implemented.

Responses to this question need to consider a range of factors, including:

• Adoption: If the works required are on private land, is it likely that adequate cost sharing arrangements could be put in place to ensure a level of confidence in implementation? Do the landholders have a history of working well together on land conservation projects? Do the landholders have the skills and resources needed to implement actions? Would actions need to be implemented directly by an agency?

• Cooperation from other organisations: Is cooperation from other organisations needed for intervention to be successful? If so, is cooperation likely? Do public and private land managers need to work together to achieve the desired outcome (e.g. pest animal control)?

Feasibility (Technical-Social or Social-Technical)	Vulnerability		
	Low	Moderate	High
Low-Low	*Low* priority		
Low-Medium			
Low-High		*Medium priority*	
Medium-Medium			
High-Medium			*High priority*
High-High			

This project has generated a series of spatially referenced socio-economic data sets, including:

- population trends,
- changes in ownership of rural land,
- trends in reasons for people owning rural land,
- relative importance of agriculture as a source of employment and wealth,

- price of rural land in $ per hectare, and

- profitability of major agricultural enterprises.

It is recommended that this information is considered, in conjunction with views of asset vulnerability and technical feasibility at this assessment step. A series of map views of these datasets, together with a description of how they\y have been generated is at Appendix 2.

Where regions have undertaken more detailed profiling of socio-economic indicators, such as social benchmarking, this information can be used to further inform considerations of socio-economic feasibility.

10. Assessing cost-effectiveness

Step 3 has determined the focus for each of the priority assets (highest value/greatest vulnerability) in terms of whether an adaptation, mitigation or hybrid response is required.

From here it would be useful to assess the nature and scale of proposed actions in order to estimate the potential costs and benefits of a range of possible projects. While it is desirable to protect all significant and vulnerable assets, this is unlikely to be possible due to limited resources. We need to select those assets where it is feasible and cost-effective to act. Failure to carefully consider these factors may result in irretrievable loss of high value assets, which could otherwise have been saved.

The following criteria should be used to assess the benefits and costs of selected priority projects, including consideration of future climate change threats. For projects that have already been prioritised without reference to climate change, this further analysis will inform the relative impact of climate change on the benefits and costs of each project.

- Asset value - What is the difference in asset value with and without addressing climate change impacts?

- Threat - What are the key threats and their magnitude (VH, H, M, L) with and without climate change?

- Lag time between implementing the actions and improving the adaptive capacity of the asset?

- Technical feasibility - What is the probability of direct actions failing to deliver the expected benefits?

- Adoption - What is the likelihood of sufficient landholder adoption?

- Risks - What is the probability of project failure due to socio-political or administrative constraints?

- Spin-offs - What is the magnitude of impacts from proposed actions on other significant assets? What is the magnitude and value of sequestered carbon and/or avoided emissions as a result of the project?

- Project cost - What is the estimated project cost over what timeframe?

- Maintenance costs - What are the future annual costs associated with maintaining the adaptive capacity of the asset?

Additional considerations should involve an assessment of the level of confidence underpinning this assessment, information quality and documentation of critical knowledge gaps.

11. Mitigation projects

Mitigation projects may aim to:

1. Sequester carbon in soil, commercial forests or biodiversity plantings, or

2. Reduce greenhouse gas emissions through changes in land use or land management.

Some adaptation projects (see previous step) may propose actions which contribute to sequestration but have a principal aim of protecting a priority asset. The mitigation benefits (or negative consequences) associated with adaptation projects are captured and assessed at Step 4a.

While a detailed methodology is yet to be developed for this step, the following requirements are suggested as elements of an assessment of cost-effectiveness.

1. Assess Benefits

- How much additional carbon will be sequestered as a result of the project? …. [Modelled surface of sequestration potential]

- What is the $ value of this carbon?

- What is the value of the non-carbon benefits (e.g. habitat)? Onsite and off-site?

2. Assess Risks

- How will permanence be assured? What is the likelihood of failure /loss of carbon store?

- What level of leakage is likely?

- What is the nature and magnitude of possible negative spin-offs (e.g. water yield) on other assets

3. What is the total project cost, including long-term ongoing costs?

The outputs of such an assessment would include:

- Benefits and costs assessed to enable ranking of prospective mitigation projects.
- Analysis of trade-off situations, where for example potential benefits such as carbon and habitat creation also pose negative spin-offs such as decreased water yield or elevated risk of wildfire.
- Identification of appropriate policy responses to facilitate project implementation.
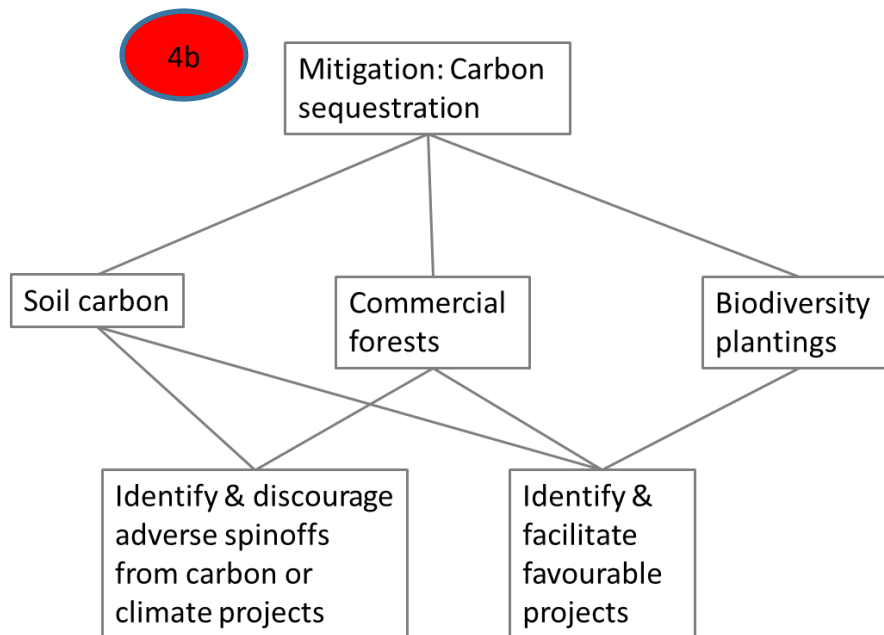
Figure 3.   Process for high-level assessment of possible mitigation projects

12. References

- Applying the Asset-Based Approach for the development of Regional Catchment Strategies - DSE Advisory Note for Catchment Management Authorities, Department of Sustainability and Environment, December 2011.

- The social drivers of natural resource management in the Wimmera region, Curtis, Allan and Mendham, Emily (2012), Institute for Land, Water and Society, Charles Sturt University, Albury.

- Integrating socio-economic and biophysical data to underpin collaborative watershed management Allan Curtis, Ian Byron, Jacinta MacKay JAWRA Journal of the American Water Resources Association 05/2005; 41(3):549 - 563. DOI:10.1111/j.1752-1688.2005.tb03754.x

13. Further information:

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Appendix 1:
An overview of decision support tools

An overview of decision support tools

There are various tools and frameworks available to CMAs to assist in the NRM decision making. This discussion is provided in the context of an asset based approach, which is consistent with the focus of the overall climate change project.

AVIRA

AVIRA (Aquatic Value Identification and risk Assessment) is an asset database that contains information on the values and threats of specified river, estuary and wetlands assets. The database also has an automated 'risk' assessment process. AVIRA only includes waterway assets that are assessed under the Index of Stream Condition, Index of Estuary Condition and Index of Wetland Condition. AVIRA stores information on three types of asset values; environmental, social and economic. Within each of these value types there are several different categories of values.

For example, there are five categories of environmental values:
o   Formally Recognised Significance
o   Representativeness
o   Rare or Threatened Species/Communities
o   Naturalness
o   Special Features

Each value is scored using a metric that is made up of one or more measures, as outlined in Peters (2009). Value scores can be either binary (yes/no) or numeric (0-5). AVIRA stores this information on the values and their scores. Six categories of threat are recognized in AVIRA:
o   Altered Water Regimes
o   Altered Physical Form
o   Poor Water Quality
o   Degraded Habitats
o   Exotic Flora and Fauna
o   Reduced Connectivity

Each category contains a number of individual threats (e.g. the Altered Water Regimes category includes changes to zero flow frequency, changes to flow seasonality, changes to bank full flow frequency, etc.). The level of each individual threat can be quantified by specific metrics/measures. This enables an assessment of threat severity for each individual threat, ranging from 5 (very high threat) to 1 (very low threat). Threat information is routinely collected as part of the Index of Stream Condition, Index of Wetland Condition and Index of Estuary Condition.

NaturePrint

NaturePrint is being developed by the Biodiversity and Ecosystem Services Division in DSE. NaturePrint includes a spatial and temporal database of information relevant to:
o   the range of biodiversity assets;
o   their relative conservation status;
o   their life history attributes (including reproductive and dispersal characteristics and tolerances of disturbances);
o   the functional context of locations where assets occur (including ecological processes, threats and opportunities); and related long-term risk and feasibility scenarios (including climate change)

NaturePrint brings together datasets on:
o   distributions of species and their habitats;

- o   condition of these habitats;
- o   how species are likely to use and move through landscapes/seascapes;
- o   how threats to species are likely to operate at site and landscape scales; and
- o   where re-establishment of habitat and/or relocation of populations is likely to be useful and feasible.

NaturePrint provides tools and/or data products to assist CMAs to access this spatial biodiversity information. It will provide a framework to integrate the various data to identify spatial locations that are candidates for investments to protect biodiversity, based primarily of scientific criteria, rather than community preferences. Its outputs include data layers that contain the results of integrated analysis of data in the NaturePrint system (i.e. results from an initial prioritization process to identify assets that are candidates for investment). CMAs might simply use those outputs, rather than necessarily having to use the system to undertake their own analyses. Outputs will be useful to understand the range of biodiversity values, threatening processes and the importance of ecosystem function. It is intended that NaturePrint will express biodiversity conservation needs across a range of geographic scales (regional, landscape/seascape and local asset). The ultimate requirement is to develop the capacity to integrate across multiple species in space and time. It will be based on the best available data and sound science and will be developed in a transparent and inclusive process.

EnSym

EnSym (Environmental Systems Modeling Tool - https://ensym.dse.vic.gov.au/) is a computer-based decision support system with several functions:

1. Provides basic mapping and data interrogation capabilities.

2. The Landscape Preference Tool is used for asset prioritisation. This tool allows the user to construct purpose built asset scoring systems based on mapped data layers with the ability to manually enter information that does not exist in mapped data layers (e.g expert opinion). Users create their own set of criteria for scoring assets in the landscape and rank assets based on these criteria. The Landscape Preference Tool does not in itself decide what the weightings that determine asset priorities are: appropriate representatives from within DSE, CMA's and other NRM agencies will need to determine weightings to be used in the Landscape Preference Tool. The Landscape Preference Tool also provides visualisation of asset priorities.

3. The Site Assessment Tool takes field and mapped data as well as onsite management actions as inputs and uses scientific metrics and biophysical modelling to quantify environmental benefits arising from these site scale management interventions. EnSym includes models to quantify benefits relating to river, wetland and native vegetation health outcomes as well as changes in catchment function (erosion, recharge and surface runoff). This tool also links with PDA's to input field data directly and generates automated management plans. The site assessment tool has been used to date by field officers for programs including EcoTender, Wetland Tender, River Tender, Coastal Tender, and the Volcanic Plains Tender.

EnSym can be used to help guide or support the following aspects of natural resource management:

1. Linking field data (collected on GIS-enabled handheld devices) into scoring systems;

2. modeling of environmental benefits from worksite-scale management interventions;

3. supporting conservation tenders (or alternative programs);

4. asset and investment prioritisation and planning; and

5. reporting of environmental accounts.

EnSym has been developed by the ecoMarkets team in the Economic Policy Branch at DSE and incorporates scientific understanding, standards, metrics and information developed within DSE and in some leading international and national scientific models.

INFFER

The Investment Framework For Environmental Resources (INFFER – www.inffer.org) is an asset-based process for planning and prioritising public investments to achieve cost effective outcomes. INFFER uses a structured and guided process to collect and integrate information. INFFER is different from the other three tools discussed here in that it does not contain a database of spatial information and does not provide a tool for spatial data analysis. Rather it is a process that draws together data and results from such analyses with other relevant information to prioritise investments. INFFER is comprised of a series of steps that require other information (e.g., AVIRA, NaturePrint) and processes (e.g., community consultation, GIS tools, EnSym) to complete. The seven steps outlined in INFFER are given below:

1. Prepare and map significant natural assets. Assets are drawn from existing documents or lists, from community workshops, from relevant experts, or from analytical processes, such as AVIRA, NaturePrint or EnSym. Assets are described and mapped.

2. Filter this list to identify assets that appear strong initial candidates for investment. The first stage of filtering requires the identification of assets of high significance, with high current or predicted future damage (data from Nature Print and AVIRA can be used, in addition to other data). Following this a Pre-assessment Checklist of five questions is applied to further discriminate between assets. Assets may be culled at this point because they are not spatially explicit, because a specific, measurable, time-bound goal cannot be formulated, or because an initial assessment indicates that the project would not be cost effective.

3. Develop and evaluate projects using the INFFER Project Assessment Form. The process supports development of logically consistent projects, which are assessed in detail using collected evidence of various types. The Public: Private Benefits Framework is used to recommend the best class of delivery mechanism. A Benefit: Cost Index is calculated to indicate the cost-effectiveness of each project. Outputs also report project risk factors, spin-off benefits and costs, the quality of information and key information gaps.

4. Identify priority assets/projects. This is based on the information in the Project Assessment Report and other relevant considerations.

5. Develop investment plans or proposals for external funding. (depending on whether INFFER is being used to allocate an internal budget or to develop and assess projects for external funding).

6. Implement Projects. In many cases, the first stage of a project should consist of a detailed feasibility assessment.

7. Monitor and adaptively manage projects. After feasibility assessment, and at regular intervals thereafter (say every two years), the data in the original Project Assessment Form for each funded asset/project should be updated to reflect lessons learned, progress towards outcomes, and any new data or analysis that has become available. At this point, managers should consider whether the original design of the project is still suitable, and whether the project should remain a priority.

Appendix 2:
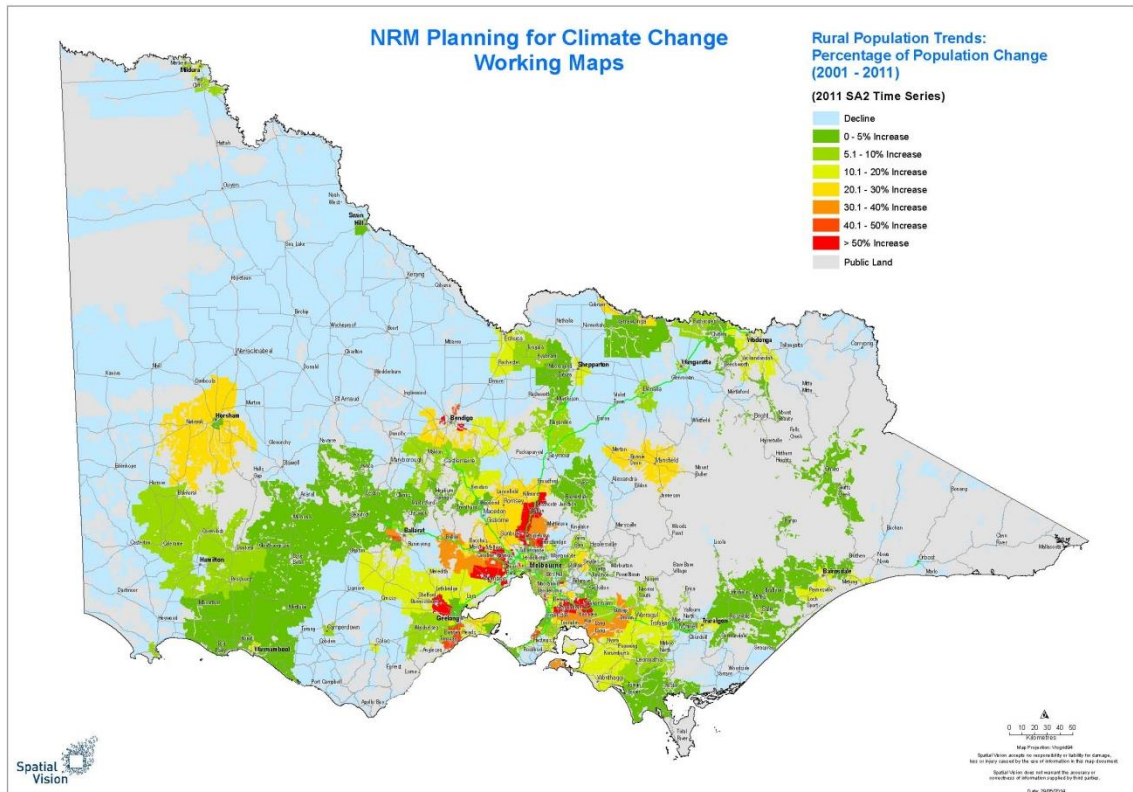# Socio-economic Indicators – sample map view of datasets

Figure 4.   Percentage Change in Total Population 2001 to 2011 (based on SA2 time series) – Rural Population Trends
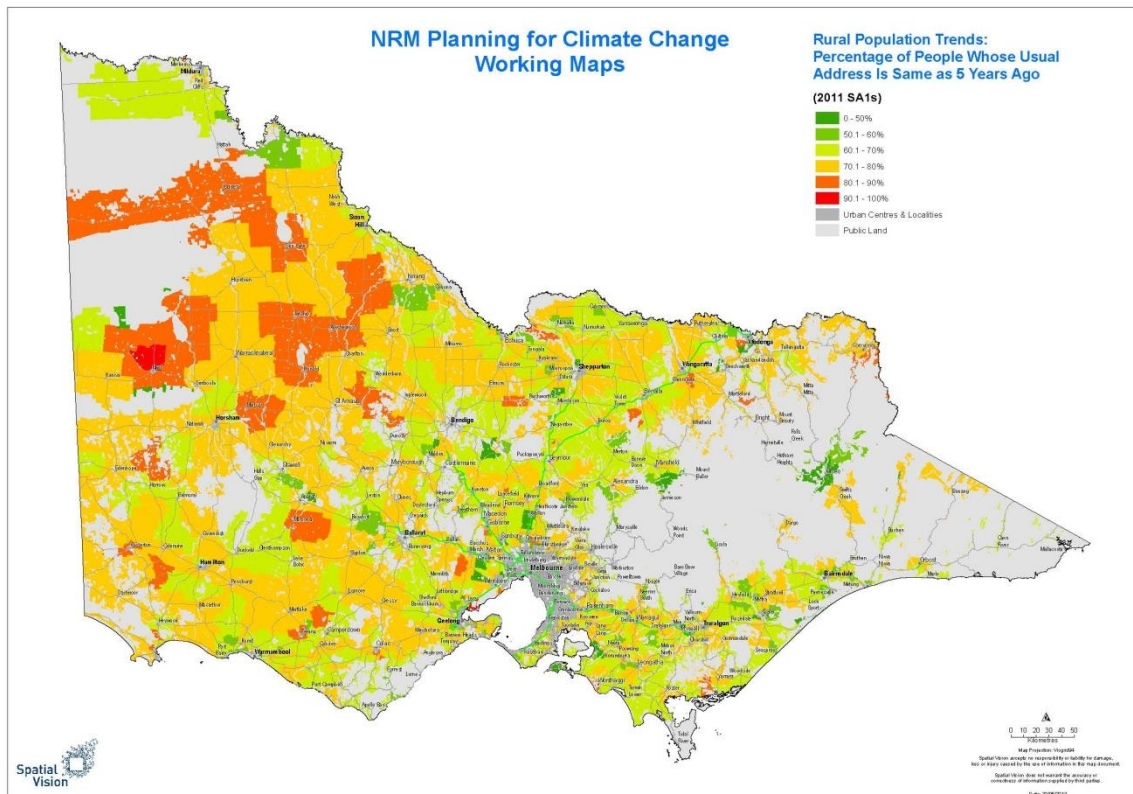

Figure 5.   Percentage Population with same address 5 years ago 2006 to 2011 - Rural Population Trends (SA1)
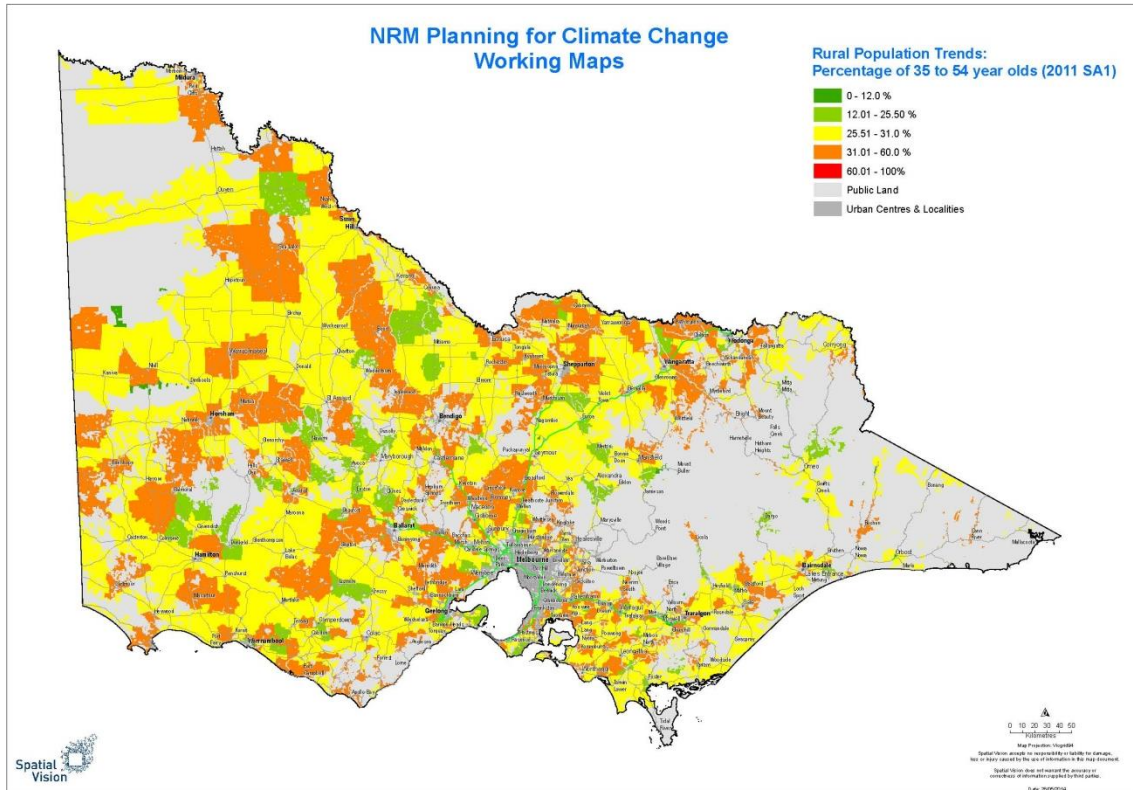
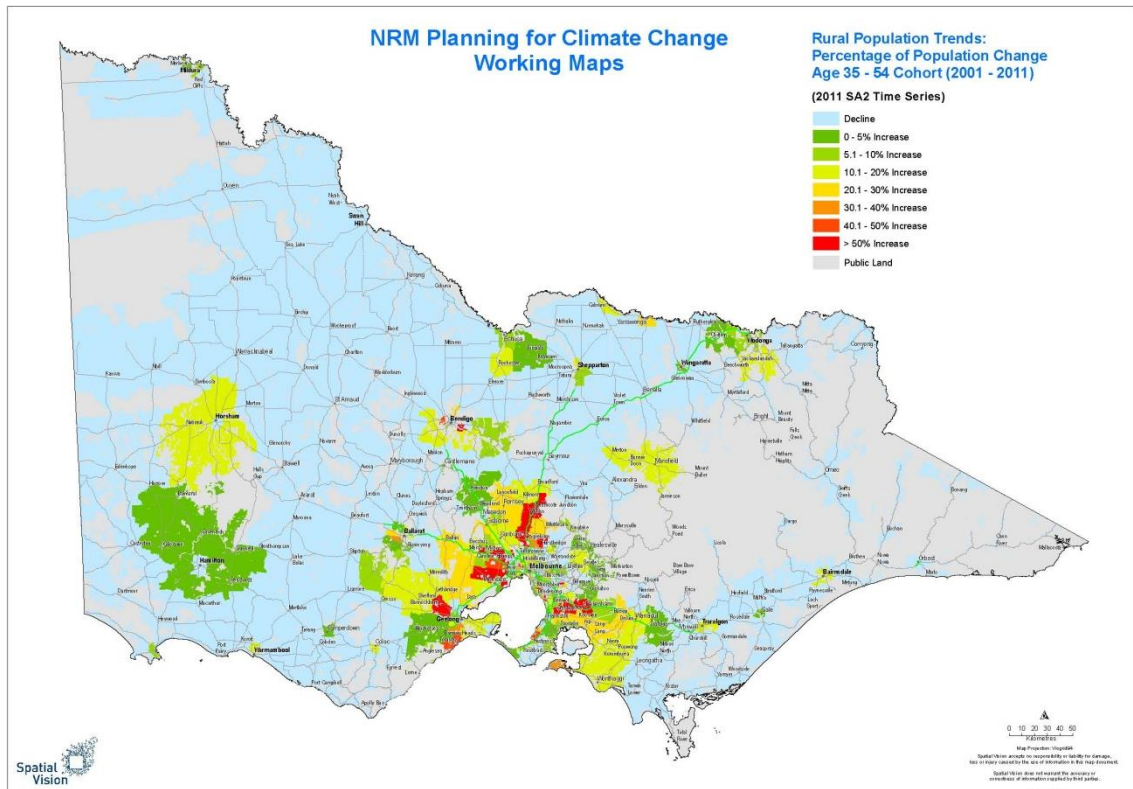**Figure 6.   Percentage of Population Aged 35 to 54 Years (2011) – Rural Population Trends (SA1)**

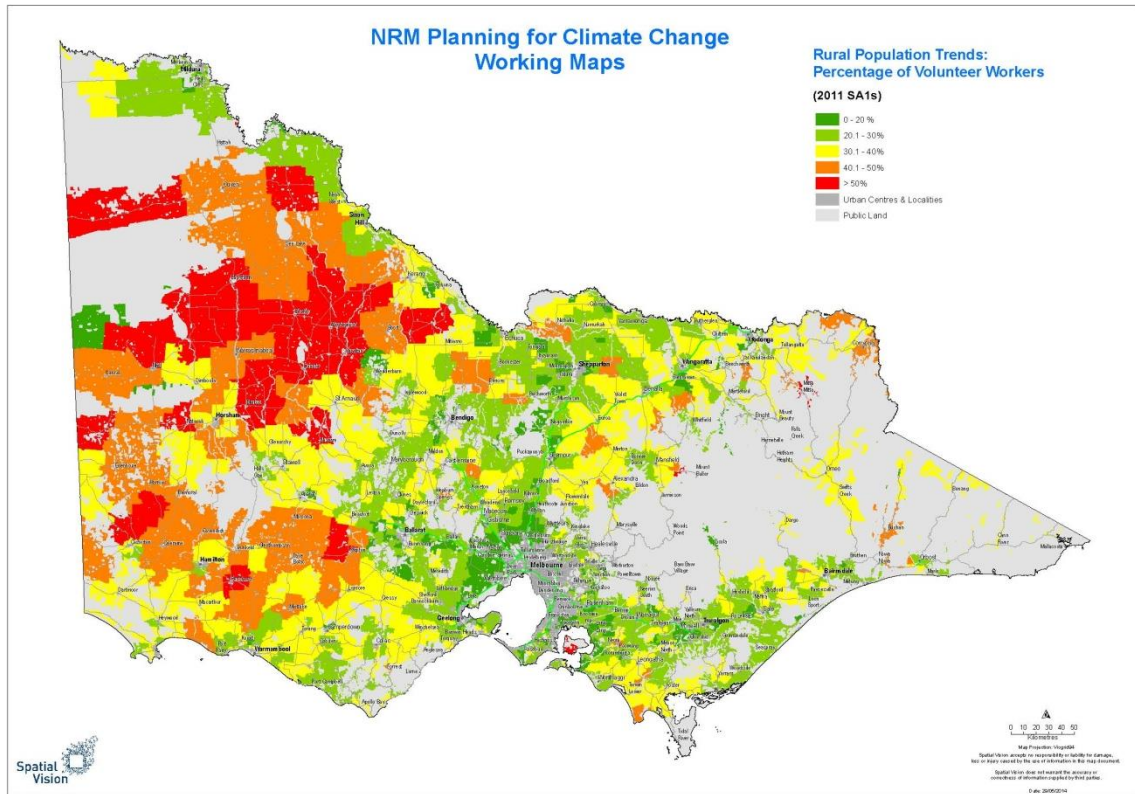**Figure 7.   Percentage Change in Population Aged 35 to 54 Years between 2001 to 2011 (based on SLA time series) – Rural Population Trends**
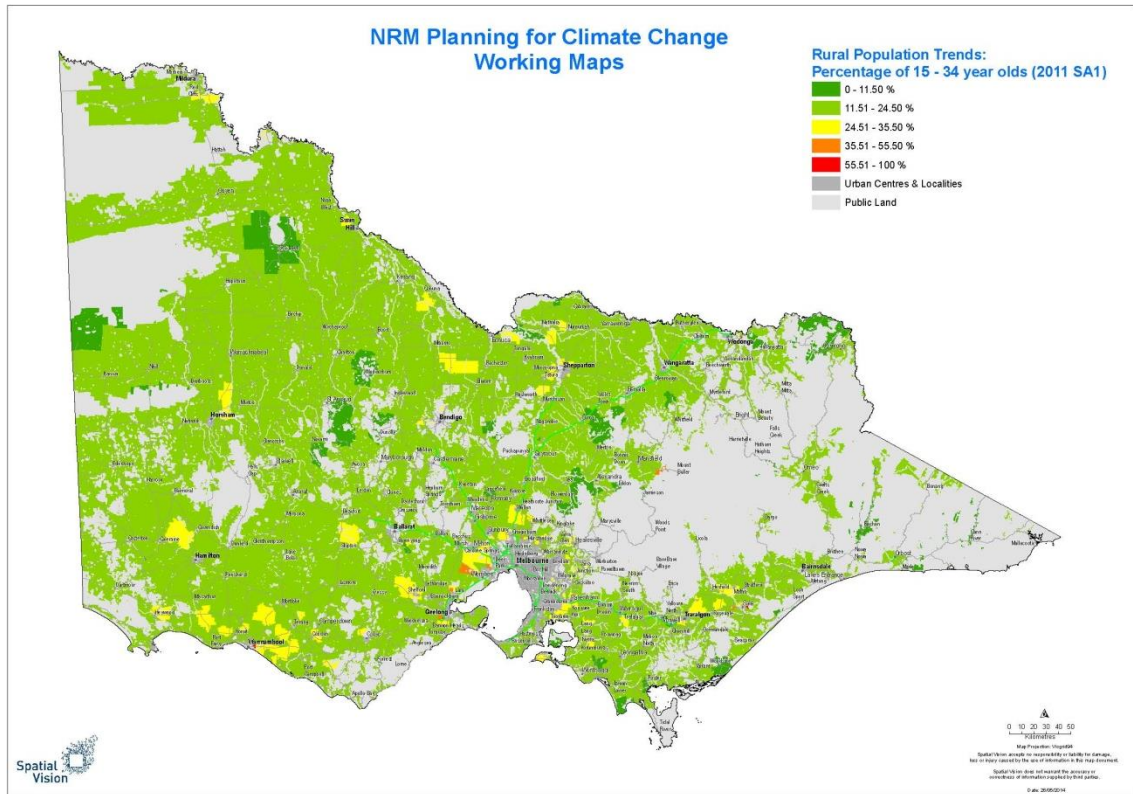
Figure 8.   Percentage of Population Aged less than 35 Years (2011) – Rural Population Trends (SA1)
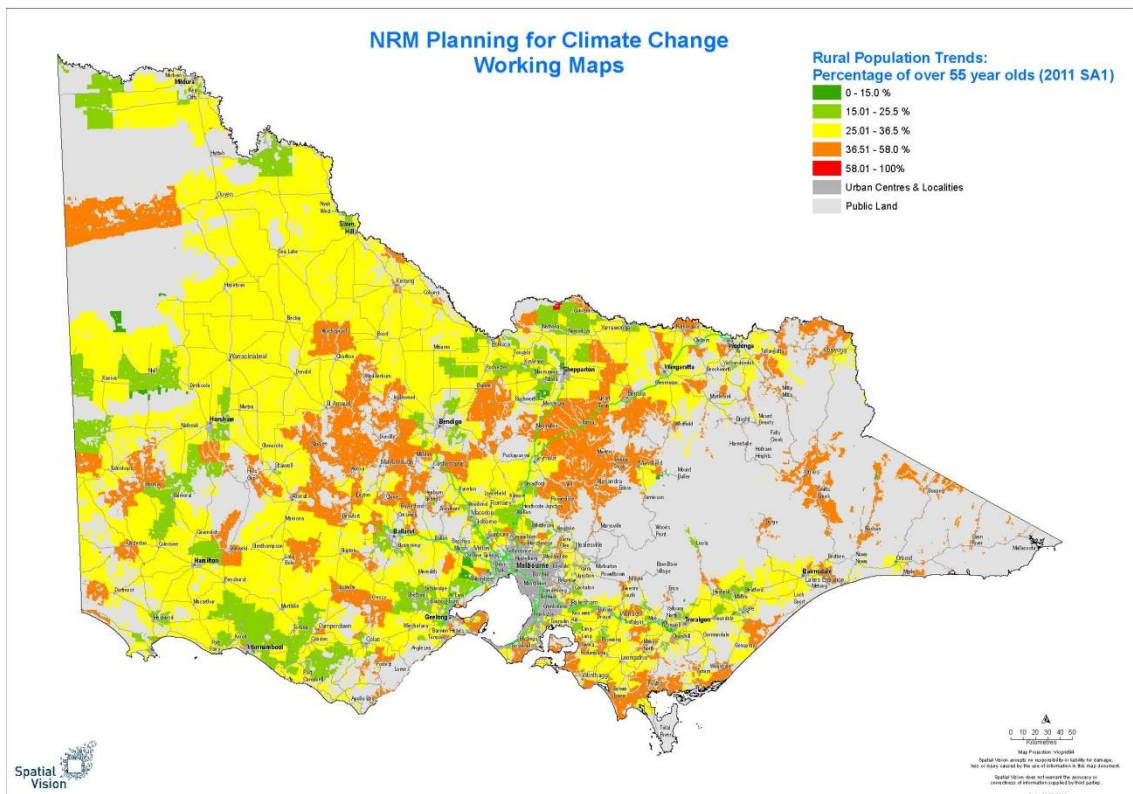
Figure 9.   Percentage of Population Aged greater than 54 Years (2011) – Rural Population Trends (SA1)

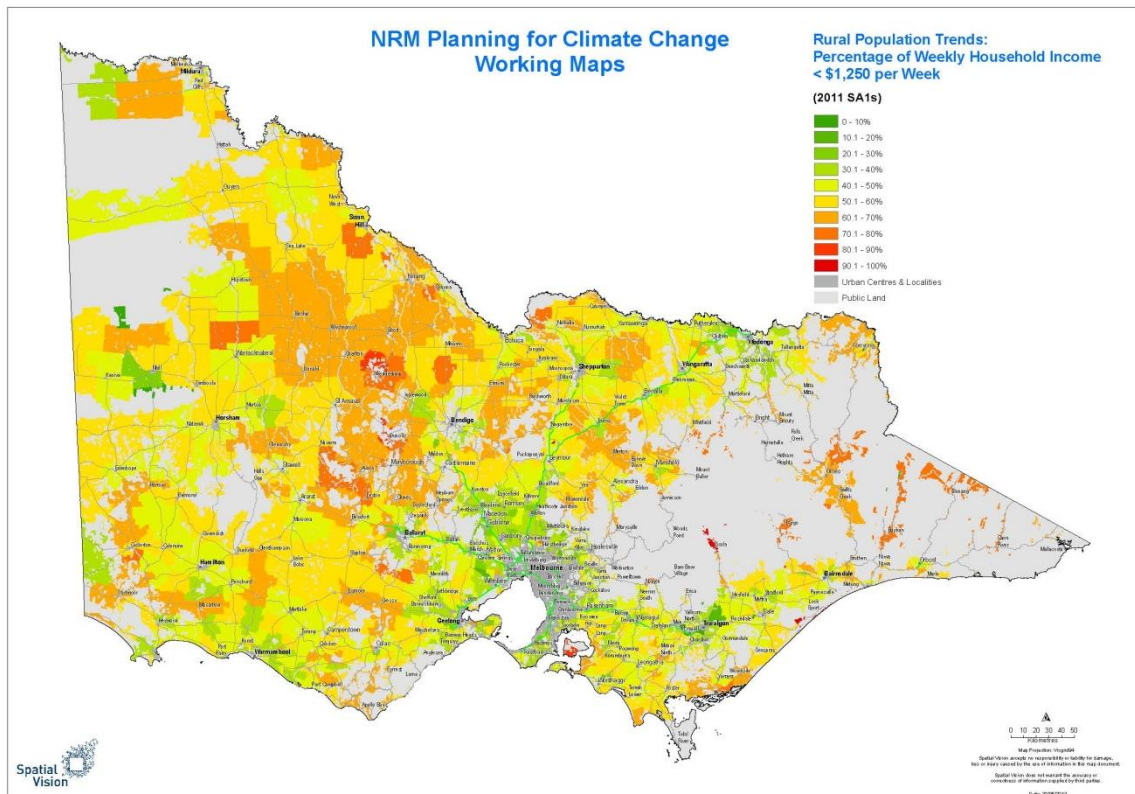**Figure 10.   Percentage of Volunteer Workers (2011) – Rural Population Trends (SA1)**

Figure 11.   Percentage of Population with Weekly Household Income less than $1,250 per week (2011) – Rural Population Trends (SA1)
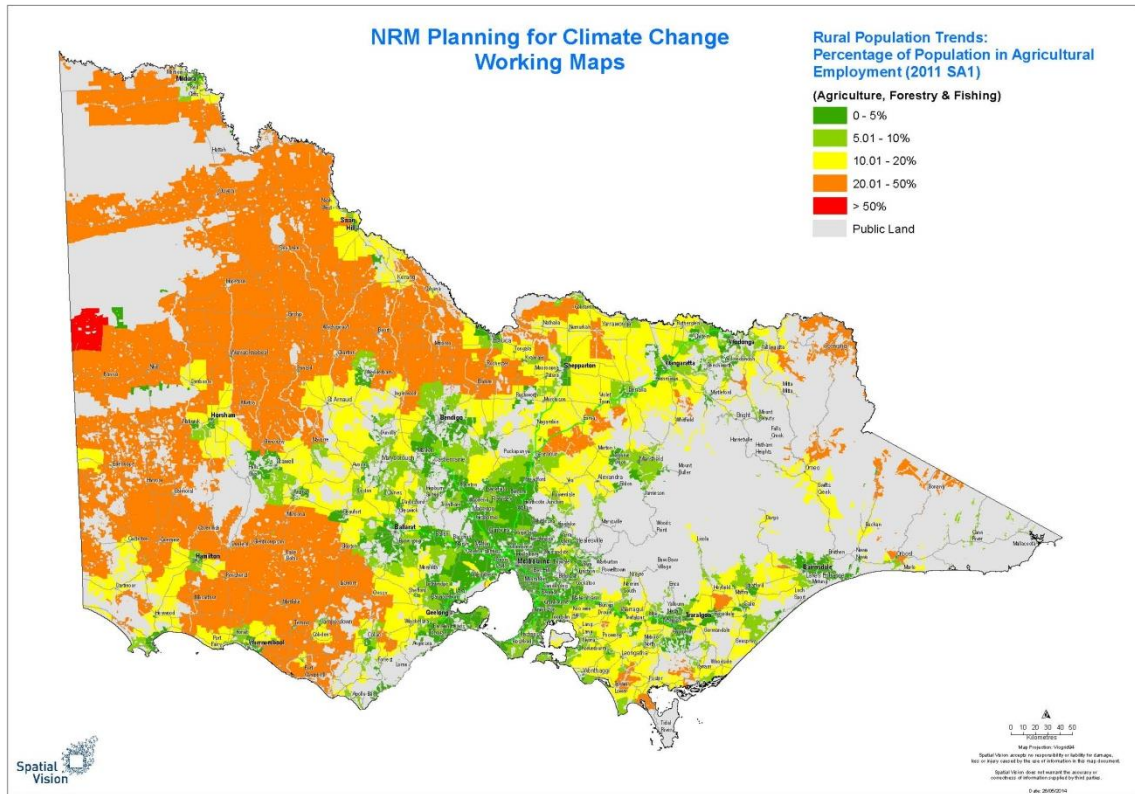
Figure 12.   Percentage of Population Employed in Agriculture (2011) – Rural Population Trends (SA1)
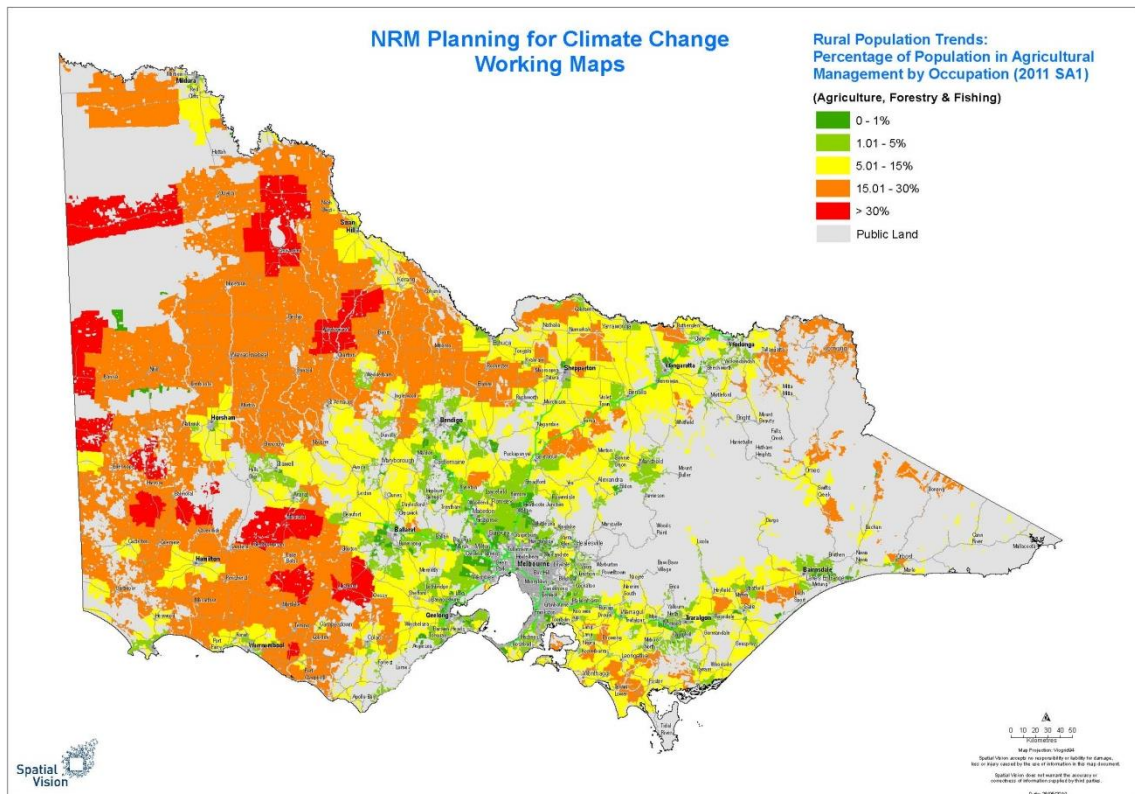

Figure 13.   Percentage of Population Employed in Agriculture that identify to be in Management (2011) – Rural Population Trends (SA1)

Appendix 3:
Simple Spreadsheet Tool to Support Application of Five Step Decision Making Framework

Figure 14. View of Simple Spreadsheet to support Five Step Decision Making Framework

	Asset	Asset type	Vulnerability	Priority	Management objective	Progress to prioritisation	Adaptive Capacity attribute 1	Adaptive Capacity attribute 2	Primary response type	Secondary response type	Asset value	Impact of intervention	Adoption	All risks	Lag	Discount factor	Up-front cost	Ma
3	Possible values										1-100	0-1	0-1	0-1	0-100 years		$ million	$ m
4	Lower Avoca grasslands	Native vegetation	High	High		Yes	Site condition	Landscape connectivity	Direct action	Engagement/Extension	50	0.5	0.6	0.4	10	0.61	1	
5	Dundas tablelands	Native vegetation	High	Medium							50	0.3	0.6	0.4	5	0.78	10	
6	Lake Connewarre	Wetland	Moderate	Low		Maybe	AVIRA - reduction in	dominant land use	Direct action	Planning/regulatory	30	0.4	0.5	0.6	10	0.61	3	
7	Lake Murdeduke	Wetland	High	High														
8	Aire River	Estuary	Low	Medium														
9	Thurra River	Estuary	High	Medium														
10	Barwon River	River/stream	Moderate	Medium														
11	Lower Campaspe River	River/stream	High	Medium														
12	Tambo Valley	Land/soils	Low	High														
13	Hopkins H11 & H 12	Land/soils	Moderate	High														
14	Lake Buloke	Wetland	Moderate	Low														

Appendix 4:
Acronyms

Acronyms

AVIRA	Aquatic Value Identification and risk Assessment
BOM	Bureau of Meteorology
CMA	Catchment Management Authority
DEPI	Department of Sustainability and Environment
EVC	ecological vegetation class
GIS	Geographic Information System
IPCC	Intergovernmental Panel on Climate Change
LGA	Local Government Area
NRM	natural resource management
PCG	Project Control Group
PV	Parks Victoria
RCS	Regional Catchment Strategy
SCARP	Southern Slopes Climate Change Adaptation Research Partnership
SV	Spatial Vision