Binjareb Boodja Landscapes 2025

Appendix K

Climate Change

Appendix K: Climate change and management of natural resources

Climate change in the Peel-Harvey Catchment is real (CSIRO & BOM, 2007) and it is essential that it be factored into the prioritisation and planning of all NRM activities in the Catchment.

This appendix provides examples of how our current understanding of climate change may influence future NRM planning and prioritisation in the Catchment. It complements Sections 5.2.2 to 5.2.5 of *Binjareb Boodja Landscapes 2025* which outline some of the major changes and implications of climate change for various natural asset classes.

A detailed discussion of the nature of climate change in the south west of Western Australia, and possible causes, is provided in the work of the Indian Ocean Climate Initiate (e.g. IOCI, 2012).

In general terms, predicted climate change for the south west of Western Australia, including the Peel-Harvey Catchment, is likely to mean (CSIRO & BOM, 2007):

- further increased average temperatures
- further decreases in rainfall
- increased frequency and intensity of storms
- sea level rise.

The future is likely to be hotter, drier with higher sea levels and an increase in the frequency and/or intensity of storms.

These changes in climate are predicted to have a significant, direct impact on the availability, location and condition of natural resources, particularly water resources and biodiversity.

They also have significant implications for where and how development should occur across the Catchment, especially near coastal, estuarine and bush-fire prone areas.

Natural resource managers, including the PHCC, need to factor into their prioritisation and planning the considerations and measures that are required to:

- assist natural resources to adapt to changes in climate, and
- assist communities to be more resilient to the effects of climate change.

These two aims are often inter-related, and programs/projects that seek to assist natural resource adaptation may also assist communities to be more resilient to the effects of climate change.

Whilst climate change is occurring at the regional and higher scales (e.g. global), the consideration of climate change in regional NRM should occur at every level of planning and implementation - regional, local and site scales.

The following brief case study provides examples of predicted climate change can be factored into biodiversity conservation planning and works.

Case study: Factoring climate change into biodiversity conservation

In recent years, a number of studies have provided information to assist prioritisation, program development and planning of projects in the Catchment which aim to conserve biodiversity:

National level

- *Implications for policymakers: Climate Change, biodiversity conservation and the National Reserve System* (national scale study) (Dunlop *et al*, 2012) - A landmark regional analysis of the impacts of climate change on Australia's biodiversity and National Reserve System (NRS) undertaken by CSIRO.

Regional and cross-regional

- SWCC Climate Change Project, *Bioclimatic Projections & Landscape Linkages Review* (Neville, 2014a) – A study for SWCC, including the Peel-Harvey Catchment, which includes:
  - Species distribution modelling (conducted by Ben Ford of the Centre of Excellence in NRM)
  - An assessment of the protection of biodiversity under existing land tenure
  - An assessment of landscape linkages, including those ecological linkages presented in Binjareb Boodja Landscapes 2025
  - Climate impacts on biodiversity, including refugia status of existing natural areas
  - Critical conservation areas, priorities for protection.

- Adapting to Climate Change in the Peel Region – improving local government emergency management and biodiversity conservation areas (PHCC, 2012).

Regional-scale information to inform biodiversity conservation

The technical and spatial analysis and modelling conducted as part of the SWCC *Planning for Climate Change* Project (the Project) provide a solid basis from which to assess priorities and develop potential projects to conserve biodiversity. This information has been produced with a clear consideration of climate change impacts on biodiversity.

Some of the Project's outputs, especially maps, that could assist in integrating climate change considerations into planning and projects with a biodiversity conservation objective include:

- Areas of high biodiversity value/ conservation value (as in Figure 5 of Neville, 2014b; Project Component 3)
- Criteria/program logic to determine location of recommended biodiversity plantings (as in Figure 6 of Neville, 2014b, Project Component 4)
- Areas defined as High Conservation Values using the 15% threshold (as in Figure 46 of Neville, 2014b)
- Protection afforded to natural areas under existing tenure (as in Figure 2, Component B2 Output of Neville, 2014a)
- Plant refugia map (as in Figure 13 of Neville, 2014a)
- Animal refugia (as in Figure 15 Neville, 2014a)

- Plant shift range as modelled by CENRM (as in Figure 20, of Neville, 2014a) and reproduced below (Figure 1)
- Analysis of ecological linkages and comparison with ecological linkages proposed in *Binjareb Boodja Landscapes 2025* (as in Figures 29 and 30, Component B3 of Neville, 2014a)

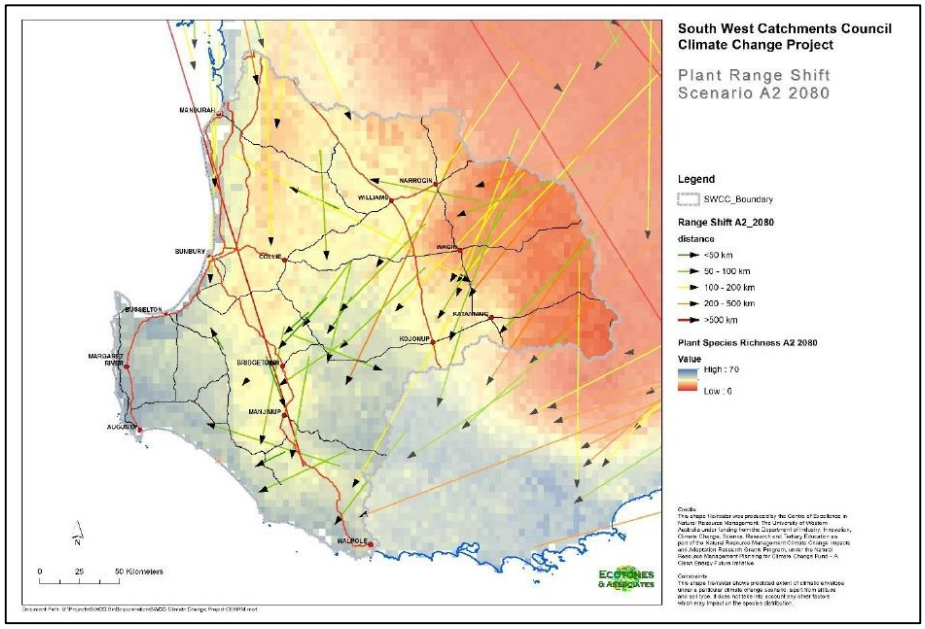

Figure 1: Plant shift range for south-west Australia as modelled by CENRM (Neville, 2014a)

Practical considerations for planning and prioritising projects to conserve biodiversity

In light of the new information provided by the SWCC *Planning for Climate Change* Project (the Project), the following preliminary guidance is provided to assist in the planning and prioritising of projects that have a biodiversity conservation objective. The guidance is general in nature, non-hierarchical and should be used as part of a wider decision-making framework.

- Factor in climate change considerations for the earliest possible stages of program and project development. This requires an understanding of the likely implications of climate change on the natural resources being targeted. Plan and prioritise accordingly.
- Ensure the program/project contributes towards landscape-scale changes or objectives, including consideration of shifts of plant and animal ranges. Plan and prioritise accordingly
- Ensure that the program/project maximises returns for ecological connectivity. For example, ecological linkages as in Figure 2 below, reproduced from Neville, 2014a, page 30. Have a long term plan for maintaining and restoring regional-scale ecological connectivity. Commit to the plan accordingly.
- Consider how projects address multiple habitats and bio-climes within project sites or suites of sites. For example, consider ecological connectivity between wetland and upland habitats at various scales. Plan projects accordingly.
- Consider how the program/project supports natural areas that act as refugia for plants and animals. Prioritise and plan accordingly.

- Factor in shifts in the ranges of plant and animals into revegetation species selection and habitat restoration. Get expert advice when considering planting of non-local species. Plan accordingly
- Consider the predicted contraction of wetland areas, and increased seasonality of watercourses in program and project development. Prioritise and plan accordingly.
- Factor in fire and fire management into the management of selected natural areas, and the planning of areas under restoration and revegetation. Response to fire is of increasing importance as fire frequency/intensity is predicted to increase. Plan accordingly.

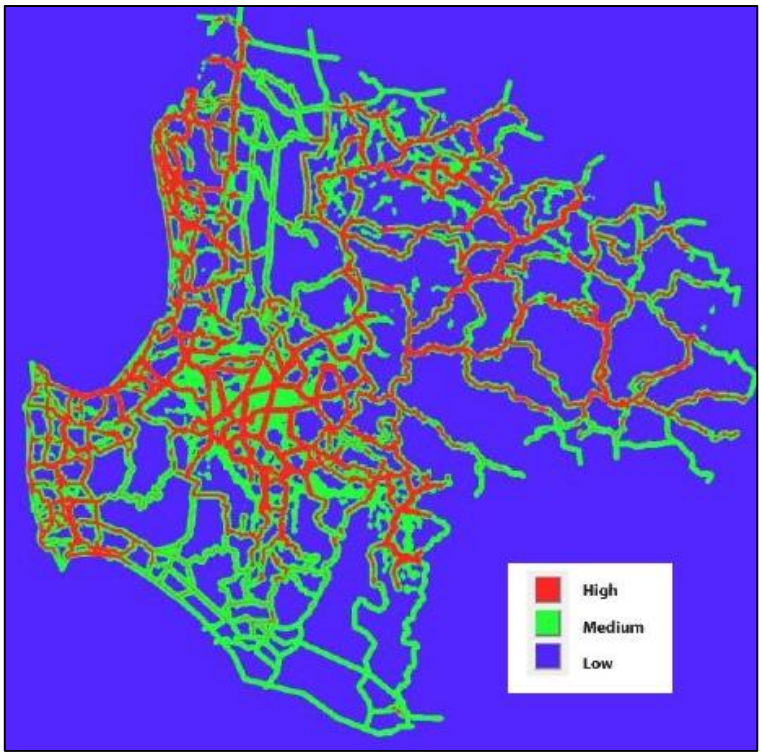

Figure 2: Analysis of regional ecological linkages. High, medium, low rating indicates relative value of linkage for ecological connectivity (Neville, 2014a)

Other climate-related considerations for NRM planning and delivery

The above case study demonstrates how comprehensively climate change may influence biodiversity conservation programs and projects.

The following is designed to present a sample of the range of climate-related considerations that should be factored into other types of NRM activities or NRM –related activities.

1. **Land use planning**
   Land use planners, including town planners should have a broad understanding of the main implications of climate change as related to their planning jurisdiction. For example, the implications for the siting of new developments, coastal and estuarine setbacks, conservation of biodiversity, management of protected natural areas and fire response requirements.

2. **Fire management**

   Given that the frequency and intensity of fires is predicted to increase, NRM planners should ensure that fire management is a priority consideration in all projects which restore natural areas or include revegetation. Strategic fire-breaks and access may assist in improving safety and reducing the impact of planned and unplanned fire. Greater communications between NRM practitioners and Fire and Emergency Practitioners should occur. Access to contingency budgets should be considered to manage post-fire areas for erosion, weeds etc.

3. **Coastal projects**

   The retention and protection of wider foreshores and coastal vegetation is of increased importance given predicted sea level rise and greater intensity of storm surges. This has implications for beach access and infrastructure placement. Consideration should also be given to putting place monitoring programs to assess long-term changes to coastal areas that may be attributed to climate change (changes over decades). The work of the Peron – Naturaliste Partnership should be useful in integrating climate change into coastal and estuarine NRM projects (http://peronnaturaliste.org.au/).

4. **Estuarine projects**

   Estuarine foreshores and peripheral wetlands are predicted to shift upslope with sea level rise. Wider foreshore reserves and buffers should be provided to ensure native vegetation can shift and adapt to changes and continue to protect banks. Infrastructure should be planned for movement of estuarine foreshores and peripheral wetlands. The restoration and revegetation of estuarine foreshore wetlands should consider long-term changes in tidal ranges. The work of the Peron – Naturaliste Partnership should be useful in integrating climate change into coastal and estuarine NRM projects (http://peronnaturaliste.org.au/).

5. **Biodiversity conservation/revegetation**

   Discussed in case study above.

6. **Weed and disease management**

   Climate change may change the competitiveness of established introduced species. New weeds may emerge, others may become less problematic. Consider contingencies in projects to control increased weed cover and disease spread that may occur as a result of summer rainfall or other unpredictable seasonal conditions.

7. **Soils, erosion control and sustainable agriculture projects**

   Predicted increased summer rainfall may have implications for soil erosion and the protection of watercourse bed and banks. This may be a consideration for greater monitoring and evaluation of the effects of summer rainfall events and storm events at key benchmark sites across the Catchment.

References used in Appendix K

Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Bureau of Meteorology (BOM) 2007, *Climate Change in Australia*, http://www.climatechangeinaustralia.com.au/index.php.

Dunlop M., Hilbert D.W., Ferrier S., House A., Liedloff A., Prober S.M., Smyth A., Martin T.G., Harwood T., Williams K.J., Fletcher C., and Murphy H. (2012) *The Implications of Climate Change for Biodiversity Conservation and the National Reserve System: Final Synthesis.* A report prepared for the Department of Sustainability, Environment, Water, Population and Communities, and the Department of Climate Change and Energy Efficiency. CSIRO Climate Adaptation Flagship, Canberra.

Indian Ocean Climate Initiative (2012) *Western Australia's Weather and Climate: A Synthesis of Indian Ocean Climate Initiative Stage 3 Research*. CSIRO and BoM, Australia. Editors: Bryson Bates, Carsten Frederiksen and Janice Wormworth.

Neville, S. (2014a). *SWCC Climate Change Project, Bioclimatic Projections & Landscape Linkages Review.* Consultant's report for South West Catchment Council Inc. Ecotones & Associates, Denmark., WA.

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Limitations of

Peel-Harvey Catchment Council (2012), *Adapting to climate change in the Peel region: Improving local government emergency management and biodiversity conservation services*, a report by Kim Byrnes to the PHCC, edited by Andrew Del Marco, Mandurah, Western Australia.