Opportunities for Ecological Adaptation in Tasmania

Report Prepared for The Tasmania Wilderness Society

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Introduction

1. This paper reviews ecological considerations in Tasmania and provides recommendations for adaptation of natural ecosystems, in particular forests, wetlands, watersheds and inshore coastal areas, under the Tasmanian National Climate Change Adaptation Framework (2008) and the Draft Climate Change Strategy for Tasmania (2006). It briefly identifies main vulnerability to climate change and proposes opportunities for adaptation adjustment to climate change of natural landscapes\(^1\) for managing landscapes and populations. The paper aims to support the implementation of relevant actions from the National Biodiversity and Climate Change Action Plan in Tasmania, which represents a relatively high biodiversity area and forestry prominent economy in Australia (DCC 2009).

Climate change and ecological vulnerability in Tasmania

2. A judicious review of literature on the different scenarios for temperature, precipitation and sea level suggests that significant loss of biodiversity is projected to occur by 2020 in some ecologically rich sites of with a major threat to alpine forest, marine and coastal (from warmer oceans and rising sea level) and wetland ecosystems (see. Nicholls 2006; Nicholls and Collins, 2006; Hennessy et al. 2007; IPCC 2007; DCC 2010).\(^2\)

3. The IPCC (2007) and National Biodiversity and Climate Change Action Plan report a number of key impacts of climate change, which now prompts re-assessment of existing conservation policy frameworks in Tasmania. The main concern is that changing temperature and precipitation regimes is already altering an extensive range of biological processes and patterns within State national reserves, parks and of species populations and habitats.

4. With a high degree of endemism (80 to 100% in many taxa) of flora and fauna in Tasmania, many species are at risk from rapid climate change because they have restricted geographical and climatic tolerance ranges on island ecosystems. While most species are well-adapted to stochastic short-term climate variability, they are weak to longer term shifts in mean climate and increased frequency or intensity of extreme events.

5. It is likely that the relative contributions of other factors such as changes in fire regimes and land use together with the natural variation will further increase the vulnerability of wild landscapes as well as the composition and location of vulnerable ecosystems.

Key Considerations for Ecological Adaptation

\(^1\) Adaptation of natural landscapes is key ecosystem management and wild country approach principles and for a dynamic product of biophysical and socio-cultural drivers that interact across different scales in Tasmania.

\(^2\) Modelling suggests an increase in annual national average temperatures of between 0.4° and 2.0°C by 2030 and of between 1.0° and 6.0°C by 2070 — with significantly larger changes in some regions by each date (DCC 2010). By 2100 the IPCC best estimates of global average temperatures suggest an increase by 2.2°C under the lowest and highest modelled emissions scenarios (IPCC 2007). Alternatively, the CSIRO and Bureau of Meteorology projections of Australian temperatures in 2070 show a difference in best estimates of 1.6°C under the same scenarios (CSIRO 2007).
6. Stemming from scientific projections for Australia is a growing body of empirical evidence that documents a range of climate-attributed impacts including altered species distributions and key ecological vulnerability as relevant to Tasmania. These can be summarized as follows:

- Encroachment by snow gums into sub-alpine grasslands at higher elevations (see Wearne and Morgan 2001)
- Increased penetration of feral mammals into alpine and high sub-alpine areas and prolonged winter presence of macropods (Green and Pickering 2002)
- By 2030, about 97% reduction in core habitats of Wet Tropics endemic vertebrates (Williams et al. 2003)
- An increased mortality of burrowing petrels, increased invasions by disturbance-tolerant alien plants such as *Poa annua*, increased abundance of existing rats, mice and rabbits on islands, and reduced distribution of *Sphagnum* moss (see Bergstrom and Selkirk 1999; Frenot et al. 2005).

7. Most vulnerable are small, isolated species populations (e.g. butterfly species see Beaumont and Hughes 2002) and reserve areas that occur along-side agricultural areas. Bioclimatic modelling studies generally project reductions and/or fragmentation of existing climatic ranges (see Nicholls 2006). Climate change will also interact with other stresses such as invasive species and habitat fragmentation. Empirical studies on climate change and conservation from other locations also suggest possible disturbance and facilitation of species range shifts within protected areas, that may similarly affect the fate of mammalian and bird populations in Tasmania (see Rinnan et al. 2007; Lenoir et al. 2008)

8. For many natural ecosystems, impacts have limited reversibility and narrow coping range\(^3\). Opportunities for autonomous and planned adaptation opportunities for offsetting potentially deleterious impacts are often constrained by fixed habitat regions of natural ecosystems (e.g., the Wet Tropics, upland rainforests and the alpine zone in Tasmania).

**Recommendations for adaptive capacity and ecosystem management**

9. **Science:** The most common adaptive strategy for vulnerable conservation areas is to provide corridors to facilitate migration of species in static protected areas under future warming (see Pressey et al. 2007; Hannah 2008; Phillips et al. 2008). Other conservation adaptation options could include expanding existing protected areas, implementing migration corridors and managing matrix areas (Williams et al. 2008). Opportunities to use protected areas and reserves to address climate change is examined by Dudley et al. 2010, which provides practical ways to integrate conservation strategies within national and local climate mitigation and adaptation plans.

10. **Science:** In the context of climate change, facilitating corridors, stepping stones and dispersal pathways not only improve interconnectedness of natural systems, but also assists in active

\(^3\) The Federal Government’s position paper on Adapting to Climate Change suggests from conclusions of IPCC 4th assessment report that even if adaptive capacity is realised for natural ecosystems, vulnerability becomes significant for 1.5 to 2.0°C of global warming (DCC 2010).
intervention in increasing genetic diversity (through species potentially able to migrate and breed through networks of protected areas in response to changing climatic conditions). This however will require changes in land use practices (e.g. forestry, infrastructure and housing) in the three regions of the State, the need for holistic landscape approaches that maintain ecosystem functions (e.g. watershed services, buffer zones, coastal/fire defenses) with mobilization of economic resources, although some schemes to promote such connectivity are already under way in certain reserves\(^4\). In addition a great advantage of expanding networks and recognizing management within national reserves and parks is the protection of carbon stores - by protecting old-growth forests and avoiding ground disturbance, high value carbon storage in forests can be facilitated (see Dudley et al. 2010).

11. **Science:** Another strategy is translocation of species or managed relocation. This is a very expensive measure, but it may be considered desirable for some iconic, charismatic or particularly vulnerable species (e.g. Tasmanian Devil).

12. **Management:** Integrated risk and vulnerability assessments and researches (qualitative and quantitative studies on impacts and adaptation) are needed to include both climatic and non-climatic pressures to identify sensitive hotspots as well as pressures on declining endangered species (e.g. weeds, diseases and feral animals). These researches *inter alia* with the National Climate Change Adaptation Research Facility and associated research networks have the value to generate the right information for local decision-makers required to manage the risks of climate change impacts in critical areas.

13. **Management:** Risk analysis focusing on integrated analyses of for example the built environment, energy, ecosystem services and water resources is useful for mainstreaming management actions at within the Regional Planning Initiatives and at the local government level (e.g. risk assessments can inform conservation activities in coastal parts of national parks and reserves). Ecological risk analytic evaluations tools (e.g. benefit-cost analysis) also need to take account of economics for assessing costs of planned adaptation options, such as, incorporating climate change and adapted for local and regional application

14. **Policy:** Improve policy, planning and governance linkages between the various strata of government from State to local, regarding adaptation policy, plans and requirements (Coleman 2004). Stronger guidance and support are required from state government and is essential to underpin efforts to promote local adaptation and reduce non-climatic pressures for highly biodiverse areas (e.g. deforestation in rainforests).

15. **Policy:** There is a wider need for policy frameworks to integrate the monitoring of impacts to recognise what is changing and where (for example, assisted migration, dynamic reserves). While existing monitoring programs could integrate this aspect, ‘programs specifically targeted to assessing the impacts of climate change would support the most effective adaptation responses possible under highly uncertain circumstances’ (Hagerman 2009).

**Conclusion and Key Message**

\(^4\) The challenge of increasing resilience of natural ecosystems is multi-dimensional. There are different and various dimensions that should be examined adapting conservation policies such as the role of disturbance in mediating species transitions and consideration of revised conservation objectives (for example see Heller and Zavaleta 2009).
16. The overall conclusion that can be drawn from scientific reports is that climate change is likely to add to existing stresses to the conservation of terrestrial and aquatic ecosystems and to achieving sustainable land use in Tasmania. While State specific studies are lacking, key likely impacts to natural ecosystems include damage to coral reefs, coasts, rainforests, wetlands and alpine areas. This will increase disturbance and loss of biodiversity, including possible extinctions, changed species ranges and interactions and loss of ecosystem services (e.g., for tourism and water).

17. Climate change vulnerability of ecologically and high biodiverse areas in Tasmania requires consideration of new means and revised objectives and expectations for adaptive conservation frameworks beyond the realm of conventional proposals for expanding protected areas and landscapes. The current climate change strategies and frameworks weakly identify adaptation options for highly biodiverse areas. Adaptation options should consider a mixture of the conventional set of means (e.g. expand protected areas) as well as new *priori* biodiversity targets under scientifically projected scenarios and changes for natural ecosystems.
Reference


