How Australian legislation can consider climate change in ecological impact assessment

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ABSTRACT

Climate change will exacerbate the suite of existing threats to biodiversity posed by human activity. While climate change considerations are currently incorporated into aspects of coastal land use planning in New South Wales, little effort has been made to include climate change considerations into the assessment of biodiversity impacts for development activities elsewhere. The legislation from which current ecological assessment procedures originate (e.g. the NSW *Environmental Planning and Assessment Act 1979* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)) predates the recognition of climate change as a major threat to biodiversity and they need to be adapted to respond to climate change pressures on biodiversity. Here it is recommended that species sensitive to effects of climate change should be included on threatened species lists under the NSW *Threatened Species Conservation Act 1995* and the EPBC Act. An assessment procedure for incorporating these species into ecological impact assessment is suggested. The ability to provide for climate change adaptation for such species through mitigation and compensatory measures is also explored.

Key words: climate change; biodiversity; ecological impact assessment; legislation; mitigation

Introduction

Climate change is considered to be the world's most urgent environmental, economic and social issue (McAlpine *et al.* 2010) and is studied intensively at the regional and global policy-setting levels (Byer *et al.* 2009). The Third Assessment Report of the Intergovernmental Panel on Climate Change (Intergovernmental Panel on Climate Change 2007) concluded that Australia would be vulnerable to the changes in climate that are projected to occur over the next 100 years due to the natural climate variability, inherent dryness of the continent, and the pattern of human settlement in low lying coastal areas. These climate changes are considered to represent a new threat to biodiversity that will exacerbate the suite of existing threats posed by humans such as habitat loss and fragmentation, pollution, invasive species, and over harvesting (Sala *et al.* 2000, Thomas *et al.* 2004, Dunlop and Brown 2008). In Australia, increased temperature, altered rainfall patterns, changes in the frequency, timing and severity of extreme weather events, rising sea levels, increased sea-surface temperatures and ocean acidification are likely (Intergovernmental Panel on Climate Change 2007). As the distribution of most species, populations and communities is influenced by climate, many species could be adversely affected by climate change unless they are able to move widely across the landscape (Hughes and Westoby 1994, Hughes 2003, Pearson and Dawson 2003, Chambers 2006). While climate change is recognised as a threat to biodiversity in the scientific literature, this is not adequately reflected in current framework of the New South Wales (NSW) and Commonwealth legislation requiring Ecological Impact Assessment (EcIA) for development proposals.

Previous strategies (e.g. Department of Environment and Climate Change NSW 2007, NSW Inter-agency Biodiversity and Climate Change Impacts and Adaptation Working Group 2007) have included some adaptation strategies dealing with climate change impacts on biodiversity on private land. However, their priority focus areas were building and managing the reserve system. Despite the continuing focus on public land, it is recognised that the national reserve system must be enhanced by more effective off-reserve conservation and that public land alone is not able to provide protection to all ecosystems under the impacts of climate change (Steffen *et al.* 2009).

Climate change should be a mandatory consideration in EcIA. However, our current legislative system does not require assessment of impacts under future climate change scenarios: incorporating climate change considerations into decision-making would mean adjustment of the current state and federal legislation that governs the conservation of biodiversity. One way of doing this might be to change legislation via the consideration of 'climate sensitive' aspects of biodiversity. This paper provides a method of interpreting the impacts of a development on climate sensitive biodiversity. Changes to our current thinking on impact mitigation are also suggested. Through the improvement of existing land-use planning and development controls to account for climate change, EcIA has the potential to play an important role in the conservation of biodiversity outside of conservation reserves in the face of a changing climate.

Pp 144 - 149 in *Wildlife and Climate Change: towards robust conservation strategies for Australian fauna*, edited by Daniel Lunney and Pat Hutchings, 2012. Royal Zoological Society of NSW, Mosman, NSW, Australia.

Ecological Impact Assessment – Its current status in the NSW system

Preservation of resilient ecosystems is an important goal of planning and development, being essential to support ecological functions essential for ecologically sustainable development (ESD) (Rookwood 1995, Beatley 2000, Lofvenhaft *et al.* 2002, Kim and Pauleit 2007, Mortberg *et al.* 2007). Article 14 of the Convention on Biological Diversity calls for each contracting party to introduce appropriate Environmental Impact Assessment (EIA) procedures to avoid and minimise human impacts to the environment (United Nations 1992). Environmental Impact Assessment (EIA) is recognised globally as an important decision tool and is embedded in the decision-making processes for projects that are likely to involve substantial environmental impacts in Australia (Glasson *et al.* 1999, Janssen 2001, Elliot and Thomas 2009).

Ecological Impact Assessment is a sub-discipline of EIA that is used to identify, predict and evaluate the impacts of proposed actions on ecosystems or their individual components (Treweek 1996, 1999, Wale and Yalew 2010). Means to mitigate impacts and/or compensate for residual impacts are also an integral part of EcIA. Designed as a scientifically defensible approach to ecosystem management, EcIA is based on ecological science; however, it is the prediction and assessment of potential ecological impacts that is the crucial component of EcIA and the aspect that distinguishes EcIA as separate from the science of ecology (Treweek 1996). A detailed account of the EcIA process and the typical steps involved can be found in Treweek (1999) and Atkinson *et al.* (2000). Increasingly, EIA is including the assessment of impacts on biodiversity and its conservation and sustainable use, as required under the Convention on Biological Diversity.

In New South Wales (NSW), the principal piece of legislation that governs land use and provides for environmental assessment is the *Environmental Planning and Assessment Act 1979* (EP&A Act) (Elliot and Thomas 2009) which has three assessment pathways:

1. Part 4 – for development that requires consent from local council;
2. Part 5 – for activities that require approval from a determining authority and various forms of development being carried out by the NSW Government; and
3. Part 3A – for a major infrastructure development that must obtain approval from the Minister[1].

Depending on the requirements of the consent or determining authority, each assessment pathway may require EcIA to be performed to determine if there is likely to be an impact on biodiversity resulting from the proposed development or activity. If, through the discretion of the practitioner, there is considered to be a risk of significant impact to threat-listed species, further assessment may be required.

Currently, seven procedures are used in EcIA to assess the significance of human developments and activities on biodiversity in NSW:

1. The assessment of significance (7-part test) (EP&A Act, s5A);
2. Species Impact Statement (SIS) (EP&A Act, Part 6, Division 2);
3. Heads of consideration (EP&A Act, Part 3A);
4. The BioBanking scheme (*Threatened Species Conservation Act 1995* (TSC Act), Part 7A);
5. Property Vegetation Plans (*Native Vegetation Act 2003*, Part 4);
6. Biocertification of Environmental Planning Instruments (TSC Act, Part 7AA); and
7. The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) significant impact guidelines for impacts to matters of national environmental significance.

Each of the procedures listed above form an integral part of any EcIA report for which they are required and require similar levels of investigation. However, the legislation from which these assessment procedures originate predates the recognition of climate change as a key risk to biodiversity (Steffen *et al.* 2009). Consequently, there is a general failure to assess the impacts of human development on biodiversity in the context of climate change. Central to the practice of EcIA is the assessment of significance of impacts on species and communities listed under the TSC Act and the EPBC Act. While *Anthropogenic climate change* and *Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases* have been listed as Key Threatening Processes under the TSC Act and the EPBC Act respectively, it is the listing of threatened biodiversity under these pieces of legislation that is the critical driver for EcIA. In Australia, every EcIA must explicitly consider impacts on threat-listed species. This is therefore a possible entry point for considering climate change impacts in EcIA.

Although the perverse outcomes for biodiversity that may result from threatened species-centric EcIA have been well documented (see Rohlf 1991, Possingham *et al.* 2002, Lunney *et al.* 2004, Bubna-Litic 2008), the way that the current biodiversity assessment and decision making process has evolved is based on the publication of threatened species lists (Lunney *et al.* 2004). Hence, the ability of EcIA to address climate change relies on the listing of species that will be detrimentally impacted by climate change as threatened under legislation. The 2008 review of the EPBC Act suggested that significant changes in policy and management for biodiversity conservation are needed to meet the challenge of climate change (Hawke 2009). Indeed, Hawke (2009) proposed that climate change adaptation issues should be addressed in the EPBC Act by listing species or communities threatened by climate change as threatened species or ecological communities.

1 This has changed since the change of the NSW State government in March 2011.

While some progress towards including climate change adaptation into biodiversity conservation strategies and action statements has been made in NSW (e.g. Department of Environment and Climate Change NSW 2007, NSW Inter-agency Biodiversity and Climate Change Impacts and Adaptation Working Group 2007, Department of Environment Climate Change and Water NSW 2010b), in other Australian states (e.g. QLD Office of Climate Change 2007) and nationally (National Resource Management Ministerial Council 2004), these action plans lack the legislative clout that is required to drive action by proponents of development. These strategies and position statements rely solely on persuasive and political force.

It is well recognised that climate change will have significant impacts on coastal developments and associated infrastructure (McGranahan *et al.* 2007). Consequently, a policy shift towards incorporating climate change considerations in development planning is occurring within the coastal zone (Myers v. South Gippsland Shire Council 2008, Department of Environment Climate Change and Water NSW 2010a, Moore 2010). While the impacts of climate change on human development are a priority for action, however, the impacts of climate change on biodiversity are not currently addressed by development controls or government policy. There is no specific mandate within the legislation to consider climate change adaptation for biodiversity (Argrawala *et al.* 2010). However, climate change risk assessments are increasingly being incorporated into the Australian EcIA process. Argrawala *et al.* (2010) provides an example of one EcIA in the Namadgi National Park in the ACT that considered climate change impacts on the threat-listed Alpine Sphagnum Bogs and Associated Fens ecological community and the Northern Corroboree Frog (*Pseudophryne pengilleyi*), a community and species particularly threatened by climate change. It would appear, however, that consideration of climate change impacts is restricted to species that are currently listed as threatened under legislation.

What changes are needed if climate change is to be addressed in EcIA?

If ESD is to be achieved in an altered climate, the following are suggested as necessary changes to the current biodiversity protection legislation:

- Listing of climate sensitive species and species of restricted range, diet and dispersal ability (Intergovernmental Panel on Climate Change 2007, Environmental Defenders Office 2009a, b, Hawke 2009) e.g. shorebirds and waders that will suffer from the loss of breeding and feeding habitat due to sea level rise;
- Insertion of climate refuges as a matter of National Environmental Significance under the EPBC Act (Hawke 2009) e.g. areas resistant to drought;
- Listing of populations at the limit of their geographic range to protect advancing populations as they migrate (Environmental Defenders Office 2009a, b) e.g. Black Flying-fox establishing in Melbourne;
- Critical habitat declared that includes possible future distributions of species (Environmental Defenders Office 2009a, b) e.g. suitable habitat southward of current distributions;
- A significant impact trigger for development in important wildlife corridors (Environmental Defenders Office 2009a, b) e.g. the Great Dividing Range;
- Adjustment of endangered ecological communities to include changes that may occur due to climate change (Environmental Defenders Office 2009a, b) e.g. new species associations; and
- Listing of non-native 'climate refugee' species that may migrate to northern Australia from Papua New Guinea or Indonesia and become resident (Chapron and Samelius 2008, Adam 2009, Environmental Defenders Office 2009a, b) e.g. species of bat and birds.

Future biodiversity assessment for developments should include a combination of site-scale assessment and strategic landscape-scale approaches. This will be necessary to take into account planning for ecological processes including pollination, predation, daily movements, and migration that will be imperative to maintain under an altered climate, rather than static patterns of current distributions (Pressey *et al.* 2007). It is unlikely that a single site scale assessment will capture future distributions of species. A good example of how a landscape-scale spatial planning approach can be used to implement adaptation measures to climate change for conservation planning is provided in Vos *et al.* (2010).

Assessment questions to determine impacts on climate sensitive species

While uncertainty surrounds the future impacts of climate change (Intergovernmental Panel on Climate Change 2007, Vos *et al.* 2010), we know that there will be detrimental consequences for biodiversity. Adaptation to climate change is about making decisions for possible future outcomes that involve a considerable amount of uncertainty (Beaumont *et al.* 2007, Vos *et al.* 2010), so the degree to which the climate will warm under different climate change scenarios should not matter for EcIA. Assessment should be focused on species that are the most sensitive to climate change and therefore likely to be affected at the lower end of climate change scenarios (Howden *et al.* 2003).

The Standing Committee on Natural Resource Management (Climate Change) (2009) suggests that the risk of a species declining or disappearing under climate change may be increased if the species has:

- Immobile or sedentary habits – species unable to move to more suitable habitats are at risk of extinction due to climate change;
- A limited geographic distribution – species with restricted distribution due to edaphic or landscape limitations are likely to decline due to climate change if these features are not replicated or available in the projected southward or upward distributional ranges of the species; and

- Poor dispersal capacity – the likely ability of species to track changing climate by southward and upward migration is constrained.

Additionally, species experiencing decline caused by other non-climatic threatening processes are less likely to be resilient to climate change impacts (Sala *et al.* 2000, Dunlop and Brown 2008). Consequently, assessment of immobile or sedentary species, species with limited geographic distribution, and species with poor dispersal capacity should occur in EcIA.

The Secretariat of the Convention on Biological Diversity (2009) states that current available impact assessment guidelines can be used to assess risks to biodiversity from climate change; however, further development and validation of tools is necessary. Like what currently occurs with the '7-part test' of significance under the TSC Act or the significant impact guidelines under the EPBC Act, a set of questions needs to be developed to assess impacts to biodiversity in an altered climate. The questions posed below are not new; they are based on well-established ecological principles that form the basis of current thinking in conservation science. The suggested assessment questions are as follows:

- Will the proposed action prevent adaptation and/or resilience of the species, population or ecological community (e.g. by contributing to existing threats or by degrading ecosystem health)?
- Will the proposed action impact on connectivity either at the local, landscape and/or ecosystem scale?
- Will the proposed action impact on migration corridors?
- Will the proposed action impact on past or future climate refugia (e.g. mountain tops, permanent wetlands, areas with a variety of landforms)?
- Will the proposed action impact on those species or groups of species responsible for maintaining ecological function and ecosystem processes (e.g. apex predators)?

Mitigation and compensatory measures can offer an opportunity to aid in climate adaptation

Climate change can only be mitigated effectively through reducing greenhouse gas emissions and by removing greenhouse gases already in the atmosphere via establishment of sinks (Intergovernmental Panel on Climate Change 2007). However, measures to allow species to adapt to climate change must be set in place. Ecological impact assessment, like the broader environmental assessment process, should consider the means to adapt to climate change and the means to mitigate climate change through the life cycle of a project (Byer *et al.* 2009). Wilson and Piper (2008) state that there should be a focus on implementing adaptation measures that reduce species vulnerability *in situ* by increasing ecosystem resilience and also by accommodating change. Restoring degraded ecosystems to improve ecosystem services delivery and safeguarding links across climatic gradients to enable species range shifts are important components of adaptation (Vos *et al.* 2010). It is also recognised that climate change is likely to result in novel ecosystems without past analogues, which will create new challenges with using current accepted best practice approaches to restoration ecology (Hobbs and Cramer 2008). Planning and maximising opportunities for adaptation to climate change means addressing the anticipated effects at policy and landscape planning levels, as well as at project level through site-scale assessment. While the ideas presented below would require a considerable amount of money, political will, shifts in current thinking and conventions on ecosystem restoration, and in some cases a certain amount of risk, these mitigation and compensatory measures may provide opportunities to enhance the adaptation of species to climate change and can readily be incorporated into consent conditions for development. Suggested measures to aid in climate change adaptation are as follows:

- Reconsider the use of local provenance plant species in revegetation (Maciver and Wheaton 2005, Harris *et al.* 2006, Millar *et al.* 2007, Environmental Defenders Office 2009a, b). Plant genotypes (e.g. *Eucalyptus crebra* Narrow-leaved Ironbark, *E. moluccana* Grey Box, *E. tereticornis* Forest Red Gum, and *E. saligna* Sydney Blue Gum) from Queensland may be better suited to plant in New South Wales and Victoria;
- Considering future climate change when incorporating mitigation measures into developments (e.g. designing fauna underpasses in coastal areas to allow for dry passage under a variety of climate change scenarios);
- Translocation of species that will not survive *in situ* may become a more viable option as their bioclimatic envelope shifts (Pearson and Dawson 2005, Harris *et al.* 2006, Hoegh-Guldberg *et al.* 2008, Environmental Defenders Office 2009a, b); and
- Creating corridors across climatic gradients to enable range shifts (Halpin 1997, Noss 2001, Vos *et al.* 2008, Environmental Defenders Office 2009a, b) instead of focusing on like for like vegetation offsets in the same catchment.

Conclusions for future EcIA in a changing climate

For the current threat-centric discipline of EcIA to contribute to off reserve conservation of species in the face of climate change, a fundamental change in legislation and consent conditions placed on developments needs to occur. Despite the problems that arise with the publishing of threatened species lists, the ability of EcIA to address climate change could be enhanced immediately by listing 'climate sensitive species' as threatened under the existing legislation. The changes to legislation suggested here are necessary if progress is to be made towards lessening the impacts of human developments and activities on species that will be or are likely to be detrimentally affected by climate change. Achieving ESD in the future will depend on considering impacts to climate sensitive species during the assessment of human activities. The government strategies and adaptation

frameworks that have been developed for addressing climate change impacts to biodiversity must be legislated so that proponents of development can comply with requirements. Otherwise, business as usual will proceed. The assessment questions posed here provide one way of addressing the impacts of human development on species that are susceptible to climate change. Finally, while the mitigation and compensatory measures suggested here might be uncomfortable in terms of current thinking on biodiversity conservation, they may be necessary to allow for climate change adaptation in an environment that has been altered by the activities of humans.

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