FACULTY OF SCIENCE AND INFORMATION TECHNOLOGY

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Standing Committee on Natural Resource Management (Climate Change)
Parliament House
Macquarie Street
Sydney, NSW, 2000

Re: Managing climate change impacts on biodiversity inquiry

Submission to the inquiry by the Legislative Assembly's Standing Committee on Natural Resource Management (Climate Change) on the adequacy of management strategies to address the impacts of climate change on biodiversity in NSW ecosystems.

The position that I would like to put is that there is considerable inadequacy in the management strategies that have been put forward to address the likely impacts of climate change on biodiversity.

This position stems from one major scientific observation that seems to be at odds with the current rhetoric on climate change adaptation and mitigation. This is the concept of adaptation. Most government documents accept that climate change is occurring and that we will not be able to reverse the trend for the next 20 or perhaps 50 years. A certain amount of climate change has been factored in. Accordingly the approach is to examine means to 'adapt' to that change. Humans can adapt in various ways, by applying increased insulation to houses and workplaces, adopting revised building codes and improved fire management strategies, by limiting coastal development and so on. Animals and plants cannot 'adapt' within the predicted time frame because of the pace at which climate change is proceeding. Although there is evidence that the pace of evolution (adaptive change) can be relatively fast in some organisms under specific circumstances, this is generally the exception to the accepted rule.

Adaptation is a central component of Darwin's theory of natural selection. All organisms 'adapt' to their environment, however the capacity to adapt to rapid changes in climate is limited by the genetic variation that occurs within an organism and the level of selection that is placed on the organism. Most organisms are constrained with their suite of features and are not able to change rapidly if the environment around them changes. This is why we can identify natural communities and ecosystems, animals and plants usually occur within a certain set of climatic and environmental parameters. Thus animals and plants that rely on cool moist environments are found only on high mountains. As the climate changes around them and it becomes hotter and drier they will not adapt to that change, the animals and plants below them in altitude will simply move higher up the mountain and replace

them. Thus with climate change whole communities will disappear and many animals and plants will become extinct.

What management strategies can be put in place to ensure that ecosystems and communities are resilient?

There are two prime challenges, the first is to predict which species will become most threatened by climate change which in turn will provide some approaches to manage and mitigate the impacts.

It is most likely that significant changes will occur to species' distribution and to ecosystem composition as the result of climate change. The most obvious communities to be impacted will be those at high altitude. Many species in these ecosystems will be placed at risk of extinction. In particular the higher peaks of the Great Dividing Range will be most impacted. Most of these sites are within National Parks and reserves, and the most significant are within World Heritage areas (e.g., Gondwana Rainforest WHA). The very World Heritage values for which the properties were declared are because the ecosystems represent outstanding examples of the past evolutionary history of the earth. Protection within reserves will not save these ecosystems from extinction associated with climate change. These communities cannot move, as is generally proposed. Corridors that link the major high mountain ranges such as the 'Alps to Atherton' concept provide a means for lower altitude and moderate altitude species to migrate north and south but this is not possible for communities at the higher altitudes.

Two biological facts must be kept in mind. First, some species are more susceptible to climate change impacts than others due to inherent attributes (physiology, life history, ecology and genetics). Second, when species with high susceptibility are faced with large climate changes the risks of extinction are high.

What are the adaptation options for ecosystems to climate change impacts?

Conduct a thorough risk assessment.

- The first step is to understand the physiological limits of a selection of organisms that make up the threatened ecosystems.
- These physiological limits (physiological envelope) need to be mapped against the predicted climate change scenarios to produce spatial maps of which species and communities will be most rapidly confined,

Define priority ecosystems for pro-active management.

- The genetic diversity that exists in isolated ecosystems must be saved. Once extinction has occurred the diversity cannot be recovered. Natural History Museums and herbariums must be directed and funded to take on a more expansive role beyond the interpretation of the natural environment and be involved in a large endeavour to identify the genetic resources and thus assist to manage their preservation.
- The first task is to catalogue the genetic diversity, and the second is to store it in retrievable seed banks or gene banks. A model to follow would be Millennium seed bank managed by the Kew Botanical Gardens in the UK. A similar approach to animals is now achievable but it seems to me that museums have not effectively investigated or adopted a proactive role in conservation. There is also a significant

role for zoos in this endeavour. Natural partnerships with research institutions are required in this approach.

Manage what can be managed to reduce the stress on ecosystems.

- Remove human impacts from priority areas, reduce visitor impacts, manage weed and pest invasion, and increase fire buffer zones.
- Establish monitoring sites in the identified priority ecosystems. Monitoring should include species that are predicted from physiological studies to have low resilience to change, and should also include surveillance for invasive pests and diseases.

Thank you for this opportunity to comment.

Yours sincerely,

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