Submission 019
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AUSTRALIAN SEEDBANK PARTNERSHIP

Committee Secretary

Standing Committee on Environment, Climate Change and the Arts

House of Representatives

PO Box 6021

Parliament House

Canberra ACT 2600

Dear Committee,

SUBMISSION BY THE AUSTRALIAN SEED BANK PARTNERSHIP FOR THE INQUIRY INTO AUSTRALIA'S BIODIVERSITY IN A CHANGING CLIMATE

Thank you for the opportunity to make a submission to the current inquiry into Australia's Biodiversity in a Changing Climate. This submission briefly introduces the Australian Seed Bank Partnership and its role in biodiversity conservation in a changing climate. Within the submission we have provided comment on several terms of reference. We have explained the crucial role of ex situ collections in supporting integrated conservation management and we highlight how seed science is critical to landscape restoration and strengthening ecosystem resilience in Australia.

Should you wish to discuss this submission, please contact the Partnership's National Coordinator, Dr Lucy Sutherland on or via email at

Yours sincerely

Stephen Forbes (Chair)

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Summary of Main Points of Submission from the Australian Seed Bank Partnership:

i. Australia's conservation seed banks play a key role in integrated conservation management and research on plant diversity and climate change.
ii. A coordinated national approach to conservation seed banking and research in Australia, through the Australian Seed Bank Partnership, is building a safety net for Australian plant species.
iii. Plant genetic diversity is central to a large number of economic, ecological and social activities in Australia.
iv. A representative third of Australia's seed bearing flora and 25% of Australia's threatened plant species are already safeguarded in conservation seed banks.
v. Plant diversity is crucial in dealing with the major environmental challenges: food security (Australia's wild relatives of rice and other main stream crops); water scarcity (diverse and resilient catchment forests); deforestation, energy and climate change.
vi. Seed science plays a critically important role in Australia's ability to restore diversity and build resilience in degrading landscapes and ecosystems.
vii. Recommendation: need for long term operational stability of nationally significant data sets and increase support for citizen science programs that engage diverse communities.
viii. Recommendation: increase the capacity for publicly funded biodiversity research, auditing and monitoring and support biological collections, such as seed banks, to support integrated conservation management.

1.0 Background to the Australian Seed Bank Partnership in terms of biodiversity and climate change

1. Australia ratified the Convention on Biological Diversity (CBD) on 18 June 1993. In 2002, Australia and other parties adopted the 2010 Biodiversity Target: *to reduce significantly the rate of biodiversity loss at global, regional and national levels*. Australia failed to achieve its 2010 Biodiversity Target.
2. The Global Strategy for Plant Conservation is a program of the CBD. This program recognises the important role of ex situ conservation in supporting in situ conservation and Target 8 of this strategy calls for: *At least 75 per cent of threatened plant species in ex situ collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes*.
3. The *National Strategy and Action Plan for the Role of Australia's Botanic Gardens in Adapting to Climate Change* (national strategy and action plan) was developed by the Council of Heads of Australian Botanic Gardens (CHABG) and endorsed by the Natural Resource Management Standing Committee (NRMSC) in September 2008. The document outlines the role of Australia's botanic gardens, and other institutions (herbaria and universities), in conserving Australia's flora in the context of climate change.
4. The national strategy and action plan highlights three key strengths of Australia's botanic gardens and botanical institutions that contribute to conserving plant diversity:

    (a) a safety net for plant species through *ex situ* conservation (i.e. germplasm banking)
    (b) knowledge and expertise to support climate change research
    (c) a key opportunity for community awareness about climate change.

5. In June 2010, CHABG undertook a survey to ascertain outcomes and assess progress against the goals and actions within the national strategy and action plan. The responses showed considerable progress had been made towards the majority of actions.

6. Some of the key achievements are outlined below:

(a) **Seed banking**

i. The Australian government appointed a national coordinator for the Australian Seed Bank Partnership (ASBP) in July 2010 to coordinate national seed banking efforts outlined in the national strategy and action plan (Strategy 1.2).

ii. The ASBP is governed by the Council of Heads of Australian Botanic Gardens and brings together the expertise of 14 partners (appendix a) from Australia's capital city botanic gardens, herbaria, state environment agencies and academic institutions, as well as non-government organisations.

iii. In November 2010, representatives from the ASBP met to prepare a 10-year national seed collecting and research program, to build the national safety net for Australian plant species.

(b) **Coordinated Plant Information System**

i. All of Australia's conservation seed banks are involved in the *Atlas of Living Australia* (ALA) project and the majority are contributing to *Australia's Virtual Herbarium*.

(c) **Community Awareness**

i. Common climate change messages, agreed by the national network of botanic gardens' educators in 2008, are being used in public education programs across Australia. These are delivered to approximately 140,000 people per annum. The combined annual visitation to Australia's capital city botanic gardens is over 13 million visits per annum.

2.0 Comments from the Australian Seed Bank Partnership on select Terms of Reference

a) ToR – Terrestrial, marine and freshwater biodiversity and its territories

Plant genetic diversity is central to a large number of economic, ecological and social activities. The value of genetic diversity is demonstrated by the authoritative estimate of Ten Kate & Laird (2002:1-2) that the annual world market for products directly derived from genetic diversity (predominantly in the agriculture and pharmaceutical sectors) is between US$500 billion and US$800 billion.

Australia has a unique and diverse flora with 92% of its higher plants being endemic (Chapman 2009). It is important to note the opportunity for innovation and adaptation afforded by this plant diversity. There is potential value of plant diversity in dealing with the major environmental challenges being faced in Australia: food security (Australia has wild relatives of rice and other main stream crops); water scarcity (diverse and resilient catchment forests play an important role throughout the country); deforestation, energy and climate change. This gives a potentially very high value to the protection of genetic variety of plants through the collection and storage of seeds in banks. These seeds become an insurance policy, and can be used to propagate plants and to re-establish populations in the wild if needed in the future.

Plant genetic diversity is being lost in Australia due to conversion of natural habitats through urban and agricultural use, over-exploitation and the introduction of alien species. Climate change will exacerbate this loss. Furthermore, few plant species have been studied for their potential use. Therefore, loss of this diversity could be catastrophic to human well being and advancement. The genetic resources (seeds) safeguarded by the Australia's conservation seed banks are valuable when used directly for human benefit, but are also valuable as reserved options in confronting the climate change adaptation challenges ahead (e.g. mitigating the additional costs expected within the agricultural sector alone).

There is no technological reason why most of this diversity should not be conserved and kept available for future use. Seed banks are the primary method of preserving the genetic variety of plants away from where they grow (*ex situ*).

Members of the Australian Seed Bank Partnership have already made a direct contribution to the conservation of threatened species. Between 2001-2009, various conservation seed banks in Australia coordinated the banking of seed of 25% of threatened plant species and secured a representative third of Australia's seed-bearing flora through seed banking activities. The Partnership is now working towards collecting and banking seed from 1,000 species which are not currently secured in Australia's conservation seed banks. The focus will be on those plants which are significant at a State and/or National level and linked to their endemic, endangered or economic value.

Phase 1 of this 1000 Species Project will place emphasis on collecting and seed banking, and on germination, dormancy and longevity studies for the conservation of Australia's significant plants and the restoration of landscapes. A second phase (planned for 2015-2017) will improve the genetic representation of species collected during Phase 1 and overcome remaining seed germination challenges.

Knowledge created during the 1000 Species Project will help increase understanding of the issues facing these species in their natural habitat and increase their restoration potential. Furthermore, information will be made publicly available to support conservation and restoration activities.

b) ToR - Connectivity between ecosystems and across landscapes that may contribute to biodiversity conservation. & ToR - Strategies to enhance climate change adaptation, including promoting resilience in ecosystems and human communities.

Australia has an international reputation for good science in restoration practices, but the missing understorey component in revegetated woodland and forest communities, for example, represents a loss in functional diversity and resilience, that needs to be rapidly incorporated into restoration practices so as to build adaptive and resilient ecosystems capable of meeting future climatic challenges. The need for restoring diversity, as is now being articulated by the restoration sector, is broad and requires considerable and careful refinement to identify species/organisms/communities as well as protocols and practices that require research investment. Some of the most critical gaps in scientific knowledge are practical techniques for germinating species, understanding the complex ecological relationships among species (plant, animal and microbial), and how these vary in time and space across Australia. This is especially so in highly degraded regions of Australia where the need to build resilience into remaining remnant vegetation is greatest. The Australian Seed Bank Partnership is working to bridge gaps in knowledge about restoring species and developing more holistic approaches to restoration by integrating research disciplines (incl. seed science, soil invertebrates, soil microbes, seed storage and germination). The outcomes of this research will have significant implications for connectivity conservation, building ecosystem resilience and restoring degraded landscapes.

c) ToR - How climate change impacts on biodiversity may flow on to affect human communities and the economy.

Australia's alpine and montane ecosystems are now significantly threatened by the prospect of climate change and are essentially 'islands in the sky'. Projected warming trends will see these pockets shrink and their capacity to maintain biodiversity highly diminished. The Australian Alps make a significant contribution to society and the Australian economy[1] and climate change impacts on this complex ecological system will have flow on effects e.g. to the tourism industry and to the nation's major watersheds.

The Australian Seed Bank Partnership's Alpine and Montane Research Program aims to contribute to developing knowledge on combating this expected loss of biodiversity through:

- seed based research to determine species and community climatic thresholds
- multiple-provenance collections to identify resilient populations that offer the potential for restoration and/or translocation
- seed collection for long-term ex situ conservation.

d) ToR - Mechanisms to enhance community engagement.

Recommendation: long term operational stability of nationally significant data sets and increase support for citizen science programs that engage diverse communities.

It is recognised that improving the integration of data relating to Australia's biodiversity and making this information accessible to a diverse community is a big task. The degree of difficulty derives from the complex systems being studied, the number of researchers, organisations and jurisdictions involved in environmental research and management, as well as the diverse audience that it needs to cater for. The

[1] e.g. The ACT economy receives an annual boost to GSP of $29.64 million, of which $2 million represents increased tax revenue going to the ACT Treasury. For NSW the GSP boost is $150.21 million per year, of which $10.5 million is increased tax revenue to NSW Treasury on account of expenditure by visitors to the NSW Alps. For Victoria, the boost to GSP is $145.02 million annually, of which $10 million is extra State tax revenue. (Mules et al (2005) Economic Values of Tourism in the Australian Alps (p.vi). Australia: Sustainable Tourism Cooperative Research Centre).

federal investments in the *Atlas of Living Australia* have enabled the creation of new and robust infrastructure which brings together a wealth of scattered data relating to Australian biodiversity, including that contained with the Australian Seed Bank Partnership collections. Nevertheless, there are key priorities for future ongoing investment in this area:

- Long term operational stability for the nationally significant data sets which support research, policy and education- A key challenge to wider adoption of the *Atlas of Living Australia* infrastructure (the main question raised by external stakeholders) is the perceived instability arising from the current funding model.
- National biodiversity reference data set - A major focus should now be to use the *Atlas of Living Australia* infrastructure as the foundation for building a comprehensive reference data set to support future research and decision-making.

Australia's conservation seed banks have a wealth of key information to support their role including phenology, ecology, seed morphology, germination/dormancy requirements and storage characteristics and collect vouchered herbarium specimens verifying the identity of seed collections. This information is an important resource for restoration and conservation practitioners and community groups, landowners, researchers, students, as well the nursery and horticultural industry. The Australian Seed Bank Partnership is working with the *Atlas of Living Australia* to create national standards for recording data on wild species collections and build an accessible online seed resource to support conservation, restoration ecology and plant diversity research in Australia.

To enhance the work already undertaken to create national data sets, further allocation of resources for the development of relevant citizen science programs is an obvious mechanism for increasing community engagement in climate change impacts on biodiversity. The Australian Seed Bank Partnership will work with the Botanic Gardens Education Network to design and launch a citizen science program to engage communities in the diverse work of the Partnership and encourage greater use of the growing seed biology information.

e) ToR - An assessment of whether current governance arrangements are well placed to deal with the challenges of conserving biodiversity in a changing climate.

Recommendation: Increase the capacity for publicly funded biodiversity research, auditing and monitoring and support for biological collections, such as seed banks, to support integrated conservation management.

There is a need to increase investment in research and development work to support the conservation of biodiversity and the restoration of Australian landscapes. While acknowledging the important work undertaken through the *Australian Research Council* and *Caring for Our Country Program*, there is critical applied research needed that is not addressed by the selection criteria of these grant / funding programs. As a result, sciences such as seed biology are poorly funded and their significant contributions to on-ground restoration are rarely fully understood.

There also needs to be greater support for longitudinal studies as part of applied research. The tradition of 3 year grant cycles is based on bureaucratic processes, but does not take into consideration the need for research using such different time frames as biological processes or climatic cycles e.g. the breaking of drought. Greater research is needed on the monitoring and evaluation of restoration activities and making findings from such longitudinal research publicly available and accessible to inform and guide future practices.

Ongoing investment is also needed in the development and maintenance of biological collections, such as seed banks, herbaria and botanic gardens. These collections involve the collection, documentation

and storage, of samples of species in a secure and accessible form. Biological collections are physical databases that support the understanding of the variability of biodiversity and in addition, the germplasm collections support the preservation of natural and crop biodiversity.

Overall, additional investment is needed to fund research (pure and applied), biological collection, on-ground conservation and restoration work, protected area extension and management, education and training (formal and informal). An independent consultative process into future funding and stewardship could assist in ensuring that there is investment in a wider range of research on Australia's biodiversity and climate change.

References:

Chapman, A.D. (2009) *Numbers of Living Species in Australia and the World*, 2nd Edition, Department of the Environment, Water, heritage and the Arts. Canberra: Commonwealth of Australia.
Mules et al (2005) *Economic Values of Tourism in the Australian Alps* (p.vi). Australia: Sustainable Tourism Cooperative Research Centre.
Ten Kate, K. and Laird, S. (2002) *The Commercial Use of Biodiversity: Access to Genetic Resources and Benefit Sharing*. London: Earthscan Ltd.

Appendix A: Members of the Australian Seed Bank Partnership

Council of Heads of Australian Botanic Gardens (CHABG):

- Australian National Botanic Gardens
- Botanic Gardens and Parks Authority (WA)
- Botanic Gardens of Adelaide (SA)
- Brisbane Botanic Gardens Mount Coot-tha (Qld)
- George Brown Darwin Botanic Gardens and Alice Springs Desert Park (NT)
- Royal Botanic Gardens and Domain Trust (NSW)
- Royal Botanic Gardens Board (Vic)
- Royal Tasmanian Botanical Gardens (Tas)

Partners:

- Australian Network for Plant Conservation
- Threatened Flora Seed Centre, Department of Environment and Conservation (WA)
- Greening Australia
- Griffith University
- Royal Botanic Gardens Kew
- University of Queensland