

Name of submitter: **Ecological Society of Australia**



The Ecological Society of Australia Ltd (ESA, www.ecolsoc.org.au) is the peak group of ecologists in Australia, with over 1200 members from all states and territories. Our members work in universities and other research institutions, government departments, NGOs, private industry and consultancies. We are a national not-for-profit organisation formed in 1959.

Submission to:

Inquiry into Funding Australia's Research

30 June 2018

SUMMARY

Research is a key pillar of support for Australia's economic, social and environmental prosperity. Many of the ESA's members are academics and researchers who regularly interact with the Australian research funding system by applying for competitive grants. Given the nature of ecological science, these interactions span multiple Commonwealth Departments and funding schemes including the Department of Education and Training, Department of the Environment and Energy, and Department of Industry, Innovation and Science. Our submission to this Inquiry thus represents the perspective of the firsthand 'users' of Australia's research funding landscape – the researchers themselves who must navigate this landscape in order to deliver economic, social and environmental benefit for Australia.

We welcome this inquiry into funding Australia's research, with the ultimate goal of improving our national research endeavours to ensure a thriving research ecosystem. We provide the following key recommendations to achieve this goal:

1. **Research is a critical national investment and must be invested in generously.** Australia needs to commit more resources to research with the goal of significantly increasing the capacity of research. Investigator-driven fundamental and foundational research are key to advancing our knowledge economy.
2. **Administration of major grants should be simplified, and transparency of assessment processes improved.** There is an urgent need to reform the application and assessment processes for major funding schemes. To achieve this Australia should commission an independent review of funding models used in other countries, to design an appropriate and less-onerous system for Australia. Major grant bodies should also investigate options to improve transparency, and thus improve trust, in the peer review system.
3. **Establish new, additional, funding programs to support long-term research.** Finding solutions to solve problems important to Australian society takes time. A funding scheme that specifically funds long-term research – research on a scale of 8-12 years - should be added to the research investment portfolio.
4. **Funding schemes should accommodate transdisciplinary research** that bridges different disciplines in order to allow innovative and creative proposals to be supported. The emergence of greater multi- and trans-disciplinary research highlights the need to allow

existing funding schemes to support cross-discipline projects, or to develop new funding lines that support projects that bridge different research areas.

We discuss these recommendations and other issues in more detail relative to each of the Inquiry's Terms of Reference below.

DISCUSSION

Terms of Reference 1: The diversity, fragmentation and efficiency of research investment across the Australian Government, including the range of programs, guidelines and methods of assessment of grants;

Increase investment in Australian research

All of the challenges described in our submission are exacerbated by the fact that members of Australia's research community are competing against each other for a share of an ever-shrinking research budget. Many researchers find themselves unfunded year after year. These are the people whose careers are being eaten away fruitlessly competing for a small amount of funding in a pool that shrinks steadily in real terms. **Research is a critical national investment and must be invested in generously** to achieve the national goals for economic, social, and environmental benefit.

Reform the application process of grant schemes

The research community typically begins the intellectual process for developing a research proposal months before the submission deadline of a major granting scheme. This has an enormous, unquantified impact on the 'business' of research – the 'opportunity cost' that encompasses the opportunity lost to use one's time to do research, teach, engage with users of research, and more. Indeed, using the same amount of work hours to teach undergraduate students and mentor postgraduates as researchers use on preparing funding proposals would likely have enormous benefits; both student groups represent an enormous stream of revenue for the University sector in Australia, and postgraduates in particular contribute greatly to Australia's research endeavours.

Added to this opportunity cost, is the direct cost of time spent writing competitive grants. Using the National Health and Medical Research Council (NHMRC) grant system as an example¹ one review estimated that each grant in 2012 took 38 person days of work; resubmitted grants (ones that narrowly missed in a previous round and were modified and then submitted in 2012) took 28 person days. In total, they estimated that in that single round of funding, the amount of time allocated was the same as a single person working for 550 years. Given that 80% of applications were unsuccessful, they estimate over four centuries of effort went unrewarded.

To address this substantial waste of effort by Australia's research community, there is an **urgent need to reform the application and assessment processes for major funding schemes**. The current ARC Discovery grant applications include a 10-page application plus project investigator

¹ Herbert, DL, Barnett, AG, Graves, N. (2013) Nature **495**, 314 DOI: <https://doi.org/10.1038/495314d>

information, budgets, and budget justification which can total over 100 pages. If these were more focused, it would reduce preparation costs to the research sector and could improve the quality of peer review of the applications as well.

There are numerous examples around the world of how countries manage major granting schemes more efficiently than Australia, and **Australia should commission an independent review of these models to design an appropriate and less-onerous system for Australia.**

For example, efficiency may be improved through a two-stage application process. Phase 1 would be an Expression of Interest application – no more than 1-3 pages outlining the questions to be addressed by the research, the rationale for such research, and the competency of the researchers to undertake this work. In Phase 2, after initial review, full applications can be received. This model already exists for some funding schemes in Australia such as the Centre of Excellence applications, and it could be adopted more broadly.

Another option is to fund everyone eligible to apply with baseline funding. In Canada, such a system has been in operation for decades. This then directs energy and effort to excellent and diverse research, rather than an onerous application administration process. It also enables a wider cross-section of researchers to undertake research.

Alternatively, a no-deadline submission of full proposals can alleviate time pressures researchers face when applying for grants. This can be especially difficult for researchers who are faced with critical fieldwork that coincides with grant application deadlines. In the USA, this model has decreased the number of submissions by nearly 50%, while retaining the quality of proposals and the demographics of researchers applying for grants². The flexibility in submitting fully, polished proposals at any time may increase success rates for researchers who can contribute more effective time, data, and coherency in their proposals.

To improve major grant application processes, the **focus on individual investigators should also be reconsidered**. While it is important to ensure that proponents have the requisite skills and experience to successfully undertake a proposed endeavour, current ARC project funding applications involve lengthy individual sections outlining the track records of individual researchers, and this information may be weighted more heavily than the parts of the application that describe the proposed research, its merits, and potential impact for Australia. This structure disadvantages early-mid career researchers in comparison to applicants at later career stages and, in doing so, can limit the exploration of new research ideas. It also leads to perverse outcomes, including a 'self-fulfilling prophecy' where the only researchers to be funded are those who have been funded previously, and have thus had the opportunity to establish a lengthy 'track record'. There are also cases where senior researchers are invited to be a part of grants purely so their individual metrics will be assessed as part of the grant, improving the grant's likelihood of success. In total, the focus on individual researcher track record within the research funding system draws effort and focus away from the research itself. Changes to the time frame over which research

² See <https://www.nsf.gov/pubs/2018/nsf18011/nsf18011.jsp> and <http://www.sciencemag.org/news/2016/04/no-pressure-nsf-test-finds-eliminating-deadlines-halves-number-grant-proposals> for details

productivity and impact are assessed over past years, to include longer time periods, also reduces the potential pool of competitive researchers and favours later career researchers, not necessarily the best research. This imbalance should be corrected to improve research outcomes for Australia.

Reform the assessment process of grant schemes

The model of assessing competitive grants such as the ARC also needs review. The current model relies on (i) the voluntary efforts of expert peer-reviewers who assess the quality of proposals, and (ii) the panelists (such as ARC College of Experts) who weigh these peer-reviews and make the unenviable decisions about which grants to fund from the limited research funding budget. While the assessment of (i) acts much like the peer review process associated with scientific publication, grant reviewing is an onerous task for many time-poor academics, and it is undertaken to different standards. Currently, there is no consequence to the reviewer for providing a detailed grant review versus a trite review, even though the consequences can be dire for the applicant. Ideally, even rejection of a funding application should be productive for the applicant – they should receive feedback on how the proposal can be improved.

The current system in many cases also results in researchers assessing and being assessed by their competitors. In a climate of reducing funding availability, this clearly creates a perverse incentive for reviewers to assess applications in a certain way, and results in a lack of trust in the review system.

True peer review would lead to better science being conducted in Australia. **To achieve this, there should be detailed assessment proformas and incentives for excellence in reviewing. Major grant bodies should also investigate options to improve transparency, and thus improve trust, in the review system.** In addition, reducing the workload of assessors by streamlining the application process as noted above, will go a long way towards better reviewing.

Diversity and fragmentation of investment

Members of the ESA interact with a range of Federal Government Departments, and numerous funding schemes including ARC Discovery projects and fellowships, ARC Linkage schemes, the National Collaborative Research Infrastructure Strategy (NCRIS), and the National Environmental Science Programme (NESP).

Challenges arise for individual researchers in interacting with this diversity of programs due to different application requirements for each funding scheme. While it is appropriate that each application is tailored to meet the requirements of the funding scheme, efficiencies could be achieved by **better aligning the application processes for similar styles of funding scheme.**

Members of the ESA have also reported challenges in applying for research funding when their research topic spans multiple fields. One example of this is the case of disease ecology, where a researcher may be investigating the life cycle of a wildlife disease or pathogen that has implications for human health. In cases such as this, it is not uncommon for a researcher to receive feedback from a non-medical research scheme that they should apply to a medical scheme because the topic relates to human health. At the same time, a medical research scheme advises

the exact opposite because the topic is not solely about human health. **Funding schemes should accommodate transdisciplinary research that bridges different disciplines in order to allow innovative and creative proposals to be supported.**

Cross-governmental coordination of grant schemes

The ESA also believes there is room for greater efficiency in research investment across the Australian Government by **establishing simple mechanisms for communication and coordination of effort across the multiple Departments that are involved in funding research activities.**

Administering a specialist funding scheme by a department with specialist knowledge is appropriate, as in the case with the Department of Environment administering the National Environmental Science Programme. However, a framework for coordination across the many Government agencies that fund research would enable the Government to better leverage its investments and ensure no duplication. This framework could result in greater awareness of national research infrastructure investments and use of national facilities, thereby increasing the Government's return on investment. It would also enable the Government to become aware of similar projects that may be submitted for funding through different programs. This gives the Government the opportunity to unite these funding efforts, increase collaboration, and avoid accidental duplication of investment.

Terms of Reference 2: The process and administrative role undertaken by research institutions, in particular universities, in developing and managing applications for research funding;

Universities expend significant time and resources on applications for research funding. The business of the typical 'research office' is to a) maximise grant success by providing expert guidance and services in support of externally funded research applications, and b) administer successful grants and ensure institutional governance responsibilities and obligations are met. Much of this effort goes to compliance checking, rather than activities that may improve the quality and practice of research.

Reducing research grant 'red tape' at the application stage would allow the skills and resources of research support staff to be redirected to more valuable outcomes. For example, compliance checking of budgets is one of the key tasks of research office personnel in most universities. As part of a simplified application process, the need to justify very detailed budgets in applications should be unnecessary. Most successfully funded projects receive less than the amount requested, necessitating a modification to the project anyway. Such a change would enable research office personnel to direct more energy to ensuring the quality of grant applications, and to directly supporting the management and administration of research activities.

Terms of Reference 3: The effectiveness and efficiency of operating a dual funding system for university research, namely competitive grants and performance-based block grants to cover systemic costs of research;

University block grants are a critical component of Australia's research ecosystem, as they fund the 'indirect costs' of research that are not covered by competitive grants, including salaries,

utilities, and research infrastructure. A 2009 study estimated that universities had to find an additional 85 cents of funding for every dollar of competitive grant funding they received to cover the indirect costs not met by the research grants themselves. Current government support for the indirect costs of research remains static at around 23 cents per competitive grant dollar. This leaves a significant gap and requirement on universities to find additional income to support research.

To conduct research supported by competitive grants in 2014, Universities Australia estimated that universities had to cover a gap of \$1 billion, which is more than double the 2002 figure of \$450 million³. Clearly, **to ensure the continued success of Australia's research the Government must invest more in the indirect costs of research.**

Terms of Reference 4: Opportunities to maximise the impact of funding by ensuring optimal simplicity and efficiency for researchers and research institutions while prioritising delivery of national priorities and public benefit.

Support basic research

Fundamental basic research is the foundation behind technology, science, and opportunities that can lead to technological advances we have today. Without the understanding of radio frequency hopping, we wouldn't have Wi-Fi; without the theory of relativity, we wouldn't be utilising Uber. While innovation and capacity to patent or commercialise products are important outcomes of scientific research, this is not the sole benefit that science provides to our society nor can these outcomes be reliably predicted at the outset of research activities. Linkages between past research and patentable inventions⁴ show that more than 80% of past research with at least one citation can be linked forward to a patent and that approximately 60% of patents can be linked backwards to foundational research, though these links were not direct or anticipated at the time of the research. Thus, **Australia should generously fund excellent foundational research** rather than focus primarily on projects that appear to have immediate potential to lead to commercial applications.

Increase funding to ecological sciences

The 2015 State of Australian University Research ERA rankings⁵ highlighted that 19 of 24 Australian Universities are ranked above or well above the world standard in ecology. The rigour and research outputs of our field contribute to the strength of ecology, but the funding we receive is minimal when compared to other fields. The research outcomes of projects such as pollination ecology of agricultural crops, health risks associated with wildlife pathogens, CO₂ capture and processes within wetlands and other ecosystems, plant pathogen devastations on forests, invasive species ecology - and much more - offer incredible knowledge on how our world works and have great social and economic benefit.

³ Universities Australia Paper: The Facts on University Funding, April 2017

⁴ <https://theconversation.com/tracing-the-links-between-basic-research-and-real-world-applications-82198>

⁵ http://www.arc.gov.au/sites/default/files/filedepot/Public/ERA/ERA%202015/ERA_2015_National_Report/ERA2015_Section1.pdf

There are increasing attempts to quantify the economic value of ecosystems, including the value of the Great Barrier Reef⁶, wetlands⁷, and impact of insects⁸. These studies show that without protecting these resources, there would be immense economic loss, not just to the environment, but to social prosperity including tourism and agriculture. **Australia should increase investment in ecological sciences to provide the knowledge base to manage these natural assets.**

Australia has a natural competitive advantage⁹ over the rest of the world when it comes to environmental research, with a wide diversity of unique and interesting ecosystems at our doorstep, and a long history of management and intervention in these ecosystems. This advantage coupled with our strong performance against world standards in the field should be leveraged to further advance Australia's excellence and leadership in ecology. Increasing investment in ecological sciences can also have great societal and economic benefit by improving our understanding of patterns and processes in the natural world so we can better manage these and mitigate risks.

Establish new funding programs to enable long-term research

Most Australian funding schemes enable only short-term research (3 years or less), with novelty a key determinant of grant success. In the multi-disciplinary field of environmental science, undertaking research to address problems important to Australian society inevitably takes time – often on the scale of decades. For example, it has taken decades of continuous ecological research activity in the Australian Alps to deliver outcomes of profound importance to society including understanding of fire regimes¹⁰, cost-effective weed control¹¹, and how to protect catchments¹². A 3-year research project could not have answered the research questions in these cases, nor delivered the outcomes of benefit to Australian society. While in this case, the collaboration and coordination of numerous researchers have enabled a long-term research program to continue, this is a risky strategy and in many other cases Australia is missing out because it does not have a mechanism to support research that, by its nature, must be undertaken over a period longer than 3 years. Hence, **a new funding program that specifically funds long-term research – research on a scale of 8 – 12 years with appropriate progress checks - should be added to the research investment portfolio.** This is particularly true for fundamental research that addresses national priorities around environmental sustainability to underpin economic and social prosperity.

⁶ Stoeckl, N. et al. (2011) The economic value of ecosystem services in the Great Barrier Reef: our state of knowledge in "Ecological Economics Reviews." Robert Costanza, Karin Limburg & Ida Kubiszewski, Eds. *Ann. N.Y. Acad. Sci.* 1219: 113–133. <https://doi.org/10.1111/j.1749-6632.2010.05892.x>

⁷ Whiteoak, K. and Binney, J. (2012) Literature Review of the Economic Value of Ecosystem Services that Wetlands Provide. <http://www.environment.gov.au/system/files/resources/fb918be6-fd56-43a5-9e61-f4e63d455e0c/files/review-ecosystem-services-report.pdf>

⁸ Losey, J. and Vaughan, M. (2006) The Economic Value of Ecological Services Provided by Insects. *Bioscience* 56(4): 311-323. [https://doi.org/10.1641/0006-3568\(2006\)56\[311:TEVOES\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2006)56[311:TEVOES]2.0.CO;2)

⁹ Dovers, S. et al. (2018) Is Australia strong in environmental research? *Aust. J of Env Management* 25(2): 147-152. <https://doi.org/10.1080/14486563.2018.1469219>

¹⁰ Williams, R. et al. (2008) Large fires in Australian alpine landscapes: their part in the historical fire regime and their impacts on alpine biodiversity. *Intl J of Wildland Fire* 17(6): 793-808. <https://doi.org/10.1071/WF07154>

¹¹ Hauser, C. and McCarthy, M. (2009) Streamlining 'search and destroy': cost-effective surveillance for invasive species management. *Ecology Letters* 12(7): 683-692. <https://doi.org/10.1111/j.1461-0248.2009.01323.x>

¹² Good, R. (1995) Ecologically sustainable development in the Australian Alps. *Mountain Research and Development* 15(3): 251-258. <https://www.jstor.org/stable/3673932>

Support transdisciplinary research

The landscape of transdisciplinary research continues to change with regards to understanding data, patterns, and processes in our natural and technological world.

Where much research used to be carried out under the banner of well-defined disciplines, it now often involves researchers from multiple disciplines collaborating to address complex questions. As noted by the 2015 State of Australian University Research ERA rankings biological sciences - which ecology falls under - was the fourth most multi-disciplinary field of 22 two-digit Field of Research codes surveyed. Even more, researchers are crossing and combining disciplines to have greater comprehensive understanding of their work. While collaboration and transdisciplinary research provide immense outputs in foundational knowledge and product commercialisation, these types of projects can have difficulty in being funded due to the continued siloed nature of funding agencies (see also comments under Terms of Reference 1).

Current funding structures are focused around discipline groupings, and there are times when this arrangement can hamper the application process for researchers who work in transdisciplinary fields. **Funding bodies need to consider how they will manage the changing landscape of transdisciplinary research and provide funding where research crosses disciplines** and break down some of the rigidity of the current silos to allow researchers the capability to apply for grants within the existing funding structures.

For further information

The ESA welcomes the opportunity to provide further information to this Inquiry or to discuss our submission in more detail. We may be contacted using the details below:

Submission prepared on behalf of the ESA by its Policy Working Group and approved by the Vice-President (Public Policy and Outreach) and President, 30 June 2018.