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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.

Innovation and Science Australia 2030 Strategic Plan: Issues Paper

Summary:

The ESA welcomes the development of a strategy for innovation science and research in Australia to 2030. The ESA considers that there is an important role for biological and environmental sciences to contribute to a sustainable future where Australia is a world leader in innovation, research and commercialisation. Ecosystem services and ecological function underpin our industries and way of life, and these basic environmental services should not be compromised in the development of competitive industries.

In response to three main questions you seek feedback on:

(1) Are they [the challenges in the document] the right ones?

The ESA agrees that addressing the challenges in the Issues Paper will help to foster science and innovation in Australia. However, we do not think the Issues Paper yet captures the full breadth of what is required for Australia to succeed as an innovation nation. The document is somewhat silent on the role of the environmental and ecological sciences in the proposed future, which is a large oversight given the importance of ecosystem services for underpinning all of industry and life. We suggest greater reference is made to the potential contribution of environmental and ecological sciences in the future innovation, science and research system. In our specific comments below, we suggest specific wording which reflects a greater recognition of environmental services.

(2) Have we missed something?

Yes, the Issues Paper currently misses something. The ESA considers that the six challenges do not adequately address the scarcity of resources megatrend. We suggest this is a serious omission and a new research challenge needs to be defined, and our suggestion with our three highest priority responses to address this change are as follows:

Taking the lead in cross-disciplinary innovation to protect the natural environment and maintain the services that nature provides.

By 2030 we imagine a highly innovative Australia would have:

- Developed a world-leading capacity to innovate in ecology, evolutionary biology, animal behaviour and eco-physiology.

- Established major hubs of cross-disciplinary research to integrate advances in ecosystem surveillance and remote sensing, big data analysis and artificial intelligence into ecosystem management, with breakthroughs in terrestrial, freshwater and marine ecosystem management.
- Adopted funding models that reflect the main beneficiary, including major government commitments, to public good research and government-industry joint funding arrangements where commercial benefits are foreseeable.

(3) How can we move from ideas to actions?

Our specific comments below provide some suggestions on this point. We welcome the consultation being undertaken, and believe that successful development of the 2030 Strategy and subsequent implementation will require continuation and broadening of consultation with all players in the Australian science and innovation landscape.

Specific Comments:

Vision

P3. Achieving this vision is not possible without strong evidence-based science applied to maintain the natural environment. The ESA suggests a rewording of the vision that includes the concept of environmental sustainability:

Innovation, which can underpin a diversity of internationally competitive industries, will enable today's and future generations to benefit from a sustainable environment, have meaningful work, and a great quality of life, in a fair and inclusive society.

P. 5 **Resource scarcity** - The resource scarcity mega trend doesn't acknowledge that services from nature extend well beyond provision of clean water. Nature provides services such as pollination, ecotourism, genetic resources for crops, health and wellbeing benefits. Nature also provides essential regulating ecosystem services such as flood and disease control.

Our suggested rewording to make this more inclusive:

- as the world becomes more populous, urbanised and prosperous, demand for energy, food, water and other services provided by the natural environment will rise. However, the planet is unable to support current models of production and consumption, planetary boundaries in climate, genetic diversity, land-system change and biochemical flows have already been exceeded. By 2030, the global population is expected to demand 35% more food, in turn increasing the demand for water, energy and other services from nature. Increased occurrences of extreme weather will also drive demand for energy. Rising seas and changes in rainfall patterns will change food growing areas and seasons, again contributing to scarcity of resources. Crisis is spurring innovation and adoption. Distributed energy and water innovations hold the potential to have a transformative impact, new technologies in genetics, machine learning and miniaturisation stand to revolutionise environmental management, and

energy technology and business model innovation could avert the worst impacts of climate disruption and drive economic growth.

Research challenge 1

Because services from nature underpin society, with the benefits of clean water, clean air, and multiple benefits of biodiversity, environmental protection must be a core consideration at all stages of stimulating innovation. Innovations that come at the expense of the natural environment undermine those critical ecological services. We therefore recommend that the section "created a winning regulatory architecture" be reworded:

Created a winning regulatory architecture. Regulations are critically important for protecting the environment, safety and rights. They are equally important for facilitating commerce. We need to aspire to high efficiency regulation and tax regimes that protect environmental values and services while supporting unfettered innovation. This will be achieved by investigating where opportunities to stimulate innovation while protecting the environment through regulatory change exist. The role and effect of the competition regulator on innovation will also be important.

Research challenge 2

We endorse this call for Government to be an effective player in the national innovation system. As this Strategy moves from ideas to action, it will be important to take a nuanced and sophisticated consideration of the role of Government.

There are some areas where Government activity and intervention is vital to ensure value for the public, in a way that private entities alone would not achieve. One example of this is the national challenge of effective environmental understanding and management. In other cases, it will be appropriate for Government to take a 'hands-off' approach, recognising that other players are more competitive and best placed to advance a field. Government could instead promote a conducive regulatory environment to support innovation in such fields, or look at other means of enabling the innovation.

The ESA strongly endorses the role of Commonwealth and state/territory science agencies, and the importance of strengthening these institutions, for achieving the 2030 agenda. With appropriate support, these institutions are well-placed to continue their vital role in improving the economic and social performance of industry for the benefit of the community.

The ESA also supports the Strategy's call to move Defence closer to the innovative frontier (p7). We recognise significant potential public value from the translation of military technological research to civilian applications for environmental public good. For example, advances in remotely piloted aerial systems (RPAS, or 'drones') have applications in biodiversity monitoring, wildlife management, and upgrading Australia's capacity to assess the state of the environment.

Research Challenge 3

The ESA strongly endorses Challenge 3 as a key driver of a vibrant innovation system.

The ESA strongly supports investment in lifelong learning. We consider that there is a need for a focus on investment past 'young people', especially where strategic investment can help the workforce of today to acquire the skills they need to transition to the workforce of tomorrow. The government will need to very carefully calibrate the learning system. Industry may have incentives and efficiency gains to employ new graduates that the graduate and government paid to educate, rather than contribute directly to reskilling older workers.

We consider that translating Challenge 3 from ideas to action will require an increased investment in all levels of education in Australia, and a focus on ensuring equity in education reducing the disparities often observed in Australia based on geography and socioeconomics. We consider this will contribute to a culture of agile learning that will foster an innovative Australia.

We can also help to create a cohesive education and training system that is integrated into the innovation and research system through encouraging a systematic internship program for graduates in cross-disciplinary positions in research and industry, and through dedicated funding to industry-funded higher research degrees.

Research Challenge 4

The ESA agrees that addressing Challenge 4 is important for achieving the vision of the Strategy. We offer two priority responses to address this challenge:

- Increased engagement could be achieved through Government investment in linkages between research and not-for-profits and state agencies. In the context of environmental science and management, end users can often be not-for-profit and community groups, Landcare groups and State government agencies - organisations that do not have the funding base of major for-profit companies. Government has a critical role to play in funding innovative linkages with community and not-for-profit end-users.
- Design and implement new systems for impact measurement in Australian academia, so that efforts towards engagement are recognised and rewarded. Currently, the scientific output (e.g. scientific publications) of Australian academics is the primary measure of their performance in most cases, not their industry engagement or efforts in research translation. This is especially true in environmental sciences. Changing this system to reward and therefore incentivise engagement would assist in achieving Challenge 4.

Research Challenge 5

Research institutions and academia in the environmental sciences have long benefited from international collaboration and mobility of knowledge. Australia has a reputation as a high-quality research destination as demonstrated by our high university rankings. International education is Australia's third largest export industry, valued at \$20 billion annually. It is vital that we continue to facilitate the inflow of international talent, particularly in teaching institutions where the workforces of the future can benefit from high talent training. The ESA strongly supports the intent of this challenge.

Research Challenge 6

The ESA agrees that Australia can play a leading role in tackling the major challenges facing the globe over the coming decades.

High-impact research initiatives aimed at solving major environmental problems with major investment in environmental prediction systems could achieve significant impacts, saving the Government billions despite having limited commercial potential. Bold "big science" research initiatives require specific funding programs, with the right balance of government and other funding dependent on who stands to benefit most. In some cases where environmental research has limited commercialisation potential, but significant public good, the funding programs must be flexible enough for government to fund the entire project.

The Issues Paper asks if Australia or our regions have a 'burning platform'. It is clear to the ESA that there are two, interlinked burning platforms demanding innovative solutions.

Loss of biodiversity is so severe that the phrase "biodiversity crisis" is widely accepted. Australia continues to lose species, and ecosystems are further degraded by land clearing and invasive species, meaning current and potential future benefits are compromised. Climate change is a second 'burning platform'. Climate change already is, and will continue, to bring about radical change and dire circumstances that effect our environments, communities, businesses, and all facets of life. If Australia is to be a successful innovative nation in the coming decades, it is non-negotiable that we invest in maintaining ecosystems and biodiversity, and in climate change prevention and adaptation. Innovating to resolve these two major 'burning platform' problems will critically depend on government investments. An innovative nation must have innovative governments that invest in research to maintain the natural systems that support our economy, health, and culture.

In conclusion, the ESA supports the push for accelerating innovation in Australia. To date, Australian industry in general has a low appetite for risk, combined for a low tolerance of failure. This doesn't create a positive investment and policy environment for innovation and entrepreneurship, and many of the strategies in the 2030 document will help to address these shortcomings. However, a nation that is a world-leading innovator in business must simultaneously find innovative solutions to maintain natural systems. ***A 2030 strategic plan for science in Australia must have fully integrated strategies for maintaining ecosystem services and the biological diversity that underpin those services.***