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**Australian Academy of Science EMCR Forum submission on  
*Australia's science and research priorities: conversation starter***

The Australian Academy of Science's Early- and Mid-Career Researcher (EMCR) Forum welcomes the opportunity to comment on *Australia's science and research priorities: conversation starter*.

The EMCR Forum represents over 6,000 of Australia's early- and mid-career researchers across science, technology, engineering, mathematics and medicine, and thus offers a unique perspective from the future leaders in STEM research.

The Forum suggests that national research priorities should focus on:

- **Sustainability and impact on the future**

We strongly recommend maximising the capability of the STEM workforce to support future generations in dealing with the expected population growth, increasing life expectancies and the known environmental challenges. In this context, sustainability encompasses environmental sustainability, sustainability of work practices, and sustainability of services (e.g., education, health). We strongly recommend the inclusion and implementation of Indigenous knowledges wherever possible.

- **Fundamental research**

We highly recommend the prioritisation of fundamental research and the inclusion of fundamental research as a pillar within each research priority area.

There is a concerning trend of favouring narrow, short-term investments to solve specific end-user problems at the expense of funding fundamental research. We emphasise that fundamental research builds an invaluable knowledge base that underpins future innovation and translational research. As there is a lag between the generation of fundamental knowledge and the uptake of technologies, it is imperative that fundamental research continues to be supported and funded over the long term, particularly beyond election cycles.

- **Building a strong, diverse, interdisciplinary and agile STEM workforce**

Ensuring the highest standards in inclusiveness, integrity, quality, and sustainability of Australia's innovation system (workplaces and funding systems) is critical for excellence and impact of research outcomes. This can be achieved by re-designing the funding system and increasing support for PhD students and EMCRs, and removing systemic barriers for underrepresented groups. We strongly encourage the Government to integrate the outcomes of their *Diversity in STEM: dialogue starter* within the research priorities.

An agile system that allows workers to transition between industry, government and academia seamlessly would improve Australia's knowledge economy and our ability to take on interdisciplinary challenges.

## Key Challenges to be Addressed

Australia's research capability is well-equipped to continue building knowledge and capacity to address the urgent issues that society is facing, including:

- **Climate and Environmental Change** - including climate change mitigation and adaptation, understanding and maintaining land and ocean biodiversity, sustainable living and public education. Research and investment are critically needed to support the development of the management systems that will underpin environmental sustainability and climate adaptation, including integrated national environmental monitoring;
- **Energy & Energy Security** - including renewable energy systems, the hydrogen economy, material technology and catalysis, grid stabilization and energy efficiency. Additionally, research is needed in the manufacturing and engineering servicing sector to support the deployment and maintenance of a net-zero energy economy;
- **Biomedical Technology** – including advancements in RNA and gene technology to aid the development of vaccines and medicines, to unlock benefits for the agricultural sector and biotechnology applications, and to develop gene therapy for inherited conditions. Fundamental research will be required to understand the ethical implications arising from the use of these technologies and to develop and refine the products;
- **Healthcare & Services** – including digital healthcare practices and governance of healthcare data, research into patient experience and exploring ways to improve access for disadvantaged groups and the aged population. Coordination of the health workforce can be improved by increasing transparency of care and communication and by making data available for continuous quality improvement purposes. Research is also needed to improve the environmental sustainability of healthcare without compromising quality;
- **Digital Technologies** – including supercomputing, quantum computing, data management and privacy, AI ethics, distributed collaboration, and fundamental and translational research. Research in these areas will transform the current tools and emerging technologies into next-generation facilities and devices that will support all aspects of our future society, including all other fields of knowledge;
- **Sustainable Resources and Food** – including the development of sustainable agriculture, aquaculture, fisheries, food production and mining practices, together with exploration, waste recycling, optimization and beneficiation of resources, the discovery of alternative materials and processes, and accessibility to natural resources.

## Capacity Building

Australia needs to continually build capability and capacity to address the aforementioned research areas and challenges through:

- **Investing in Education** – This includes hiring and supporting highly trained and motivated teachers to ensure all children and teenagers, including those from disadvantaged backgrounds, have access to high-quality educational environments and resources. Investment in K-12 and tertiary education will equip future generations to engage with STEM-focused career opportunities;
- **Investing in research training** – The current national research panorama discourages talented graduates from enrolling in PhD programs due to low stipends (which are at the poverty limit), excessive workloads and hyper-competitive environments resulting in the lack of a sustainable academic career pathway. The brain drain away from academia should be addressed by re-assessing the current funding system for PhD students and EMCRs. This would encourage the growth and retention of local EMCR talent and attract high-calibre international EMCR talent;
- **Increasing support for international collaborations** – This can be done in a variety of ways, including through dedicated funding schemes and via the establishment of strategic partnerships (e.g., exchange programs, joint funding schemes) with selected countries/organisations that have demonstrated excellence in relevant topics. International initiatives should also, where appropriate, seek to benefit from digital technologies to enable more inclusive collaboration.

## Research Principles

We recommend adding “future-focused” as a principle for shaping priorities. Whenever a direction is taken, an analysis of the impact on the future should be undertaken. This would ensure that research directions taken today will not leave tomorrow’s generations unsupported. There is a dangerous trend in both research and decision-making whereby challenges are addressed with short-term perspectives. This prevents the understanding of the long-term impact of certain directions and decisions and, simultaneously, excludes directions and decisions that may have limited short-term impact but, high long-term impact.

To discuss or clarify any aspect of this submission, please contact Dr Mari Kondo, EMCR Program Manager at [mari.kondo@science.org.au](mailto:mari.kondo@science.org.au).