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### **Australian Academy of Science submission on the Australian Space Agency's Australian sustainability of space activities policy discussion paper**

Australia's economy and society are dependent on space-derived capabilities and services, mostly delivered via global supply chains and strategic alliances. These enable economic, environmental, societal and national security priorities.

Australia's space sector and national capabilities are built on our capabilities in space science. Without a commitment to space science, the sustainability of the space sector is questionable. Science is also the language of space agencies around the world. It underpins productive engagement in international space programs, which leverage expertise and expand our knowledge base.

Support for space science research and development (R&D) is an essential pillar of Australia's space strategy and is a policy theme that is notably missing in the discussion paper. To address this the Academy recommends:

- That the 'Australian sustainability of space activities policy' addresses the importance of fundamental space science in the future of Australia's space sector. This should be a key theme of the policy.
- Strategic investment to support underpinning space science is essential to meet the proposed policy objectives.

Regarding questions posed in the survey and consultation paper, the Academy recommends that:

- Australia joins the Group of Friends of the Dark and Quiet Sky for Science and Society.
- Sustainability of space weather research activities should be secured to help protect critical infrastructure and advance space weather forecasting and space situational awareness activities.
- Australia seeks to leverage our geographic position to access international opportunities, including access to satellites for science and research and collaborative space missions with partner agencies.

#### **Sustainability of space activities is reliant on strong R&D investment in space science**

The following two sections address questions one to three of the survey regarding *key issues that an Australian sustainability of space activities policy should address, whether the proposed vision is fit for purpose, and missing policy themes.*

The long-term sustainability of Australia's space sector depends on Australia's commitment to the underpinning fundamental science. The absence of a policy theme focussed on the importance of R&D in the discussion paper is a serious omission.

Australia has established and emerging space science capabilities, yet the outcomes they deliver for the country and the space industry are not guaranteed. Sustained support for space science advances knowledge, discovery and technological development which delivers broad benefits for society in areas such as communications, earth observation, health and national security.

Engagement in space R&D strengthens collaborations with overseas space agencies, enables access to services, opens opportunities for industry, and supports capability and workforce development through the transfer of knowledge and skills. These interactions benefit Australian science and technology development and develop our capacity to grow and sustain space-related and other high-tech activities.

International studies have shown that sustained investment in national space programs provides economic multiplier effects.<sup>1</sup> For example, the UK Space Agency yields £3-4 in direct value to the space industry and additional spillover impacts of £6-12 for every £1 of public expenditure.

Australia's investment in space science remains significantly lower than that of other OECD countries. The overall Australian Government investment in space in 2019 was 0.003% of GDP, compared with Canada at 0.016% and South Korea at 0.03%. This is incompatible with Australia's national space ambitions and strategic priorities. Although Australian researchers engage in world-class collaborations with colleagues overseas, Australia does not partner in or lead major space programs. Without adequate, sustained funding, Australia will miss opportunities for international collaborations and contributions to global advancements in space and the benefits in the form of advanced technologies that flow.

Current policies actively restrict opportunities for space science research in Australia, and many researchers are not eligible for funding from existing programs. Basic space science research funding has come primarily from one-off projects from the Australian Research Council (ARC). New federal investment in civil space activities, such as the Moon to Mars initiative and SmartSat Cooperative Research Centre, mostly aims to stimulate rapidly implementable mid-to-high TRL developments and may require commitments from industry partners. The result is an ad-hoc funding environment, with new entities that have perceived or real overlapping remits with the ARC, but a gap in support to sustain the necessary fundamental research.

### [Strategic investment is required to develop a skilled space workforce](#)

A sustainable space sector requires the workforce to support it. Australia needs a workforce of scientists and engineers trained on missions to feed a burgeoning industry and research sector and act as ambassadors for our nation as we engage with other agencies. High-level training for space scientists occurs in university research settings and undergraduate programs. The absence of space from the critical research areas of the National Science and Research Priorities is a significant omission, and universities will struggle to offer the specialised training necessary in undergraduate courses and Higher Degrees by Research to develop a skilled space workforce.

### [Australia should join the Group of Friends to protect dark and quiet skies](#)

This section addresses the priority theme under survey question four: *supporting astronomy and space science by advocating for the protection of dark and quiet skies.*

Through its National Committees for Science, the Academy has sought perspectives from members of the space science and astronomy communities in preparing this submission.

It is important to note that space science and astronomy are separate and distinct scientific fields, dealing broadly with science topics inside and beyond the solar system, respectively. However, the growing proliferation of satellites impacts both disciplines. The accumulation of satellites and debris in Earth's orbit threatens all future use of space. The increasing light and radio pollution from satellites jeopardises optical and radio astronomy, in which Australia is a major player.

The [Group of Friends of the Dark and Quiet Sky for Science and Society](#) (GoF) is an initiative launched by the United Nations COPUOS (Committee on the Peaceful Uses of Outer Space). The GoF is focused on the impact of satellite constellations on astronomy and the night sky. Australia is not currently a member of the GoF, other than involvement as an observer through the Square Kilometre Array Observatory (SKAO). Joining this group would enable Australia to actively participate in global discussions and share best practices to protect dark and quiet skies.

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<sup>1</sup> National Committee for Space and Radio Science (2022). *Australia in space: A decadal plan for Australian space science 2021–2030* (Australian Academy of Science)

## Sustained support for space weather research would help protect critical infrastructure and improve forecasting

This section addresses the priority theme under survey question four: *reducing risks to space assets that provide essential services to Australia through space debris mitigation and related activities*. This section also discusses the consultation prompt from the discussion paper (page 15): *Is your organisation impacted by the adverse effects of space weather? If so, what would help your organisation mitigate these effects?*

Space weather affects the operation and tracking of spacecraft, space-reliant services and critical infrastructure. Solar eruptions trigger magnetic storms and space weather events, which can damage satellites and affect their orbits, degrade radio communications links, over-the-horizon radar operations and GNSS services, impact aviation, and damage long pipelines and electricity distribution grids.

Australia has leading space weather capability across various university and government groups, which is at risk due to a lack of sustainable funding. A national program focusing on space weather research activities would help protect critical infrastructure and advance space weather forecasting and space situational awareness activities. This program should be supported by observations from a diverse and extensive suite of sovereign ground- and space-based sensors.

## Australia should leverage our geographic advantage to access international opportunities

This section addresses the priority theme under survey question four: *supporting the development and implementation of rules and norms that seek to support the safety, stability and sustainability of outer space, including through international engagement*.

Due to our geographical position, Australia plays a critical role in hosting key deep space tracking facilities for the US National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA). Australia could use our position more strategically to secure research access to NASA and ESA satellites. Australian space science researchers receive requests from international collaborators to provide ground services in exchange for partnership in significant science missions. These requests cannot be met as no funding for these activities exists. Funding would allow Australia to develop collaborative space missions with partner agencies. These collaborations can leverage international expertise for national benefit to grow Australia's capability and international profile.

This submission has been prepared with the assistance of the National Committee for Space Science and the National Committee for Astronomy. To discuss or clarify any aspect of this submission, please contact Mr Chris Anderson, Director Science Policy at [chris.anderson@science.org.au](mailto:chris.anderson@science.org.au).