



Geoscience Australia Submission to Women in STEM Decadal Plan

11 OCTOBER 2018

Dr James Johnson, Chief Executive Officer, Geoscience Australia



1 Background

[Geoscience Australia](#) (GA) is Australia's national geoscience organisation, applying science and technology to describe and understand the Earth for the benefit of Australia. GA provides impartial evidence-based advice and information that is relevant and timely and based on the best available science.

As a Commonwealth science agency, GA employs scientists, technicians, IT specialists, and engineers. Currently, GA has approximately 30% women and 70% men in STEM (science, technology, engineering, mathematics) roles. GA recognises the complex challenges associated with improving the retention of women in these fields and is committed to addressing them. Gender equity is essential to creating an inclusive environment for everyone and improving productivity and excellence within our organisation.

Accordingly, Geoscience Australia developed a [Gender Diversity Strategy](#) and has also signed up to the national [Science in Australia Gender Equity](#) (SAGE) program that promotes gender equity and diversity in STEM fields. The key deliverable for SAGE is a completed, peer reviewed application that provides data and analyses on the current situation for the organisation and an action plan due by the end of July 2019. To support our application for bronze accreditation in SAGE, we are currently gathering and analysing data to identify the areas in which we can make practical changes to improve gender equity in GA.

The current submission draws on these efforts to address the key consultation questions below. In addition, we compiled responses from Geoscience Australia's Senior Leadership team (SES) and other key staff identified for their diversity of experiences and views. With this submission, we aim to focus on geoscientific perspectives and agency-specific needs and initiatives, thus complementing submissions received from other organisations and individuals.

2 Response to Consultation Questions

What changes need to occur to enable more girls and women to participate in STEM education at any level?

Women are lost at every stage of STEM education and career development, and each stage requires discrete changes to enable more girls and women to participate in STEM.

Preschool

With younger children, the barrier to STEM involvement for girls is very much a cultural issue. From an early age, children associate certain careers with either men or women. For this reason, **increasing the visibility of women** in STEM is the most significant change we can make with this age group. Geoscience Australia has a strong cohort of women for outreach and educational activities to increase visibility of women in geoscience.

Primary

A key change to occur at this stage is **appropriately educating teachers** in STEM subjects. Teaching is currently a female-dominated profession. Resources are required to train teachers to confidently,

comprehensively, and enthusiastically cover STEM subjects in a gender-neutral manner. This ensures students not only learn about STEM but also see more women teaching STEM. Geoscience Australia has a well-established and high-quality outreach program, primarily comprising women with STEM training. These staff engage both teachers and scientists with school groups in our [Education Centre](#) which offers [geoscientific classroom resources](#).

Secondary

One of the most important changes to be made at this stage is in the manner in which STEM subjects are taught and promoted. **Making science enjoyable and social** (e.g. interactive lab groups) is a key aspect of science education for all children and may be particularly important in secondary education. Being around peers who share a common STEM interest can strengthen a comfortable and collegiate environment. Teachers and career advisors can also more strongly encourage women to pursue STEM at university by facilitating mentorship opportunities or using tailored approaches (e.g. [emphasising the humanitarian aspect of STEM](#) may increase female university STEM).

Tertiary

The main changes at this stage of education relate to **ensuring equitable opportunity**. At the tertiary stage, women have usually committed to a career path but may lack the support to fully realise their potential in STEM fields. Mentorship programs can pair early career women and established STEM researchers (either women or men) to facilitate collaboration, networking, and personal support. Flexible working hours and work-life balance may also start to become an issue at this stage.

Across all education stages, both men and women should be **promoting STEM in a positive gender-neutral** way, thus building confidence and encouraging participation. As part of this, Geoscience Australia recognises the importance investing in programs aimed at parents and careers to support the increased participation of girls in STEM by avoiding stereotypes and promoting gender equity.

What are the most effective things we can do to change inaccurate stereotypes about STEM professionals and the range of STEM careers?

Inaccurate stereotypes persist because the true diversity of STEM professionals is not broadly visible. We need to make people who don't fit the mould more visible, including women from non-white and LGBTQI+ communities. This can be accomplished in several ways for geoscience and the broader STEM sector:

- **Effective media policies** in workplaces and universities can ensure diverse representation;
- **Outreach activities** can change stereotypes, both directly by confronting the stereotypes as appropriate for a given audience and indirectly through simply including women from various stages of their careers and across varying disciplines;
- **Advocacy by leaders** in science, industry, politics, and communication sectors – both in actions and words – can break misplaced stereotypes around gender in STEM and provide valuable role models and champions of change; and
- **Avoidance of tokenism** ensures that the right person is afforded the right opportunity.

What measures should we be using to determine eligibility for career recognition and progression?

At the recruitment stage, gender bias may still be an issue in many institutions. This could be addressed by scoping **alternative recruitment methods** (e.g. inclusive wording, blind shortlisting, non-traditional interviews or presentations) that challenge how candidates respond to different

situations. GA is implementing inclusive wording for role profiles and job advertisements; this should be standard practice in STEM organisations. It may even be time to re-examine the Australian Public Service Act or Employment Act with a view that they be changed to allow for positive discrimination in specific circumstances.

Career recognition and progression in academia traditionally hinge on an individual's publication record and grant success. However, success as measured by publication and citation records can be flawed given possible career-breaks, part-time status, flexible working hours, and [potential gender bias](#). **Measures of success beyond publication record** should therefore be considered, particularly in academia.

As a government science agency, Geoscience Australia focuses its measures of success for career progression and recognition on meeting government priorities and associated impact. Nonetheless, our data suggest that women advance more slowly than men through the ranks. A deeper **examination of the interpretation of the Merit Principle** by which Australian Public Servant employees are (as required by legislation) promoted may be warranted to promote workforce diversity. For example, since team-work is increasingly essential to organisational success, there must be increasing focus on the importance of teamwork skills and performance, as well as increasing recognition of the contribution that individuals make toward the team as a unit.

Regardless of the measures for success and procedures for appointment, they must be **clear, transparent and open to all employees**. Less subjective expectations and processes for career progression and recognition are less susceptible to the effects of unconscious bias and make it potentially easier for less outspoken or confident applicants to put themselves forward.

On that note, career recognition and progression rely on an applicant to put themselves forward. There is evidence to suggest that a lower proportion of women than men apply for such opportunities. This then requires a **cultural shift to instil gender-neutral confidence and resilience** in all children to progress a career in STEM.

Australia has more than 330 different initiatives to foster the participation of girls and women in STEM. What types of initiatives are demonstrating the most effective impact in your area of interest?

The large majority of these initiatives were unknown to Geoscience Australia, even those related to the Earth sciences. One of the key recommendations is therefore to **promote this list to potential applicants and ensure it is maintained** (e.g. adding and deleting programs, updating eligibility and deadlines). Discipline-specific agencies or professional societies should be encouraged to select from this list to promote applicable programs through their networks, thus offering a more tailored and practical sub-set of suitable initiatives for potential applicants.

As well as merit-based initiatives, Geoscience Australia also supports programs that are not purely merit-based and **celebrate the achievements and diversity of women in STEM** (e.g. Superstars of STEM).

Any program that fosters **hands-on experiences** is well-suited to promote STEM to young children. The geosciences are ideal for this, with cost-effective opportunities available to explore Earth sciences in the field or through sample collections.

What society and regulatory issues (i.e. not STEM-specific) will have the greatest impact on women in STEM, and how should we address those that are barriers?

Many of the challenges facing women in STEM can be traced back to broad cultural issues of **stereotypes and unconscious bias**. Towards women, this can take the form of assumptions about ability (e.g. women are not as capable at certain STEM subjects) and aspiration (e.g. women prioritise family over career). Of particular note, the barriers caused by unconscious biases are also directed towards men. Traditional stereotypes of men as primary breadwinners and secondary caregivers are as much of a problem as the converse for women.

To address these barriers, Geoscience Australia strives for the following:

- Apply evidence-based approaches to refute stereotypes (e.g. recent research that shows [girls and boys perform similarly in STEM subjects](#));
- Provide equal opportunities for men and women by requesting the most suitable staff member for a given task regardless of personal circumstances (e.g. not assuming a mother of young children will avoid fieldwork);
- Encourage work-life balance and associated flexible working arrangements for all staff. It is crucial that men are visible in part-time, flexible hours, and work-from-home roles, thus alleviating traditional pressures on women as primary caregivers;
- Provide on-site access to trusted and qualified childcare, thus reducing staff commuting hours;
- Support staff with parental responsibilities in work-related travel (e.g. guidelines to book work travel with accompanying children).

Progress towards gender equity in STEM will require changes. How do we address the challenge of backlash and resistance to these changes?

Change leaders need to **understand and address the root causes of resistance**, such as fear, change fatigue, cultural and industry norms, and misunderstandings. Formal change management techniques may be useful, including anti-discriminatory or diversity training, strategies to develop inclusive cultures, setting and enforcing standards of behaviours and attitudes in the work environment, and clearly conveying the importance and evidence behind changes. Importantly, it is crucial to **candidly discuss the issues and people's concerns** about the proposed actions and consequences. Male champions of change at senior levels can play an important role by clearly articulating and practicing changes related to gender equity. This may enshrine changes more readily into normal workplace behaviour, as well as increasing positive responses of some men.

As a scientific agency, Geoscience Australia is committed to **evidence-based improvements to the workplace** (e.g. Cultural Audit in 2013), and the research is quite clear that workplaces benefit significantly when diversity increases. This message should appeal to most staff, even those who come may not have experienced or noticed discrimination or inequity. Through our involvement in the SAGE program, Geoscience Australia highlights the benefit of gender equity at individual, agency, and discipline levels. We have formed a Cultural Reference Group and conducted a Cultural Audit in 2013 which addressed the issue of unconscious bias using an evidence-based approach. Recently, Geoscience Australia staff have organised a Diversity in Geoscience Lunch at the inaugural Australian Geoscience Council Convention to discuss their experiences and thoughts about diversity, inclusion and equality in the geoscience community.

If Australia is to take a strategic approach to improving the participation of girls and women in STEM, where would effort best be placed?

The Women in STEM Decadal Plan could benefit from a similar multi-sector strategic engagement as that recently employed by the mineral exploration community in the Academy of Science's [UNCOVER initiative](#). This initiative developed a Roadmap that articulated the desired future state (vision) and set out the key priorities, their interdependencies, the national capacity to deliver and required resources and actions (now and into the future) to meet the goal. The Academy is deft at such strategies, with sustained, authoritative, and apolitical leadership. As part of such a strategy, all Government agencies could commit to delivering programs that address gender equity in STEM, thus ensuring continuous, year-to-year support for education services to build stronger ongoing programs.

In addition, the current 300+ programs targeted at Women in STEM would benefit from a mapping process into a common strategic framework. Any strategic plan should have a clear roadmap, with key performance indicators to assess progress.

Keystone elements of a strategic approach to female participation in STEM are likely to be:

- (1) The benefits of gender equity and diversity, including workplace productivity but also extending to secondary benefits in workplace health, workplace integrity (and thus risk profile) and even beyond the workplace to Australia's social fabric;
- (2) Visible success of women in STEM as high-profile role models, as well as a clear sense of the possible;
- (3) STEM education, including an increased role of women in teaching STEM as discussed above; and
- (4) Understanding and addressing the 'leaky pipeline' phenomenon whereby women leave STEM professions or advance more slowly than men.

Is there anything else you have not yet covered in your response which could improve gender equity in STEM?

In addition to discussing the challenges, it is essential to also portray **positive messages about women working in STEM**, particularly to girls and young women. There are women in STEM who have successful and rewarding careers who have not faced widespread barriers and discrimination. Too many negative messages may be turning girls and women off. Geoscience Australia has several staff willing and able to promote their positive experiences as women in STEM.

Fieldwork is a critical and even diagnostic component in geoscience and many other STEM disciplines. However, **fieldwork involves several challenges for women**, particularly if they are the sole female in a remote location. These include the increased likelihood of discrimination or harassment and inappropriate facilities. In addition, the simple assumption that women may not enjoy or be as capable of fieldwork as much as men, particularly if they have caregiving responsibilities, can reduce the opportunities for women in many STEM fields.

Increasing the number of women in STEM doesn't just apply to girls and young women. **Mature-age women should also be supported** to consider a career change to STEM. Fast-track programs that account for prior teaching or field experience or focus on targeted skills (e.g. programming, data management) may be especially suited to this age group. In addition, a grant or award program to target mature age early-career women in STEM could be developed.

The **prevalence of short-term positions and expected international experience** (e.g. postdocs) in STEM may dissuade some women from pursuing such a career, particularly if they have caregiving responsibilities. Again, this comes back to cultural bias and normalising both men and women as primary caregivers. In addition, the increasing lack of long-term job security in the academic sector should be reviewed.

3 Closing

Geoscience Australia wholeheartedly supports the development of a strategic and collaborative *Women in STEM Decadal Plan* and looks forward to its early implementation. Our organisational view is that gender equity, and diversity in general, enables individuals and teams to perform at their best – productive, resilient and adaptive. Gender equity therefore fundamentally enables productivity and excellence. Data show that women are squeezed out of STEM for various reasons, some of which are not well understood, and that women in STEM are under-represented, especially at senior levels. Geoscience Australia looks forward to the emergence of the Decadal Plan which will help to articulate the barriers and solutions to gender equity in the STEM workforce.