



राष्ट्रपुत्र वीरवार

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WOMEN IN



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Prof. Ajay Kumar Sood

*Principal Scientific Adviser to the
Government of India*

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FEATURE STORY: WOMEN IN STEM



Women in STEM

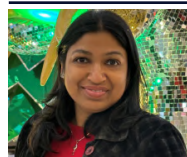
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Prof. Ajay Kumar Sood

Principal Scientific Adviser to the Government of India

In this edition of Vigyan Dhara, PSA Prof. Ajay Kumar Sood underlines the importance of promoting Women in STEM

●●● FOREWORD

As we celebrated India's 75th Republic Day, the all-women tri-services contingent's historic march down the Kartavya Path was not just a ceremonial display, it was a powerful statement of our nation's commitment to empowering women. This symbolic display not only marks a significant shift in gender dynamics within traditionally male-dominated spaces but also serves as a testament to the significant strides women have made in various fields, including the areas of Science, Technology, Engineering, and Mathematics (STEM).

Any discussion on STEM advancements of the last few decades would be incomplete without acknowledging the crucial role Women in STEM, or WinSTEM, have played. Over the past few years, major scientific breakthroughs, from the development of mRNA vaccines to pioneering genome editing and click chemistry, have been

spearheaded by women scientists, resulting in immense positive impacts globally. At home, we have noteworthy scientists like Dr. Soumya Swaminathan, appointed as the first-ever Chief Scientist of the World Health Organisation, making her the first Indian and first woman to hold this position. Then there's Rocket Woman of India Dr. Ritu Karidhal Srivastava who led India's Mangalyaan and Chandrayaan Missions, and Dr. Kalaiselvi who was appointed as the first Woman Director-General of the Council of Scientific and Industrial Research, in its 80-year history. These are the women in science of current times, their lives and journeys inspiring countless aspiring scholars to take bold steps and ascend to great heights.

However, despite significant progress by women in advancing the science and technology ecosystem, their underrepresentation in STEM fields remains a critical issue. I believe it is crucial to look into factors contributing to this issue.

Globally, trends in the participation of women and girls in STEM indicate that while graduation rates are higher among women than men, fewer women enroll in STEM fields in post-graduation, particularly in Engineering, Information and Communication Technology (ICT), and Physics. Many factors play a role in steering women away from STEM disciplines: socio-cultural constraints and stereotypes that perpetuate the notion that certain professions are better suited for men. For women who have transgressed these initial barriers, the journey ahead is no cakewalk either. Women in STEM encounter systemic biases, including domestic burdens, family care responsibilities, relocation issues, two-body problems, unequal pay, limited mentorship opportunities, and challenges advancing to leadership roles when they enter the workforce. The burden of immaculacy adds another layer of complexity to the challenges faced by WinSTEM, when women in high-profile STEM positions find themselves under intense scrutiny, where any

misstep is magnified and used to undermine their credibility. All these factors contribute to the 'leaky pipeline' phenomenon, which is to say that despite the ability to succeed in STEM careers, women tend to not pursue or gradually drop out of the workforce.

Addressing gender-based inequalities in STEM has been a top priority for the Government of India. Various programmes have been initiated to tackle these issues. The Department of Science and Technology has launched several programmes under the Women in Science and Engineering-KIRAN (WISE-KIRAN) scheme. These include fellowship programmes such as the 'WISE PhD program,' which supports women pursuing a PhD in five subject areas of basic and applied sciences. The 'Women's Instinct for Developing and Ushering in Scientific Heights & Innovations (WIDUSHI) programme' aims to encourage and support senior women scientists in conducting research in interdisciplinary S&T areas. Mentorship programmes like 'Vigyan Jyoti' target high school girls in rural areas, encouraging them to opt for STEM subjects. The Department of Biotechnology's (DBT) BioCare programme helps women scientists re-enter the scientific mainstream. Moreover, the 'Consolidation of University Research through Innovation and Excellence in Women Universities (CURIE)' programme supports the development of infrastructure and research facilities for women. The 'Gender Advancement for Transforming Institutions (GATI) programme' assesses gender inequality and aims to transform institutions towards gender-sensitive approaches. These initiatives represent our commitment to nurturing a generation of women leaders in science, providing support from the early stages to later ones. On an institutional level, the Supernumerary Scheme has been a game changer in pulling up the number of women students enrolling for IITs, another small step towards addressing the gender disparity and creating a culture of encouraging young women to pursue sciences.

In fact, recently, I had the honour of inaugurating the [Science for Women-A Technology & Innovation \(SWATI\) Portal](#), on the occasion of the International Day of Women and Girls in Science. This first-of-its-kind interactive platform is designed to consolidate Indian Women and Girls' presence in STEMM (Science, Technology, Engineering, Mathematics & Medicine), and aims to serve as a powerful tool for policy-making to address gender disparities. The portal will be hosted by the National Institute of Plant Genome Research (NIPGR) under the commendable leadership of Dr. Subhra Chakraborty, Director, NIPGR.

The gender inequality in STEM has also been addressed in several inter-governmental forums, with women chief scientists leading the narrative. The recently-concluded G20-Chief Science Advisers' Roundtable (G20-CSAR), led by the Office of Principal Scientific Adviser to the Government of India (OPSA), also saw Women Heads of Delegations representing their countries on a global science advice mechanism. I am proud to highlight my QUAD co-chair and Chief Scientist of Australia, Dr. Cathy Foley, Government Chief Scientific Adviser to the UK Professor Dame Angela McLean, European Union's Joint Research Centre HoD Dr. Liliana Pasecinic, Executive Director of the International Centre for Innovation in Science, Technology and Education and Russia HoD Dr. Irina Kuklina and Vice Minister, Ministry of Science, Technology, and Innovation, Brazil Dr. Marcia Barbosa, and a young researcher from Saudi Arabia Atheer Alkubeyyer- leaders exemplifying women's empowerment on a global stage.

Sharing best practices and role models is one of the crucial aspects of addressing gender gaps, as raising awareness is the key to bringing transformative change. Our vision is a future

where scientific success is dictated by talent and merit where gender parity and equity is a natural outcome. Through targeted initiatives, global partnerships, policy interventions, and a shared commitment to diversity and equity, we endeavour to chart a scientific landscape that we all can be proud of!

As we approach International Women's Day, let's recognize and celebrate the role of women in shaping the STEM fields. This special edition of the Vigyan Dhara newsletter is a tribute to women leaders, entrepreneurs, academicians, government administrators, and grassroots innovators for their commendable work advancing STEM and

socio-economic development in their unique ways. The newsletter also features a section on understanding Women in STEM in Education and Occupation through a data lens. I am also glad to note that through this newsletter, women scientists working at OPSA have shared their thoughts and experiences working as women of science. To say the least, it's a reflection of our collective journey as a society towards a future where women in STEM are the norm and not the exception.

Happy International Women's Day to all!



DATA STORY

Status of Women in STEM Education and Employment in India

— By Sayak Sinha and Devika Oberai

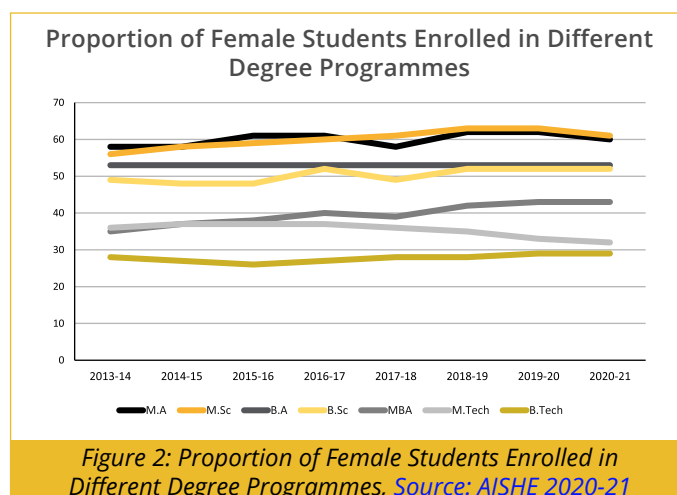
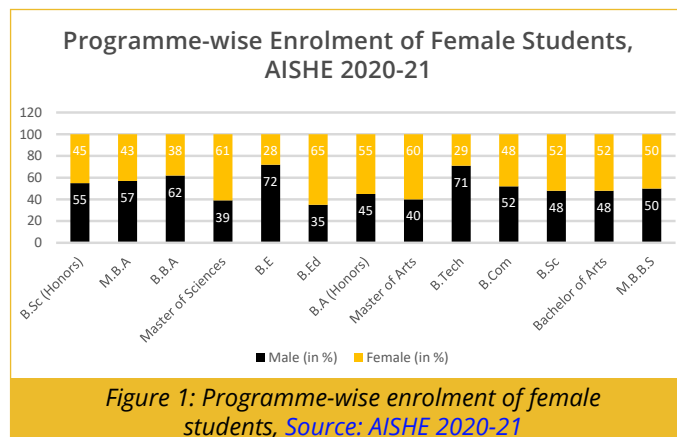
Science, Technology, Engineering, and Mathematics, referred together as STEM, are imperative to a nation's economic prosperity and global competitiveness. Prioritizing gender diversity in STEM holds the key to the creation of new technologies and industries, sustainable solutions to climate challenges, and greater participation in the global economy. According to the Global Gender Gap Report 2023, women remain underrepresented in STEM globally, accounting for only 29.2% of workers across 146 countries. India reflects this trend, as reported by Muralidhar and Ananthanarayanan (2023) that women make up only 17% of STEM faculty across 100 universities.

Such low participation of women in STEM fields is an outcome of the cultural perception of STEM as 'masculine' work. It can be better understood through the phenomenon of a 'leaky pipeline' that starts wide at the time of education but narrows considerably as one moves upwards. Boys and girls are socialised into traditional gender roles at home and school from a young age, which keeps girls from pursuing higher studies in STEM. Further, as one advances in the STEM workforce, the dominance of men isolates women from professional opportunities and discourages them from continuing in the sector.

The phenomenon of leaky pipeline is well reflected in data on education and employment in the sector as well. The following piece presents gender-disaggregated data on multiple indicators on education, employment, and quality of life, shedding light on the current levels and the various factors affecting women's presence at different levels of STEM education and employment. Reports by leading R&D organisations and departments of the

Government of India like the Council of Scientific and Industrial Research (CSIR), Department of Science and Technology, Ministry of Education, etc. have been referred to. As gender-disaggregated data on the Indian STEM ecosystem is currently sparse, the cited data is primarily sourced from CSIR, where gender-disaggregated data is being collected. The CSIR sample, therefore, presents the most recent snapshot of women's participation in the STEM workforce. The report then delves into the various factors that facilitate women's participation in STEM and discusses how a robust monitoring and evaluation framework can help in targeted interventions to increase women's participation in the sector.

Women in STEM Education:



Socio-cultural factors largely shape the choice of higher education degree of women. As a result, their enrolment in science, engineering, and technology degrees remains relatively low as shown in Figure 1. Even with STEM, as Figure 2 shows, female enrolment across degree programmes has remained at similar levels across iterations of AISHE. Female enrolment in Bachelor of Technology was at 28.7% and in Bachelor of Engineering was at 28.5%. Even within this, female enrolment has been low in Mechanical, Civil, and Electrical with Mechanical having less than 10% female students across all levels. These numbers indicate a worrying trend of segregation of women into particular streams. While women's overall participation in STEM might be increasing, their presence in engineering and technology fields remains limited to a few streams like biology and computer sciences.

The Supernumerary scheme of IITs has been very successful in increasing female enrolment across IITs since its introduction in 2017 (Figure 3). The scheme adds to existing seats in IITs for every branch over and above the quota seats to achieve female representation of a minimum of 14%.

IIT Female Students Admission Since Supernumerary Scheme in 2017

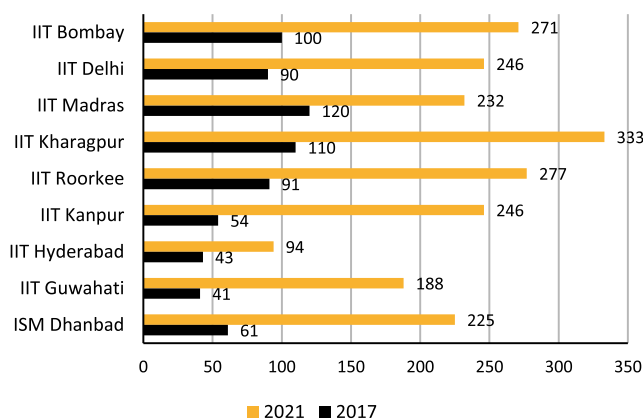


Figure 3: IIT female students' admission since Supernumerary Scheme in 2017, Source: India CSR

Women in STEM Occupation:

Full Proportion of Personnel Directly Engaged in R&D Activities

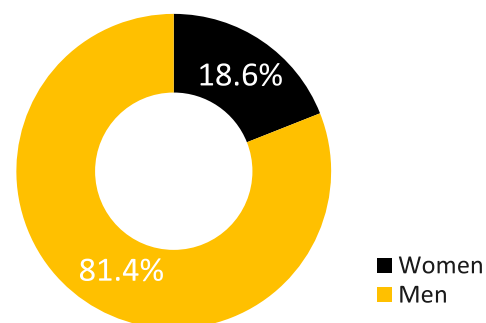


Figure 4: Proportion of personnel directly engaged in R&D activities, Source: Research and Development Statistics at a Glance, 2022-23, DST

Proportion of Women Full-time Employed in R&D

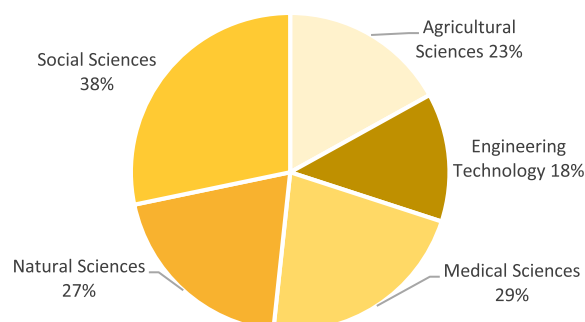


Figure 5: Proportion of women employed full-time in R&D, Source: Research and Development Statistics at a Glance, 2022-23, DST

Cluster-wise proportion of women S&T staff

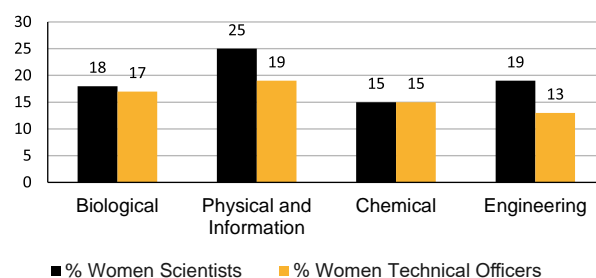
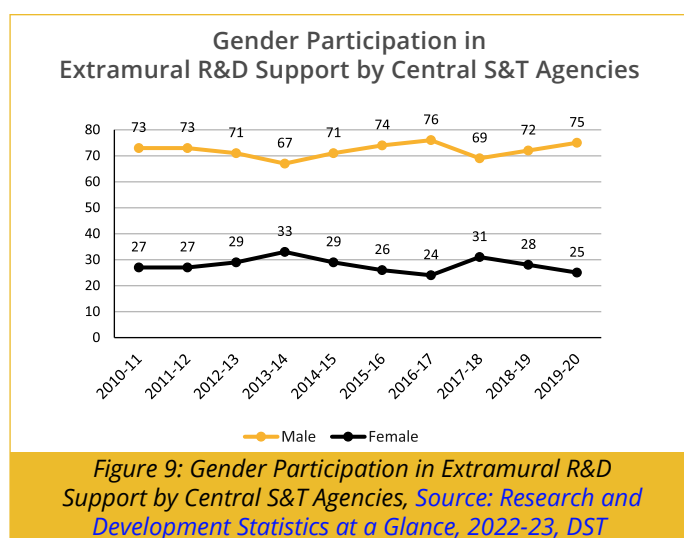
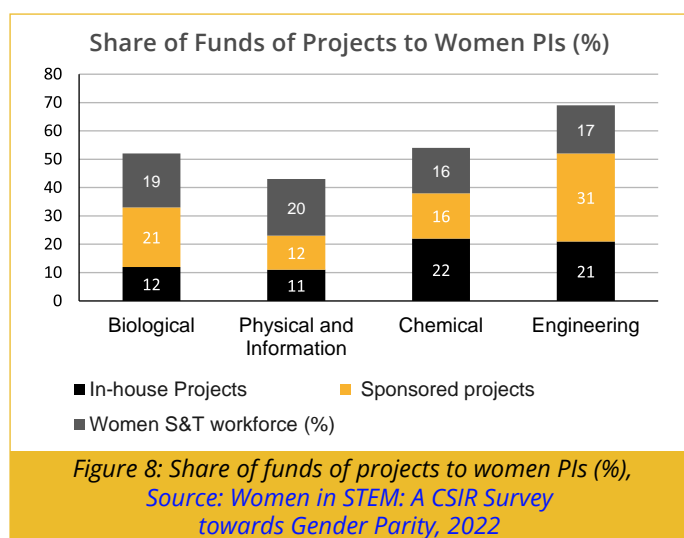
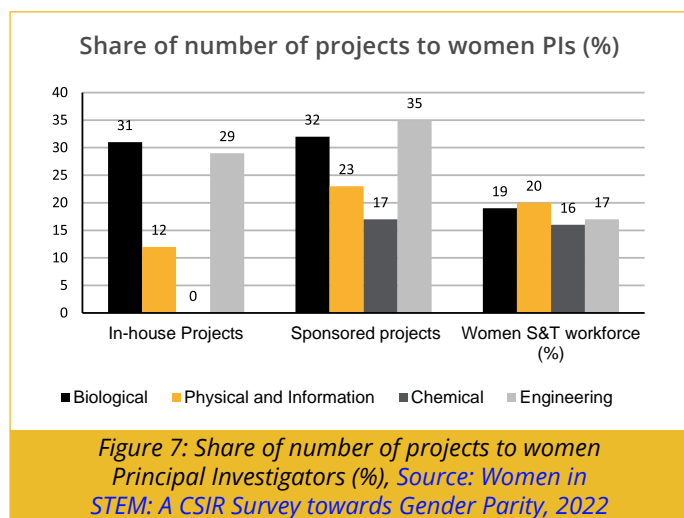
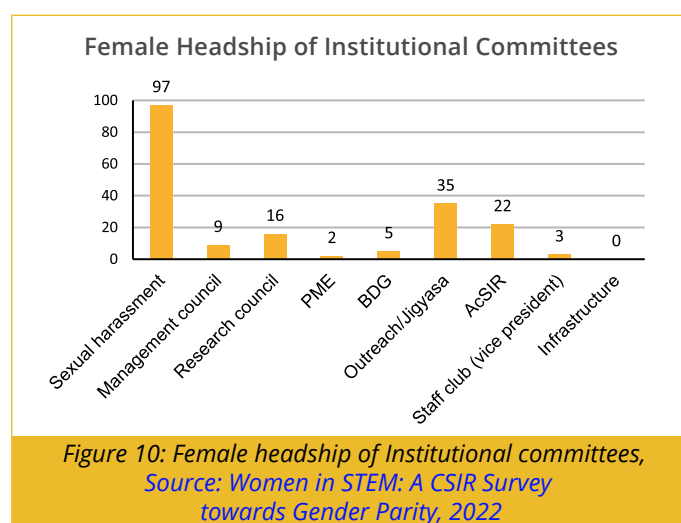


Figure 6: Cluster-wise proportion of women S&T staff, Source: Women in STEM: A CSIR Survey towards Gender Parity, 2022

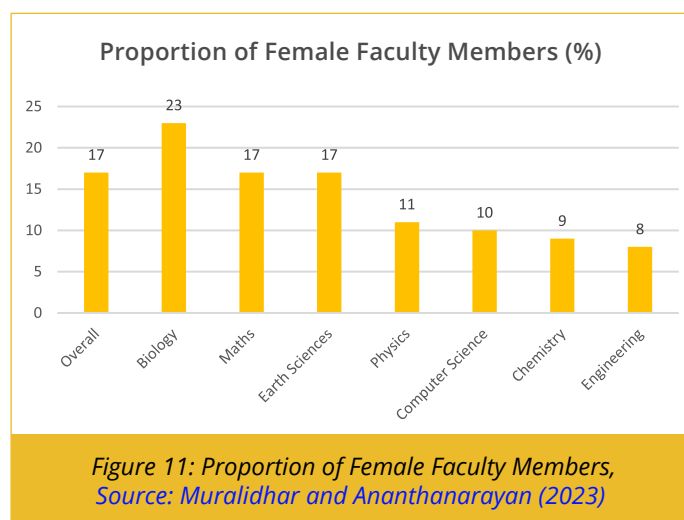
Less than a fifth of employees directly engaged in R&D activities are women. Within CSIR laboratories, it is reported that women hold a very low proportion of scientist and technical officer positions.



Research funding received by an individual S&T staff member in a lab determines the quality and quantity of research activity. The funding is either in-house or sponsored by outside agencies, including State and Industry owned. Figures 7 and 8 compare the share of women in funding against their share in the number of projects. It shows that women PIs have a greater share in research projects but less in funding, which highlights another area of concern for increasing women's participation.



Women have also struggled to break the glass ceiling in reaching important positions like heads of institutional committees. The dominance of men in STEM isolates women from growing into leaders and this is reflected in the appointments of committee heads. Among various categories of committees, women headship is concentrated in POSH committees. The second-highest women headship is in committees pertaining to outreach activities. This trend again highlights the segregation of women within areas of work that are traditionally deemed suitable for women.

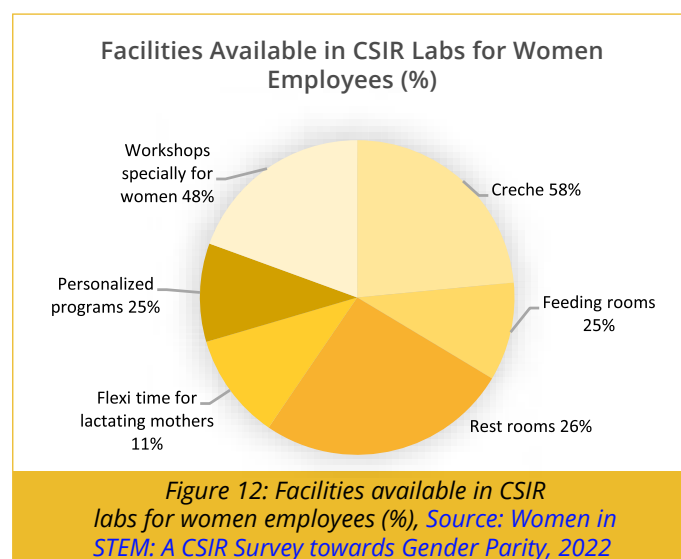


A study conducted by Muralidhar and Ananthanarayan in 2023 found a very low proportion of women faculty members across 100 Indian universities (Figure 11). The study collected data on women representation at the faculty level in Indian STEM academia and underscores the lack of women representation and gender imbalance in Indian STEM talks, conferences, workshops, and panels. Women faculty members only comprise 17% of the faculty. Even within the 17%, most women faculty members are segregated within Biology (23%) which again echoes the issue of occupational segregation of women within STEM.

To understand women's participation in STEM-oriented industries, it is imperative to look at the technology sector. Even with a participation of 34.2% in computer science and allied streams at the undergraduate level as per the AISHE 2021-22, women make up only 29% of the workforce, with only 8% in leadership positions, as reported by the think-tank *AIM Research in their Women in Tech 2023 (India) report*. The report further points out that women tech employees earn 17% less than their male counterparts, even though they constitute almost a third of the workforce with experience of less than three years.

Enablers of women's participation in STEM:

Women's participation in the workforce hinges upon a number of factors. For example, facilities that substitute for care responsibilities of women like creches enable greater workforce participation. Figure 12 shows that while the number of restrooms and creches is considerably high, feeding rooms are not available in several labs. There is no provision of flexi-time for lactating mothers in most of the labs which is a concern since it has a direct impact on the quality of work life. Further, a robust public transport system ensures the mobility of women with safety. The time and effort invested on a daily basis by women in reaching their workplace constitute an important indicator on their work-life balance.



Conclusion:

The low participation of women in STEM can be understood as entry-level and retention problems. At the entry-level, social conditioning plays a major role in discouraging young girls from seriously pursuing STEM. Discouragement at home coupled with traditionalist school curriculum and pedagogies undermine the self-esteem and confidence of girls. Such gaps can

be addressed through targeted interventions that inspire younger girls to meaningfully engage with STEM.

The other major challenge of retaining women in the STEM workforce requires professional opportunities to be equally available to all genders. The dominance of men in STEM turns institutions and organisations into 'boys clubs' which systematically excludes women from availing networking opportunities and growing into leadership roles. This problem is further exacerbated by childbirth, as opportunities for re-entry are low and care responsibilities of women do not allow them extended hours at work as much as men.

Another challenge is the low frequency and overall

lack of gender-disaggregated data on women's participation in the STEM workforce. While enrolment of women across courses and degrees is recorded through the All India Survey on Higher Education, gender-disaggregated data for the workforce is sparsely accessory and can help in designing targeted interventions to enhance female participation.

Considering the significant impact of science and technology on economic growth, it is essential to promote and retain women in STEM fields. Developing monitoring and evaluation frameworks should be prioritised as it will enable targeted investments in educational opportunities, supportive policies, and initiatives that address gender-specific barriers to entry and advancement.

(Sayak Sinha is a Manager, Policy and Advocacy at the Institute for What Works to Advance Gender Equality and Devika Oberai is a Public Policy Associate at The Quantum Hub)

FEATURE STORY: WOMEN IN STEM

Women in STEM Administration: Ascending the Steepest Ladders

— By Dakshata Lingayat

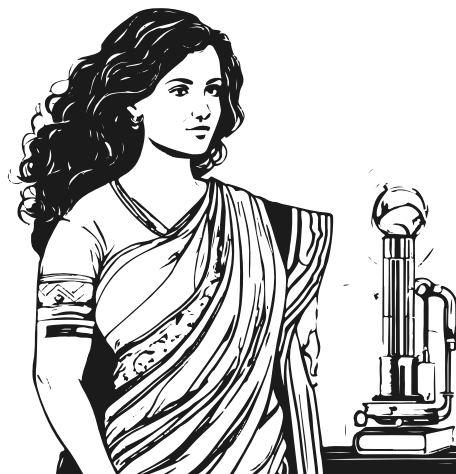


Dr. Ekta Kapoor

Head of Scientific Division, Frontier and Futuristic Technologies, Department of Science and Technology

In many invisible and unrewarded ways, women contribute to the societal and economic well-being of a country while also fighting the stereotypical mindset. Some feel blessed to have had a conducive upbringing and inspiring mentorship, while others struggle to find their way up the ladder. However, all of them have one thing in common, a constant question mark on their capacity to do well and an ability to excel. Dr. Ekta Kapoor, a senior scientist at the Department of Science and Technology (DST), Government of India, with her two decades of experience working with the key government body of the country and leading multiple national bodies of importance, shared that her journey till here wasn't a cakewalk either. Furthermore, a significant part of her struggle to reach where she is now can be understood through a gendered lens.

Dr. Kapoor is currently heading the Frontier and Futuristic Technologies Division of DST and the National GLP (Good Laboratory Practice) Compliance Monitoring Authority. Under her leadership, India became the first non-OECD country in South Asia to adhere to the Mutual Acceptance of Data. Dr. Kapoor was designated as the vice-chair of the OECD Working Party on GLP in 2023 and is currently chairing it. While talking about women's representation on such international fronts, Dr. Kapoor says, "We have a very colourful room when we have the meeting [OECD working party meetings] because all women are in different colours". suggesting the importance of the diversity that women bring to the table.



AI-generated image using Canva

It is discussed widely and at length that women bring immense benefits to diplomacy due to their distinct styles of leadership, priorities, and expertise. Evidence shows that having more women in leadership roles fosters gender-sensitive and responsive decision-making and workplace practices. In India, while women's representation in positions of leadership, especially in government, is gradually increasing, it is far from enough.

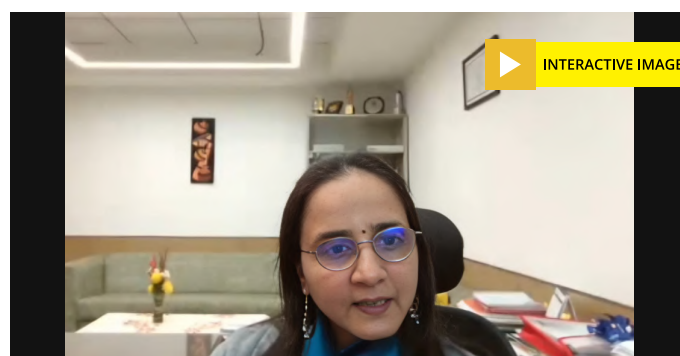
Lack of policy imperatives, societal biases, priorities of the state, etc. could be some of the reasons behind the underrepresentation and, most importantly, low retention of women. However, Dr. Kapoor brought up the most critical impediment to women's success- 'behavioural bias'. While talking about this behavioural bias, she said, "Self-promotion is risky for women. Although it can convey status and competence, it is not at all considered communal. While men can use bluster to get themselves noticed, modesty is always expected out of women. Accomplishments should not be boasted of by women." She added, "When I entered into the government career, I really felt bad when people used to ask my age and then used to tell me, 'abhi to aai ho, abhi kaha itna upar udna hai' ('you have just entered the workforce; why do you want to fly high this early?'). 'Just go slow'. I mean, why should people be telling women all these things when they are never told to any men?" Dr. Kapoor's recollection and insights shed light on many invisible and less apparent behavioural biases that women of all ages go through. Even after they climb the leadership ladder, despite the hardship they face, people's gendered perception of effective leadership comes their way. Forceful agentic leadership traits are generally associated with men. There is always an expectation from women to be affectionate, helpful, friendly, kind, and sympathetic, as well as interpersonally sensitive, gentle, and soft-spoken. On the other hand, men are associated with more agentic qualities that convey assertion and control, such as aggression, ambition, dominance, and confidence. These behavioural factors are key to understanding the ingrained misconceptions and biases women, even at the leadership level, constantly go through.

A significant part of scientists' job working in the ministries and departments of the Government of India is science administration. Scientists are engaged in several governance and policy-related initiatives that may or may not have a connection



AI-generated image using Canva

with their areas of expertise and formal education. Dr. Kapoor also recalled instances where her taking up a leadership role in a frontier technology initiative was doubted by some due to her formal education in a non-technology arena. She asserts that she ran a lot of extra miles to upskill herself on her job to take up this leadership responsibility. Her firm belief that "all streams of science converge on technology" paved the way for her to take this as a challenge. She also mentioned the important role her colleagues at DST, her mentors, and her peer networks played in helping her "steer the mission at the right pace and in the right direction."



Dr. Kapoor sharing her insights on WinSTEM
(Scan the image using Overly App to watch the full video)

Dr. Kapoor highlighted that the gender imbalance in government is very pronounced. She added that "in a certain way, I think there is definitely a need to provide substantial support for women, especially during their key transition periods, such

as childbirth. Because I feel that these events are typically accompanied by the steepest decreases in their workplace representation.”. She underlined supportive policy interventions by the government, including policies on flexible working conditions, maternity leaves, access to affordable childcare, etc., considering the role of gender diversity and inclusion in education and

the workforce. Having said that, she also urged for institutional changes if we need to achieve gender parity in the true sense. In Dr. Kapoor’s words, “It is only through gender inclusivity that we will be able to prove that the entire population of the country can harness the available resources to perform at our level best.”

(Dakshata Lingayat is a Policy Fellow at OPSA.)

FEATURE STORY: WOMEN IN STEM

ENHANCING REPRESENTATION IN STEM: FOSTERING INCLUSIVITY IN ACADEMIA

By Sanchita Jain



Prof. Vidita Vaidya

*Chairperson, Department of Biological Sciences,
Tata Institute of Fundamental Research*

Image Credit: Infosys Science Foundation

"Women are not even a minority, but a representation," says Professor Vidita Vaidya, neuroscientist and Chairperson of the Department of Biological Sciences at the Tata Institute of Fundamental Research (TIFR), Mumbai. Her words echo a profound truth about not just the lack of visibility of women in science but also a lack of awareness and normalization of their presence. Therefore, the sharing stories of women leaders in STEM, she asserts, isn't merely about glorifying their achievements; they're about normalizing their existence in these male-dominated spaces.

Recently, there has been a great focus on the underrepresentation of Women in Science, Technology, Engineering, and Mathematics (WinSTEM), with greater emphasis on the

alarming underrepresentation of WinSTEM in academia. While the number of women receiving postgraduate degrees has increased in recent years, the number of women in STEM faculty positions remains largely unchanged. This narrative is a reflection of deeper societal and institutional biases hindering women's opportunities to excel in their academic pursuits.

Prof. Vaidya, a recipient of the prestigious Shanti Swarup Bhatnagar Award, reflects on the state of women in STEM and affirms that the journey of women in science is not just about overcoming gender disparities but about challenging the very foundations that perpetuate these inequalities.

The Intersectional Hurdle

The challenges to women's representation in STEM, are magnified when viewed through the lens of intersectionality. Prof. Vaidya highlights how caste, religion, and socio-economic status intersect with gender, creating a multi-faceted barrier to women's representation. "If women are already a minority, you can imagine then when you look at the intersection of caste, religion, et cetera that it becomes even harder to really see a reasonable representation in the STEM field," she notes, bringing to light the nuanced layers of underrepresentation that become apparent when considering intersecting identities such as caste and religion alongside gender.

The Privilege of Support

Prof. Vaidya firmly believes that the conversation of privilege is conveniently left outside of scientific tables and the overall community and the system is unconducive to anyone who is not a male belonging to a certain upper caste or class. While

acknowledging her privilege as being born to parents who were both clinical researchers and growing up on a research campus meant science was a fairly easy career choice for her, she also notes that her experience is not the standard but an exception. For the majority of women, the path in academia is often riddled with systemic and societal hurdles, ranging from patriarchal norms to inflexible institutional policies to a disproportionate ratio of caregiving responsibilities.



Image for Representational Purposes Only

Prof. Vaidya cites an example from her early days at TIFR when the institute had less than 15 female faculty members in a cohort of 100. "When I joined, there were a few other women around at the time, and the department meeting sometimes used to be at 6:30-7:00 pm. And that's not a viable time to have a meeting, especially if you have young kids or the meetings used to be set on weekends when you want to give quality time to your kid. So then, which is interesting because many of the men in that room also had kids. It's not like it was only the women, but because we are socialized to view our responsibilities differently. The men had never raised the point about the fact that "listen, we don't want to do a meeting on the weekend." Prof. Vaidya insists that this calls for a consideration to change practices and policies that are designed to exclude the "minority rather than leaving it to the person who's a rare member to make an effort to fit in."

Power of Policies and Individuals

Yet, Prof. Vaidya is cautious not to oversimplify the solution to gender disparities in STEM as a mere function of policy changes. While policies play a crucial role, she asserts the importance of individual actions and the collective culture within academic institutions. "It's sometimes about policies, but sometimes even more than policy. It's about the individuals who are implementing that policy. You can have great policies and individuals who are not willing to implement them. So then it's really no use having those policies," she remarks, advocating for a change in the ecosystem both from the perspective of policies and the role of people fostering this inclusive ecosystem.

Her vision for the future of women in STEM is one where support structures, both within and outside the academic environment, are strengthened and diversified. Taking cognizance of the dual battles many women face — combating systemic biases in their professional spheres while managing responsibilities at home — calls for a concerted effort to build policies and practices that genuinely support women's advancement in science.

Choosing Role Models Carefully

In discussing the value of role models, Prof. Vaidya stresses the need for careful selection. She challenges the conventional wisdom of holding up exceptional women in STEM as beacons for others to follow, pointing out the inherent flaws in a system that elevates individuals without acknowledging the privileges that facilitated their success. "They have one negative, which is that they are women in an environment where women are really underrepresented, but they are carrying a whole bunch of other advantages (in terms of caste or class)," she says. "When you discuss merit, you have to simultaneously discuss

privilege, as there is no such thing as pure merit," she adds passionately. In STEM academia, this diversity in role modeling is crucial for inspiring the next generation of women scientists, ensuring that they see reflections of their own identities and possibilities for success.

Reimagining the Role of Women in Leadership

Prof. Vaidya sheds light on some of the unique challenges faced by women in STEM, often being the sole female voice in decision-making forums and bearing the brunt of representing an entire gender. "This puts a dual pressure on women, which is not okay," she implores, suggesting that women, upon reaching positions of influence, often shoulder the additional responsibility of championing Diversity, Equity, Inclusion, and Accessibility (DEIA) initiatives. This expectation creates an imbalance, asserts Prof. Vaidya, highlighting the disproportionate burden women face in fostering an inclusive scientific community.

This imbalance calls for a collective approach to DEIA efforts in STEM, emphasizing that the responsibility should not fall solely on those who have navigated significant barriers to reach their positions. Achieving true diversity and inclusion requires the active participation and commitment of the entire STEM community. By sharing the responsibility of DEIA initiatives, the field can move towards a more equitable and supportive environment for all its members, alleviating the undue pressure on women and facilitating a more inclusive path forward.

Role of Mentorship

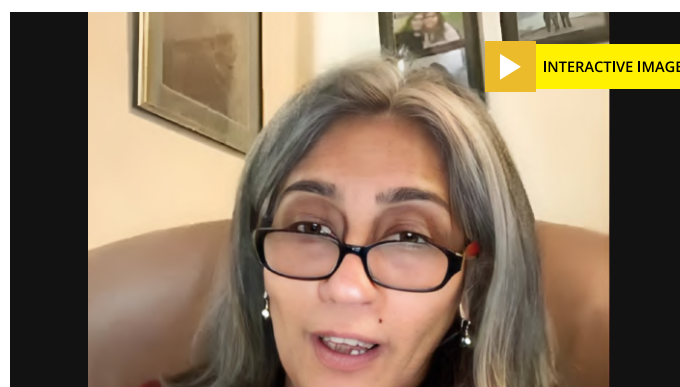
Sound mentorship plays a pivotal role in carving the journey of young scholars wishing to pursue a career in the sciences. Prof. Vaidya says she was lucky to work under mentors including the late Dr. Ronald Duman and Dr. Eric Nestler who demonstrated a sustainable work-life balance to

(Sanchita Jain is the Communications Specialist at OPSA.)

her when she was a PhD scholar, these attributes ingrained in her when she has stepped into the shoes of her mentors. This aspect of mentorship goes beyond guiding academic pursuits; it's about shaping a more inclusive and empathetic academic culture.

Policy and Institutional Reforms

Prof. Vaidya asserts the critical need for gender audits in STEM institutions, advocating for a comprehensive assessment beyond scientific output. She proposes that institutions, especially those funded publicly, should undergo audits to evaluate their performance in diversity, equity, inclusion, and mentorship, along with their scientific achievements. Let's hear more on institutional reforms from Prof. Vaidya in the following video:



Prof. Vaidya sharing her insights on WinSTEM
(Scan the image using Overlay App to watch the full video)

Prof. Vaidya's journey and insights serve as a clarion call for continued conversation and action around diversity, equity, inclusion, and accessibility in STEM. Her experiences underline the multifaceted nature of the gender gap and the importance of a concerted effort from all stakeholders to bridge this divide. Institutions must implement meaningful changes that support women's participation and advancement in science, while society challenges and changes the cultural norms that limit women's opportunities in STEM fields.

FEATURE STORY: WOMEN IN STEM

Indian Innovators And Entrepreneurs Inspiring Change

By Dakshata Lingayat



Ms. Aparna Saraogi

Head, Credit Risk, India, NatWest Group
& Co-Founder WEE Foundation & INSquare

“What is the best investment for any country or an organisation?” asks Ms. Aparna Saraogi, Head, Credit Risk, India, NatWest Group, and CoFounder Women Entrepreneurship and Empowerment (WEE Platform) and Inclusive Innovation in New Normal (INSquare). “The clear answer was and is ‘gender parity.’ Billions of dollars can be added to the world economy and our country's economy if only we have gender parity in entrepreneurship and labour participation. I firmly believe that the disparity that exists between female and male entrepreneurs is unacceptable and is holding our country back. The unrealised potential of women entrepreneurs for the Indian and global economy is enormous,” she added.

The gender gap in STEM directly impacts the economic growth of a country. Indian women in

the industry are making a mark through their ventures and participation in various STEM fields. However, the STEM field continues to remain gender skewed, especially at the intersection of STEM and industry. Along with several socio-cultural impediments, economic factors such as low labour force participation, gender pay gap, gender wealth gap, etc. constrain women's participation in STEM. In an environment such as this, having networks and collectives dedicated to empowering women through fostering entrepreneurship and innovation can positively impact women's participation.

Story of Women Entrepreneurship and Empowerment (WEE) Foundation, in the words of its co-founder Ms. Aparna Saraogi.

WEE is my journey from ME (Me being an empowered woman) to We (where I took numerous initiatives with a group of my friends to strengthen women entrepreneurship) to WEE (where we all come together, hold each other's hands, and make a chain of billions of women entrepreneurs across the globe). To start the WEE journey, we studied the entrepreneurial ecosystem in our country and across the globe. We spent time with women entrepreneurs across the sectors who were at different trajectory points in their entrepreneurial journey and in almost all parts of our country. This made us realise that we need to create an ecosystem where women entrepreneurs can come together, be each other's founder/co-founder, mentor, supplier, and customer, and thrive together.

WEE was started with the vision of making entrepreneurship a viable career option for women entrepreneurs. We organised multiple cohorts and created an environment facilitated by industry leaders where women entrepreneurs started strengthening each other's entrepreneurial journey and taking their ventures to the next level.

For example: There was an entrepreneur in our batch who made affordable sanitary napkins; another one was going to rural Maharashtra to source raw donkey milk for her anti-ageing products. They joined hands through WEE; the first entrepreneur was able to scale her business by selling her affordable sanitary napkins in these rural areas. It created a win-win for all.

During the pandemic, almost everyone was impacted. There was a global decrease in female labour force participation, and some of our WEE women entrepreneurs were also adversely impacted. Out of adversity comes opportunity. We thought it was an opportunity to **Build Back Better**. It was a very apt time to leverage global best practices, collaborations, and the embedding of modern innovative technology to strengthen women empowerment. So, I co-founded **Inclusive Innovation in New Normal (INSquare)**. **INSquare** has global co-founders. We have a core team from India, Australia, and the US.

At **INSquare**, we focus on bringing global leaders together on a platform to have more women in leadership positions. We have hosted numerous global conferences to strengthen women in leadership positions (Boards/ executives/ entrepreneurs).

For example: we recently hosted a conference with Indian and Israeli women entrepreneurs in collaboration with ecosystem partners from Israel. This created a lot of opportunities for

collaboration for entrepreneurs. We also hosted another conference with sustainability leaders from India, the Netherlands, and Australia. The focus was to strengthen the sustainability agenda on boards.

India's growth story inspires me. Seeing our country's economy grow and the role of women entrepreneurs/ women in leadership positions growing inspires me.



Image Credit: Ms. Aparna Saraogi

Along with support networks and collectives such as the WEE Foundation, the role of mentors and role models is very critical, especially for young innovators and entrepreneurs to flourish. While talking about the role of mentors, Ms. Saraogi said, "Mentor steers us and enables us to validate our achievements and navigate challenges. It is of immense value when we know someone who has been on a similar journey as ourselves is with us and helping us to succeed," she added.

Similarly, it is also critical to empower young female innovators, firstly to innovate and then throughout the process of commercialisation including patenting, marketing, etc.

Story of a young innovator: Dr. Pooja Shailendra Laxmi Gupta



Dr. Pooja Shailendra Laxmi Gupta
Clinical Physiotherapist and Founder
of Spiro-Ease

Dr. Gupta, a Clinical Physiotherapist and founder of Spiro-Ease innovated a Modified Volume-Oriented Incentive Spirometer, a device that can be used to improve the lung capacity of people of all ages. It can also be used for post-surgical interventions to improve lung ventilation. The device is made to be user friendly, especially for children and visually impaired people. Dr. Gupta's innovation is a multifold improvement on the regular incentive spirometer.

While sharing her idea and inspiration behind this modified device, Dr. Gupta said, "So this is [incentive spirometer] a widely used device on a larger scale. It is based on visual feedback. You need a visual field to see and use the device. This makes it difficult to use for people with visual impairments. During my practice in 2016-17, I came across a 75-year-old patient to whom we were trying to explain how the device works.



Modified Volume-Oriented Incentive Spirometer
Image Credit: Dr. Pooja Gupta

However, given his age, he was facing some vision-related issues. That was the moment when I thought we should have an alternative technology to this, such as auditory signals or lights that are flashy enough that a person can hear or see and can be more catchy for the patient to understand easily. That's when the idea popped into my head that I should do something like this, which might help the population, not just the elderly population or the visually impaired community, but children. Dr. Gupta's improved device uses audio-sensory cues to make the feedback collection and usage of the device easier and more accessible.



Dr. Gupta sharing her insights on WinSTEM
(Scan the image using Overlay App to watch the full video)

Dr. Gupta's journey so far is filled with challenges. At the manufacturing stage of the device, she faced difficulties in finding an engineer who could translate her ideas into a device. Finding parts for the device was also a challenge. After building the device, she had multiple questions about where to go next. Patent filing, projecting innovation, marketing, etc. were the areas she was not immersed in. To overcome this, Dr. Gupta recalled the role that her support systems, including her parents, peers, and mentors, played in providing her with directions as well as much-needed support. While talking about her journey, Dr. Gupta brought up an important aspect of sectoral bias and how it intersects with gender. Physiotherapy as a stream of research and innovation remains highly unexplored in India. Though the institutions of national importance have significant synergies with the medical field, the field of physiotherapy remains uncharted.

(Dakshata Lingayat is a Policy Fellow at OPSA.)

Physiotherapy as a field of practice has historically been dominated by women. The sectoral bias creates another layer of marginalisation for women who wish to innovate in this field. Several such domains often remain uncharted. It is important to divert our attention to such fields of STEM and provide them with a boost to realise their fullest potential.

Dr. Gupta, with her innovation driven by a cause, is now in the process of understanding the nuances of upscaling and marketing. This journey from an innovator to an entrepreneur is not easy for many young female innovators, as highlighted by Dr. Gupta. But as she says in her message to young girls who want to be innovators, "Hurdles will keep coming. You have to be strong. You will shine at the end, no matter the darkness."

FEATURE STORY: WOMEN IN STEM

The Bird Whisperer: Dr. Purnima Devi Barman and the Rise of the Hargila Army

— By Jahnab Bharadwaj

In STEM, the journey of women working at grassroots levels is both a testament to their resilience and a reflection of the transformative impact they can have on future generations. WinSTEM working at the grassroots faces numerous challenges, from limited access to education to deep-seated gender biases. Their journey often involves overcoming stereotypes and breaking through barriers that have persisted for years. These women, as Grassroot Warriors embody intersectionality, acknowledging that their gender intersects with other aspects of their identity, such as race, ethnicity, and socioeconomic status. Despite challenges, these women's work extends beyond local communities, addressing issues, driving sustainable development, and fostering a more inclusive and diverse STEM landscape.

Amid the lush greenery of Assam, India unfolds a story woven with culture, tradition, resilience, and the inspiring journey of Dr. Purnima Devi Barman. Her path didn't start in academic halls but in her childhood village in Assam, where a spark kindled a love for nature that later evolved into a movement. Driven by a deep passion for the Greater Adjutant Stork, or Hargila, Dr. Barman chose an unconventional route to champion the cause of this often misunderstood scavenger and foster environmental awareness within her community.

Dr. Barman's connection with nature and her awareness of the imminent threat of extinction for this endangered species began at an early stage.



Image source: eBird.org

Greater Adjutant (Leptoptilos dubius)

The greater adjutant stork, a large and unique bird species, is known for its distinctive appearance with a hunched posture and a featherless head. Often found near wetlands and garbage dumps, these storks play a crucial role in the ecosystem by contributing to waste management.

"I want to give a big salute to my grandma, who inspired me in life. She was a farmer and always took me to her rice fields and by the river. She'd point out birds and share her love for nature. Even though she didn't go to school for nature stuff, her strong connection with nature stuck with me." - Dr. Barman

The pivotal moment did not unfold within the pages of a research paper but emerged from a poignant act of cruelty. Dr. Barman was about to

start her PhD on the greater adjutant and one day she got a call about a Hargila nesting tree being cut down. Seeing the suffering of the injured birds made Dr. Barman more determined, inspiring her to do more beyond research. She said, "This wasn't just about birds; it was about motherhood that connects us with nature, about nurturing life, and about protecting a vital part of the environment". Delaying her PhD studies, she started grassroots initiatives to spread awareness about the misunderstood bird, its nesting places, and the crucial need for species protection. To connect with her community, she opted for a different strategy, one that aligned with their traditions, values, and natural nurturing instincts. This laid the foundation for the "Hargila Army."



(Women of Hargila Army wearing the Hargila Headrest, Image Credit: Dr. Barman)

This wasn't an army in the traditional sense, but a force of over 10,000 women, empowered and united by a shared purpose of protecting nature. This started spontaneously, and the number of women involved increased over time. Inspired by her grandmother's stories and the lively tradition of celebrating motherhood, Dr. Barman came up with the "Hargila Baby Shower." This special initiative struck a chord with the women, establishing a link between their cultural identity, motherhood, and the conservation of the Hargila.

Dr. Barman faced numerous challenges in her journey. The main hurdle to her conservation work was the widespread stigmatization of the bird, with people viewing it as a 'Bad Omen.'



(Women of Hargila Army celebrating Hargila Baby Shower through Assamese traditions, Image Credit: Dr. Barman)

"Hargila is a scavenger bird. And because they go to garbage dumps, people often have a negative perception of them. When I went to meet people, many of them reacted by putting their hands on their noses, indicating that these birds are considered dirty and unwelcome. It was very stressful for me, especially with my daughters accompanying me most of the time, and when I started I didn't have adequate resources to address these misconceptions." - Dr. Barman

Besides the public view of the bird, Dr. Barman encountered significant challenges in how people perceived her role and efforts. When she initially mobilized women for conservation efforts, she dealt with gender biases, societal expectations limiting women's involvement, and skepticism from within the conservation community.

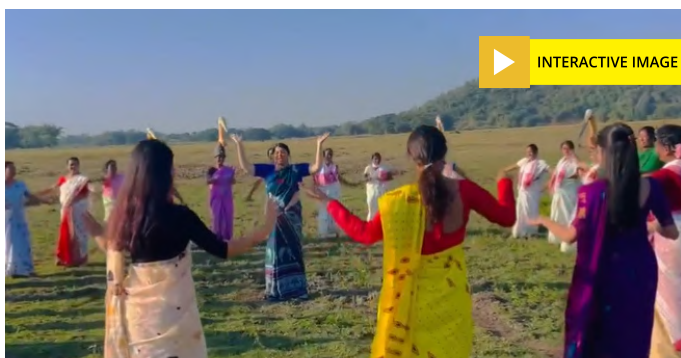
Driven to include more women, she continues creating new solutions through culture and traditions.



(Dr. Purnima Devi Barman during 'Empowering Women Through Biodiversity Classes' program, Image Credit: Dr. Barman)

"At first, when I arranged meetings, nobody came. When I asked why, they said they were too busy with household chores and cooking for their kids. I got it – women have a lot to do at home. So, I came up with a solution. I started organizing cooking competitions and festivals to bring everyone together, and it worked. They started joining in." - Dr. Barman

Dr. Barman and her team launched programs to raise awareness in communities, spreading knowledge to a wider audience through educational initiatives reaching villages. Their conservation efforts include establishing 'Hargila Learning Centre' in schools, conducting education campaigns from Village to Village, and creating a youth curriculum for environmental awareness, etc.



(Celebration of Hatching season of Hargila, Image Credit: Dr. Barman)

(Scan the image using Overly App to watch the full video)



(From village to village education, Image Credit: Dr. Barman)

(Scan the image using Overly App to watch the full video)

Dr. Barman firmly emphasizes the crucial role of women in discussions about climate change and inclusion of women as leaders and decision-makers in addressing environmental challenges.

"I always encourage them to develop leadership skills and become future leaders. Simultaneously, I urge them, especially when working with the Hargila Army, to engage with other mothers. We emphasize the importance of encouraging their young girls and children to participate in environmental education." - Dr. Barman

Her strong belief in the strength of collaboration and community spirit led the way. The Hargila Army thrived, turning backyards into safe spaces for the birds, creating textiles with Hargila motifs, and raising awareness through song, dance, and storytelling.

"Our women started weaving traditional attire like Mekhela Chador, Scarves, and shawls which we promote through offline and online stores. People love these cultural symbols, some of these products are in museums as well... In this manner, our women gain empowerment through looms and sewing machines, and also through environmental education." - Dr. Barman



(Assamese traditional 'Gamosa' with Hargila motifs,
Image Credit: Dr. Barman)

The impact was significant. Not only did the Hargila population increase, but the lives of the women also transformed. They learned how to become leaders, entrepreneurs, and guardians of their environment. Dr. Barman's remarkable contributions earned her numerous awards and accolades. In 2017, Princess Anne of the United Kingdom honored her with the prestigious Whitley Award, often called the Green Oscar. Additionally, in 2022, Dr. Barman received the Champions of the Earth award from the UN Environment Programme (UNEP) in the Entrepreneurial Vision category.

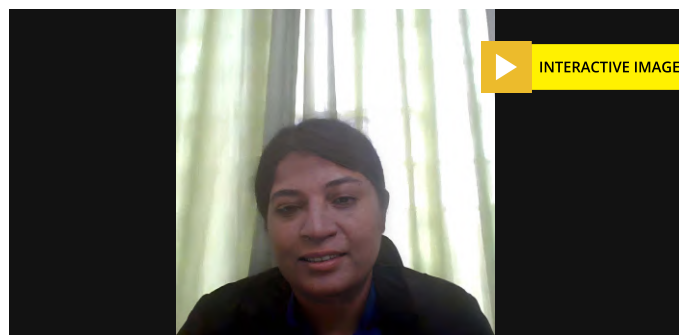


(Dr. Purnima Devi Barman receiving
the prestigious Whitley Award,
Image Credit: Dr. Barman)

Dr. Barman's narrative extends beyond the realm of conservation; it weaves a tapestry of empathy, innovation, and community spirit. It serves as a

(Jahnab Bharadwaj is former Communications Associate at OPSA.)

compelling example of how the formidable challenges we face can be conquered through collective efforts driven by a shared purpose and fueled by the strength of tradition and cultural understanding. As Dr. Barman says, "Environmental education and conservation action start at home, at your backyards of the house."



Dr. Barman sharing her journey and insights
on WinSTEM

(Scan the image using Overly App to watch the full video)

It is a common occurrence for the stereotypical image of women in lab coats to narrow our perception of the diverse landscape within the realm of STEM. Dr. Barman's narrative, intertwined with the experiences of her group in the field, serves as a powerful catalyst in challenging these limiting stereotypes. Beyond breaking down preconceived notions, their stories play a pivotal role in broadening our understanding of the multifaceted roles that women actively engage in across various STEM disciplines. This narrative not only dismantles the confining imagery associated with women in STEM but also emphasizes the significance of inclusivity and the incorporation of diverse perspectives within the scientific community. By showcasing the remarkable contributions of women in addressing global challenges, Dr. Barman's story exemplifies the vital role that women play in shaping the fields of science, technology, engineering, and mathematics. It stands as a testament to the fact that embracing diversity fosters innovation and strengthens our collective ability to address complex issues in STEM and beyond.

OPSA'S INITIATIVES FOSTERING WOMEN IN STEM

It is widely recognised that advancements in STEM are a prerequisite for achieving sustainable and inclusive growth. In this ecosystem, women's participation is essential, not only for enhancing the effectiveness of scientific discovery and innovation but also for ensuring a more diverse approach to decision-making. United Nations Sustainable Development Goals (SDGs), particularly SDG-5, which aims to achieve gender equality and empower all women and girls by 2030 also advocates for mainstreaming women's participation in STEM.

Despite its recognition, the underrepresentation of women in STEM remains a global challenge. The Global Gender Gap Report 2023 ranks India at 127th out of 146 countries, with women constituting only 27% of the STEM workforce. This highlights the urgency of initiatives designed to not only encourage women to embark on STEM careers but also support their sustained engagement in these sectors.

Promoting women in STEM and striving to create a more inclusive scientific ecosystem has been a priority of the Office of the Principal Scientific Adviser to the Government of India (OPSA). The OPSA's approach includes offering fellowships to aspiring women scholars, deploying technology interventions to enhance livelihood opportunities for women, and organizing outreach activities to spotlight notable women in STEM fields. Women scientists are increasingly taking the lead in global initiatives that have a profound impact on lives worldwide. Their stories serve as powerful sources of inspiration, illuminating paths for aspiring young minds and underlining the importance of gender diversity and representation within STEM fields.

Exemplifying this, Dr. Parvinder Maini herself a woman scientist is the Scientific Secretary in OPSA and is also spearheading the scientific administration of the Office as its Executive Head.

Dr. Maini's extensive experience in science and science administration has been instrumental in the successful execution of projects of national importance, including the National One Health Mission, One Nation One Subscription, Anusandhan National Research Foundation, and National Deep Tech Policy. Her career spanning over three decades showcases the vital role of leadership in promoting gender diversity within the scientific community, serving as an inspiration to many other aspiring young minds.

Dr. Maini's message on International Women's Day resonates with the need for more female role models in the field of science. "Women in science in India need more role models they can identify with," she asserts, emphasizing the necessity to nurture and prepare the next generation of women scientists.

INITIATIVES ANCHORED BY OPSA

The following multifaceted initiatives shed light on the efforts spearheaded by OPSA to cultivate a more inclusive and dynamic S&T landscape:

Kamala Sohonie Memorial Lecture Series

The OPSA, in collaboration with the India International Centre, Delhi, IIT Madras Alumni Association, and Teamwork Arts launched a bi-monthly lecture series to amplify [women's voices](#) across STEM and ensure broader dissemination among global audiences, on the occasion of International Women's Day (March 8, 2022). Named after the first Indian woman to get a PhD and head a prominent science institute in India, Dr. Kamala Sohonie, the lecture series established a platform to celebrate her acclaimed achievements by enabling women in STEM to share their journey.

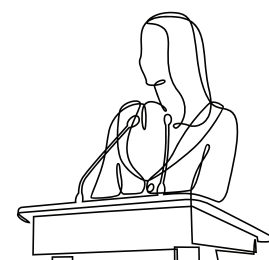


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Manthan Platform

Manthan, developed by the Office of PSA, serves as a digital platform to foster research and innovation by bringing together diverse stakeholders from research, academia, and industry and creating an environment for R&D, innovation, and exploration of emerging technologies. A dedicated “Women in STEM” section on the platform caters to women achievers, opportunities, proposals, and innovations in STEM fields. The platform has achieved positive outcomes through several scholarship programs. With 332 women entrepreneurs and 65 women in STEM on the platform, 19 opportunities have been identified to seek solutions to identified problem statements.



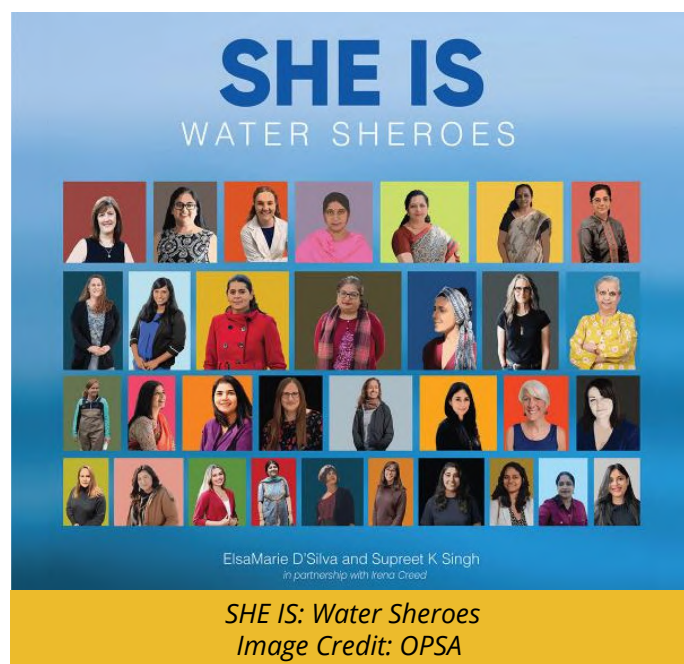
Stories of Women Advancing the Sustainable Development Goals in India. Image Credit: OPSA

‘She Is Book’ Series by Manthan The ‘She Is’ book series, anchored by the Manthan platform and written by ElsaMarie D’silva and Supreet K Singh, showcases more women role models for youth, displaying their leadership while generating interest in SDGs. The first edition of ‘She Is’ covers **‘Stories of Women Advancing the Sustainable Development Goals in India’** that aims to highlight the journeys of women leaders in their respective

fields, realizing 17 SDG goals through their work across different professions like judges, scientists, policewomen, etc., overcoming the socio-economic barriers and contributing to a greater good.



The second edition of ‘She Is’, in collaboration with the Red Dot Foundation, British High Commission, and FICCI FPO, highlights **76 Women in STEAM** across the country, highlighting gender, leadership, and sustainable development in the fields of STEAM. The book sheds light on the personal and professional struggles of these women whose stories exemplify their grit and serve as role models for young girls aspiring to work in these fields. It seeks to make women in the fields of Science, Technology, Engineering, Arts, and Mathematics (STEAM) more visible, celebrate their significant contributions, and acknowledge their journeys which are often fraught with challenges that are gendered. The **‘She Is’ Women in STEAM** book is important because it is time we foster an inclusive workforce, and the book will push the agenda of gender diversity in the STEM space. Therefore, this book is an inspiring tool to encourage diversity and the rich perspectives needed to drive innovation at the workplace.

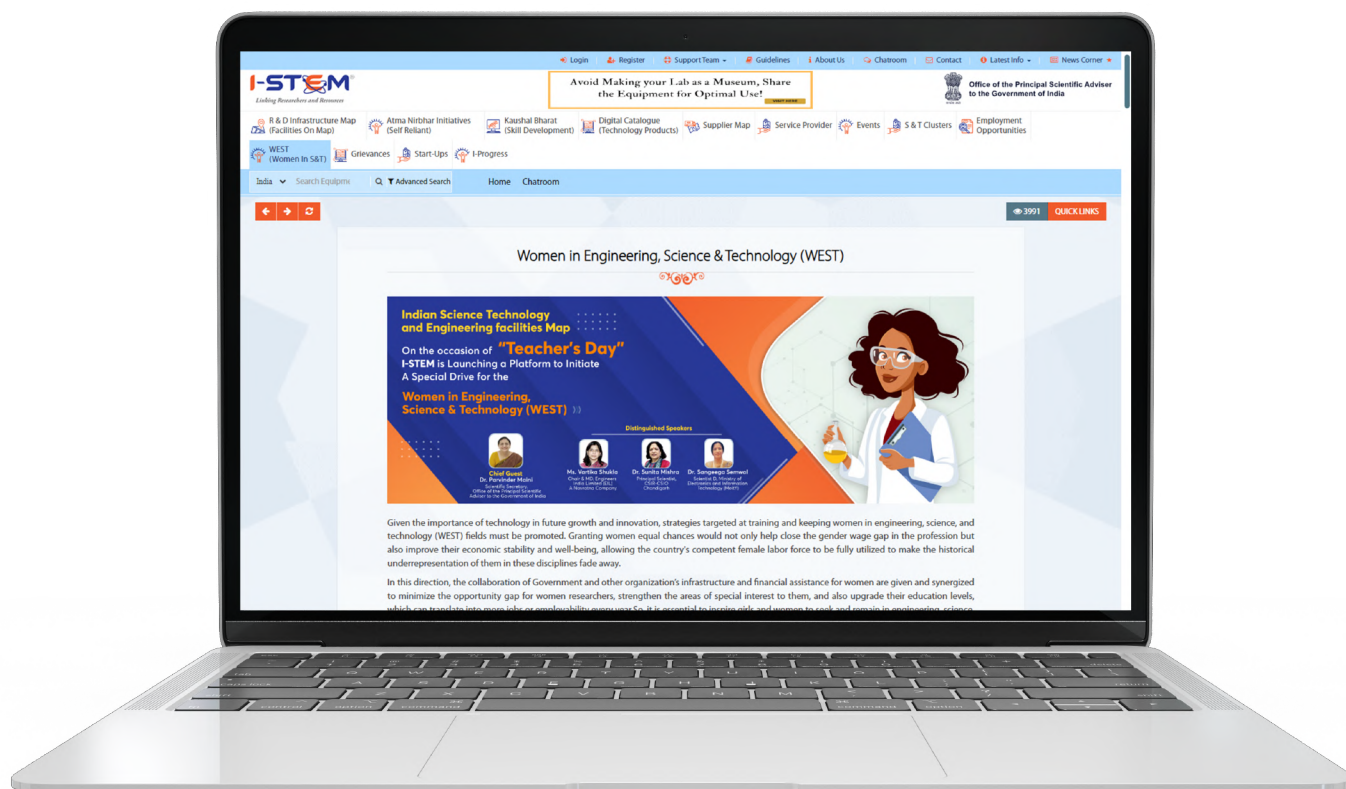


The third in the series, '*She Is - Water Sheroes*', highlights the achievements of Indian and Canadian women in the realm of water. They represent scientists, researchers, community organisers, entrepreneurs, and youth leaders. Their work is collaborative, community-driven, and has long-term societal impact. As we enter the decade of action to accomplish the

United Nations' SDGs, we must all recognise our role in ensuring that water is available in both quality and quantity. Women scientists have made significant contributions to climate change, particularly on water issues, and women leaders are frequently excluded from public view due to patriarchy. These initiatives have helped young girls become role models and fight gender norms by increasing their visibility and motivation.

Women in Engineering, Science, and Technology (WEST) Platform under I-STEM portal

Designed to support women to excel in STEM fields, this platform was launched on September 5, 2022, as part of a larger Indian Science, Technology, and Engineering Facilities Map (I-STEM) portal. [Women in Engineering, Science, and Technology \(WEST\)](#) platform aims to create a supportive ecosystem for scientifically inclined younger women by offering them opportunities to explore careers in science and engineering, including roles of technicians, technologists, scientists, and entrepreneurs.



Women in Engineering, Science, and Technology (WEST)

The initiative also aims to arrange specialized skill development programs in R&D labs to enhance technical abilities and invite R&D proposals, providing technical guidance, expert advice, and catalytic grants, including access to R&D resources. This effort aims to facilitate women's participation in research and provide them with opportunities to showcase their expertise on global platforms, effectively connecting them with the country's extensive R&D infrastructure. Additionally, by establishing a Digital Consortium, the initiative aims to encourage discussion and interaction on new ideas to tackle regional issues, guiding these ideas towards actionable tasks and projects. So far, 2679 female researchers have been listed under this initiative.

WEnyan Scholarship & Mentorship Programme

The Pune Knowledge Cluster (PKC), one of the seven national Science and Technology Clusters created by the Office of the Principal Scientific Adviser (OPSA) on the recommendation of the Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC), aims to address local challenges through S&T interventions. By synergizing efforts between academia, R&D institutions, industries, startups,

and local governments, these clusters foster a collaborative environment to propel scientific innovation and development.

In line with this, the PKC launched the WEnyan Scholarship & Mentorship Programme in 2022, in collaboration with BASF Chemicals India Ltd., to incentivize women to pursue careers in science, focusing on sustainability and chemistry. The WEnyan Programme is designed to encourage women to develop entrepreneurial ideas that lead to commercially viable technologies. Additionally, it aims to empower women from Tier-II and Tier-III cities in Maharashtra to engage in scientific projects within research institutions and industries.

A key feature of the programme is its emphasis on experiential learning, facilitated through industry visits and mentorship sessions. These sessions, both in-person and online, cover practical and widely applicable topics such as project management and fund management. A distinctive aspect of WEnyan is its "For Women, By Women" approach, wherein women leaders in scientific fields play a pivotal role in selecting, mentoring, and monitoring candidates. This initiative offers a unique platform for women researchers, industry professionals, and entrepreneurs to contribute to their community and support emerging talent.



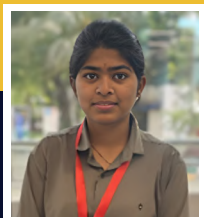
Image Credit: Pune Knowledge Cluster

One of the programme's highlights is the online talk series, "*Conversations with Women Role Models in STEM*," which provides young girls the opportunity to engage with and draw inspiration from the personal and professional journeys of women leaders in various STEM fields.

The programme specifically supports candidates actively involved in or with nascent business ideas in the areas of Fuel Cells/Batteries and fundamental Chemistry, offering patent grants and scholarships. Since its inception, the WEnyan Programme has seen over 600 applicants, with 49 deserving candidates from 16 districts and 18 colleges across Maharashtra being awarded the scholarship. The positive testimonials from awardees shed light on the programme's significant impact.

“

Ms. Baleshwari Shirodiye, Arvinbabu Deshmukh Mahavidyalaya, Bharsingi, and WEnyan Bachelors Scholarship Awardee 2023-24, tells "The WEnyan Program is a beacon of hope for individuals like me, offering not only financial backing but also a golden opportunity to turn dreams into reality by providing us with mentorship for our projects."

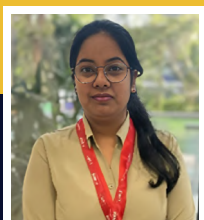


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Ms. Baleshwari Shirodiye
Image Credit: Pune Knowledge Cluster

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Ms. Sharvari Wagh, MVP Samaj's K. K. Wagh Arts, Science and Commerce College, Pimpalgaon and WEnyan Masters Scholarship Awardee 2023-24 says, "WEnyan is more than financial support- the program promises to fuel my research with resources, refine my skills with mentorship and expand my horizons with a network of passionate mentors. This scholarship will empower me to chase a sustainable future in energy research."



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Ms. Sharvari Wagh
Image Credit: Pune Knowledge Cluster

Rural Technology Action Group (RuTAG) Technologies

Initiated in 2004 by the OPSA, the Rural Technology Action Group (RuTAG) aims to step up science and technology support for rural areas beyond what traditional government programs have offered. Established across seven Indian Institutes of Technology (IITs) in Madras (2004), Guwahati (2005), Kharagpur (2008), Delhi (2009), Roorkee (2009), Bombay (2010), and Kanpur (2013), RuTAG centers focus on developing demand-driven technologies that cater to the upgradation, training, and demonstration needs of rural communities. With a specific emphasis on women's empowerment, RuTAG's initiatives are crucial in addressing the unique challenges faced by women in rural areas. By designing technologies that enhance livelihood opportunities for women, RuTAG not only enables them to make significant contributions to their communities but also promotes their economic independence and social well-being.

Electronic Jacquard Handloom for Weaving Fine Korai Design Mats (EJH)

(Developed by RuTAG IIT Madras)

The introduction of the Electronic Jacquard Handloom (EJH) marks a significant leap forward in empowering women weavers by upgrading the traditional handloom technology. At its core, the EJH features a controller and an electromagnetic needle selector that automates the weaving of jacquard fabric. This modern setup not only facilitates the digital storage and retrieval of designs but also greatly improves the ergonomics of the weaving process. Designed with the well-being of women weavers in mind, the EJH promotes better working postures and reduces the physical strain commonly associated with conventional weaving methods.



(Electronic Jacquard Handloom for Weaving Fine Korai Design Mats (EJH))



With this upgrade, women weavers have seen a remarkable increase in their efficiency, with a reported minimum improvement of 25% in working time. This boost in efficiency has dramatically shortened production timelines—from a traditional span of 9-11 days down to just 2-3 days, resulting in a threefold increase in productivity. Beyond the immediate benefits of increased efficiency and reduced physical strain, the EJH technology also necessitates specialized training and skill development for women weavers. This training not only equips them with the necessary skills to operate the advanced machinery but also opens up new avenues for entrepreneurship and economic growth.

The impact of EJH technology has been positive in the Tirunelveli and Veeravanallur regions of Tamil Nadu with six EJH units installed producing over 500 mats. This innovation also allows for experimentation with new patterns and designs, further enriching the craft and providing women weavers with a platform to showcase their creativity and skill.

Modified Bicycle Vending Cart

(Developed by RuTAG IIT Guwahati)

The **Modified Bicycle Vending Cart**, innovatively crafted from locally sourced bamboo sticks, represents a significant advancement in supporting rural vendors, particularly enhancing women's economic participation. This eco-friendly and ergonomic solution is specifically designed to ease the transportation of goods, allowing vendors to carry larger loads with less effort thanks to

its two-chain drive system. This system reduces the physical strain of moving goods, enabling women vendors to make more trips in less time, thus boosting their productivity and increasing their income.

Launched as part of a collaborative effort between the Department of Science and Technology's Science for Equity, Empowerment, and Development (SEED) Division and the Ministry of Panchayati Raj, Government of India, this initiative has seen the successful distribution of 20 units in Kamrup, Assam. Moreover, the adoption of the Modified Bicycle Vending Cart allows vendors to save up to ₹1200-₹1500 per week on transportation costs, translating into a net profit increase of 13%. This saving not only boosts women vendors' economic activities but also contributes significantly to their social inclusion and empowerment.

These initiatives reflect OPISA's commitment to fostering an inclusive S&T ecosystem where women's contributions are recognized and valued. Highlighting the achievements of women in STEM and providing support through scholarships, mentorship, and technology, not only advances gender equity but also contributes to national progress in science and technology. It is essential to understand that women's empowerment in STEM fields is not just about achieving gender parity but is also a crucial factor in the holistic development and innovation capacity of the nation.



(Modified Bicycle as a Rural Vending Cart)



VOICES OF WOMEN SCIENTISTS WORKING AT OPSA

In this issue of Vigyan Dhara, women scientists from the OPSA offer insights for the upcoming generations of scientists and scholars. Their insights aim to guide young minds through the

complex and dynamic landscape of scientific research, helping them to navigate their paths with greater clarity and confidence.



Dr. Preeti Banzal
Adviser/Scientist 'G', Office of the Principal
Scientific Adviser to GOI

Q. In your experience as one of the senior officials at the Office of PSA, how do you view the current landscape for women in STEM in India, and what progress have you observed in recent years?

A. "Well, so when I look back when I joined my engineering in 1985 there were about 10 girls out of out of a bed size of 200. And when I joined...Scan the image using Overly App to watch the full video."

Q. As someone leading the division of strategic alliances for OPSA, what advice would you give to young women considering a career in STEM, based on your own journey and experiences?

A. "My advice would be fourfold. The first one would be in terms of being assertive and always being confident and independent largely because...Scan the image using Overly App to watch the full video."



Dr. Sapna Poti
Director, Strategic Alliances Division, Office
of the Principal Scientific Adviser to GOI



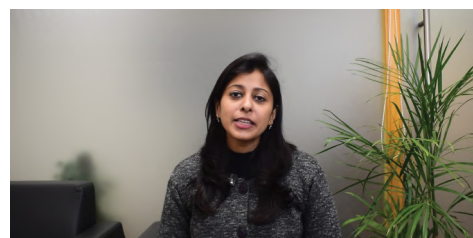
Remya Haridasan
Scientist 'D', Office of the Principal
Scientific Adviser to GOI

Q. Do you think that steps have been taken at an institutional level for promoting women in STEM? Also, what kind of support systems have been crucial to your career, both professionally and personally?

A. "In my opinion, the various steps to promote women in STEM have been deeply embedded in the institutional mechanism...Scan the image using Overly App to watch the full video."

Q. How important has mentorship been in your career, and do you actively engage in mentoring others, particularly women in STEM?

A. "Talking of which I would like to emphasize here, the importance of mentorship and networking. I have noticed this as a constant trait...Scan the image using Overly App to watch the full video."



Dr. Nidhi Thakur
Team lead, One Health Mission, PMU, Office of the
Principal Scientific Adviser to GOI



Dr. Sneha Malhotra
Chief Technology Officer, Office of the
Principal Scientific Adviser to GOI

Q. Would you like to shed light on any specific challenges women face in pursuing and thriving in STEM careers in India, and how can these challenges be addressed?

A. "So as a researcher and as a PhD, I've observed that after PhD and during the postdoc, most of the people...Scan the image using Overly App to watch the full video."

(This article has been curated by Sanchita Jain, Communications Specialist)

OPINION

Shared and Distinct Realities: Women in STEM in Asia-Pacific

— By Dakshata Lingayat

“Don't let anyone rob you of your imagination, your creativity, or your curiosity. It's your place in the world; it's your life. Go on and do all you can with it, and make it the life you want to live.” invokes Dr. Mae Jemison in a clarion call to all women. Yet, the realisation of women's true capabilities is hurdled by their realities.

Two young researchers, me, and an equally enthusiastic female colleague boarded this ship to understand the reality and realities of women in different fields of STEM. Why ‘realities’? Every woman we interacted with had a reality that was unique to her. The experiences that are impossible to put in a box.

insights. We studied five countries, Malaysia, Sri Lanka, Samoa, Uzbekistan, and the Republic of Korea sampled based on their geographical location, Gender Gap Index, adult female literacy, and Human Development Index. This was a policy exercise that began with a mapping of resource allocation and prioritization to improve women's participation in SETI followed by an assessment of their participation, promotion, retention, and performance in SETI.

Three instruments were used in the process of data collection:

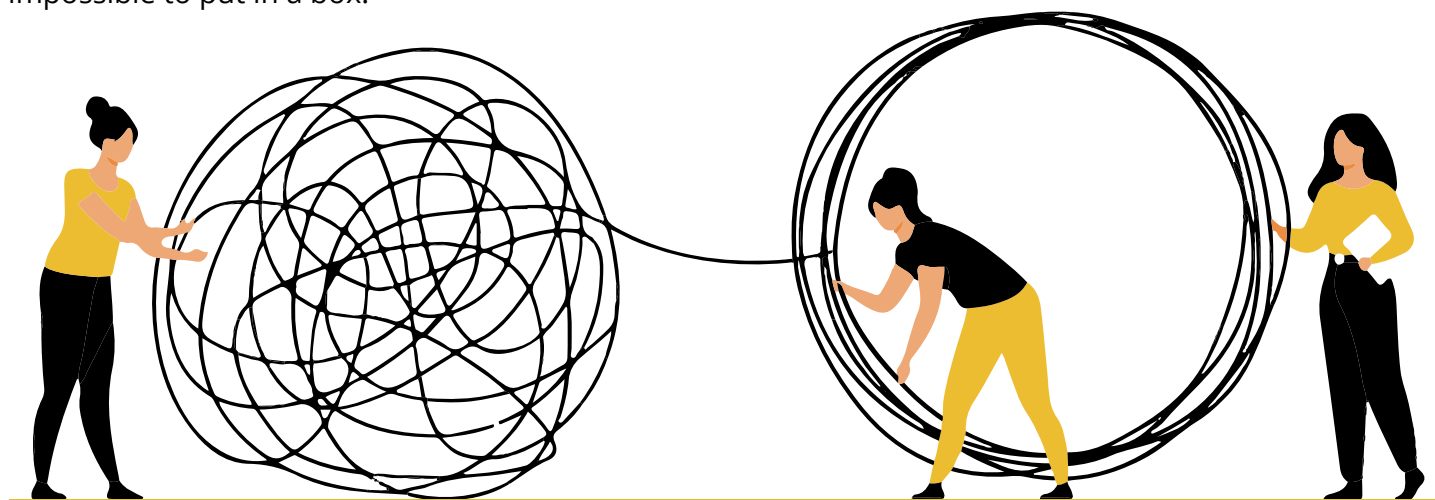


Image for representational purposes only

‘Needs and Assets Mapping for Women in SETI (Science, Engineering, Technology, and Innovation) in the Asia-Pacific’ was the first study we conducted in collaboration with UNESCO. Realising the gender disparity in the field of innovation, we continued this study *‘Mapping Strengths and Challenges: Women in Innovation in the Asia-Pacific’*. With limited funding, only enough for focused desk research, how could we have made it inclusive and exhaustive if not for all the wonderful women lending us their time and

- Analysis of cross-sectional and time series gender-disaggregated data, relevant research, and literature available for the country.
- Online surveys disseminated through partner organizations in study countries focusing on women in SETI education, careers, and related socio-political environments.
- Structured Focus Group Discussions (FGDs) that brought diverse perspectives from policymakers, practitioners, early career scholars, and other relevant stakeholders.

Discussing policy enablers and gaps shed light on several shared realities between the women in the study countries. In all five countries, there are policy measures in place to increase women's participation in STEM education and the labour force. Their national S&T strategies have prioritised initiatives on strengthening women's participation in STEM fields. However, when it comes to participation in certain fields of STEM that are traditionally masculine, women's retention in all STEM fields, and most importantly their promotion, the gender disparity is wider. Female students outnumber and outperform male students in subjects like science and mathematics at primary and secondary levels of education across the study countries. However, the unfortunate reality is that out of these outperforming students, male students are more likely expected to work as engineers or scientists in their 20s as compared to their female counterparts. A takeaway here is that policies cannot be looked at in isolation. Despite having stronger policy instruments in place, what is impacting women in STEM the most is underlying social, cultural, political, and most importantly behavioural aspects.

Having said all of the above, what we learned through our surveys and FGDs is that the experiences of women remain plural. While there are common challenges, the degree and nature of their impact vary with social, cultural, political, economic, regional, and behavioural contexts. This is especially true for STEM domains. Recounting the story of a young researcher who was kept away from blue skies or fundamental research by her parents quoting 'Women do not get a second chance'. Another scientist recalled her being made to clean the lab in order to access it. These are a few of many. Instances like these make us reassess our approach to looking at women's realities. Policy efforts to build the bridges where the pipelines are leaking, leveling the playing field to retain women in STEM careers, and gender-sensitive and gender-responsive policymaking can be some vehicles of change. Moreover, policies that are cognizant of heterogeneity and intersectionality of women's experiences from when they start their educational journey are imperative to achieving holistic equity for women in STEM.

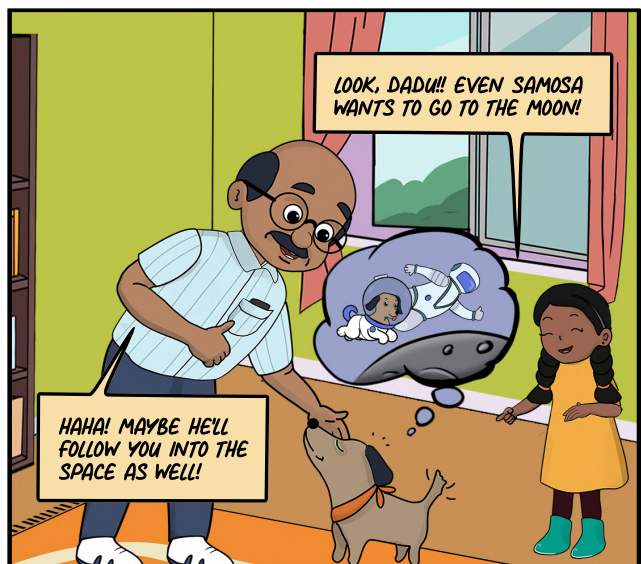
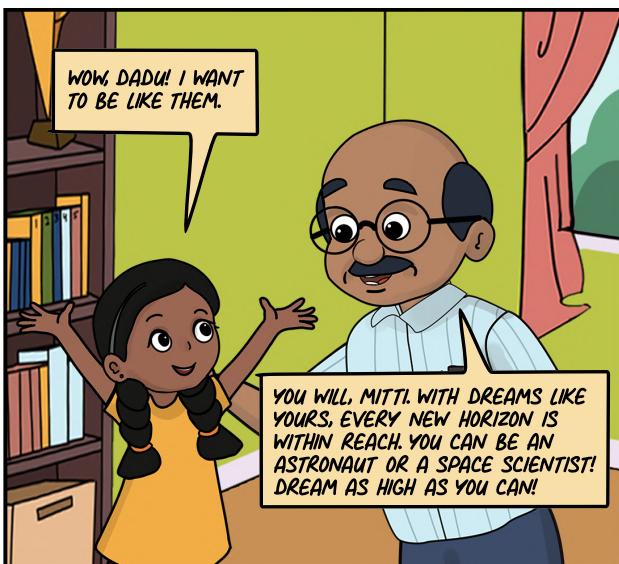
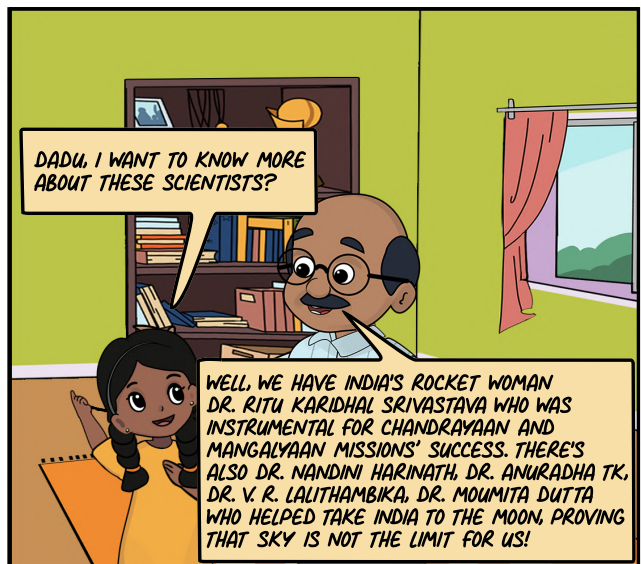
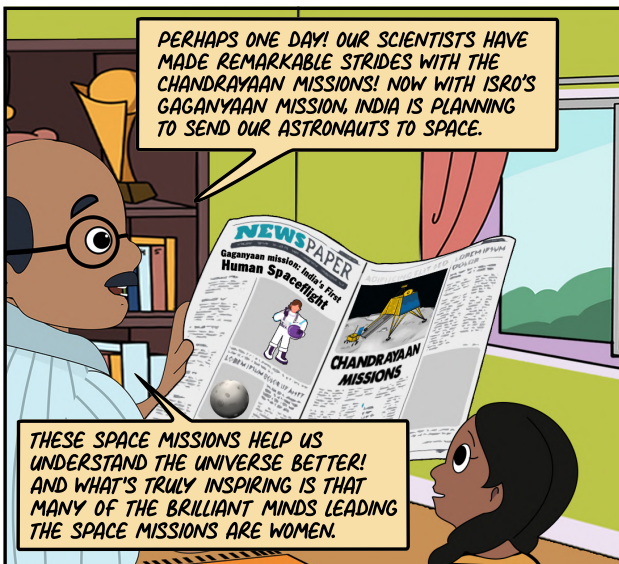
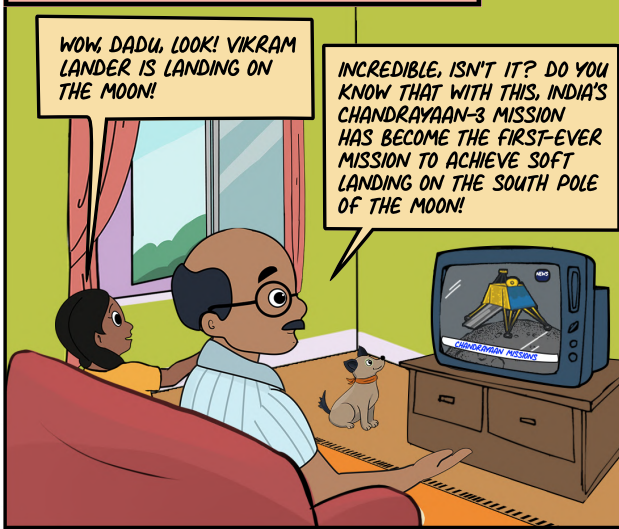


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(Dakshata Lingayat is a Policy Fellow at OPSA. The mentioned studies were carried out with support from UNESCO, while Dakshata was hosted at the OPSA as part of DST-STI (Science, Technology, and Innovation) fellowship.)

Chapter 7: To New Horizons & Beyond

Concept by - Sanchita Jain
Illustration by - Infoneo Technologies





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