

# Women, Science and Public Policy in India

## From Inclusion to Influence

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India is living through a defining moment in its development journey. From space missions and digital public infrastructure to biotechnology and climate technologies, the nation increasingly speaks the language of science and innovation. Yet, within this inspiring national narrative lies a quieter, unresolved question: who gets to participate in science—and who gets to shape it? This is not merely a matter of representation. It is a matter of national capacity. A country cannot build a durable innovation ecosystem when a large portion of its talent does not remain engaged in scientific careers or is excluded from scientific decision-making. In that sense, the relationship between women, science, and public policy is not an optional social debate; it is a critical development agenda for India@2047.

### Science and the Indian woman: an unfinished journey

India has made visible progress in bringing girls and young women into education. Across many parts of the country, women now enter science education in substantial numbers, and in some disciplines—particularly life sciences and medical fields—they form a strong presence in classrooms. However, the optimism of this progress begins to fade when one follows the trajectory beyond graduation. The number of women declines as academic levels rise, and further reduces as careers become more competitive. By the time one reaches the leadership layers of science—principal investigators, heads of institutions, grant committees, expert panels, advisory councils, and science-policy platforms—the representation of women is far thinner.

This drop is often called the “leaky pipeline,” but the phrase should not make the problem sound inevitable. The decline is not natural. It is structured. It reflects the ways in which society and institutions distribute opportunity and burden. The issue is not about whether women can do science; it is about whether women are enabled to do science continuously, safely, and with recognition.

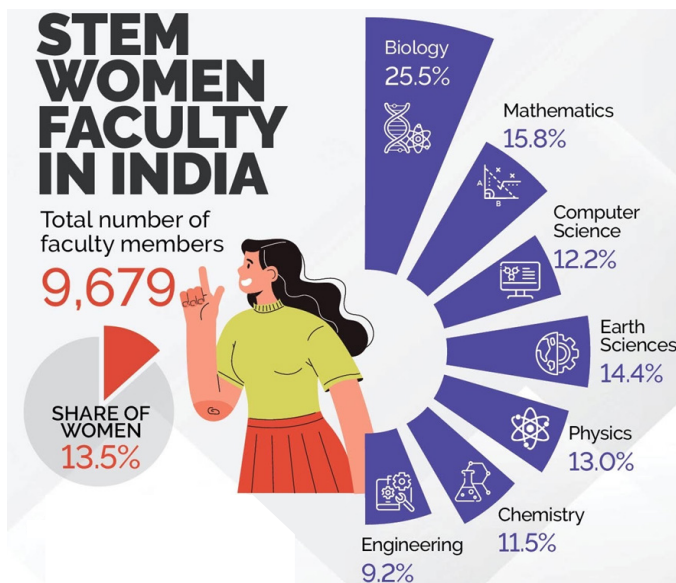
For decades, women’s participation in science was framed largely as a question of empowerment or equality, often addressed through scholarships or awareness programmes. While these interventions are important, they are not sufficient. Women in science must be understood as a public policy issue because it shapes outcomes that affect all citizens. Public policy depends heavily on scientific understanding and scientific capability, whether the subject is public health, climate change, food systems, water management, emerging technologies, or national innovation missions.

When women are absent from research careers, India loses trained talent in which it has already invested public resources through schooling and higher education. When women are underrepresented in research leadership, the national research agenda risks becoming narrower. When women are missing from science-policy bodies, the policy process itself becomes less diverse, often less humane, and less sensitive to the lived realities of half the population. In short, women in science is not only about inclusion; it is about increasing the quality and relevance of India’s scientific and policy ecosystem.

### The real problem is not entry into STEM, but retention and progression

India’s primary barrier today is not the absence of women at the point of entry into science education. The bigger challenge lies in retention and progression. Many young women complete their degrees but do not move into long-term research. Others begin research careers but discontinue due to personal and structural





pressures. Still others remain in the system but face slow career growth because of institutional biases and unequal access to opportunity.

The points of dropout are predictable. After graduation, family expectations regarding marriage, location, caregiving, or “acceptable work environments” begin to influence career options. During the PhD stage, the uncertainty and financial limitations of research often collide with cultural pressure for stability. Post-PhD and early career years become even more difficult because they coincide with the period when many women are expected to take on the largest share of domestic and caregiving responsibility. Even after surviving these stages, women often encounter invisible barriers—limited access to networks, fewer high-value collaborations, fewer nominations, fewer opportunities to lead, and weaker visibility within academic and research ecosystems.

These realities confirm a simple truth: the issue is not about women lacking ambition. The issue is about institutions and social structures failing to support continuous scientific careers for women.

India has not ignored this issue. Over the years, the country has built multiple frameworks to support women in science. The National Education Policy 2020 strengthened the national emphasis on equity and inclusion, and created a policy climate that recognizes gender responsiveness as integral to educational reform. Such direction matters because education policy is the root of the pipeline; it shapes confidence, aspiration, and access.

In the science ecosystem, the Department of Science and Technology (DST) has contributed significantly through programmes designed to support women scientists, including return-to-work opportunities for those who take breaks due to caregiving

responsibilities. These schemes reflect a modern understanding: scientific talent should not be treated as disposable merely because a researcher’s life includes pauses. Career interruptions, particularly for maternity or caregiving, are not evidence of incompetence; they are evidence of social responsibility. A nation benefits when its policy systems allow women to re-enter scientific work without stigma.

Equally important is India’s movement towards institutional reform. Instead of merely offering individual support, institutional transformation initiatives signal a shift in philosophy—from correcting women to correcting the systems around them. Such reforms are essential because discrimination in science rarely occurs openly. It often occurs through subtle gatekeeping: recruitment committees, unequal lab space allocation, informal networks, biased evaluation practices, and leadership cultures that are not inclusive.

Even with such initiatives, the challenge remains large because the problem is complex. Policy has opened some doors, but the structure of scientific careers still continues to reward uninterrupted, mobility-heavy life patterns. Unless the career design itself changes, support schemes will only partially solve the problem.

## The barriers that remain: safety, caregiving, bias, and visibility

A critical obstacle for women in science, especially in India, remains the larger environment in which careers are pursued. Scientific work does not always take place in safe and predictable settings. Fieldwork, travel, lab schedules that extend late into the evening, and male-dominated professional cultures can create real constraints. Safety is not just a social issue; it is a participation issue. Where women do not feel safe, they naturally self-limit their career options. This includes choosing disciplines that require less travel or avoiding leadership roles that demand greater mobility and visibility.

Another barrier is the motherhood and caregiving penalty. Scientific careers rely heavily on publications, continuity of research, conference participation, and networking. Even a short break can weaken competitiveness. The system often fails to account for the realities of motherhood and family responsibility. Without childcare support, flexible work structures, and fair evaluation mechanisms, women pay a disproportionate professional cost for social responsibilities.

Bias also persists in allocation of grants and recognition. Research careers advance not only through competence but through opportunity. The ability to lead large projects, gain high-impact collaborations, and secure leadership-level grants is influenced by

networks, mentorship, and institutional culture. Women frequently receive fewer such opportunities. This limits their visibility and later limits their inclusion in policy-making and high-level scientific boards.

There is another dimension that is often overlooked. India is beginning to include women in science education and in research participation, but it is still struggling to ensure women become science-policy leaders. This difference is important. Science has power because it shapes policy, and policy has power because it decides what science gets funded, what research priorities are considered urgent, and what knowledge is taken seriously.

If women remain absent from scientific advisory bodies and regulatory systems, then women are not participating in the creation of national futures; they are merely consuming futures designed by others. India needs women not only in laboratories, but also in committees that design technology regulation, public health communication systems, climate adaptation planning, biotech ethics frameworks, and AI governance.

For India's long-term national development, it is essential to treat women scientists as future policy actors. Their role must evolve from participant to influencer, from contributor to decision-maker.

## Science communication: India's powerful opportunity to build scientific citizenship among women

The COVID-19 pandemic taught the world a significant lesson: science is not effective unless it is communicated well. Knowledge must travel from journals to society. Trust must be built. Misinformation must be addressed. Public understanding must be strengthened. In this domain, women can play a transformative role in India.

Women as teachers, science communicators, editors, educators, health communicators, and creators can strengthen scientific citizenship in society. When science is explained in culturally relevant ways, and when women lead that explanation, it has a multiplier effect. It strengthens public understanding, reduces fear, and builds aspiration among young girls who begin imagining themselves as scientists. Science communication is thus not only about spreading information; it becomes a policy tool to expand participation and build a long-term culture of scientific temper.

India's ambition for 2047 requires a science ecosystem that is inclusive by design and resilient by function. This means policy must move beyond broad intentions to measurable reforms. The first



step must be to track retention and progression, not just enrolment. India should systematically measure how many women continue from STEM education into research, how many reach senior scientific ranks, how many lead funded projects, how many enter deep-tech entrepreneurship, and how many participate in national advisory platforms. Without such monitoring, leakage remains invisible and therefore uncorrected.

The second step must be to treat childcare and caregiving support as research infrastructure. A modern science ecosystem cannot rely on unpaid domestic labour by women. Funding structures and institutional arrangements must incorporate support systems that allow career continuity without penalty.

The third step is to make institutional transformation mandatory, not optional. Institutions receiving public research funding should be expected to demonstrate equity systems, transparent recruitment and promotion metrics, functional harassment prevention and redressal mechanisms, and mentorship structures that produce leadership pathways for women.

Finally, women must be made visible and powerful in frontier science missions. India's future is being shaped in domains such as quantum technology, artificial intelligence, genomics, clean energy, space systems, and climate technology. Women must not merely be staff in such missions; they must lead them. National scientific leadership must reflect national society. ♦

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