Zugänge, Barrieren und Potentiale für die internationale Mobilität von Wissenschaftlerinnen

Länderbericht Indien

GESIS – Leibniz-Institut für Sozialwissenschaften

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Country dossier India

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1 Introduction

Women constitute a vast pool of untapped human resources in India, with an overall female labour force participation rate of 20.5% compared with 76.1% for men (Human Development Report, 2020). The Country Dossier for India focuses on the low representation of women scientists from India among grantees and fellowship holders of the Humboldt foundation and seeks to determine the reasons for this. The report examines the representation of female scientists and gender-specific qualifications and career structures with respect to India.

Drawing from secondary as well as primary data, the dossier seeks to highlight the contextual factors impacting the international mobility and the scientific careers of female scientists in India. Primary data was collected through in-depth interviews with three senior women academics, each having experience of international academic mobility *(Appendix 1)*. The interviews were recorded with permission. Issues discussed during the personal interviews related to reasons for the underrepresentation of women in scientific careers in India, gender-specific aspects of international mobility among academics and researchers, and factors influencing the choice of destination country for international mobility among Indian scholars generally, and women scientists particularly.

The report begins with a context analysis of the Indian higher education and research system and a discussion of gender participation in tertiary education and academic careers. The social, cultural and institutional contextual factors that influence the scientific careers and international mobility of women scientists are discussed subsequently.

2 Context Analysis of the Indian Higher Education and Research System

2.1 Key figures on the size and importance of research and development and participation in tertiary education

<u>Size and structures of research and development (R&D)</u>

The India data with respect to gross domestic expenditure on research and development (GERD) expressed as a percentage of gross domestic product (GDP) shows a decline from 0.71% in 2013 to 0.65% in 2018 (Figure 1). Though marginal, this decrease in spending on R&D was due to a decrease in the expenditure by the government sector and the business enterprise sector. The share of GERD in GDP declined from 0.40% (2013) to 0.37% (2018) in the government sector, and from 0.27% (2013) to 0.24% (2018) in the business enterprise sector. On the other hand, R&D expenditure increased nominally in the higher education sector, where GERD as a percentage of GDP rose from .04% (2013) to .05% (2018). With respect to the private non-profit sector, GERD as a percentage of GDP remained constant at .03%

from 2015 to 2017 (Figure 2).[1] India recorded the highest R&D expenditure in the year 2008, when GERD as percentage of GDP stood at 0.859%, and has declined since then.[2]

The government is the main source of research funding in India, as is evident from GERD. Over 60% of GERD in India was performed by the government sector (including the higher education sector) in 2017–2018: central government accounted for 45.4%, state governments for 6.4%, the higher education sector for 6.8% and public sector industry for 4.6%. Private sector industry contributed 36.8% during 2017-18. (Source: National Science and Technology Management Information System, NSTMIS, Department of Science & Technology, Government of India). Business enterprise (industrial) sector participation in GERD has been just over 40% during the last 5 years.[3]

Total government expenditure on education as a percentage of GDP was 3.85% in 2013, and decreased to 2.8% in 2014-2015. India spent only 3.1% of its GDP on education according to the Indian Finance Ministry's Economic Survey 2020-21.[4] Expenditure on tertiary education (as a percentage of government expenditure on education) in India was 28.53% as of 2013. Its highest value over the past 14 years was 36.45% in 2009, while its lowest value was 17.54% in 1999. According to a report by the Ministry of Human Resource Development (now Ministry of Education, MoE) published in 2018, public expenditure on university and higher education in India as percentage of GDP was 0.57% in 2014–15 and increased to 0.64% (provisional) in 2016-2017.[5]

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[1] UNESCO Institute for Statistics 2020c

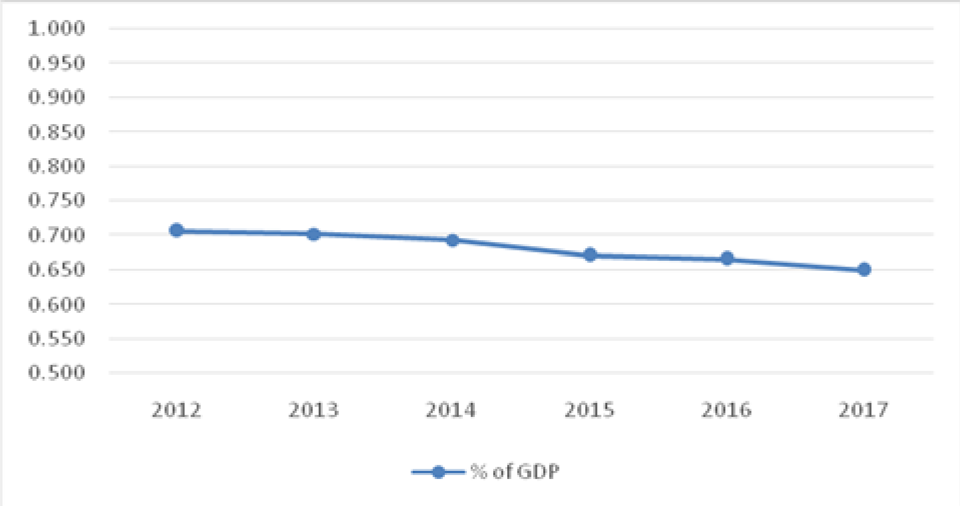
[2] https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?contextual=default&locations=IN (checked 4.3.2021)

[3] NSTMIS, Research & Development Statistics at a Glance (2017-18) and (2018-19). Department of Science and Technology (DST), Ministry of Science & Technology, Government of India, New Delhi. Available at: http://www.nstmis-dst.org/RegularPublication.aspx

[4] 'Social Infrastructure, Employment and Human Development'. In *Economic Survey 2020-21*, Vol.2, pp. 325-368. Ministry of Finance. Government of India.

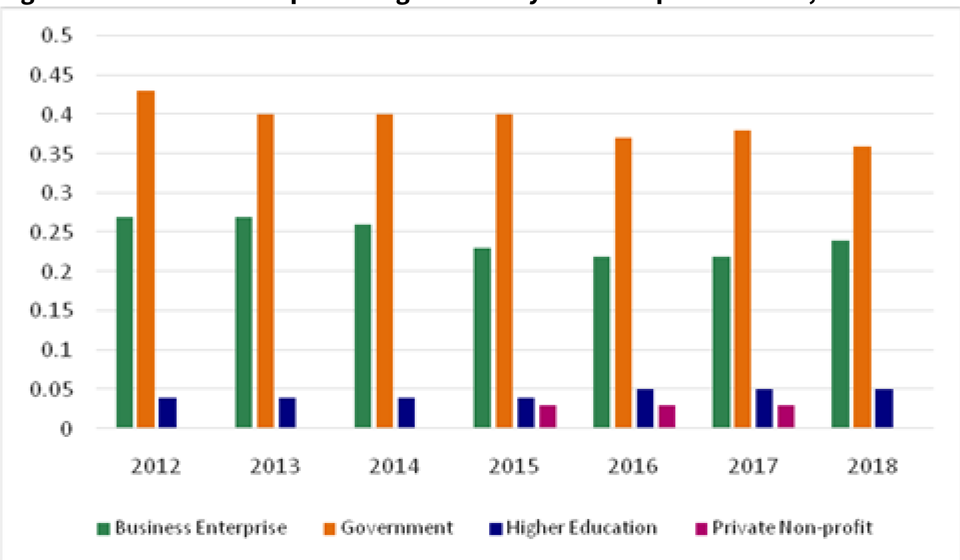
[5] (2018) 'Analysis of Budgeted Expenditure on Education 2014-15 to 2016-17'. Ministry of Human Resource Development, Department of Higher Education, Government of India. Planning, Monitoring and Statistics Bureau, New Delhi

Figure 1 **GERD as a percentage of GDP, 2012-2018**



Source: UNESCO Institute for Statistics 2020a

Figure 2 **GERD as percentage of GDP by sector of performance, 2012-2018**



Source: UNESCO Institute for Statistics 2020b
Data for GERD performed by the private non-profit sector is available only for three years.

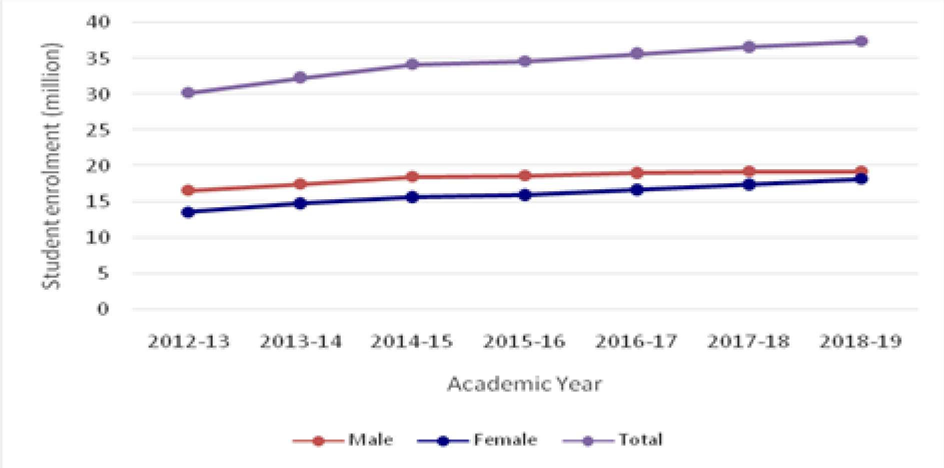
Participation in tertiary education

The enrolment of students at tertiary level in Indian higher education institutions (HEIs) increased from 5.7 million in 1996 to 36.6 million in 2017-18 – a sixfold increase.[6] In 2018, the total enrolment of students in HEIs was 37.4 million, of which 19.2 million were male students and 18.2 million were female. This marks an increase in total enrolment of 23.8% compared with 2012–13, when the total enrolment in HE was 30.2 million, of which 16.6 million were male and 13.6 million were female students (Figure 3). Of the total student enrolment, the percentage of female student enrolment increased from 45% in 2012–13 to 48.6% in 2018–19. The gross enrolment ratio (GER) in HE in India calculated for the age group 18–23 years has consistently increased over the years, from 21.5% in 2012–13 through 24.3% in

[6] https://wenr.wes.org/2018/09/education-in-india (checked 15.3.2021).

2014-15, to 26.3% in 2018 (All India Survey on Higher Education (AISHE) Report, 2018–2019, 2012–13)[7]. Of the total student enrolment at tertiary level, the percentage enrolled in Bachelor's or equivalent level programmes (ISCED 6) decreased from 86% in 2012–13 to 79.8% in 2018 (University Grants Commission Annual Reports).[8] With respect to educational attainment, only 9.1% of the population aged 25 years and older had completed at least Bachelor's or equivalent level education (ISCED level 6) in 2011[9].

Figure 3 Student enrolment at tertiary level by sex (regular and distance education)



Source: All India Survey on Higher Education (AISHE), 2018-19 (Table 43)

Less than 0.4% (95,425) of the total students in tertiary education were enrolled in doctoral programmes in 2012–13 (AISHE Report 2012-13).[10] The figure was less than 0.5% in 2018 – that is, approximately 169,000. However, in the five years from 2014–15 to 2018–19, enrolment in doctoral programmes in India showed a compound annual growth rate (CAGR) of 7.6% (AISHE 2018–19). Of all the graduating students at tertiary level (excluding diploma/certificate programmes) in 2018, only 0.51% – that is, 40,813 students – were awarded a doctoral degree (ISCED level 8) in India (AISHE Reports 2018–19, 2013–14). This represents only a marginal increase from 2013, when 0.33% (23,861) of all graduating students (excluding diploma/certificate programmes) obtained a doctoral degree (Figure 4). As per the data from the UNESCO Institute for Statistics (2020c), the total number of graduates from ISCED level 8 programmes in tertiary education in India was 24,300 in 2013, which decreased to 22,528 in 2015. Since then, there has been a marginal increase, although the numbers remained constant in 2017 (28,778) and 2018 (28,779). Hence, doctoral graduates (ISCED level 8) as a percentage of all tertiary education graduates ranged from 0.27% in 2013 to 0.34% in 2018,[11] showing a slight variation from the AISHE data.

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[7] All India Survey on Higher Education (AISHE), Ministry of Education, Government of India. (https://www.education.gov.in; www.aishe.nic.in)

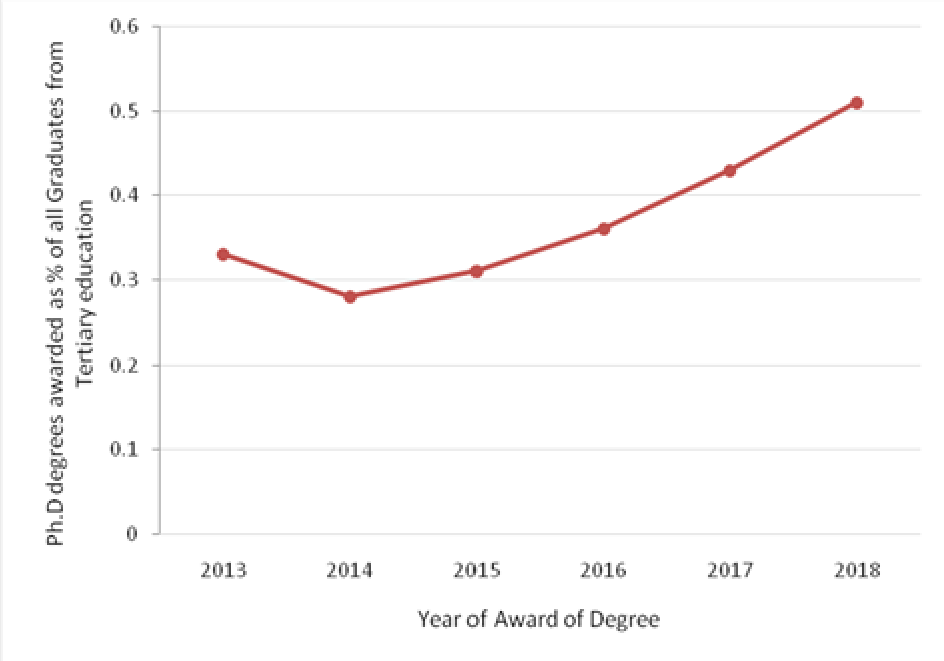
[8] Annual Reports published by University Grants Commission (UGC), Government of India. The UGC is responsible for maintenance of standards of university education in India. https://www.ugc.ac.in

[9] https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?contextual=default&locations=IN (checked 4.3.2021)

[10] All India Survey on Higher Education (AISHE), Ministry of Education, Government of India. (https://www.education.gov.in; www.aishe.nic.in, checked 11/4/2021)

[11] UNESCO Institute for Statistics (2020c).

Figure 4 Students awarded a Ph.D. as a percentage of all graduates from tertiary education 2013–2018*



Source: own calculations based on data from All India Survey on Higher Education (AISHE) reports
* Total tertiary graduates exclude students pursuing post-graduate diploma, diploma and certificate programmes

Human resources in science and research[12]

Total R&D personnel (in full-time equivalents, FTE) in India increased from 528,219 in 2015 to 552,969 in 2018, which is a mere 4.7% increase. During the same period, total R&D personnel per million inhabitants (FTE) increased marginally, from 403.174 to 408.81. Data indicates that the total R&D personnel per thousand labour force (FTE) remained stagnant at about 1.1% (1.11% in 2015; 1.13% in 2018). A similar trend prevailed with respect to R&D personnel (FTE) per thousand total employment, which stood at 1.17% in 2015 and 1.19% in 2018 (Table 1).

Table 1 Total R&D personnel (FTE) for 2015 and 2018*

Total R&D Personnel	2015	2018
Per million inhabitants	403.17	408.81
Per thousand labour force	1.11	1.13
Per thousand total employment	1.17	1.19

Source: UNESCO Institute for Statistics (2020e)
* Data available only for 2015 and 2018

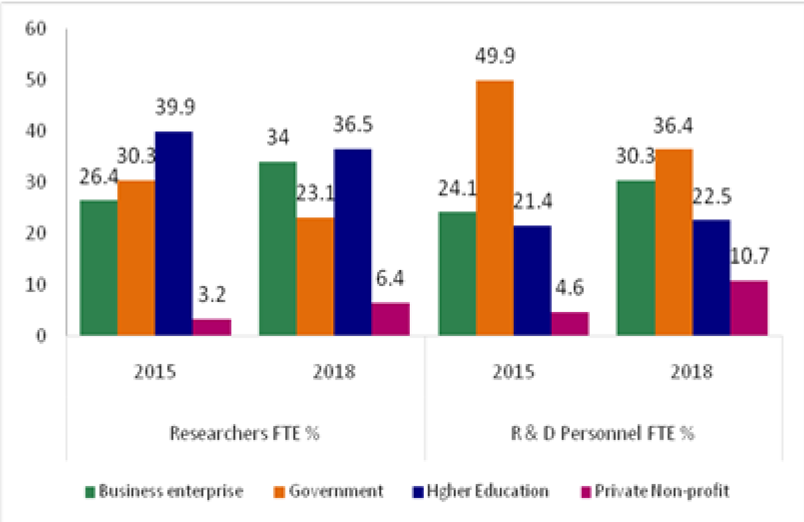
R&D personnel in India are employed across sectors such as business enterprise, higher education, government etc. Interesting trends with respect to R&D personnel as a percentage of total R&D personnel were observed for all sectors. Specifically, there was a decline in R&D personnel (FTE) in the government sector as a percentage of total R&D personnel, from

[12] UNESCO Institute for Statistics (2020c).

49.87% in 2015 to 36.42% in 2018. On the other hand, the share of R&D personnel in total R&D personnel in the business enterprise sector in FTE increased from 24.11% in 2015 to 30.30% in 2018. R&D personnel (FTE) in the private non-profit sector as a percentage of total R&D personnel increased from 4.62% in 2015 to 10.73% in 2018. The corresponding increase in the HE sector's share in total R&D personnel was rather small – that is, from 21.41% in 2015 to 22.55% in 2018 (Figure 5).

The share of researchers employed in different sectors also indicated trends similar to that of R&D personnel, except for the HE sector. While R&D personnel in the HE sector as a percentage of total R&D personnel showed an increase between 2015 and 2018, researchers (FTE) in the HE sector declined from 39.96% in 2015 to 36.48% in 2018. Researchers (FTE) employed in the government sector declined from 30.32% in 2015 to 23.13% in 2018. On the other hand, the proportion of researchers (FTE) underwent an increase in the business enterprise sector, from 26.45% in 2015 to 34.02% in 2018, and in the private non-profit sector from 3.27% in 2015 to 6.37% in 2018 (Figure 5).

Figure 5 Percentage of R & D personnel and Researchers in different sectors (FTE), 2015 and 2018*

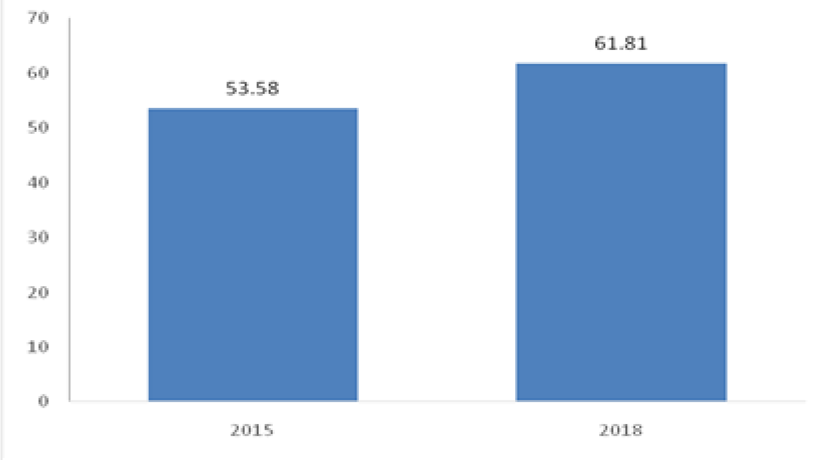


Source: UNESCO Institute for Statistics 2020e
* Data available only for 2015 and 2018

Overall, researchers as a percentage of the total R&D personnel (FTE) rose from 53.58% in 2015 to 61.82% in 2018[13] (Figure 6). Data regarding the distribution of academic staff based on type of institution or college was not available for India.

[13] UNESCO Institute for Statistics 2020c

Figure 6 Researchers as a percentage of total R&D personnel (FTE) for 2015 and 2018*



Source: UNESCO Institute for Statistics 2020e
* data available only for 2015 and 2018

2.2 Basic Characteristics of the Higher Education and Research System

The policy and planning for the higher education institutions in India is under the Department of Higher Education, Ministry of Education (MoE), Government of India (GoI). The department looks after expansion, access and qualitative improvement in HE. The number of universities and university-level institutions in India increased from 20 in 1950 to 677 in 2014 – a 34-fold increase. There are 45 central universities, of which 40 are under the purview of the MoE (GoI), 318 state universities, 185 state private universities, 129 institutions of higher education declared as “deemed to be universities[14]”, 51 institutions of national importance (established under Acts of Parliament) under the MoE and 4 institutions established under various state legislations.[15]

The University Grants Commission (UGC)[8] is a statutory body of the GoI established by an Act of Parliament in 1956 for the coordination, determination and maintenance of standards of university education. The commission advises the central and state governments on the measures which are necessary for the development of HE. In addition, the role of the UGC is to provide grants to eligible universities and colleges. The UGC frames regulations to specify the minimum qualifications for appointment of teachers and other academic staff in universities and colleges as well as measures for the maintenance of standards in HE.

Funding for research is also one of the primary mandates of the UGC. General Development Grants are provided by the UGC to the central, state and deemed to be universities for aspects like enhancing access, ensuring equity, imparting relevant education, improving quality, augmenting research facilities, etc. Private universities are given grants for teachers and student programmes only.

[14] Institutions of higher education which have been declared as Deemed to be Universities under Section 3 of the UGC Act, 1956
[15] https://www.education.gov.in (checked 28.3.2021)

The UGC also implements various collaborative academic programmes of the GoI between India and foreign countries. The UGC has been running Joint Research Programmes with countries like the USA, the UK, Israel, Norway, New Zealand, Germany etc. Several scholarships, fellowship and research programmes for Indian scholars are available. These include programmes such as Raman Fellowships for Post-doctoral research in the USA, Erasmus Mundus, the UK-India Education and Research Initiative (UKIERI), Indo-German Partnerships in Higher Education (IGP), Indo-New Zealand Joint Research Projects, Australia-India Educational Council (AIEC), Commonwealth Medical Fellowships, among others.[16]

The Department of HE under the MoE has established several councils, such as the Indian Council for Social Science Research (ICSSR), the Indian Council for Historical Research (ICHR), the Indian Council for Philosophical Research (ICPR) etc. These councils provide grants for research projects, senior, doctoral and post-doctoral fellowships, international collaboration etc. to promote research in the respective disciplines. There are several other research funding agencies in India, in addition to the above. They include ministries of the GoI and government departments, such as the Department of Science and Technology (DST) and the Department of Biotechnology (DBT).[17]

The UGC, DBT and DST[18] have special research funding schemes for women, such as the Woman Scientists Scheme (WOS-A) of the DST, the BioCare Research Grant Opportunity (RGO) of the DBT, and post-doctoral fellowship schemes for women's empowerment (UGC). The UGC has been providing 100 such fellowships per year. However, data related to the number of women who have actually availed of these fellowships was not available.

The New Education Policy (NEP) 2020[19] by the MoE (GoI) presents a vision for the restructuring of the HE system that consists of larger multidisciplinary universities and colleges offering undergraduate and graduate programmes. A spectrum of institutions is envisaged ranging from research-intensive universities, teaching-intensive universities, and autonomous degree-granting colleges. The NEP also proposes to change the structure and duration of degree programmes (Table 2).

[16] A detailed list is provided in the Annual Report 2017-–2018, University Grants Commission (UGC), pp. 193-197. (https://www.ugc.ac.in, checked 11/4/2021)

[17] A database of funding opportunities for Indian researchers has been compiled by the National Center for Biological Sciences, Tata Institute of Fundamental Research and can be accessed at https://www.ncbs.res.in/rdo/sponsor-funding (accessed 11/4/2021; last updated 8/12/2020).

[18] The DST launched the 'Women Scientists Scheme (WOS)' during 2002-2003 aimed at providing opportunities to women scientists and technologists in the age group 27 to 57 years who had a break in their career but desired to return to the mainstream. It has three components: WOS-A, WOS-B and WOS-C. In 2014, the DST restructured all women- specific programmes under one umbrella, KIRAN (Knowledge Involvement in Research Advancement through Nurturing). KIRAN addresses issues related with to women scientists and aims to provide opportunities in research. The DST launched GATI – Gender Advancement for Transforming Institutions in February 2020. GATI focuses on gender advancement in the STEMM (science, technology, engineering, mathematics and medicine) area domains at institutional level. (https://dst.gov.in, checked 11/4/2021).

Table 2 Change in structure and duration of degree programmes under NEP-2020[19]

Programme	Present structure and duration	Proposed structure and duration in NEP- 2020
Undergraduate Bachelor's in Arts/Science/Social science (ISCED 6)	3-year programme	Either 3 or 4 years duration with multiple exit options within this period
Post-Graduate/ Master's (ISCED 7)	2-year programme	*Three alternate designs proposed* a) 2-year programme, 2nd year devoted entirely to research for those who have completed a 3-year Bachelor's programme b) 1-year Master's programme for students completing a 4-year Bachelor's programme with research c) 5-year integrated Bachelor's/Master's programme
M.Phil (optional) (ISCED 7)	1 year and 6 months to 2-year programme including course work and dissertation	Discontinued
Ph.D. (ISCED 8)	3-6-year programme after Master's degree or M.Phil degree	Shall require either a Master's degree or a 4-year Bachelor's degree with research

The NEP-2020 also proposes to establish a National Research Foundation (NRF) that will competitively fund research in all disciplines and encourage the development of research culture in the universities. Institutions that currently fund research at some level, such as the DST, DBT, Indian Council of Agriculture Research (ICAR), Indian Council of Medical Research (ICMR), Indian Council of Historical Research (ICHR), and University Grants Commission (UGC), as well as various private and philanthropic organizations, will continue to independently fund research according to their priorities and needs. However, the NRF will coordinate with other funding agencies. The Higher Education Commission of India (HECI) is also proposed to be set up as a single umbrella body for entire higher education, excluding medical and legal education. Public and private higher education institutions shall be governed by common norms for regulation, accreditation and academic standards.

[19] https://www.education.gov.in (checked 28.3.2021)

2.3 Qualification and Career Structures for Academic Careers

India adopted the structure of higher education (HE) from the British educational system. The typical sequence of tertiary level academic qualifications for preparing for an academic career in India that is currently followed is presented in Table 2 (column 2). For professional courses such as architecture, engineering, medicine etc., undergraduate study spans 4 to 5 years followed by a 2-year Master's programme and 3–6 years of Ph.D. study.

The comparative structure of the Indian Standard Classification of Education (InSCED) 2014 and the International Standard Classification of Education (ISCED) 2011 with respect to tertiary education is given in Table 3.

Table 3 Comparative Structure of InSCED 2014 and ISCED 2011 at Tertiary Level

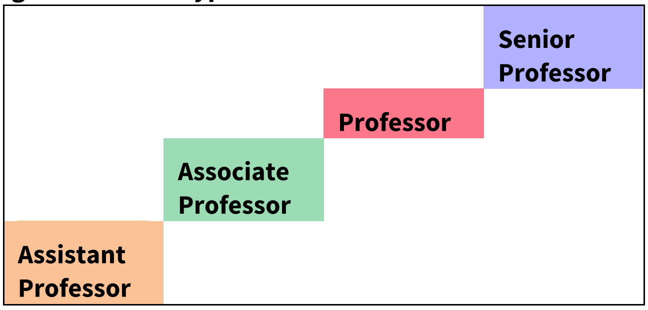
InSCED 2014	ISCED first digit Code	ISCED description
Under Graduate	Level 6	Bachelor's or equivalent
Post Graduate	Level 7	Master's or equivalent
M.Phil*	Level 7	Master's or equivalent
Ph.D.	Level 8	Doctoral or equivalent

*Discontinued in the Draft New Education Policy 2019.
Source: MHRD, Department of Higher Education, GoI (2014) Indian Standard Classification of Education InSCED

Official data on the number of post-doctoral fellowships completed across various disciplines is not available. A greater number of researchers from the STEM disciplines pursue post-doctoral research in India when compared with social science. Generally, the age range for obtaining a Ph.D. degree varies between 28 and 32 years. Some doctoral researchers begin their teaching career on a non-tenure basis while at the same time pursuing research.

A post-graduate degree was traditionally considered to be the minimum eligibility requirement for moving into a teaching position. However, over the past several years, in practice, post-graduate scholars are considered for temporary or guest teaching positions only. Evidence of quality research demonstrated by way of a doctoral degree and publications in reputed journals are important eligibility criteria for appointment as assistant professor, which is the first step in the academic career ladder. The typical academic career path in India is as follows: assistant professor, associate professor, full professor and senior professor (Figure 7).

Figure 7 **Typical academic career ladder in India**



The co-ordination and maintenance of standards in teaching and research in higher education in India is the statutory responsibility of the University Grants Commission (UGC). The policies evolved by the UGC are circulated to universities to enable them to frame their own statutes and ordinances in keeping with the guidelines provided. The UGC frames regulations regarding the qualification of teachers in tertiary education at the time of recruitment as well as laying down the criteria for promotion. The UGC also provides special support for research and innovation at post-graduate, doctoral and post-doctoral levels apart from various other research-oriented schemes across disciplines at doctoral and post-doctoral levels with the objective of women's empowerment.

3 Gender Participation in Tertiary Education and Academic Careers

<u>Academic and Doctoral degrees</u>

The total **enrolment** of students in regular courses including certificate/diploma courses, across all levels (ISCED level 6 and above) in tertiary education increased from 21.501 million in 2012–2013 to 33.427 million in 2018-2019. Of these, women constituted 43.28% (9.306 million) in 2012–13 and 49.17% (16.437 million) in 2018–2019 (UGC Annual Reports).[20]

The total number of students graduating from ISCED level 6 programmes in tertiary education was 7.357 million in 2013; this figure decreased to 6.724 million in 2015. The total number remained more or less consistent between 2016 and 2018, at approximately 6.77 million.[21] Gendering of data did not reveal significant perceptible differences among graduates across Bachelor's or equivalent programmes (ISCED level 6). From 2013 to 2018, on average, there was an equal proportion (approximately 50%) of female and male graduates at Bachelor's or equivalent level. On the other hand, the trend among graduates from post-graduate or equivalent level programmes (ISCED level 7) suggests a small but gradual increase in the proportion of female graduates, from 48.71% female post-graduates in 2013 to 54.99% female post-graduates in 2017. When compared with men, the percentage of women graduates at the ISCED level 7 in 2015 was 51%, going beyond 50% for the first time. From 2015 to

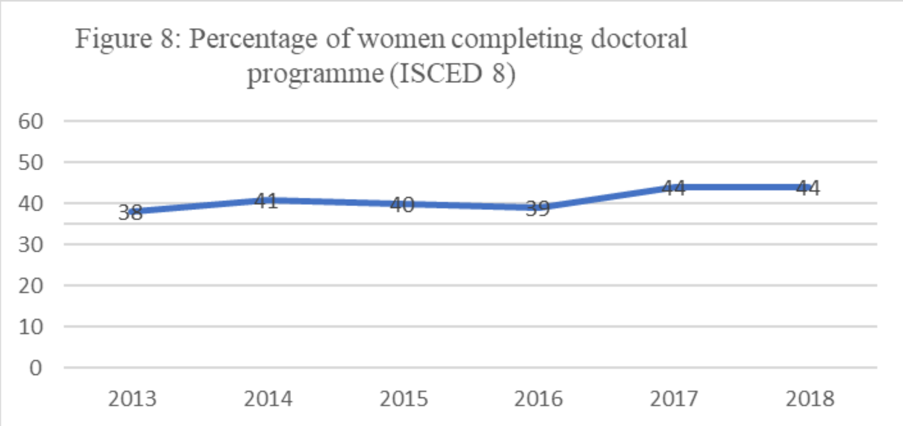
[20] Annual Reports published by University Grants Commission (UGC), Government of India. The UGC is responsible for maintenance of standards of university education in India. https://www.ugc.ac.in

[21] UNESCO Institute for Statistics 2020c

2018, the share of women graduates at the post-graduate level remained consistently above 50%[22].

Although the percentage of women completing post-graduate level tertiary education was higher than that of men, a similar trend did not continue in the doctoral level programmes (ISCED 8). Nonetheless, there was an upward trend in the share of women among students completing doctoral (ISCED 8) or equivalent programmes in India from 37.5% in 2013 to 43.5% in 2018.[23] According to the data, the participation of women in tertiary education suggests an increasing trend at all levels. (Figure 8).

Figure 8 Share of women completing doctoral programmes (ISCED 8), 2013 to 2018



Source: own calculations based on data from UNESCO Institute for Statistics 2020a

The gender parity index (GPI) calculated for the age group 18–23 years in terms of the ratio of females to males in HE improved from 0.89 in 2012–2013 to 1.00 in 2018-2019 (UGC Annual Report).

<u>Scientific staff (academic staff by gender/gender per grade)</u>

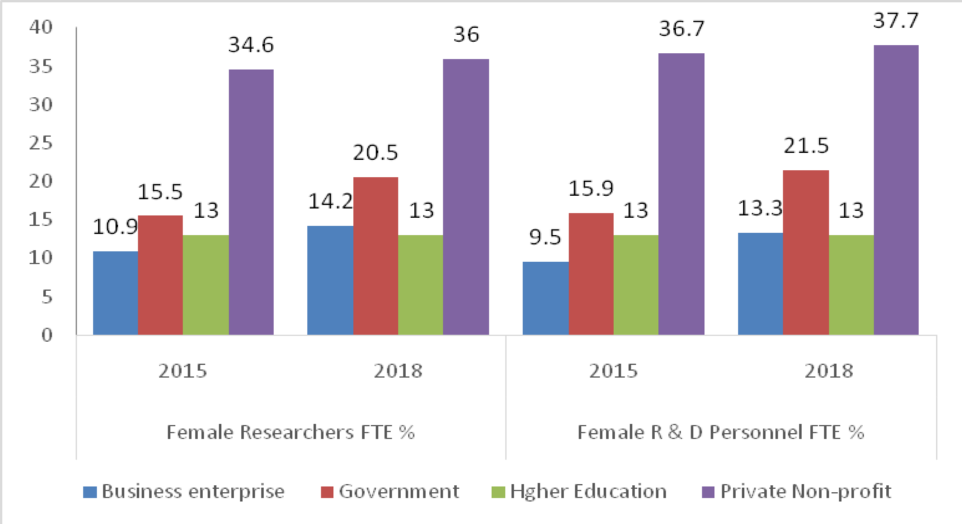
Representation of women in R&D (FTE) employment in India is highly disproportionate in favour of men. Women constituted only 14.7% (FTE) of total R&D personnel in 2015. There was an increase of merely about 4% by 2018, when female R&D (FTE) employment stood at 18.9%.[24] Even though the participation of women in tertiary education has increased during this period (2015 to 2018), the R&D employment of women in the country did not mirror a similar increase. Hence, the transition from education to employment is even more gendered for those with the higher degrees.

R&D employment in India remains particularly male dominated in the business enterprise, government and higher education sectors, where the share of women R&D personnel in 2015 was 9.5%, 15.9% and 13% respectively. The representation of women R&D personnel (FTE) remained more or less constant in the business enterprise and higher education sectors till 2018. However, there was an increase of 3.5% in female R&D personnel in the government sector between 2015 (15.9%) and 2018 (21.5%). In the private non-profit sector, female R&D

[22] Calculations based on data from UNESCO Institute for Statistics 2020a
[23] UNESCO Institute for Statistics 2020c
[24] UNESCO Institute for Statistics 2020c

personnel as a percentage of total R&D personnel (FTE) was 36.7% in 2015, increasing by 1% to 37.7% in 2018 (Figure 9).

Figure 9 Percentage of female R&D personnel and Researchers (FTE) by sector of employment*



Source: UNESCO Institute for Statistics 2020e
* data available only for 2015 and 2018

With respect to **female researchers as a percentage of total researchers (FTE) in India**, there was an upward trend. The total number of female researchers (FTE) increased from 39,389 (13.9%) in 2015 to 56,747 (16.6%) in 2018. There was a significant increase in the percentage of female researchers in business enterprises from 10.9% to 14.2% – a 30% increase. In the private non-profit sector, the percentage of female researchers (FTE) increased by 4%, from 34.6% in 2015 to 36% in 2018. The percentage share of female researchers among total researchers (FTE) in the government sector, evidenced a change from 15.5% in 2015 to 20.5% in 2018 – a 32% increase. The percentage share of female researchers in the higher education sector remained constant from 2015 to 2018, at 13% (Figure 9). Headcount (HC) data was not available for India[25].

The proportion of **female academic staff** showed a steady increase between 2012 and 2018. Women comprised only 39% of all tertiary level teachers (excluding visiting teachers) in 2012 and 2013; the female share increased to 42% in 2018, a 7.7% increase (UNESCO Institute for Statistics 2020c and AISHE 2018-–19; 2012-2013).

Gender-disaggregated data on academic staff positions has not been routinely maintained in India. It was from the academic year 2015–2016 onwards that statistics relating to the percentage of women professors became available from published reports of the UGC, and from 2010–2011 onwards from AISHE data.

Vertically disaggregated gender data for academic staff suggests that, moving up the ladder, the percentage share of women academics when compared with men in the same grade, tends to decrease (Table 4)[25]. In 2012, the proportion of female academic staff

[25] Data from All India Survey on Higher Education (AISHE) and own calculations

(university departments and affiliated colleges) in comparison to male staff at Grade C (Lecturer/Assistant Professor level) stood at 41% and had increased to 43.5% by 2018–2019. Female academics constituted 34% of Grade B (Reader/Associate Professor level) and 25% of total Grade A (Professor and equivalent) academic staff in 2012. The share of women academics when compared with men increased to 37% for Grade B and 27% for Grade A in the year 2018-2019 (Table 4).

The situation with respect to female academic employment in university teaching departments alone (excluding affiliated colleges) suggests a smaller proportion of female representation when compared with men *(Appendix 2)*. The percentage of female academics who were full professors (Grade A) in university teaching departments (excluding affiliated colleges) was 20.6% of all academic staff in 2012-2013. The share of women academics at Grade A in university departments (excluding affiliated colleges) had increased to 24.02%, that is, by 16%, in 2018-2019[25] *(Appendix 2).*

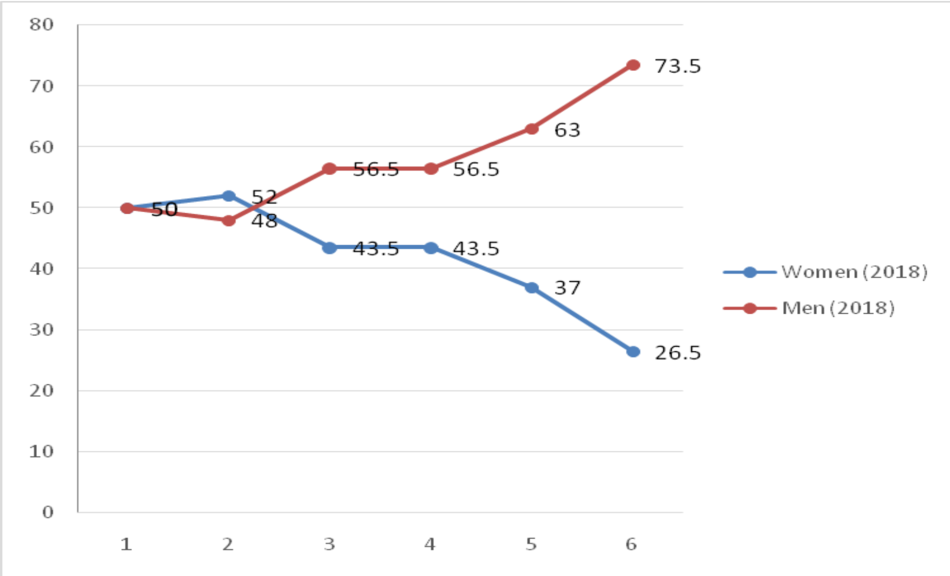
Of the total female academic staff at tertiary level (university departments and affiliated colleges), female academics at full professorial level (Grade A) continue to represent a very small percentage (approximately 6%) compared with around 69–70% of total female academic staff at Grade C assistant professor level (Table 4)[25]. The trend therefore suggests that although a higher proportion of women enter an academic career, few women progress up the career ladder. Comparison of progression of women and men in a typical academic career from ISCED level 6 to women at full professor level (Grade A) is presented in Figure 10.

Table 4 Proportion of female academic staff by Grade at tertiary level*

YEAR		**Grade C Assistant Professor**	**Grade B Associate Professor**	**Grade A Professor**
2012-13	**Percentage share of women academic staff compared with men in the grade**	**40.6%**	**33.8%**	**25.2%**
	Percentage of total female academic staff at tertiary level at each grade	69.27%	12.85%	6.04%
2014-15	**Percentage share of women academic staff compared with men in the grade**	**40%**	**34.49%**	**24.09%**
	Percentage of total female academic staff at tertiary level at each grade	68.36%	12%	5.96%
2018-19	**Percentage share of women academic staff compared with men in the grade**	**43.51%**	**36.78%**	**26.5%**
	Percentage of total female academic staff at tertiary level at each grade	71.11%	10.47%	5.95%

* employed in university departments and affiliated colleges
Source: AISHE Survey Reports for the respective years

Figure 10 Progression of women and men in a typical academic career – from ISCED 6 graduates to Grade A (2018)



ISCED 6 ISCED 7 ISCED 8 Grade C Grade B Grade A

Source: 1. Calculations from UNESCO Institute for Statistics 2020e for data on graduates, 2. AISHE data for academic grades

Government publications on HE do not record data on the award of post-doctoral fellowships. According to a report on the IndiaBioscience platform, the post-doctoral programmes are not very popular on Indian campuses resulting in a very low representation of post-doctoral researchers in India.[26]

4 Gender-specific Aspects of Scientific Careers

Horizontal and vertical segregation

A comparison of female and overall enrolment percentages reflects differences between female and male enrolment percentages across different disciplines. In 2018-2019, enrolment percentage of women relative to overall student enrolment (men and women) for specific fields/disciplines in higher education from ISCED level 6 and above (excluding diploma and certificate programmes) was highest in education programmes (64% of total student enrolment in education programmes) followed by medical science (60%), social science (54%) and science (53%). On the other hand, women were underrepresented in information technology and computer science subjects (14%) and in engineering and technology disciplines (30%).[27] Hence, horizontal gender segregation was most significant in engineering and technology-related disciplines.

[26] https://indiabioscience.org/columns/opinion/the-curious-case-of-the-missing-indian-postdoc (checked 28.3.2021)

[27] UGC Annual Report 2018-2019. Own calculations based on total number of women enrolled in specific streams relative to the overall student (men and women) enrolment in each stream from ISCED Level 6 to level 8

In 2012–2013, of all the women enrolled in higher education, the percentage enrolment of females at ISCED level 6 and above (percentage of total women enrolment) was highest in the arts, at 42.66%, followed by science (19.07%) and commerce/management (16.16%). Female enrolment in the engineering and technology stream was 10.55%, while in education and medicine it was 4.76% and 4.20% respectively of the total female enrolment. In 2018-2019, female enrolment in tertiary education as a percentage of total women enrolment was similar to 2012-2013 for commerce/management (17%), declined in science (17%) and engineering and technology (7.3%); increased marginally in education (6.6%) and medicine (5.1%).[28] New courses and programmes offer diverse career choices to students which offers an explanation to this trend.

The above statistics find support in the views of the senior academics who were interviewed in preparation for this dossier:

"In India the percentage of female enrolment in sciences(relative to men) is increasing and women are outperforming men. However, there were still fewer females in science disciplines, particularly engineering, when compared with males" (Prof.2: Prerna)

"There are more women in humanities and social science streams" (Prof.3: Sharmila) whereas in "maths there are more men" (Prof.1: Rita).

A cross-national comparative study by aspiring minds on barriers to women in engineering (found that the traditional underrepresentation of women in the engineering streams in India was not linked to in-college environmental barriers such as the 'chilly climate' for female engineering students.[29] There was also no evidence of leakage or female drop-outs in engineering education after securing admission in India. Rather, females in engineering as well as non-engineering disciplines in India reported higher confidence, being more open to working with males, and being respected as compared to male students. This indicates a lack of a hostile environment for women in HE in India, and it is also suggestive of a confident new generation of women in India. Yet, the study found that the representation of females in top engineering institutes in India was much lower compared with developed countries. Evidence suggested that females reported lower self-perception of ability and preparedness for competitive examinations when compared with males. The existence of these pre-college barriers inhibited aspiring females from gaining admission to B.Tech programmes. Hence, college was not a significant point for leaks in the pipeline in India; rather, leaks occurred for females before reaching college level. The study recommended that policy makers should revisit the parameters used as selection criteria to identify India's most capable female talent and not depend on scores of a written test alone. This would be likely improve the participation of capable females in engineering.

Data in respect of women faculty across various disciplines was not available from official publications of the Government of India (GoI). However, a study on the status of women in

[28] Annual Reports published by University Grants Commission (UGC), Government of India. https://www.ugc.ac.in and own calculations from AISHE (2012-2013; 2018-2019)
[29] *Women in Engineering: A Comparative Study of Barriers across Nations*. A study by Aspiring Minds. Accessed from https://aspiringminds.com (checked 5/4/2021)

science conducted in 2016-17 (Mallik and Dhara, 2017) reported that while women constituted over one third of the total science graduate and post-graduate degree holders in India, they comprised only 15–20% of tenured faculty across research institutions and universities in India. According to that report, of the total working science professionals, females constituted less than 30% for most of the institutes of science and technology in India. In some of these institutes, women constituted less than 5% of all scientific staff.

One senior professor interviewed in preparation for this dossier observed: *“Women in India are doing very well in sciences up to the Ph.D level. However, by this time they are expected to shoulder family responsibilities and hence forgo chances in their career”* (Prof.2: Prerna). Another interviewee pointed out that *“women in sciences do not last to reach their career goals”*; *“women tend to choose jobs that allow time for family”*. (Prof.3: Sharmila)

Vertical gender segregation was also manifest in the academic life of women as they progressed from ISCED level 6 to ISCED level 8 and later in their academic and scientific careers. Female enrolment data for the year 2018 indicates that the proportion of females enrolled at undergraduate ISCED level 6 is higher, and that it decreases at doctoral level (ISCED level 8) across most streams or disciplines.

In 2018, female enrolment for medical science was 61% and 46% at undergraduate and doctoral research level, respectively. A similar trend was observed for education, social science and science. However, the trend was reversed for engineering and technology (29% female enrolment at undergraduate level and 31% at Ph.D. level), information technology and computer science (41% female enrolment at undergraduate level and 51% at Ph.D. level) and management (38% female enrolment at undergraduate and 46% at Ph.D level). With respect to the share of women graduating at different levels in 2018 when compared with men, data indicates that fewer women graduate at doctoral research level in all major disciplines except for information technology and computer science (53% women doctoral graduates). For science disciplines, there was an increase in the percentage of women graduates at post-graduate level (64% female graduates) over undergraduate level (54% women). However, at doctoral research level, female graduates in science accounted for 46% of the total graduates.[30]

Summary:

The share of women in academic positions reflects the ‘leaky pipeline’, with the proportion of women teaching staff progressively decreasing as one progresses from Grade C (assistant professor) level to Grade A (professor) level. The trend was similar for 2012 and 2018 (Table 4). The proportion of female academic staff (relative to men) at Grade C increased from 41% in 2012 to 44% in 2018; Grade B female staff increased from 34% (2012) to 37% (2018); and Grade A female teaching staff increased from 25% to 27% between 2012 and 2018 (AISHE survey reports). When compared with the percentage of Ph.D.s awarded to women, the share of women in faculty positions in science disciplines, in general, is much lower and fewer women are present at the top of the career ladder The trend is similar even in the biological sciences, which traditionally have a higher proportion of women (33% of women in

[30] Annual Reports published by University Grants Commission (UGC), Government of India. https://www.ugc.ac.in

science disciplines were in the 'biology, health and allied sciences', Mallik and Dhara, 2017) . A study conducted in the biological sciences in India (Bal, 2005) found that women were largely at the junior faculty level.

Data also suggests that from the total scientific manpower in India there is a loss of trained women scientists during the transition from Ph.D. to post-doctoral research (Mallik and Dhara, 2017). In the year 2016, the proportion of female post-doctoral fellows among science professionals was less than 29%. Male post-doctoral fellows were thus 2.5 times more numerous than their female counterparts. The gender gap at the Ph.D level was narrower with males less than two times more numerous than the female doctoral fellows in the science disciplines.The proportion of overall post-doctoral enrolment out of Ph.D enrolment was 18.03%, of which 19.3% were males and 15.4% were females. The study sponsored by the National Institute for Transforming India, Niti Aayog (Mallik and Dhara, 2017) found that only 35.4% of female respondents held positions in academic administration; 35.2% and 28.9% of female respondents had visited abroad professionally for a long or short duration (only for the two years previous to the study, i.e. 2014-2016), respectively. This study provided clear evidence for the loss of trained women scientists in transitioning from Ph.D to post-doctoral research in India.

In spite of the increasing number of women in tertiary science programmes, women's participation at higher levels of science in tenured research positions evidences little improvement in India. According to the R&D statistics published by Department of Science and Technology (DST),[31] of the total R&D personnel directly engaged in R&D activities in 2015, 39,388 (13.9%) were women; this figure increased to 56747 (16.6%) in 2018.

Fewer women compared to men get elected as fellows of science academies. In the Indian Academy of Science (IAS) in 2021,[32] 100 of the 1,113 fellows are women, which is only 9%. Similarly, between 2015 and 2019, 942 fellows were elected to the Indian National Science Academy (INSA),[33] of whom only 85 (9%) were women scientists. One of the professors interviewed in preparation for this dossier (Prof.1: Rita) strongly felt that *"membership of science academies was significantly dependent upon networking and nepotism"* which has caused *"discrimination and unfairness"*. According to her, *"90% of women who are elected as fellows of science academies are either wives or relatives of someone in the academy. Women who are independent of such a support system are only 10% of the total female membership".*

Social, cultural and institutional context

The disproportionate representation of women in scientific disciplines and in senior academic positions is attributable to several contextual factors such as gender stereotypes and gender roles, differential gender-based reinforcements during child-rearing, societal and family obligations, to mention but a few. Kurup et al (2010) in their study reported that

[31] NSTMIS, Research & Development Statistics at a Glance (2017-18) and (2018-19). Department of Science and Technology (DST), Ministry of Science & Technology, Government of India, New Delhi. Available at: http://www.nstmis-dst.org/RegularPublication.aspx

[32] Website of Indian Academy of Science (IAS) (checked 11.4.2021)

[33] Website of Indian National Science Academy (INSA) (checked 11.4.2021)

family commitments were the main reason for the loss of trained women scientists engaged in scientific research and teaching across research institutes and universities: 51.7% of the women in research surveyed perceived family commitments as a reason why women dropped out of science; organizational factors were the second most frequently perceived reason (20.2%), followed by socio-cultural factors (8.1%).

Socialization in a patriarchal culture: The foundations for gender segregation are laid early in childhood in India, with boys expected to play with toy cars and aeroplanes while girls play with dolls. This sets the stage for gendered expectations that conform to roles defined for males and females by the society. A dearth of women role models adds to the situation. Patrifocality affects entry of women into science, and the patriarchal considerations spill over into the workplace (Subrahmanyan, 1998). Child-rearing practices in India encourage girls to help with household chores during their growing up years. The differentiated gender roles in the typical patriarchal family system in India attribute household management to girls (Gupta, 2019). Girls and women are also expected to sacrifice personal career ambitions and prioritize family. 'Career-oriented' and 'ambitious' are the traits that are viewed negatively in women.

These sentiments were echoed in the views of the academics who were interviewed for this dossier:

> *"Stereotypes are encultured in early childhood through toys, dress etc"* (Prof.2: Prerna).
>
> *"It is in the bringing up. Girls are socialized to choose a stream and jobs that allow time for family. There is enormous familial pressure on women to wind up studies for matrimony or to get a job which is not too time-demanding"* (Prof.3: Sharmila).
>
> *"Social expectations are that the family and children are the responsibility of women* (Prof.1: Rita).

Gender role expectations and dual burden: A greater numbers of parents in India are encouraging their daughters to pursue higher education, as is evident from the enrolment figures discussed earlier. However, there is a fall in the number of women scientists entering the workforce, particularly at senior levels. It is evident in the context of women who, after having obtained their doctoral degrees, either do not pursue a career in science or undergo a break in employment after commencing a career. Factors such as marriage, lack of family support and child-bearing are major reasons why women scientists exit (drop-out) the workforce. This is reflected in the lower percentage of female scientists in tenured positions as compared with the percentage of females holding doctoral degrees; or in the fact that there is a larger difference between the number of women and men doctorate holders pursuing post-doctoral research compared with the differences in numbers at the doctoral level (Chandra et al. 2008). Often women, who manage to start a career in science undergo career breaks due to the dual burden of work and family and the lack of gender sensitivity on the part of the institutions that are generally patriarchal and unaccommodating of competing time demands faced by women. The lack of sensitivity also manifests in the lack of attention to providing non-academic infrastructure such as flexible working hours, support services (transportation, housing, elder and child care support, etc.). In the words of the interviewees:

> *"Women have primary responsibility of family and children. Therefore, they have time limitations due to which they cannot do very well"* (Prof.1: Rita).
>
> *"There is greater number of women faculty teaching at undergraduate level. But the number of women faculty teaching at the post-graduate level is much lower since it is more demanding and requires long hours. And as you move up the ladder in higher academia in the academic career, there are fewer women. There is a lot of attrition due to societal pressure"* (Prof.2: Prerna).
>
> *"I know of several women who continued with their careers either in research or academic positions. They chose not to get married or have families. Those who do get married do not pursue their career to that extent – they are content with status quo"* (Prof.3: Sharmila).

The problem of the impact of the dual role related to family care and marriage on the career continuity and attainment of women in science in India begins at the stage of higher studies and research in science. In respect of women, career choices and decisions are traditionally 'family' decisions. Data reveals that a large number of women drop out from higher studies and research in science (Kurup, 2016, Chandra et al, 2008) and scale down their ambitions to accommodate family (Gupta et al, 2005).

Gender biases: Women scholars may find it difficult to be assigned a research supervisor due to prevalent norms and biases. Male professors reported a lack of preference for women students due to apprehensions that they would discontinue research upon marriage. Similarly, women scholars are perceived to have constraints of social mobility due to social norms and issues of safety (Subrahmanyan, as cited in Kumar 2009). On the other hand, women faculty, particularly in the science disciplines, also find it difficult to get Ph.D students under their supervision, as students perceive that women faculty would have fewer contacts and less time for academics (Gupta, 2001).

This belief that women are simply not able to put in the long hours expected in a scientific career, emerged also as an important underlying theme from the in-depth interviews conducted in preparation for this dossier. For instance, one of the professors interviewed for this dossier stated that "*there was an unconscious bias against women. In hiring interviews, women are asked gender-discriminatory questions such as, are you married? How many children do you have?" (Prof.3: Sharmila).* Similar sentiments were expressed by Prerna : *"Factors other than merit play a role in hiring. Gender bias is an important factor. Women are asked about their marital status, children".* Prof.3: Sharmila noted that: *"The belief is that women will not put in long hours that are expected in academia because of family responsibilities and kids."*

Gender bias results in marginalisation of women in faculty positions and also influences the career review process, thereby further contributing to gender disparity (Women in S&T: A Vision Document, 2016).

> "*There is in-built gender discrimination. Lack of gender equality in behaviour in institutional set-up is the main hurdle for female academics. There is a very traditional anti-*

> *female mindset in universities. Gender inclusiveness is not there. There is also lack of acceptance of women colleagues in the sciences. Women have to make more efforts than men*" (Prof.1: Rita).

Institutions are characterized with an overwhelmingly male-dominated environment. Men bring stereotyped notions of male superiority to workplace, such as, women are not suited for handling purchases, finance or to make important decisions. Women scientists believed that they had to work much harder and longer than men in order to prove themselves equally capable (Gupta and Sharma, 2002, p.905). Hence, career success and progression for women is delayed. In an empirical study of gender inequities in scientific institutions in India, Kumar (2001) found that career paths for women were flatter than for men.

Institutional and structural reasons for the underrepresentation of women scientists

Factors such as exclusion from networks, lack of female mentors in senior positions, the condescending attitude of male colleagues, age limit for competitive grants, lack of representation of women on funding committees, and the absence of women-friendly workplaces are some of the reasons for the underrepresentation of women scientists in the workforce.

These key explanations/causes for the underrepresentation of women in academic career paths were substantiated by the interview data.

> *"In academia, contacts/liaisoning are important. Gender disparity exists (at this level) since women cannot generally approach people or influence them to get projects or positions. Men use various ways such as networks or contacts to meet their career goals. For women it is difficult since they are juggling multiple things. In academia connections matter. Alignment and networking with big shots is important to get career benefits. Women who have spouse or a parent in the system find it easier in academia"* (Prof.1: Rita). "*Women tend to be poorly networked due to family responsibilities"* (Prof.2: Prerna).

> *"In sciences there is underrepresentation of women and those who are there have reached there with such great difficulty that they don't always enable female researchers to follow their career trajectory. Institutions have to enable their female employees by providing support groups for women academics in a male dominated institution. There should be more women on hiring committees in academia. Child support systems are important at the workplace for working mothers. This can make the female academic much more productive"* (Prof.3: Sharmila). *"Support systems are not there for women academics, such as creche, flexible working hours, accommodation etc"* (Prof.1: Rita)

> *"Women tend to be perceived as incapable of working on important assignments/projects. Male colleagues demonstrate doubts regarding capabilities of female colleagues. Men do not like women to be equal to them – hence women are excluded through unfair means, not on the basis of performance or capabilities"* (Prof.1: Rita)

In a study on the social and work environment of women scientists in institutes of science and technology in India, Gupta and Sharma (2002) found that women scientists believed that male colleagues did not accept women as equals and doubted the capabilities of female colleagues particularly in the early years of their career. Success in scientific research was not always in proportion to merit.

Women academics and scientists also felt excluded from the ‘male culture’ of departments with few women faculty. Exclusion from internal networks also resulted in not being taken seriously, dependence on hostile colleagues and seniors, conflicting gender and scientific roles and silence around women’s issues. Such experiences resulted in lack of collaboration, contacts and recognition. This was true of single women also and not limited to married women. In fact, compared with married women, Gupta and Sharma (2002) found that single women had lower research activity, in terms of average number of publications and participation in conferences, and faced greater constraints in collaboration with male scientists.

Contacts outside the organization and informal networks with other scientists were essential to success. Women scientists were not very active in maintaining informal networks due to the time constraints resulting from their family responsibilities. Women faced constraints of geographical mobility due to family commitments and security issues related with travelling (Gupta and Sharma, 2002). Women also travelled less than men scientists, and their participation in conferences was lower. In the event of conflicting demands between family and career, social norms and socialization ensured that women prioritized family responsibilities relative to their career. Hence, women compromised with career often giving up opportunities that came their way, such as, international fellowships, visiting scientist/ professor positions, conference participation etc. (Gupta and Sharma, 2002).

Since women had to work harder than men to prove themselves, women in India also faced career-related stress of working in a hostile work environment (Gupta et al, 2005). Women scientists grappled with the anxiety of obtaining funds, results and recognition common to all scientists (Gupta et al, 2005).

In a qualitative study on gender inequality conducted at four prestigious research organizations in India, Gupta (2020) found that the scientists perceived a separation between gender issues and the organizational domain. Hence, they did not blame the organization for gender inequality, but rather they rationalized gender inequality as “social”. Thus, informal behaviour related to gender inequality was seen to be separate from the “system”, thereby keeping intact the rationality and meritocracy of the organizations/institutions. Women were perceived to be “privileged”, as the ‘system’ accommodated their concerns. The study highlighted the role that men play in undoing various government initiatives towards creating gender-equal workplaces. For instance, schemes by GoI specifically targeted towards women scientists who had a break in their career, or schemes for advancement of women in STEMM fields are viewed by men as ‘privilege’ granted to women. General sentiment among male scientists is that while they have to ‘compete’, women are ‘cushioned and favoured’. This sets in motion a vicious circle where women strive harder to justify that they deserved the fellowship.

As already discussed, several initiatives have been adopted by the Ministry of Science and Technology, the Ministry of Education,[34] the Government of India, the UGC and various other bodies to increase participation of women in science.

[34] The Department of Science and Technology (DST) launched the ‘ Women Scientists Scheme (WOS)’ during 2002-2003 with the aim of providing opportunities to women scientists and technologists in the age group 27 to –57

5 Gender and international academic mobility

Few women tend to apply for fellowships in general. For example, in 2020, out of a total of 438 nominations received by the Indian National Science Academy (INSA) for consideration of fellowship, only 60 were of women scientists.[35] It is interesting to note that the gender ratio was more favourable for young/junior scientist awards in 2008 when 18.1% women received INSA young scientist award. On the other hand, only 3.8% and 4.2% women scientists received INSA senior awards and INSA academy fellowships respectively. This is suggestive of the fact that women performed better when they were still studying science than in later years when they took up careers in science (Report of National Task Force for Women in Science, 2008)[36]. Hence, the glass ceiling becomes tougher at the level of practising science and recognition than at the level of studying science. Gender-disaggregated data on awards of international fellowships is not reported and hence not available in India. However, manual counting from the list of awardees indicates that in 2019-2020, percentage of women receiving the INSA young scientist and INSA fellow awards was 20% each (Annual Report, INSA 2019-2020)[37]Government initiatives for fellowship schemes targeted towards women scientists could be a primary factor[34]. Gupta and Sharma (2002) reported that there is an increase in research activity among women faculty and scientists in the age group 50-55 years. In the 50s women scientists do not have child-care issues and have also built contacts and networks resulting in higher research productivity.

Access to opportunities for international mobility: All the senior academics who were interviewed noted that there is no gender inequality in access to opportunities for international mobility. However, filtering occurs at the stage of application for international fellowships. Fewer women apply due to family reasons, such as competing demands for time due to family responsibilities when applying for a fellowship, lack of family support, social expectations, duration of the fellowship (prefer short-term fellowships due to family reasons, etc.) Greater flexibility in the design of international mobility programmes is likely to encourage women to apply and also avail the fellowships. The length and terms of the fellowship need to be customized to match the life and career stage of the potential recipient.

Further, all the academics interviewed were of the view that female academics prefer international mobility fellowship where funding covers the stay of spouse and children. With respect to the process of selection for the award of a fellowship by the funding agencies, two of

years who had a break in their career but desired to return to the mainstream. It has three components: WOS-A, WOS-B and WOS-C. In 2014, the DST restructured all women- specific programmes under one umbrella – KIRAN (Knowledge Involvement in Research Advancement through Nurturing). KIRAN addresses issues related to women scientists and aims to provide opportunities in research. The DST launched GATI – Gender Advancement for Transforming Institutions in February 2020. GATI focuses on gender advancement in the STEMM area domains at institutional level. (https://dst.gov.in, accessed 5/4/2021).

[35] Annual Report 2019-2020 Indian National Science Academy (INSA). www.insaindia.res.in

[36] (2008) 'Evaluating and Enhancing Women's Participation in Scientific and Technological Research: The Indian Initiatives'. Report of the National Task Force for Women in Science, Department of Science and Technology, Ministry of Science and Technology, Government of India.

[37] (2008) 'Evaluating and Enhancing Women's Participation in Scientific and Technological Research: The Indian Initiatives'. Report of the National Task Force for Women in Science, Department of Science and Technology, Ministry of Science and Technology, Government of India.

the professors interviewed in preparation for this dossier believed that there was no gender discrimination (Prof.1: Rita and Prof.3: Sharmila). However, the third professor believed that there were biases, though not conscious, in the selection process for the award of international fellowships (Prof.2: Prerna). Rita, professor from Botany had spent three months in Germany on a fellowship and was familiar with German academic setting. According to her Germany with its world renowned institutions and labs provided opportunity for research exposure and academic growth for Indian academics and students.

Apart from the family and social factors, the interviewees cited other reasons for fewer women being awarded and availing of international mobility fellowships:

a. *Women often lack information to apply for fellowships* (Prof.2: Prerna)
b. *Networking is important for international mobility. Since male professors can sustain networks, they get more opportunities* (Prof.1: Rita).
c. *Institutional factors like not being sanctioned leave* (Prof.3: Sharmila
d. *Administrative and bureaucratic issues* (Prof.1: Rita)

To increase international mobility among women academics in India, the following measures were suggested:

a. Increase in government funding opportunities and initiatives for women only (Prof.1: Rita and Prof. 2: Prerna). Divisions in ministry of science and technology, GoI is promoting international mobility and research collaborations among women through various schemes. Department of Science and Technology (DST) has started some programmes for women,[35] more are required (Prof.1: Rita).
b. International mobility fellowship to cover family expenses (all three interviewees)
c. Academic institutional structures to facilitate leave etc. Award of international fellowships to academics adds to the prestige of the institution/university (Prof.3: Sharmila).

Career advantages of international mobility for women academics: The professors interviewed were unanimous that collaboration and international mobility is important for the professional growth of women academics across all streams: “International exposure is important to find out new trends in research” (Prof.3: Sharmila). Additionally, women academics benefit in their careers in several ways (Prof.2: Prerna):

a. Opportunity to work with reputed labs and groups of academics
b. Exposure and experience gained
c. Stronger CV
d. Opportunities to publish increase. Publication record improves

In India, the importance of international collaboration/ mobility for a successful career path varies among institutions and disciplines. Though not an essential requirement in recruitment or promotion, some institutions consider these factors important at a nonformal level. Institutions also differ in the emphasis they place on international exposure in research and teaching. The weightage given to international experience is higher among science disciplines and also in economics, sociology etc.

Preference of countries for international mobility: All the professors interviewed unanimously believed that the USA was the most popular first preference for international mobility fellowships among academics and scholars. However, Europe as a destination has gained popularity in recent times, particularly after Erasmus Mundus (Prof.2: Prerna). Among the European countries, the UK, Germany and France are also preferred for fellowships by students and academicians alike. Some of the factors in the choice of country for international mobility among Indian women researchers are presented in Table 5.

Table 5 Preference for countries, and factors influencing choice of destination country for international mobility among Indian women academics

Country Preferred and Factors	Prof.1: Rita* (Department of Botany)	Prof.2: Prerna* (Department of Physics)	Prof.3: Sharmila* Department of English
Most preferred country	USA, Canada, UK	USA	USA
Other destinations gaining popularity	Europe (Germany)	UK, Germany, France	Europe (Germany), Scandinavian countries
Gender differences in choice of country	No	No	No
Language as a factor in choice of country	Language is not the main factor	Language is not a deterrent for France and Germany	Language is not important
Important factors influencing choice of country	-Research output, exposure and infrastructure in host country -Living conditions -Language (in some European countries) -Funding		Research culture and prestige of host institute One-to-one connection established with an academic in host country

Source: In-depth interviews of senior women academics in India (Primary Data)
*Pseudonyms, names have been changed to mask the identity of the academics

The common view expressed by the professors who were interviewed was the increasing attractiveness of Germany as a destination for Indian women researchers for international mobility. The major reasons for preference for Germany include: the reputation of Germany as a country, the quality of its institutions, the nature of research being conducted (Prof.2: Prerna); the academic prestige of the country, Germany is among the most preferred European countries though language may sometimes be a barrier (Prof.1: Rita); very renowned institutions such as German Max Planck Institutes (Prof.3: Sharmila).

Increasing participation of Indian women academics and scholars in the Humboldt programme: Based on the interviews with women academics, it was evident that awareness about Humboldt programmes was lacking among Indian scholars and therefore information about these programmes needs to be more widely disseminated. Measures suggested for increasing the attractiveness of Humboldt programmes among Indian academics, particularly women, are;

a. *There is a need to publicize and advertise these programmes more. Most academicians are aware of Fulbright and Commonwealth scholarships but not of Humboldt (Prof.1: Rita & Prof. 2: Prerna)*
b. *To increase the online presence, information about Humboldt programmes should be made available on University websites in India and in Germany (Prof.3: Sharmila (Prof. 2: Prerna).*
c. *It should enter into memorandums of understanding (MOUs) with universities directly like Erasmus Mundus (Prof.2: Prerna)*
d. *Humboldt alumni should be encouraged to disseminate information about opportunities on their return (Prof.3: Sharmila).*

6 Conclusion

It is evident that socio-cultural and institutional contextual factors play an important role in shaping the participation of women in scientific careers. Family responsibilities are an important factor that constrain women from applying for and availing of international mobility fellowships and awards. With respect to Humboldt programmes, it emerges that information about these programmes is not well disseminated. Hence, scholars and academics lack awareness about these opportunities. Interviewees suggested several measures for creating more awareness and attractiveness of Humboldt programmes among Indian women in academic careers. Since Germany has emerged as an important destination in Europe for international mobility, publicizing Humboldt programmes through various channels, and extending international mobility fellowships to sufficiently cover family expenses will serve to generate higher interest for Humboldt fellowships and awards for international mobility among women scholars in India.

Appendix

Appendix 1

Table 6 Information on Personal Interviews

S.No.	***Designation***	***Department/Discipline***	***Mobility experience***	***Mode of interview***
1	***Professor***	Rita	1. Visiting faculty, University of Western Ontario, DBT overseas fellowship (6 months) 2. Fellowship for a training course in biotechnology, Germany, 3 months	Personal/ face-to face
2	***Principal Retired Presently associated with GATI programme of DST***	Prerna	1. Tata Fulbright travel fellowship (1995) 2. Commonwealth academic staff fellowship (1987)	Telephonic interview
3	***Professor***	Sharmila	Washington D.C. on individual basis (no fellowship)	Zoom meeting

Appendix 2

Table 7 **India data: Women Professors**

YEAR	Full Professors		%		
1993-94				Women teachers across all levels in universities in India were 11.6% of the total.	
1997	Females	274	10.5%	*Source: Singh (2008)* In Women in HE Leadership in S.Asia: Rejection, Refusal… by Morley, L. and Crossouard, B. (Commonwealth) Center for HE & Equity Research, University of Sussex.	
2000	Females	769	18.0%		
2006	Females	1,190	18.5%		
2011-2012	Males	22,129	80%	Total	27,699
	Females	5,570	20%		
2012-2013	Males	24,453	79.4%	Total	30,802
	Females	6,349	20.6%		
2013-2014	Males	25,919	79%	Total	32,818
	Females	6,899	21%		
2014-2015	Males	27,466	78.6%	Total	34,928
	Females	7,462	21.4%		
2015-2016	Males	28,952	78.65%	Total	36,810
	Females	7,858	21.35%		
2016-2017	Males	24,074	76.8%	Total	31,346
	Females	7,272	23.2%		
2017-2018	Males	22,874	76.2%	Total	30,020
	Females	7,146	23.8%		
2018-2019	Males	26,761	75.98%	Total	35,221
	Females	8,460	24.02%		

Note: Data pertains to university departments from 2011-2012 to 2018-2019). Gender disaggregated data on faculty are not available in India prior to 2010.
Source: AISHE Reports, Ministry of Education (GoI), for data from 2011-2012

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