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CRDF CEPT RESEARCH AND DEVELOPMENT FOUNDATION

ASSESSMENT OF GOVERNMENT OF INDIA'S GENDER MAINSTREAMING PROGRAMS FOR WOMEN IN SCIENCE

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NATIONAL REPORT

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Department of Science & Technology
Govt. of India

PROJECT COMPLETION REPORT

Project Title
Assessment of Government of India's Gender Mainstreaming Programs for Women in Science

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Network Mode Project
National Level Analytical Report

Submitted by:

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National Science and Technology Management Information System (NSTMIS) Department of Science & Technology

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Disclaimer:

Every care has been taken to provide the authenticated information. However, the onus of authenticity of data rests with the National Coordinator and Regional Principal Investigators of this Network Mode Project.

Preface

Underrepresentation of women in STEM education, research and professional practice remains a challenging issue in today's modern India. An immediate attention to this issue is a need of the hour as women represent almost half of the population. Keeping this in mind, Government of India has introduced several programmes through its various Departments since early 2000's. Department of Science and Technology (DST) has been at forefront introducing various programmes for women in the field of science and technology. To this effect, since 2003 to present day, the financial support for this purpose has been increased manifold, showing DST's priority and commitment towards achieving the goal of increasing women representation. Highest priority was given to encourage women who want to continue to pursue their research career despite career breaks due to family reasons. The challenge is to systematically address key bottlenecks in their professional career such as lack of suitable job opportunities for women, career breaks, limited S&T skillset, wage discrimination, problems related to relocation, and lack of suitable work environment etc. Various schemes and programs were introduced in past two decades. Many of those were amalgamated into KIRAN (Knowledge Involvement in Research Advancement through Nurturing) Scheme.

It is a herculean task for the funding agencies to track and measure the impact of their schemes for longer time periods. The principal objective of the schemes is the overall professional development of individuals which can only be measured when respective progress is tracked over a period of time. In order to determine the efficacy of the schemes intended for women scientists, assessment is needed in terms of professional career enhancement, knowledge, skill building, achievements and recognitions.

In order to evaluate impact of multiple funding programmes, appropriate analytical framework and systematic study is envisaged, catalysed and supported by CHORD (NSTMIS) Division, Department of Science and Technology, New Delhi. This study aims to assess Government of India's Gender Mainstreaming Programmes for Women in Science, namely: DST's WOS Schemes (A, B & C), DBT's Bio-Care and UGC–PDF. The objective is to evaluate the direct and indirect impact of programmes in the lives of women scientists before and after project completion with emphasis on

achievements and professional career development. Those opportunities were looked into which helped building their confidence in fulfilling the responsibilities, receiving the recognition and awards. This present work analysed the effect of various schemes on the beneficiaries to understand their pattern of outcomes and impacts. The analysis was carried out strictly from the data collected through questionnaire survey only from women scientist beneficiaries. Various statistical tools were adopted for assessment of the impact and SWOT analysis was carried out, which ultimately helped in identifying curative and suggestive measures.

The national coordinator has developed analytical framework, relevant project plan based on initial research, expert consultation, development of field data collection strategy, which was realised by thirteen regional principal investigators representing thirteen regions from six zones covering entire nation.

The Centre for Applied Geomatics, CRDF, CEPT University, Ahmedabad was entrusted responsibility as a National Coordinator for this nation-wide network mode project titled 'Assessment of Government of India's Gender Mainstreaming Programmes for Women in Science'. We have put our best efforts in bringing out the appropriate analytical framework, coordinated and guided the regional principal investigators, compiled a booklet also video interviews containing success stories of the women scientist beneficiaries.

We are thankful to the CHORD (NSTMIS) Division, DST, New Delhi for giving this opportunity, trusting our abilities as a coordinator and keeping confidence in us.

Our gratitude to the Regional Principal Investigators for their generous cooperation. A special note of thanks to all the women scientists who have responded to our request and filled the questionnaire, shared their achievements and helped this project reach to a completion.

I am obliged to thank for support and help received from CAG and CEPT University.

Prof. Anjana Vyas, Ph D.

National Coordinator,
Network Mode Project (NSTMIS, DST)

Centre for Applied Geomatics (CAG)
CEPT Research & Development Foundation (CRDF)
CEPT University, Ahmedabad.

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I am grateful to Dr. H.B. Singh, Scientist E (Retd.), Department of Science and Technology, New Delhi for shaping this project, identifying the core importance of the project. His timely comments, meticulous observations, supervision and guidance while striving for perfection during the project is remarkable. My heartfelt thanks to Dr. H. B. Singh.

I extend my sincere thanks to Dr. P. K. Arya, Scientist B, CHORD Division, DST, New Delhi who has been a 'single window' solution for me and all the Regional PIs. I am obliged to him for being immensely helpful in resolving all administrative issues in timely manner.

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Dr. Pawan Kumar, Scientist C, DST, New Delhi for giving valuable suggestions during the brain storming meetings as well as helping in data collection. I also owe special thanks to Dr. A. N. Rai, Scientist F, NSTMIS DST, New Delhi for his noteworthy comments and remarks.

My sincere thanks are to all the officers and their respective team members from Department of Science and Technology, Department of BioCARe, TIFAC, New Delhi for providing the relevant data, information and direction when required. I express my gratitude to all the officers from various departments of Government of India for their support and cooperation in every aspect of this project.

The success and the final outcome of the project required good understanding and a positive cooperation from the Regional Principal Investigators, Dr. Bharathi Salimath, South West Zone; Dr. Sophia S., South East Zone; Dr. Maninder Kaur, North Zone; Dr Himanshu Padhy, East Zone; Dr. Tanuja Singh, East Zone; Dr. Archana Reddy, South East Zone; Dr. Brajeshwar Chandelia, North Zone; Dr. Ekta Manghani, West Zone; Dr. Satheesh Patchikolla, South East Zone; Dr. Jyotsna, North-East Zone; Dr. Vimmi Malhotra, North Zone; Dr. Geetha Dayal, South West Zone. I am extremely grateful to each and every one of them for their support, cooperation and friendship all through this journey. Without their active participation, this project could not have been completed.

I thank all the women scientists who have patiently filled the questionnaire forms, shared their success stories and video clips.

My personal thanks to Dr. Darshana Rawal, Director, Projects & Technical, CAG, CRDF, CEPT University for her deep involvement, meticulous efforts and untiring help in every facet of the project, from the beginning to the end. I convey my sincere thanks to my faculty colleagues from CEPT University, to name a few with a special mention, Dr. Dipak Samal, Dr. Ganesh Devkar, Dr. Anil Roy. Heartfelt thanks to Dr. Ami Divatia for helping in carrying out statistical analysis and giving opinion on the inferences. A special thanks to Dr. Vyjayanthi N., Mr. Jayachandra Ravi. Last but not the least, I thank the project team, Ms. Priyanka Jangra, Mr. Ajay Tiwari, Mr. Mukesh Parmar and Dr. Kajal Joshi, Mr. Nikunj Pithva for their hard work and support.

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As India races ahead for its rightful place in science and technology in 21st century world, the equitable women representation will make that dream closer for realization. The gender-mainstreaming of woman scientists in S&T by DST, Government of India and other Central Government Ministries/Departments is a visionary initiative stated in early 2000. It gives me immense pleasure to note that the trend has been very encouraging over years as more women scientists benefit from these programmes. Those women who have had career breaks are becoming part of mainstream scientific research and making it possible for nation to harness their valuable expertise and available potential. The schemes have been formulated taking into account the gender sensitivity involved and yet more remains to be comprehended. In this regard, the present project serves as a valuable feedback from grass roots level and permits deeper insights into finer aspects of issues and challenges. The statistics and analytical deductions from the result of this work will help identification of grey areas where more efforts can be put in as we aim for a more equitable representation across the country. I am sure that the result of the project helps in gender sensitive policy making and implementation with a more human face as the objective seeks to assess the issues and concerns by women scientist beneficiaries. I appreciate and congratulate the project team constituting of a National coordinator and Regional Principal Investigators across the country for their untiring efforts and congratulate them.

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Women have a significant role to play in growth and development of science and technology in India. With a goal to increase their representation and contribution in science, Government of India has brought many schemes that financially support and encourage the women scientists to continue in scientific research despite previous discontinuation. To comprehend the situation and assess the progress, status and impact of these schemes on beneficiary women scientists since 2002-03, NSTMIS, DST has catalysed and supported a national level, network mode cross-sectional study. The Centre for Applied Geomatics, CRDF, CEPT University, Ahmedabad was bestowed with an important responsibility as a national coordinator. For the study, all the states of India were divided into six zones and thirteen regions covering all the states. This two-year project involved analysis of collected primary information from 1714 women beneficiaries through an on-line questionnaire survey under supervision of regional coordinators. The broad spectrum of analysis also accounts for professional career enhancement, awards and achievements and the social support received as successful outcomes of scheme. I express my gratitude to DST for helping us at every stage of the project. I extend my sincere thanks to all the Regional Principal Investigators. I am sure the project outcomes could be useful in shaping a gender mainstreaming agenda with evidence-based policy planning in the S&T sector in years to come.

Executive Summary

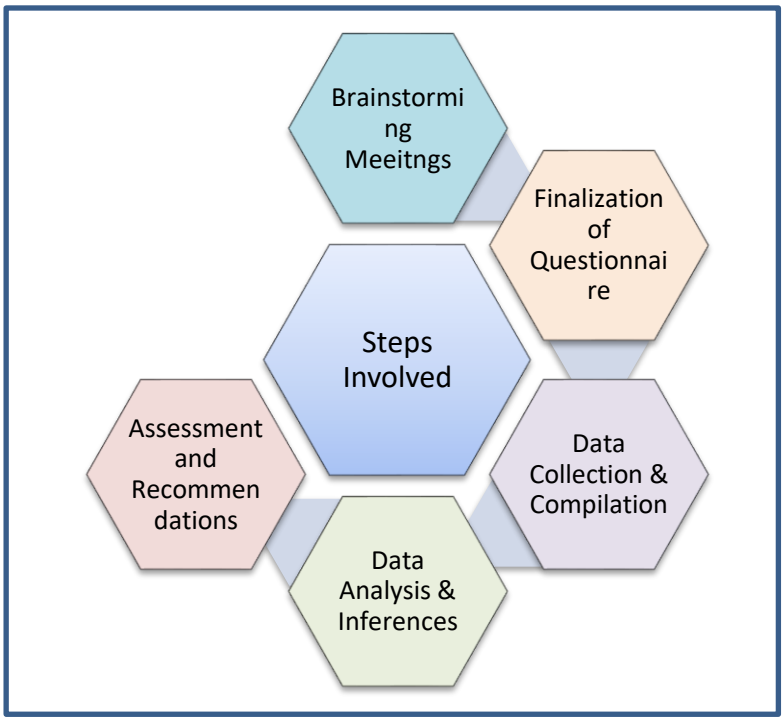
Since 2002-03, when gender mainstreaming programmes in science were initiated by Government of India, the pace of availing the schemes by women scientists had only gained momentum. It also led to the necessity of requiring insights into the issues and challenges that beneficiaries faced, so that essential changes and adjustments could be made to it.

With this need in mind and to further knock the gender gap in scientific contributions in Science, Technology, Engineering and Mathematics (STEM), the project entitled 'Assessment of Government of India's Gender mainstreaming program for women in science' was launched in 2018-19. It is a network mode project catalysed and supported by the CHORD (NSTMIS) Division, Department of Science & Technology (DST), Government of India. The aim of the project is to assess the impact of these gender mainstreaming programmes and suggest indicative framework for effective policy planning. The project results would assist in the identification of the measurement parameters and evaluation of the professional status of women scientists after availing the support for the project. The large-scale cross-sectional study was carried out for this. It has assessed, analysed and evaluated the overall effectiveness of a programme by collecting individual information from respective beneficiaries. This project results could also assist in identifying the limiting areas, easing the implementation, enabling the strategies to encourage suitable prospective women scientists to join the schemes. The data collection strategy involved a large-scale national level survey headed by 13 Regional Principal Investigators across 6 different zones: North Zone, North East Zone, East Zone, South East Zone, South West Zone, and West Zone. A national coordinator was appointed and entrusted with the responsibility to formulate project proposal and coordinate entire project all over the country.

The Methodology of the Project:

This cross-sectional study used a mixed-method research design approach. It is a procedure for collecting, analysing, and 'mixing' both quantitative and qualitative research and methods in a single study to understand a research problem. The broad steps involved:

Analytical Framework



a) **Brainstorming meetings**: Brain-storming meetings with the stakeholders were conducted. Project theme, the structure, the questionnaire, time schedule was discussed.

b) **Finalization of questionnaire**: To collect the information from the women beneficiaries, a questionnaire was designed for a primary survey. The pilot survey was conducted with help of a few women scientists with a purpose to modify and edit the designed questionnaire. The questionnaire was then prepared in the on-line format using Survey123, and was sent to all the women beneficiaries.

c) **Data collection and compilation**: The responses were collected from beneficiaries of five schemes (WOS-A, WOS-B, WOS-C, BioCARe and UGC PDF) and followed up by actively thrusted Regional Principal Investigators (RPIs). The compilation was done by national coordinator from responded beneficiaries who availed the schemes during 2002-03 to 2018-19, i.e., seventeen years of span. There were total of 3530 beneficiaries as data received from the DST, of which about 48.5% of them, i.e.,1714 women scientists have enthusiastically responded and filled up the questionnaire completely. The data

collection strategy involved a large-scale survey headed by 13 RPIs across 6 different zones: North Zone, North East Zone, East Zone, South East Zone, South West Zone, and West Zone. The detailed analysis was carried out for five schemes, namely, WOS-A (2002-03), WOS-B (2002-03), WOS-C (2002-03), UGC PDF (2008-09), and BioCARe (2011),

d) **Data Analysis**: Analysis was carried out from the primary data of received questionnaires filled by women scientists. The analysis addressed the nature of support, programme specific areas, geographical spread, affiliated institutes, and improvement in the project deliverables. The success stories of women scientists were selected based on the parameters such as their achievement level, societal contribution, their education, and professional growth. Compilation of these success stories served as a driver of inspiration for aspiring young women scientists.

e) **Assessment and recommendations:** An assessment on performance, advancements, issues, challenges, and opportunities that could help establish i) social support dimensions of women, and ii) educational progression, iii) career progression, iv) entrepreneurship and innovation activities was analysed and discussed. The project outcome-based recommendations were given.

Of the total 3530, about 48.5% i.e.,1714 women scientists have enthusiastically responded and filled up the questionnaire completely. The following are details of composition out of total responses (1714-woman scientists) and decreasing order of respondent **participation percentages of each zone**: **South West Zone** with **highest zonal respondent participation rate of 59%** and constitute 13.4% (236 respondents) of total respondents (1714) received. The **second highest** was **West Zone with zonal respondent participation rate of 52%** constitute 16.7% (285 respondents) of total responses received. The **East Zone stood third with respondent participation rate 51.5%** constitute 13.1% (232 respondents), the **North-East Zone with zonal respondent participation rate 51.2%** and constitute 4.5% (78 respondents) of total responses received. The **North Zone with zonal respondent participation rate 46%** and constitute 32.5% (541 respondents) of total responses received. The **South East Zone had least zonal respondent participation rate 42%** and constitute 19.8% (342 respondents) of total responses received. The analysis was carried out on these datasets

of the available responses and assumed to represent the total population of woman beneficiaries.

The following are details of composition out of total responses (1714-woman scientists) and decreasing order of respondent **participation in percentages of each scheme**: The **highest was WOS-B with respondent participation rate of 56%** constitute 6.76% (116 respondents) of total responses received. The **WOS-A stood third with respondent participation rate 48.7%** constitute 6.56% (1038 respondents) of total responses received. The **BioCARe scheme had respondent participation rate 47.53%** and constitute 7.87% (135 respondents) of total responses received. WOS-C the participation rate of **38%** and constitute 16.9% (291 respondents) of total respondents (1714) received. The **UGC PDF had least respondent participation rate 21.96%** and constitute 7.81% (134 respondents) of total responses received from the women scientists.

The reasons of non-response of woman scientists were several. Of the multitude of factors, the predominant reasons were: changes in postal addresses, email ID, and mobile numbers. Some woman scientists were unable to access required documents and faced inaccessibility of their formal communication channels also owing to global pandemic outbreak which disallowed their institutional presence. Apart from problems like inapproachability to mentors, other issues like indifference and reluctance towards sharing details was also noticed.

The four important aspects were analysed from the information gathered from the respondent women scientists. Those are i) Social Support Dimensions, ii) Educational Progression, iii) Career Progression and iv) Entrepreneurship and Innovation Activities considered as a Professional Dimension. Each of those are explained as below:

Social Support Dimensions:

The women education inequality is not uniform across all social strata. It is obvious that within complex stratification systems in India and social categories, the relative status of women is more obscure within the more disadvantaged segments of the population. (Dunn, 1993) Several initiatives are taken by the Government of India to

provide support to the researchers belonging to the Scheduled Caste and Scheduled Tribe including the frontier areas of science and engineering. **Of total responses received 4.5% of the women scientists belonged to SC and ST category**. The percentage of women registered in SC and ST categories was lesser in all the zones in comparison to other castes except for the North East Zone. Around 10% of the total beneficiaries belonged to this category. **UGC PDF had the highest percentage (17.9%) of beneficiaries belonging to the SC and ST** category.

Family support is an important parameter for scheme. Among zones, **beneficiaries from East zone (87.41%) had highest family** support. Among schemes, **beneficiaries from WOS-B (84.6%) had highest family support.**

Mentor support is an important opportunity for beneficiaries to develop research aptitude. Among zones, **beneficiaries from South West Zone (68.95%) had highest Mentor support.** Among schemes, **beneficiaries from WOS-B (78.65%) had highest Mentor support.** BioCARe is starkly different from rest of zones as almost one-fifth have poorly rated mentor support.

The gender mainstreaming programs are about providing support to women who desire to return to the mainstream after a career break into the scientific profession. There are four predominant issues considered in the questionnaire: i) family issues, ii) maternity or health issues iii) marriage and iv) mobility as 'reasons for break'. **Out of total responses received 77.1% of women beneficiary had revealed a break in career**.

The decreasing order of zonal percentages of respondents having '**family issues' as the reason for break** is as follows: **North-east (27.27%), North (27.16%), South East (26.28%), West (21.86%), East (18.58%), South West (17.89%)**. The decreasing order of zonal percentages of respondents having '**maternity or health issues' as the reason for break** is as follows: **South West (32.16%), South East (31.09%), West (27.13%), North (20.49%), North-east (14.29%), East (26.28%)**. The decreasing order of zonal percentages of respondents having '**marriage' as the reason for break** is as follows: South West (16.58%), West (12.96%), South East (12.18%), North (12.10%), North-east (10.39%), East (10.38%). The decreasing order of zonal

percentages of respondents having '**mobility' as the reason for break** is as follows: **South West (8.04%), West (5.67%), East (2.73%), North-east (2.6%), South East (2.56%), North (2.47%)**. The decreasing order of zonal percentages of respondents **who had 'no break'** is as follows: **East (49.18%), North (23.21%), North-east (19.48%), South East (16.35%), South West (16.08%), West (14.17%)**.

The decreasing order of scheme-wise percentages of respondents having '**family issues' as the reason for break** is as follows: **WOS-A (26.78%), WOS-B (23.28%), UGC PDF (14.18%), BioCARe (8.89%)**. The decreasing order of scheme-wise percentages of respondents having '**maternity or health issues' as the reason for break** is as follows: **WOS-A (26.97%), BioCARe (16.3%), WOS-B (15.52%), UGC PDF (13.43%)**. The decreasing order of scheme-wise percentages of respondents having '**marriage' as the reason for break** is as follows: WOS-B (15.52%), WOS-A (14.35%), UGC PDF (5.22%), BioCARe (3.7%). The decreasing order of scheme-wise percentages of respondents having '**mobility' as the reason for break** is as follows: **WOS-B (8.62%), WOS-A (3.85%), UGC PDF (2.24%), BioCARe (1.48%)**. The decreasing order of scheme-wise percentages of respondents **who had 'no breaks'** is as follows: **BioCARe (62.96%), UGC PDF (47.76%), WOS-B (17.24%), WOS-A (14.26)**.

The **increasing** order of zone-wise **''duration of break'' in months** by the women scientist respondents due to '**family issues' as the reason for break** is as follows: **South East (26.61), East (28.58), North (36.6), South West (37.3), North-east (42.19), West (43.12).** The increasing order of zone-wise 'duration of break' in months by respondents due to '**maternity or health issues' as the reason for break** is as follows: **West (24), East (25.5), South West (26.07), North (28.24), South East (28.79), North-east (38.54).** The increasing order of zone-wise 'duration of break' in months by respondents due to '**marriage' as the reason for break** is as follows: **East (34.26), South East (41.64), North (42.06), South West (45.15), West (56.31), North-east (56.87).** The increasing order of zone-wise 'duration of break' in months by respondents due to '**mobility' as the reason for break** is as follows: **South West (27.62), East (30.2), North (31.2), West (35.71), South East (40), North-east (90).**

The **decreasing order of scheme-wise ‘‘duration of break’’ in months** by respondents due to **family issues as the reason for break** is as follows: **WOS-B (39.51), BioCARe (39.20), WOS-A (34.5), UGC PDF (30.52)**. The decreasing order of scheme-wise ‘duration of break’ in months by respondents due to ‘**maternity or health issues’ as the reason for break** is as follows: **WOS-B (32.4), WOS-A (27.94), UGC PDF (24.66), BioCARe (20.27)**. The decreasing order of scheme-wise ‘duration of break’ in months by respondents due to ‘**marriage’ as the reason for break** is as follows: **WOS-A (46.66), WOS-B (42.38), BioCARe (42), UGC PDF (16.57)**. The decreasing order of scheme-wise ‘duration of break’ in months by respondents due to ‘**mobility’ as the reason for break** is as follows: **WOS-B (49.7), WOS-A (34.15), BioCARe (12), UGC PDF (6)**.

Educational Progression:

As a result of supported projects under these schemes, by the **end of duration of project** beneficiaries’ education level from bachelor to master level incremented by 2, Masters to PhD level incremented by 370 whereas PhD to Post-Doc level incremented by 239 in numbers. There was a total increase of 0.91% (2) Master degree holders, 67.33% (371) PhD degree holders, 615.38% (240) Post-Doc holders by the end of sanctioned project due to research enabled and supported by the DST schemes considered here for the study here. The beneficiaries’ current education levels progressed further after the project completion, Masters to PhD level incremented by 69 whereas PhD to Post doc level incremented by 16. There was increase of 7.73% (70) PhD degree holders, 5.73% (16) Post Doc degree holders as of **time of survey** since their project completion.

The zone wise percentage increment of education level **from masters to PhD degree is North (69.75%), South East (64.48%), South West (61.32%), West (60.40%), East (57.14%), North-east (46.88%)**. Among the zones, the North Zone observed a major hike in the Ph.D. holders. The zone wise percentage increment of education level **from PhD to Post-Doc degree is North (44.07%), West (30.66%), South East (28.69%), South West (28.57%), East (11.28%), North-east (9.09%)**. As seen, there is higher increment of women beneficiaries from the North Zone to Post Doc degree holders.

The scheme wise percentage increment of education level **from Masters to PhD degree is BioCARe (83.33%), UGC PDF (77.78%), WOS-A (65.06%), WOS-B (36.84%)**. Among the schemes, the BioCARe observed a major hike in the Ph.D. holders. The scheme wise percentage increment of education level **from PhD to Post-Doc degree is UGC PDF (68.85%), WOS-A (26.58%), BioCARe (15.70%), WOS-B (10.34%)**. As seen, there is higher increment of women beneficiaries from the BioCARe to Post Doc degree holders. The above statistics show that beneficiaries have progressed significantly in improving their level of education due the opportunity provided by these schemes and to carry out the research projects by the women scientists.

'**Publications**' is one of the important 'achievement parameters' for the beneficiaries. The number of respondents' publications ranging from one to five was quantified as percentage within each respective zone. The **decreasing order of zonal percentages** of respondents with **five publications** is as follows: **North (20.24%), South East (20.19%), West (17.81%), East (15.84%), South West (11.55%), North-east (10.39%)**. The decreasing order of zonal percentages of respondents with **four publications** is as follows: **North (10.86%), South West (10.55%), South East (8.33%), North-east (7.79%), West (6.07%), East (4.91%)**. The decreasing order of zonal percentages of respondents with **three publications** is as follows: **South East (16.98%), East (14.75%), North (14.07%), West (12.55%), South West (10.55%), North-east (10.38%)**. The decreasing order of zonal percentages of respondents with **two publications** is as follows: **North-east (20.78%), South East (18.91%), West (18.22%), North (16.54%), East (16.39%), South West (13.57%)**. The decreasing order of zonal percentages of respondents with **one publication** is as follows: **East (24.04%), South West (23.11%), North-east (22.07%), West (19.83%), South East (16.98%), North (16.79%)**. The decreasing order of zonal percentages of respondents with **no publications** is as follows: **South West (30.65%), North-east (28.57%), West (25.51%), East (24.04%), North (21.48%), South East (18.59%).**

The decreasing order of **scheme-wise** percentages of respondents with **five publications** is as follows: **UGC PDF (30.59%), WOS-A (17.91%), WOS-B (10.34**

%), BioCARe (7.4%). The decreasing order of **scheme-wise** percentages of respondents with **four publications** is as follows: **UGC PDF (11.94%), WOS-A (8.76%), BioCARe (6.66%), WOS-B (4.31%)**. The decreasing order of **scheme-wise** percentages of respondents with **three publications** is as follows: **UGC PDF (15.67%), WOS-A (14.45%), BioCARe (13.33%), WOS-B (6.89%)**. The decreasing order of **scheme-wise** percentages of respondents with **two publications** is as follows: **WOS-A (17.63%), WOS-B (17.24%), BioCARe (17.04%), UGC PDF (13.43%)**. The decreasing order of **scheme-wise** percentages of respondents with **one publication** is as follows: **BioCARe (25.18%), WOS-B (21.55%), WOS-A (19.17%), UGC PDF (14.17%)**. The decreasing order of **scheme-wise** percentages of respondents with **no publication** is as follows: **WOS-B (39.66%), BioCARe (30.37%), WOS-A(22.06%), UGC PDF (14.18%)**. There was a positive significant correlation of the 'Age' and 'Number of Publications' observed, with an increase in the age, there was an increase in number of publications.

Career Progression:

To study the career progression of the beneficiaries, the nature of the employment of the respondent women scientists was analysed. The beneficiaries were asked about the nature of their employment in terms of 'Employed' or 'Unemployed' before the project and also at the time of filling up the questionnaire (current). By the end of the project availed, 64% of women beneficiaries were employed. Of the surveyed population, around 30.7% worked in academics, 22.3% as scientists, 17.8% were research scholars, and 5.8% were 'others' includes Freelancers, Vocational Instructors, Data Coordinators, Analysts, etc. The remaining 23.3% of women were unemployed who were either 'searching for jobs' or were 'housewives'. It was interesting to note here that the **average level of satisfaction of job was found maximum among Scientists (3.86 out of 4 scale) and Academicians (3.85 out of 4 scale)**. These averages indicated more than 'Good' level of satisfaction among Scientists and Academicians. The average of level of satisfaction was found relatively less among Research Scholars (3.67 out of 4 scale).

The employment details the time of survey (in 2018-19) were collected. **Among the schemes** in decreasing order**, as of 2018-19, about 42.64% women who have been**

beneficiaries under WOS-B scheme have gained highest employment growth with change in number and change percent of positions as academicians 25 to 29 (16%), research scholars 26 down to 21 (-19.23%), scientists 3 to 37 (1133.33%) and others 15 to 10 (-33.33%) as compared to before scheme. **About 23.89% of Women who have been beneficiaries under WOS-A scheme have gained employment growth** with change in number and change percent of positions as academicians 255 to 312 (22.35%), research scholars 295 to 174 (-41.01%), scientists 45 to 239 (431.11%) and others 53 to 58 (9.43%) as compared to before scheme. **About 13.41% women who have been beneficiaries under UGC PDF scheme have gained employment growth** with change in number and change percent of positions as academicians 42 to 30 (-28.57%), research scholars 29 to 50 (72.41%), scientists 4 to 6 (50%) and others 8 to 7 (-12.5%) as compared to before scheme. **About 1.72% Women who have been beneficiaries under BioCARe scheme have gained employment growth** with change in number and change percent of positions as academicians 59 to 66 (11.86%), research scholars 34 to 9 (-73.52%), scientists 17 to 36 (111.76%) and others 6 to 7 (16.7%) as compared to before scheme.

Among the zones in decreasing order**, as of 2018-19, about 74.07% women who belong to East zone have gained highest employment** growth with change in number and change percent of positions as academicians 35 to 53 (51.42%), research scholars 31 to 30 (-3.22%), scientists 7 to 46 (557.14%) and others 9 to 12 (33.3%) compared to before scheme. **About 24.07% women who belong to West Zone have gained employment** growth with change in number and change percent of positions as academicians 66 to 79 (19.69%), research scholars 69 to 35 (-49.27%), scientists 12 to 63 (425%) and others no change in 24 (0%) as compared to before scheme. **About 22.72% women who belong to North-east zone have gained employment growth** with change in number and change percent of positions as academicians 8 to 23 (187.5%), research scholars 29 to 7 (-75.86%), scientists 3 to 20 (566.67%) and others 5 to 4 (-20%) as compared to before scheme. **About 20.64% women who belong to North Zone have gained employment** growth with change in number and change percent of positions as academicians 90 to 110 (22.22%), research scholars 123 to 74 (-39.83%), scientists 25 to 89 (256%) and others 13 to 25 (92.3%) as compared to before scheme. **About 9.73% women who belong to South East zone have gained**

employment growth with change in number and change percent of positions as academicians 136 to 117 (-13.97%), research scholars 64 to 67 (4.68%), scientists 8 to 57 (612.5%) and others 19 to 7 (-63.2%) as compared to before scheme. **About 7.97% women who belong to South West Zone have gained employment** growth with change in number and change percent of positions as academicians 46 to 55 (19.56%), research scholars 68 to 41 (-39.70%), scientists 14 to 43 (207.14%) and others 12 to 10 (-16.7%) as compared to before scheme.

The employment growth details the after project completion and current status of the beneficiary for each zone and the scheme were compared.

The east zone (20.98%) recorded highest percentage of respondents who gained employment growth among all zones after their project completion. WOS-A (4.43%) recorded highest percentage of respondents who gained employment among all zones after their project completion.

Entrepreneurship and Innovation Activities:

About **64.23% beneficiaries** out of total responded positively to the **special contributions/achievements** by them as result of their research. **West Zone had the highest (70.85%) and North Zone had the lowest (58.20%) beneficiaries** who claimed special contributions/achievements. **Across the schemes, WOS-B had the highest (68.1%) and UGC PDF had the lowest (58.20%) beneficiaries** who claimed the special contributions/achievements.

Science is one of the most important channels of knowledge. It has a specific role, as well as a variety of functions for the benefit of our society: creating new knowledge, improving education, and increasing the quality of our lives. About **46.7% beneficiaries** out of total responded positively to the research that led to **societal benefits** as result of their research. **South East zone had the highest (75.86%) and East zone had the lowest (35.55%) beneficiaries** who claimed contributing to society through technology research. **Across the schemes, WOS-B had the highest (75.86%) and BioCARe had the lowest (35.55%) beneficiaries** who claimed contributing to society through technology research.

About **34% beneficiaries** out of total responded positively to the research that led to **technology dissemination** of science and technology. **South East zone had the highest (42.3%) and East zone had the lowest (20.76%) beneficiaries** who claimed contributing to the technology dissemination. **Across the schemes, WOS-B had the highest (66.4%) and BioCARe had the lowest (22.96%) beneficiaries** who claimed contributing to the technology dissemination.

About **59% beneficiaries**, out of total responded positively to **skill development** as a result of project under scheme. **South West Zone had the highest (73.36%) and East zone had the lowest (37.70%) beneficiaries who claimed skill development**. **Across the schemes, WOS-A had the highest (62.13%) and BioCARe had the lowest (51.85%) beneficiaries who claimed skill development.**

Overall, the decreasing order of best ranking of zones averaging the four parameters of entrepreneurship and innovation activities from what is claimed by respondents is as follows: South East, South West, West, North, North-east, East. Similarly, the decreasing order of best ranking of schemes averaging the four parameters of entrepreneurship and innovation activities from what is claimed by respondents is as follows: WOS-B, WOS-A, BioCARe and UGC PDF. (***Note: this ranking is based solely on the responses from beneficiaries related to their contribution in entrepreneurship and innovation activities. Any unrealistic responses from beneficiaries may lead to biased results***.*)*

SWOT Analysis:

SWOT Analysis for the gender mainstreaming programme of Government of India was intended to identify beneficiaries related as well as programme related factors that were favourable and unfavourable to the success and growth of the programme. The SWOT analysis would not only promote or inhibit successful implementation of necessary strategic changes but would also be helpful in assessing the use and distribution of available resources. The two variables were considered for SWOT analysis: i)Achievement parameters of beneficiaries and ii) Satisfaction Levels (of beneficiaries)

with the programme. To quantify achievement of beneficiaries, scores of questions (from the questionnaire) were summed up.

Achievement parameters to calculate Beneficiaries Score: 1) Awards/Honours received, 2) No. of publications, 3) No. of International Seminars Attended, 4) Papers Presented in International Seminars, 5) No. of National Seminars Attended, 6) Papers Presented in National Seminars, 7) No. of International Workshops attended, 8) Papers Presented in International Workshops, 9) No. of National Workshops Attended, 10) Papers presented in National Workshops, and 11) H index.

Score to calculate Satisfaction levels of beneficiaries with the Programme, the variables considered: 1) Satisfaction with the Programme, 2) Respondent Women Scientists'' Rating on Programme; where the Level of Satisfaction: Range from 1 to 5, of this 1 being Not satisfied to 5 as Excellent level of satisfaction. This is expressed as, 1 = Not Satisfied; 2 = Average; 3 = Good; 4 = Very Good; 5 = Excellent.

As mentioned above, the eleven parameters of achievement allow calculating of achievement score of each respondent. **The median of observed achievement scores has been found to be 11 and has been taken as a threshold value for an individual to be considered having research achievements.** To construct the categories of 'High Achievement' and 'Low Achievement', the score was divided into two categories with the help of median. Beneficiaries scoring 'Above 11' were categorized as 'High Achievers' and those who scored '11 and Below' were categorized as 'Low Achievers' as the median was calculated as 11. For satisfaction score the total ranged from 2-10 with the mean of 8.6. Mean was used to form two categories: 'High Satisfaction' and 'Low Satisfaction'. The beneficiaries scoring '9 and Below' were categorized as 'Low Satisfaction' and beneficiaries scoring 'Above 9' were categorized as 'High Satisfaction'.

The Strength considered: High Achievement but Low Satisfaction, Opportunity where High Achievement and High Satisfaction. Weakness included Low Achievement and Low Satisfaction and Threat where the women scientists have responded Low Achievement but High Satisfaction.

It was observed that highest proportion (27.2%) of total beneficiaries of North Zone was found in the category of 'Weakness'. In East (32.8%), North East (38.9%) and South East (28.8%) zones the highest proportion of beneficiaries were in the 'Threat' category where they expressed High Satisfaction with the programme but they were Low Achievers. In South West (33.2%) and West (29.9%) zones highest percentage of beneficiaries were from 'Weakness' category.

In BioCARe (28.1%) and WOS-B (32.8%) it was evident that majority – consisting highest number/proportion of beneficiaries were in the 'Threat' quadrant. There were 37.3% of beneficiaries of UGC PDF who were in the 'Opportunity' quadrant. There were 28.6% of beneficiaries of WOS-A who were in the quadrant of 'Weakness'. It was noteworthy here that, similar to this, 27.3% beneficiaries were in the 'Threat' quadrant.

Probability Analysis:

SWOT Level of Achievement*:*

The Logistic Regression (LR) method was used to statistically fit logit function and calculate the probability of occurrence of event which in our case is that beneficiary can move to higher quadrants of SWOT, i.e., have higher **score of achievement**. There were eleven parameters that were used in SWOT analysis for calculating achievement score of each respondent, score of 11 being median of observation has been taken as a threshold for achievement. The Logistic Regression is more suitable in this achievement dataset because the distribution of scores is more skewed. **The method calculates the probability of a beneficiary to ascend to what can be called an achievement and sets as qualification criteria for each of each of eleven parameters or their optimum combination.** For example, the higher achievement score (i.e. higher than 11 points) could also be realized with the different values of the single parameter namely 'Number of Publications' or a combination of parameters to assess research output of an individual. Assume a certain case of beneficiary with 'No. of Publications' equal to 1 yield 28% achievement probability, 'No. of Papers presented in International Seminars/Workshops' presented equal to 1 yields 33% achievement probability and 'No. of National Seminars/Workshops' attended equal to 2 yields 37% achievement probability. Hence, summing them up, with a total of 98% Probability,

higher achievement may be fructified. **The probabilities of a parameter are additive in case of combinations of parameters**.

This would help to decide the policy makers to develop such a combination of the probabilities for different variables that would lead to higher achievement scores by the beneficiaries availing the schemes and ascend to higher quadrants (along axis of achievements) in SWOT.

SWOT level of Satisfaction:

It was also tried to calculate probabilities with respect to **score of satisfaction** of beneficiaries. The variables such as Age, Family support, Mentors' support, Institutional support, 'duration of break', No. of projects done, change in their Employment were entered in to Logistic Regression model. **None of the above mentioned variables turned out to be significantly related with the satisfaction of the beneficiaries.** Hence, it was not feasible to predict the probability associated with the increase in the satisfaction level.

Ranking the Zones:

Rank analysis was carried out for the zones separately for all parameters within variables. Ranks are calculated for each dimension or parameter within variable and are summed up for each zone to assess performance of zone. These variables considered for **Social Support Dimension** Ranking were 'duration of break', No of Projects undertaken, Mentor's Support, and Institutional Support, Family Support. Among the Social Support Dimensions, South West Zone was ranked one zone followed by North and South East both on 2nd position. North East stood third, East fourth and West Zone the last rank.

The other ranks were identified zone wise for the respondent women scientists' **education progression**, before and after the project availed. The variables considered to rank the education progression were Current Education Level, Change from Masters' to PhD, PhD to Post-Doc. Calculating the overall rank for the Educational Progression variables, North Zone secured first position, West zone second rank, South East, East,

South West and North East Zones availed third, fourth, fifth and sixth ranks respectively.

The third aspect of the respondent women scientists for zone wise ranking was **Career Progression.** The variables considered were level of satisfaction with Current Employment, Employment Growth after the Project, Employment Growth as of 2018-19 (current), and Women Scientists' Involvement in Extension Activities. For the Career Progression, it was observed that East zone was at 1st position, West on 2nd, South West achieved third rank, fourth rank was shared by North and South East Zone. North East Zone ranked the lowest.

The fourth aspect for ranking the zones was **Entrepreneurship and Innovation Activities** carried out by the respondent Women Scientists. The variables included were their Special Contributions, Societal Benefits, Technology Disseminations, and any skills acquired. The South East zone stood in the first position for Entrepreneurship and Innovation Activities. South West Zone stood in the second position. Third rank availed by the West Zone, followed by North, North East and East Zone with fourth, fifth and sixth ranks.

Aggregate of abovementioned four aspects, the ranks i.e., Social Support Dimension, Education Progression, Career Progression and Entrepreneurship & Innovations, revealed the zone wise status. South East zone stood first overall in ranking mainly driven by strong entrepreneurship and innovation activities as well as social support dimensions. North Zone stood second mainly driven by education progression and social support dimensions. South West Zone also stood second overall in ranking mainly driven by social support dimensions and entrepreneurship and innovation activities. West Zone stood fourth mainly driven by education progression and career progression. East zone stood fifth mainly driven by career progression. North-east is stood sixth driven by social support dimensions.

Discussion:

In the above analysis, the variations across zones as well as schemes-wise were clearly reflected. Especially the regional imbalances of researchers were visible across the

zones. East zone had a demography with tremendous potential for growth in scientific research and tops in terms of family support and employment gain but needed improvement in i) education progression, ii) research outputs and iii) Entrepreneurship and Innovation Activities. The researchers required more employment opportunities. The growth of educational, research and development institutions may thrust the opportunities for research and development in private sector as well. The WOS-B had women with more 'duration of break' than others with WOS-A being only second from it. The age differences reflect clearly in terms of aspirations and research outputs. **The younger generation in WOS-B are ambitious and have zeal to contribute to the society through their research whereas scheme like UGC PDF have more experienced and mature researchers who are adept to making significant contributions in terms of research outputs like scientific publications.**

Publication of research papers have remained very important for the respondent women scientists; publications enhance the visibility and network among the subject fraternity. Indirectly this may help in career enhancement and professional progression. It may be suggested that the women beneficiaries 'must' attend the 'writing workshop' at least 2 in case of three-year duration of the project. **The 'writing workshop' may be arranged by the DST periodically, one in six months by the eminent and expert institutions or the established publishers like, Springer, Tylor & Francis or any other.** Emphasise may also be given in regard to the improvement in the quality research, similar to the 'writing workshop' at regional level with the help of IITs and other universities a 'research methodology workshop' may also be made mandatory to be attended by the project awardee women scientists.

There is need for regional sensitization workshops to attract young talent in regions that need improvement. Such initiatives are needed for talented young women scientists who are prospective or aspiring candidates, can draw more candidates where more participation is needed in certain schemes. The same may be organised periodically in close **collaboration with institution**s and with **a robust mechanism for talent identification** to make sure that schemes are availed to the most deserving only.

The **committees and teams of experts** who can provide in valuable inputs to bring in more awareness in young women scientists in institutions from **two-tier and three-tier cities** will pave for much difference in their further careers. Besides, this will improve the participation **from areas which have been traditionally lagging due** to various reasons in research. The able and deserving candidates may be **made aware of research facilities, utilities and their availabilities** that can be useful for their research studies.

The **directory of institutions and research projects** may be made accessible to all with a periodic review status update. The **best performing women scientists may be rewarded and encouraged**. The successful women scientists can be enabled to act as **ambassadors for promoting research** in science and technology.

Research training can act as an important means of equipping the woman scientists with necessary skills and knowledge helpful in carrying out research and develop **research writing useful for publishing** as well as skills needed presenting their work. The woman scientists may be familiarized with publication practices and requirements. The **guidelines and manuals** will be resource that can help solve the bottlenecks in research methodology. The material may be prepared for research ethics and practices. The **coffee-table books** consist of best practices, success stories adding with common mistakes and expert guidance will help allaying misunderstandings and doubts. Encouraging **the active presentation and speaking in conferences** can support the researcher in taking suggestions, crucial observations of others. The productivity of the work is directly affected by these skills which learned can score points to further advance and rise in research field.

The **professional and scientific societies and associations** which are actively organising science and technology related activities may be encouraged to conduct programmes **at national and regional level** targeting increase in women representation in research. Very specific emphasise may be given to the project awardee women scientists. This enhances the spread, outreach motivated by renewed collective conscience for gender balance in scientific research and professional involvement in India.

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Acronyms

AISHE	All-India Survey on Higher Education
ANOVA	Analysis of Variance
CHORD	Centre for Human and Organizational Resource Development
DBT	Department of Biotechnology
DST	Department of Science and Technology
FD	Factorial Design
GPI	Gender Parity Index
IASc	Indian Academy of Sciences
INSA	Indian National Science Academy
IPR	Intellectual property rights
KSY	Kishori Shakti Yojna
LR	Logistic Regression
MDGs	Millennium Development Goals
MDS	Multi Dimension Scaling
MS	Mahila Samakhya
MS	Marital Status
NASI	National Academy of Sciences
NEP	National Education Policy
NSTMIS	National Science & Technology Management Information System
R & D	Research and Development
RB	Reason of Break
RGSEAG	Rajiv Gandhi Scheme for Empowerment of Adolescent Girls
RPI's	Regional Principal Investigators
SDGs	Sustainable Development Goals
SEDGs	Special Economic Disadvantaged Groups
SSA	Sarva Shiksha Abhiyan
SSESS	Society of Socio Economic Studies and Services
STEM	Science, Technology, Engineering, Medicine
SWOT	Strength Weakness Opportunity Threat
WOS	Women Scientist Scheme
WTP	Women Technology Park

1 INTRODUCTION

Mankind's pace and scale of success in scientific research and development depends on equitable opportunities to all among its population. The alleviation of differences essential to remain prime focus to bring about synergetic and efficient use of human resource capital. Removal of gender inequality in scientific contributions is a vital obligation and a need of the hour. Major contributions of women in science is necessary to bring about modern knowledge society.

The contributions of women scientists are at times overlooked due to gender inequalities, cultural factors and discrimination. There are barriers to build the professional career for women, to name a few, handling important responsibilities and projects of certain specializations, participating in conferences and skill-building workshops, also non availability child-care facilities at workplace and non-flexible working hours. There are certain well-known constraints added to these for the women's entry into Science, Technology, Engineering, Medicine (STEM) include environmental and social barriers.

Although the disparity of women participation in science in highest in developing nations, many developed nations are also still struggling to reduce the gap. It is well accepted fact that the proportion of women participating in scientific research has a direct impact on economies as seen in some developed nations. According to one of the estimates by the US, women represent less than 30% of the R&D workforce worldwide. In India, academia, industry, and science professionals have expressed major concerns about the underutilization of potential of women personnel, especially in scientific proficiency. Their concern is about lagging role of women scientists in nation building as their participation important for scientific progress. The Science, Technology, Engineering, and Mathathematics (STEM) streams still remains a lot to be done towards women participation as these streams are linked to national growth. Despite the remarkable gains that women have made in education and employment over the recent decades, progress observed has been uneven.

The most pressing issues that restrict the women from excelling in science and necessitating the dropouts are desired to be identified. The target issues could be social,

economic, cultural in nature, yet their prevalence if found to be wide and inhibiting the career growth of women, need to be addressed on top priority. Accordingly, the needs, aspirations and compulsions are to be considered to encourage women to continue and pursue their goals in scientific education and research. Emphasis is needed to root out gender bias in science stream which takes many different forms. Some are more explicit and recognizable, while others are subtler and yet extremely harmful, resting on gender stereotypes and limiting the expression of women's potential.(*Measuring Gender Equality in Science and Engineering: The SAGA Toolkit - UNESCO Digital Library*, n.d.). In order to improve nation's capacity in STEM and to achieve the SDGs of the United Nations' Transforming our World: the 2030 Agenda for Sustainable Development, gender equality in science must be prioritized and actively addressed through policies and programmes. Government of India through its Ministry of Women & Child Development in association with Ministry of Education, Ministry of Electronics and Information Technology, Ministry of Science and Technology is conducting various initiatives to promote women education in science and promote awareness among the public. Various efforts have taken shape in past decades and yielded satisfactory results. Yet, more studies are needed to be carried out to understand how they are impacting the beneficiaries, giving them new opportunities ultimately contributing to uplift of the women's participation and the welfare of the nation.

1.1 Demographic Profile of India

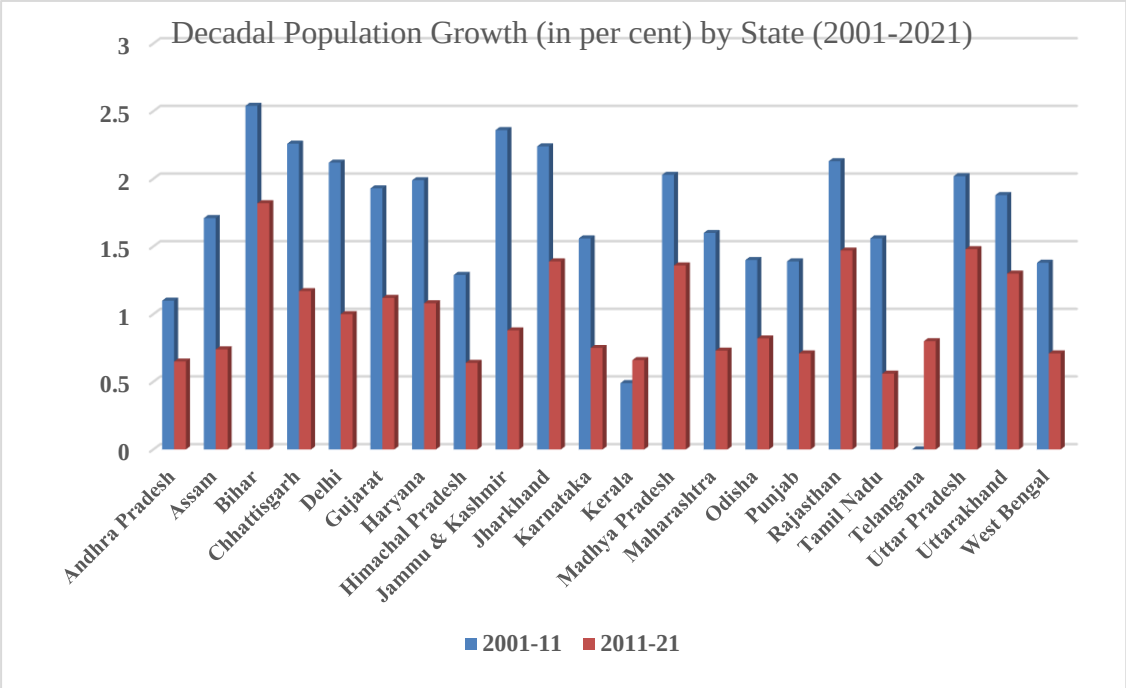
Indian population has an average age below 30 years and gender ratio of 108 males per 100 females in its projected population size of 134 crores in 2021 as per Census of India. The population of India comprises people of different cultures, languages, religions, customs, castes which vary in the social development. Growth in population is determined by changes in demographic parameters like birth and death rates, infant mortality, rate of migration. The demographic analysis reveals gender ratio, literacy rate, caste wise population, higher education. The study of demographic profile demonstrates the level of urbanization and economic development of the region. It is also important for the equitable development across all groups matching the needs and aspirations.

Table 1: Decadal Population Growth

Year	Total Population (in millions)	Average Annual Growth Rate (%)	Decadal Growth Rate (%)
1901	238	-	-
1911	252	0.56	5.8
1921	251	0.03	-0.3
1931	279	1.04	11.0
1941	319	1.33	14.2
1951	361	1.25	13.3
1961	439	1.96	21.6
1971	548	2.22	24.8
1981	683	2.20	24.7
1991	846	2.14	23.9
2001	1028	1.95	21.5
2011	1210	1.63	17.7
2021 (projected)	1339	1.01	10.6

Source: website: *http://ayush.gov.in*

The decadal and annual growth rate of population was highest between 1961-71 and 1971-81 which has seen 24.8, 24.7 and 2.22, 2.20 percent respectively. The growth rate has seen gradual decline in last three decades.



Graph 1: State wise Decadal Population Growth (in per cent) by State (2001-2021)

Source: Census 2011, International Institute for Population Science (IIPS) projections, India's Demography at 2040: Planning Public Good Provision for 21st Century

Graph 1: State wise Decadal Population Growth (in per cent) by State (2001-2021) reveals the decadal population growth between 2001-11 and 2011-21 for all states is shown in Graph 1. The initial decade 2001-11 shows the highest population growth in

Bihar, flowed by J & K, Chandigarh, Jharkhand, Rajasthan. During the decade of 2011-21 all states have observed the lower rate of growth. The least growth rate is found in Tamil Nadu, Himachal Pradesh, Kerala, but Bihar state reveals the highest growth rate which more than 1.5%.

1.2 Age Structure

Table 2: Age group-wise population and estimation

Age wise population and estimate				
Year	Population (million)	Age Group (in %)		
		0-14	15-64	65 & above
2001	1027.02	34.4	61.1	4.5
2011	1186.75	28	66.8	5.2
2021	1345.24	26.1	67.5	6.4
2031	1463.23	22.4	69	8.5
2041	1559.97	20	68.8	11.1
2051	1627.96	18.9	66.5	14.6

Source: https://niti.gov.in/planningcommission.gov.in/docs/aboutus/committee/strgrp/stgp_fmlywel/sgfw_ch2.pdf

As per NITI Aayog's demography studies of the age-wise population, more than 60% of the population belong to working age group, i.e., 15-64 years. It is estimated that working age population will peak at 69 % during 2021-31 which may marginally reduce to 68.8% in 2031-41. This estimation reveals that the non-working population, i.e., age groups- less than 14 years and above 65 years are ranging between 31 percent in 2021-31 to 39 percent in 1991-2001. This shows the percentage share of adolescent population is decline since 2001 whereas that of senior citizens is increasing. It is estimated that the percentage of adolescent population during 2041-51 will fall nearly to half of percentage of what was during 1991-2001 whereas the percentage of senior citizens will quadruple by 2041-51. This may be attributed to falling birth rate and increased life expectancy.

1.3 Gender Ratio

The decadal analysis of gender ratio as shown in Table 3: Decadal Analysis of Gender Ratio describes the declining female population per 1000 males from 972 in Census year 1901 to 927 in 1991. The gender ratio improved to 933 in 2001, 943 in 2011. This

Year	Sex Ratio (females/1000 males)	Year	Sex Ratio (females/1000 males)
1901	972	1961	941
1911	964	1971	930
1921	955	1981	934
1931	950	1991	927
1941	945	2001	933
1951	946	2011	943
		2021 (projected)	945
Source: https://censusofindia2021.com/sex-ratio-of-india-2021/			

Table 3: Decadal Analysis of Gender Ratio

may be attributed to the government's measures to criminalize the female foeticide and bringing up initiatives, programmes encouraging girl child education, health and wellbeing along with increased awareness in public. This shows that increased public conscience, incentivized support together with strict measures to root out discrimination yield positive results in achieving gender balance and equitable society.

1.4 Literacy

Literacy rate is a key indicator for progressive societies as it directly impacts social development and economic growth. Women literacy has direct impact on families. Moreover, women literacy can empower women to have a greater control over their lives and individual choices. Targeting to achieving nation-wide primary education, promoting gender equality and women empowerment are important part of Millennium Development Goals (MDGs).

Table 4: Decadal Literacy Rate and Gap in Male – Female Literacy

Literacy Rate					
Census year	Literacy Rate (in %)	Gap in Male-Female Literacy Rate (in %)	Census year	Literacy Rate (in %)	Gap in Male-Female Literacy Rate (in %)
1901	5.4	9.2	1961	28.3	25.05
1911	5.9	9.6	1971	34.45	23.98
1921	7.2	10.4	1981	43.57	26.62
1931	9.5	12.7	1991	52.21	24.84
1941	16.1	17.6	2001	64.83	21.59
1951	18.33	12.3	2011	74.04	16.68

Source: Census of India, 2011

Literacy rate of India at the start of twentieth century was 5.4 percent and by 2011 it was 74.04 percent. The literacy rate improved substantially post-independence such

that from 1951 it has started increasing near about 10 percent per decade. The initiatives by governments to encourage children attending school like Mandatory primary education, Mid-day meal scheme, free girl child schooling together with general awareness of benefits of education in society have brought about the positive change. The gap in male-female literacy rate widened to 26.62% by 1981 from 9.2% in 1901 census year though gradually narrowed in following decades to 16.68% by 2011.

1.5 Education in India

The Gender Parity Index (GPI) Table 5: Gender Parity Index in Education at different levels of education show that the girl education at primary level and elementary level has undergone transformation from 0.41, 0.38 during 1950-51 year to 1.03, 1.05 during 2014-15 respectively. Gender Parity Index till senior secondary schooling is satisfactory indicating the female enrolment is at par with male enrolment. In higher education, women education has seen an improvement from 0.69 in 2005-06 to 0.92 in 2014-15. The trend suggests that recent years might have seen further improvement and achieving gender equality in higher education is not a distant dream.

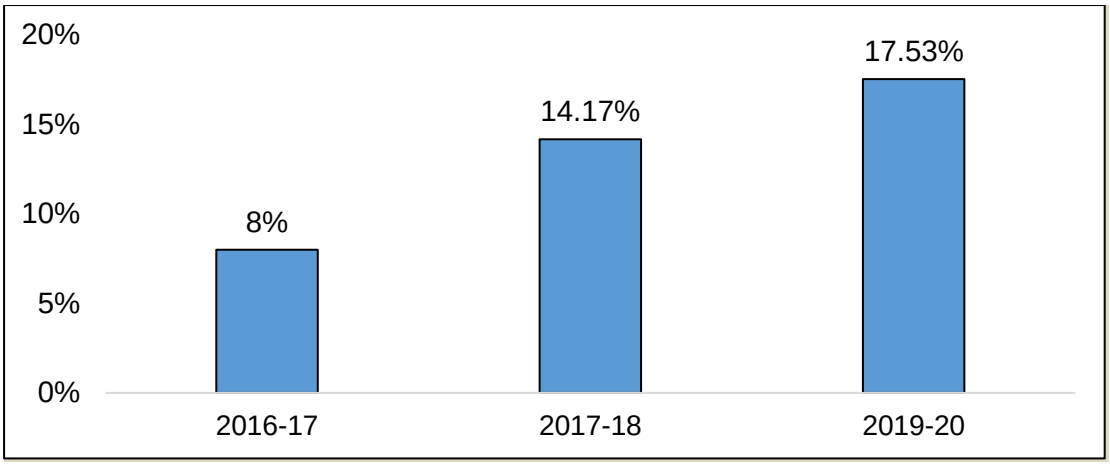
Table 5: Gender Parity Index in Education

Level/ Year	Primary (I-V)	Upper Primary (VI-VIII)	Elementary (I-VIII)	Secondary (IX-X)	Senior Secondary		Higher Education
					(IX-XII)	(XI-XII)	
1950-51	0.41	0.22	0.38	NA	NA	NA	NA
1960-61	0.5	0.34	0.47	NA	NA	NA	NA
1970-71	0.63	0.45	0.59	NA	NA	NA	NA
1980-81	0.67	0.53	0.63	NA	NA	NA	NA
1990-91	0.75	0.61	0.71	NA	NA	NA	NA
2000-01	0.82	0.75	0.8	NA	NA	NA	NA
2005-06	0.94	0.88	0.92	0.8	0.8	0.8	0.69
2006-07	0.94	0.9	0.93	0.81	0.83	0.82	0.69
2007-08	0.98	0.91	0.96	0.85	0.84	0.85	0.7
2008-09	0.99	0.93	0.97	0.86	0.85	0.85	0.72
2009-10	1	0.94	0.98	0.88	0.87	0.88	0.74
2010-11	1.01	0.95	0.99	0.88	0.86	0.87	0.86
2011-12	1.01	0.99	1	0.93	0.92	0.93	0.88
2012-13*	1.02	1.05	1.03	0.96	0.94	0.99	0.89
2013-14*	1.03	1.08	1.04	1	0.98	1	0.92
2014-15*	1.03	1.09	1.05	1.01	0.99	1.01	0.92
Source:http://mospi.nic.in/sites/default/files/reports_and_publication/statistical_publication/social_statistics/WM17Chapter3.pdf							

* Figures related to School Education are provisional.

To increase the participation of women in STEM education, supernumerary seats have been created in IITs & NITs. As a result of creation of supernumerary seats in IITs and

NITs, the total number of girls in NITs, has grown from 14.17% in 2017-18 to 17.53% in 2019-20 and in IITs from 8 % of total in 2016 to 18 % in 2019-20 for B Tech programmes.



Graph 2: Participation of Women in STEM
Source: The Times of India, 2020

Table 6: Gender wise enrolment of disciplines in various fields of science (in %)

Disciplines	PhD (%)		M.Phil. (%)		Post Graduate (%)	
	Male	Female	Male	Female	Male	Female
Mathematics	54.3	45.7	27.4	72.6	34.5	65.5
Chemistry	56.7	43.3	36.7	63.3	42.2	57.8
Physics	60.7	39.3	35.3	64.7	41.5	58.5
Other Science	52.6	47.4	37.2	62.8	39.8	60.2
Zoology	43.1	56.9	31.0	69.0	28.8	71.2
Botany	40.8	59.2	33.1	66.9	27.0	73.0
Bio-Technology	41.2	58.8	30.2	69.8	29.0	71.0
Microbiology	39.4	60.6	12.2	87.8	26.0	74.0
Statistics	50.	49.9	30.0	70.0	39.7	60.3
Life Science	48.0	52.0	36.4	63.6	32.4	67.6
Bio-Chemistry	44.5	55.5	19.7	80.3	27.9	72.1
Environmental Science	48.8	51.2	37.8	62.2	42.5	57.5
Geology	63.6	36.4	75.4	24.6	60.8	39.2
Bio-Science	40.7	59.3	17.9	82.1	27.7	72.3
Electronic	55.7	44.3	35.6	64.4	55.2	44.8
Geo-Physics	70.8	29.2	NA	NA	57.6	42.4
Genetics	46.0	54.0	11.1	88.9	28.5	71.5

Source: https://aishe.gov.in/aishe/viewDocument.action?documentId=277

Highest enrolment of female at PhD level was observed in microbiology stream, least enrolment observed in Geo-physics. Highest enrolment of females at M.Phil. level was

observed in Genetics, least enrolment observed in Geology, given in Table 6 above. The highest enrolment of females at post-graduation is in microbiology and least enrolment was observed in geology.

1.6 India's National Education Policy

India's National Education Policy (NEP) strives to improve the state of education in India removing the barriers in access to education and encouraging all sections to get better access to education regardless of their background. The education improves the chances of employability as it seeks to increase the skillset of individual. To this effect, in new NEP 2020, the differences in education with respect gender and of Special Economic Disadvantaged Groups (SEDGs) were sought to be alleviated through appropriate mechanisms and interventions. Government of India plans to allocate funds under 'Gender Inclusion Fund' to ensure equitable quality education to all, irrespective of gender. It has been recognized that education to girls is a sure way to also improve the education levels of SEDGs not just in the present but also in future. The Policy seeks to reduce the dropout rates of children from school, especially the girl children and children of migrant labourers. Appropriate steps would be taken to mainstream the dropouts back in to education. Such steps include development of adequate infrastructure at schools, providing incentives, deploying local languages through teachers to engage students and letting them not lose interest.

Many initiatives introduced were aimed at improving girl and women education while seeking to negate the social, economic, cultural and family barriers on path faced by girls and women. The multitude of reasons such as economic burden, household work, daily wagers, domestic family reasons, early marriage, lack of sanitation, lack of transport, lack of access to institutions, discrimination and unequal treatment all contribute to girls and women losing their education and career path. The idea is to make the formal and non-formal education along with other educational programmes like online education and distance education accessible and encouraged to all girls and women.

2 WOMEN IN SCIENCE

Traditionally in India, women education was an important part of the society. However, with confluence of various other cultures, ideologies and due to socio-political compulsions, it has changed markedly with deterioration of gender equality. Nevertheless, the social status allowed few women of elite to educated, but the number was small in pre-independent India. Formal inclusion of women into education started only recently in late nineteenth century. Around 1880s, institutions in Calcutta, Madras and Bombay started admitting women for formal education. Until 1921, the progress of women going to universities was extremely limited and slow. Female literacy grew very marginally from tiny 0.2 % in 1881 to 1.8 % in 1921. It is only after 1921, the female education had started growing the pace. The substantial advancement in inclusion of women in education could be added only post-independence. Concurrently, science and technology in India also witnessed expansion in the post-Independence era. A national committee appointed on women education submitted a report in 1959 pointing out the slow progress of women's education in first decade of independence(Kamat, 1976). In First Five Year Plan (1951-56), though government has given some attention to women, it remained as a mere subject of 'welfare'. The same welfare approach continued to reflect in Second to Fifth Plans (1956-79). A significant shift in the approach from woman 'welfare' to 'development' appeared in the Sixth Plan (1980-85)(| *NITI Aayog*, n.d.). A Committee was appointed in 1964 on differentiation of Curricula for Boys and Girls by National Commission on women's education has recommended a uniform curriculum at all levels of school. The women's enrolment increased significantly during 1970's in streams such as commerce (3% to 16%), Science (18% to 28%) and Education (36% to 48%)(Kohlstedt, 2015)

Women's participation in science in India has much potential and is underutilized in India. Despite efforts of increased representation, even today only a few women make it to senior decision-making positions and there is still inequality in gender representation in Indian scientific institutions. Working environments in organizations are not equipped according to gender sensitivity, needs and aspirations. The family responsibilities, cultural constraints (Raj, 1991), unequal treatment, behavioural and interpersonal relations (Jaiswal, 1993); are often found to play against women in work

environments. The discrimination in scientific and technical fields in India (Duraisamy & Duraisamy, 1998), than among other fields like social sciences is worrying (Kumar, 2016).

2.1 Government Initiatives

Indian National Science Academy's 2004 Report entitled 'science career for Indian women: An examination of Indian women's access to and retention in scientific careers' studies factors influencing science career and proposes specific recommendations. National Task Force for women in science submitted its report in 2010 entitled 'Evaluating and enhancing women's participation in scientific and technological research: The Indian initiatives' detailing the current status, the challenges faced by women in science and proposing suitable recommendations and action plan to overcome the challenges in women participation in science and technology. The report discusses various strategies to promote entry and retention of women in science while analysing the effectiveness of past policies and practices, and thereby delineate the best practices, policy recommendations. Society of Socio Economic Studies and Services (SSESS) Kolkata under the Aegis of NITI Aayog, in its report in 2017 entitled 'Status of Women in Science among Select Institutions in India: Policy Implications' tries to bring out core issues, challenges faced by women in pursuing higher education or research in science. (Status of Women in Science among Select Institutions in India : Policy Implications, 2017) As per latest All-India Survey on Higher Education (AISHE), women constitute paltry 14% of the 0.28 million workforce in India's R & D institutions of STEM. The government of India has been encouraging women by recognizing and awarding them those who has been playing part in India's growth and transformation through achievements in their fields.

In the Five-Year Plans major importance has been given to women. Various programmes and schemes made for women empowerment in various consecutive Five-Year Plans, described as follows.

Table 7: Various initiatives of women empowerment in Five Year Plans

Name	Description
The Third Five-Year Plan (1961-66)	Under welfare strategy, female education was emphasized.
The Fourth Five-Year Plan (1969-74)	Gave importance on education for adult women.
The Sixth Five-Year Plan (1980-85)	Thrust on three developmental aspects of women: health, education and employment.
The Tenth Plan (2002-2007)	Department of Science and Technology launched fellowship scheme for women scientists, aiming to bridge a break in career that women face in view of family responsibilities. This government policy aims the empowerment of women by accommodating and ensuring better and greater participation of women who are in the field of S&T.
Twelfth Five Year Plan (2012-2017)	Health, education facilities, urbanization and good governance with target of faster, sustainable and more inclusive growth.

Source: Planning Commission Government of India (Five Year Plans, 2017)

The efforts of government seem to be paying off, as a positive development emerges, according recent findings by All-India Survey on Higher Education (AISHE) show country's gender gap in higher education has narrowed in comparison with past decades. It was found that female students currently constitute close to half (48.6%) of the total enrolees. The following are the initiatives for girl and women education:

Table 8: Various Programme Initiatives for Girl and Women Education

No.	Name	Description
1	Mahila Samakhya (MS) Programme (1988)	To empower socially and economic backward, marginalized women through education, especially in rural areas.
2	Sarva ShikshaAbhiyan (SSA), 2000-01	Universal and inclusive primary education for all children aged between 6 to 14 in accordance with constitutional right of free and fundamental education to every child. Other schemes implemented within programme include: National Programme for Education of Girls at Elementary Level (NPEGEL), Kasturba Gandhi Balika Vidyalaya (KGBV) Scheme.
3	Kishori Shakti Yojna (KSY) and Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG) – 'SABLA' (2000)	KSY: Empowerment of adolescent girl through skill building as well as improved awareness of nutritional, hygiene, health and family care. RGSEAG: To train both school-going and out-of-school adolescent girls in the age group of 11 to 18 years at regular intervals at Angan Wadi Centres (AWC) on skills education, nutritional, health, socio-legal information.

No.	Name	Description
4	Right to Education Act (2009-10), MHRD, GoI	To provide free and compulsory education of all children in the age group of six to fourteen years as a Fundamental Right in such a manner as the State may, by law, determine under Article 21-A and the RTE Act (2009) came into effect on 1 April 2010.
5	The Rashtriya Madhyamik Shiksha Abhiyan (2009)	To ensure access and provide quality, inclusive secondary education to everyone irrespective of gender, socio-economic status and disabilities.
6	Saakshar Bharat Scheme (2009-17)	To enable and promote adult training and skill development, with special focus on women and adolescents who previously missed access to formal education.
7	UDAAN, 2014	To increase the enrolment of girl students in engineering education by providing free of cost support of offline / online resources to girl students preparing for engineering entrance exams during class XI and XII.
8	Beti Bachao Beti Padhao (2015)	To eliminate pre-birth and post-birth discrimination and social constructs against girl child by eradication of female foeticide and ensuring empowerment, safety, education.
9	Mahila Shakti Kendra (2017)	To enable community participation, capacity building and learning of skills by rural women from backward districts to increase their livelihood opportunities.

Source - (United Nations (RIS) Research and Information System for Developing Countries, 2016), (india.gov.in, Natinal Portal of India, 2014), Other Sources

The DST through its initiatives and schemes targeted to improve the socio-economic status of women in S&T, as the quality and standard of living of women scientists directly impact their skill building, confidence and achievements. A scheme was introduced by DST in Sixth Five Year Plan for enabling employment opportunities for women.

Table 9: Initiatives by Government's organizations for women scientist in India

Institutions	Purpose
DST - DBT	for women to come back to science after a break
DBT, INSA and NASI	special awards for women
Task Force by DST	for Women in Science
DST, DBT and other organizations	Support to women entrepreneurs
DST-NASI, IASc, NIAS and DST	Mentorship and awareness programs for women

Source: Compiled from various literature and Government Reports

DST has launched Women Scientists Scheme (WOS) in 2002 with an aim to provide women scientists of 27-57 age group opportunities to undertake research and improve their current skills required to get back to professional career and economic stability after observing a long or short tenure of break. The other schemes introduced were BioCARe, CURIE, Mobility as explained in the following Table 10.

Table 10: Government of India's Schemes for Women in Science

Year	**Name of the Scheme**	**Description**
2002-03	Women Scientist Scheme-A (WOS-A): Research in Basic/Applied Science	Offers research opportunity in the areas of: i) Physical & Mathematical Sciences ii) Chemical Sciences iii) Life Sciences iv) Earth & Atmospheric Sciences v) Engineering Technology
2002-03	Women Scientist Scheme-B (WOS-B): S&T interventions for Societal Benefit	Encourage S&T projects by women scientists for social benefit.
2002-03	Women Scientist Scheme-C (WOS-C): Internship in Intellectual Property Rights (IPRs) for the Self-Employment	Train women scientists to obtain intellectual property rights (IPR) for scientific pursuits.
2002-03	Women in STEM	To promote the entry of women in science, their retention, respect and recognition in STEM
2002-03	Women Technology Park (WTP)	A technology modulation and a training centre for women with a purpose to promote development and adaptation of livelihood technologies, transfer and demonstration.
2002-03	S&T Women	To improve the quality of life of women scientists along with chances of newer opportunities to disadvantaged groups like rural women through support and technology induced adaptation and development.
2008-09	UGC Post-Doctoral Fellowship to Women Candidates	To benefit unemployed Ph. D. degree holding women and enable the participation in development of advanced studies and research.
2011	Bio-Care for Women Scientists	For Career Development of employed or unemployed women Scientists in biotechnology of age up to 45 years.
2014	CURIE	Empowerment of women in S&T through development of research facilities in women universities in areas like Artificial Intelligence
2014	Mobility	To enable women scientists to remain engaged in research despite domestic reasons like relocation and other responsibilities.

Source: Compiled from various sources.

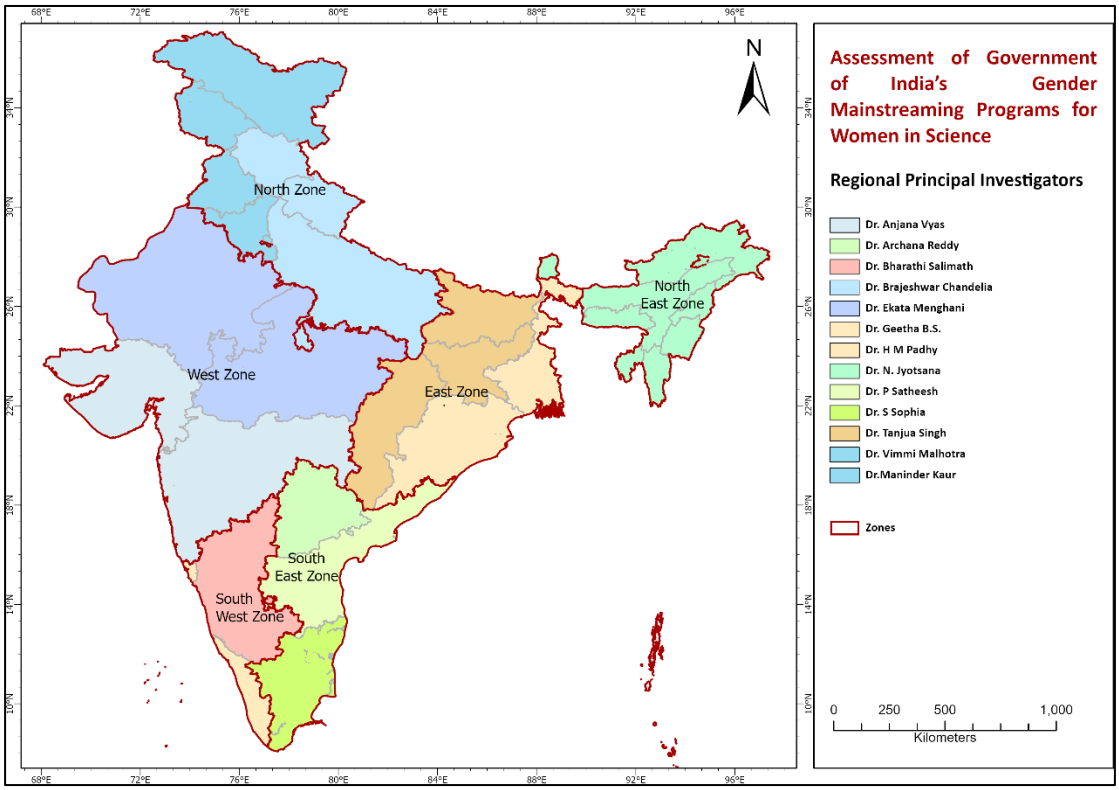
3 METHODOLOGY

Over the years, the programmes initiated by the Government of India for the 'Women in Science' gathered momentum. It also leads to better insights into the issues and challenges that women faced and made the necessary adjustments to address these.

To strengthen the focus on the programmes and efforts supporting gender equality and Gender Advancement in India and provide the most beneficial assistance to the Centre to improve the status of women in STEM, 'Assessment of Government of India's Gender mainstreaming program for women in science' project was launched in 2018 and initiated in 2019. It is a network mode project catalysed and supported by the CHORD (NSTMIS) Division, Department of Science & Technology, Government of India.

It was a large-scale cross-sectional study that involves a time series analysis for accessing the change in the development of women in science. This project was one-of-a-kind initiatives. It signifies on evaluating the overall effectiveness by tracking individual progress over time. The project output will benefit in the ease of implementation, identification of beneficiaries and enable to attract a large number of women scientists to avail of the benefits. It will address the nature of the support, programme specific areas, geographical spread, affiliated institutes, and mentor's support and improvement in the project deliverables. The national coordinator will be developing a web-portal and a dashboard which comprehend a collective database influencing a large number of applicants. The web portal will be deployed for the extraction of information for visualization through a single access point. The result of the analysis would even help increase collaboration and active participation with industries. The project outcomes will shape a gender mainstream with evidence-based policy planning in the S&T sector at grassroots.

This cross-sectional study used a mixed-method research design approach i.e., quantitative followed by qualitative to comprehend the situation of women scientists and the role of gender-positive policies for promoting women in science careers. The study concentrated on achieving a nationwide impact assessment of the gender mainstreaming programs of the Government of India.



Map 1 : Map showing 6 Zone and 13 Regions

The data collection strategy involved a large-scale survey headed by 13 Regional Principal Investigators across 6 different zones: North Zone, North East Zone, East Zone, South East Zone, South East Zone, South West Zone, and West Zone. CEPT University, the National Coordinator, was assigned the responsibility to formulate the project proposal and coordinate with the other 13 Regional Principal Investigators to achieve a nationwide assessment of the programs. Details of all the Zones and Regional PI's responsible for the data collection was mentioned in Map 1.

3.1 Aim of the Study

To aim of the project is to assess the impact of gender mainstreaming programmes/ schemes of Government of India and suggest indicative framework for effective policy planning.

The project's aim is achieved by using two approaches, namely, by surveying women who benefited from gender equality schemes in STEM, and by identifying and designing relevant indicators for assessment. Thus, this research will assist the

department around identifying the measurement parameters and evaluation of the situation of women scientists after the project.

3.2 Research Objectives

- To assess the impacts of the various programmes/ schemes of Government of India for the Women Beneficiaries (PIs) in S&T using appropriate statistical methods during 2003 to 2018.
- To suggest an indicative framework for strengthening of the gender mainstreaming programmes of various departments of Government of India.
- To collect and compile the 'best practices' from the Women Scientists.

3.3 Limitations

The study results were solely dependent on the information given by nearly 50% of the women beneficiaries contacted and could carry certain degree of biasedness if any, as it represents only one section of stakeholders. Many bottlenecks were faced during the course of project most of which is during the survey. Owing to the global pandemic, institutions of women scientists remained closed denying some required information for survey. Besides it, many women scientists were indifferent or ignorant of communication sent to them for survey. Few others had issues faced like change of contact numbers, mentor's retirement, etc., which made it impossible for many to share details.

The research is a response-centric network mode study for the women scientist who were the beneficiaries of Government of India's gender mainstreaming programs and schemes. The participation in survey was voluntary and relied on the willingness of individual respondent. The assessment includes parameters such as achievements level, societal contribution, education, skill development and professional growth of beneficiaries.

3.4 Analytical Framework

The rationale behind the use of qualitative components in the study was to provide an in-depth and contextualized insights into how women scientists perceived the outcome and the benefits (effects and changes) of the utilization of the gender mainstreaming schemes. This descriptive research included surveys, qualitative interviews, fact-finding inquiries and discovering relationships between certain variables. Whereas the survey provided information about the extent to which gender mainstreaming programs for women in science were witnessed as beneficial and relevant by women scientists. The information produced by this survey would allow policy-makers, policy analysts and researchers to cluster policies, detect limitations in the policy, and establish an agenda for filling any gaps. The qualitative interviews provided productive information about the anticipation of the gender mainstreaming programs, how adaptive these programs were with women scientists, specific reasons that lead them to participate in these programs, and how have been the benefits accrued. In terms of research strategy, the qualitative interviews aimed at complementing the survey data with rich and non-standardized information thereby, obtaining the overall and accurate picture of the situation of women scientists.

3.4.1 Data Collection

Effective data collection is a crucial requirement of the assessment framework. Collection of program-specific information about the application pool, beneficiaries, and stakeholders can be a challenging yet vital requirement for successful assessment. Concerning the objectives and scope of the research, the study determined the impact of various programs on women scientists for the period 2003-18. There were different methods available to collect the information depending on the sample size, time frame for the survey implementation, and availability of the resources. The decision between the different methods of collecting information was influenced by the research goals, the sensitivity or complexity of the system, and the budget available. For the current study, the collection of data was done through an online embedded digital platform. These online surveys provided respondents with more flexibility as they can be accessed and filled the information at their convenient time. The secondary data were collected from official sources such as government reports and independent surveys, websites of different ministries of Government of India covered under this survey. The

data has been used to get a basic idea about presence of women in science, the gender mainstreaming programs/schemes, nature of the support provided and the profile of women scientist in the country.

The survey questionnaires involved the set of standard questions that aimed to collect information for accessing the change in the development of women in science. It was sequentially expressed as: i) gathered general information on women scientists, current affiliated institution and Pre-project conditions of women scientists, ii) had project and program related information, iii) collected professional development information and the last iv) covered program feedback and opinions of the women scientist. The data collected through these questionnaires covered both objectives observable parameters as well as a few subjective parameters related to perception and attitudes.

3.4.2 Questionnaire Design

An online survey form was prepared and tested on a smaller group of women scientists to identify potential weaknesses in the design and allow for improvement before it was circulated to the regional principal investigators and the women scientists. After necessary editing the on-line survey forms and respective links were sent to all women scientists to collect the information regarding their respective project journey. Depending on the nature and support of the program a separate set of questionnaires was designed for WOS-C. Identification of Women scientists/beneficiaries for cross-sectional study to capture objective as well as subjective parameters, which was the most challenging task.

3.4.3 The Primary Survey

The on-line questionnaires were circulated to 3530 women scientists across the country. Out of total only 48.5 % (1714) of the women scientists' have responded and filled the questionnaire. Following Table 11 depicts the zone-wise and scheme-wise responses received from the Women Scientists.

Table 11: Zone-wise and Scheme-wise Total Number of Beneficiary Women Scientists

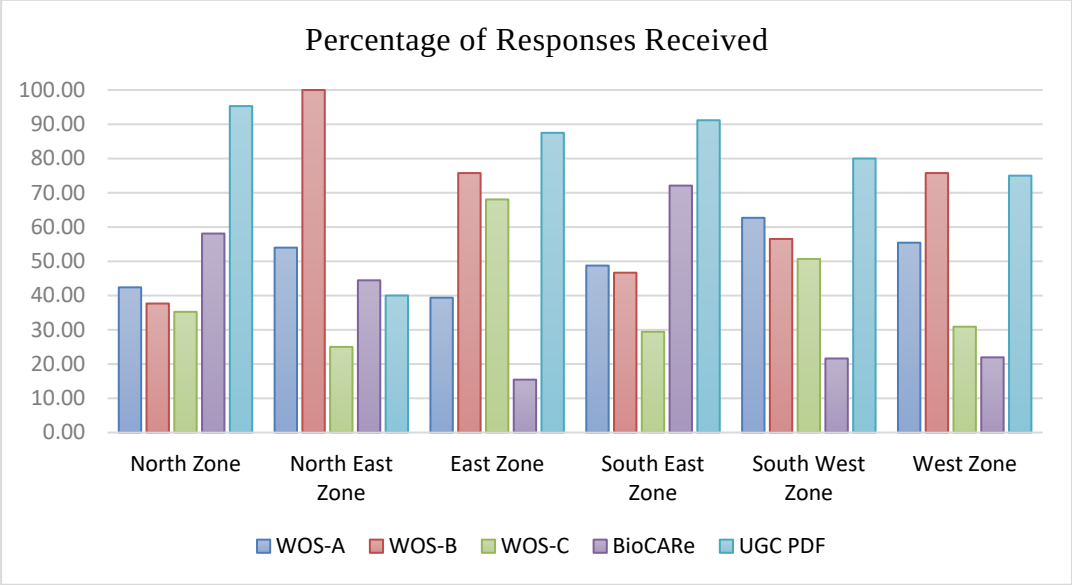
Zone	WOS-A	WOS-B	WOS-C	CURIE and Mobility	BioCARe	UGC PDF	Grand Total
North Zone	611	77	386	1	105	64	1244
North East Zone	113	10	4	0	9	10	146
East Zone	287	33	72	0	136	24	452
South East Zone	519	30	102	4	43	34	732
South West Zone	260	23	73	1	37	10	404
West Zone	341	33	123	2	41	12	552
Grand Total	**2131**	**206**	**760**	**8**	**271**	**154**	**3530**

Table 12: Zone-wise and Scheme-wise Responses Received from Beneficiaries Women Scientist

Zone	WOS-A	WOS-B	WOS-C	BioCARe	UGC PDF	Grand Total
North Zone	259	29	136	56	61	541
North East Zone	61	10	1	2	4	78
East Zone	113	25	49	24	21	232
South East Zone	253	14	30	14	31	342
South West Zone	163	13	37	15	8	236
West Zone	189	25	38	24	9	285
Grand Total	**1038 (60.56%)**	**116 (6.77%)**	**291 (16.98%)**	**135 (7.88%)**	**134 (7.82)**	**1714 (100.0%)**

Out of total responses (1714-woman scientists) (Table 12) and decreasing order of respondent participation of each scheme: WOS-A with highest respondent participation was with 1038 (60.56%) respondents, WOS-C 291 (16.98%) respondents, The BioCARe and UGC PDF the responses received were 135 (7.88%) and 134 (7.82%) respectively. The least number 119 (6.77%) responses were from WOS-B scheme. The zone-wise highest responses received (in percentage) from North Zone was 556, followed by South West Zone 229 (59.45%), West Zone 287 (55.56%), North east zone with 77 (53.06%) respondents, South East Zone 340 (44.24%). The East zone had reported the lowest responses 224 (18.20%) responses received. Across the zones majority, (47.1%)of the responses from the WOS-C beneficiaries were from the North Zone. The east zone received 16.8%, the West Zone 13.1%, the Southwest with 12.7% and 16.8% responses were received from the South East Zone. Uttar Pradesh in the North Zone had the maximum (27.5%) responses from the beneficiaries availing the

benefit of the WOS-C scheme. West Bengal from the East zone had 11.7% responses and 10.6 % were from Delhi in the North Zone.



Graph 3: Responses received from the Total Women Scientists (in %)

The reasons of non-response of woman scientists were several. Of the multitude of factors, the predominant reasons were: changes in postal addresses, email ID, and mobile numbers. Some woman scientists were unable to access required documents and faced inaccessibility of their formal communication channels also owing to global pandemic outbreak which disallowed their institutional presence. Apart from problems like inapproachability to mentors, other issues like indifference and reluctance towards sharing details was also noticed.

3.4.4 The Analysis

As large number of funding schemes and programs were administered time-to-time, a funding agency couldn't measure and track the impact merely based on the data submitted by the beneficiaries at the end of funding support. Since the nature of support is targeted toward overall professional development, the resulting impact couldn't only be determined by tracking an individual's progress over a while, long enough after funding support stopped. For determining overall effectiveness, the analysis spanned across schemes to evaluate the demography of beneficiaries to reveal any trends or patterns. Across all the schemes and programs, the underlying objective was to professionally empower women and 'break their break' in the professional career. The effectiveness of the program could be assessed based on indicators that could help

establish i) **Social Support Dimensions**, ii) **Educational Progression, iii) Career Progression and iv) Entrepreneurship and Innovation Activities.**

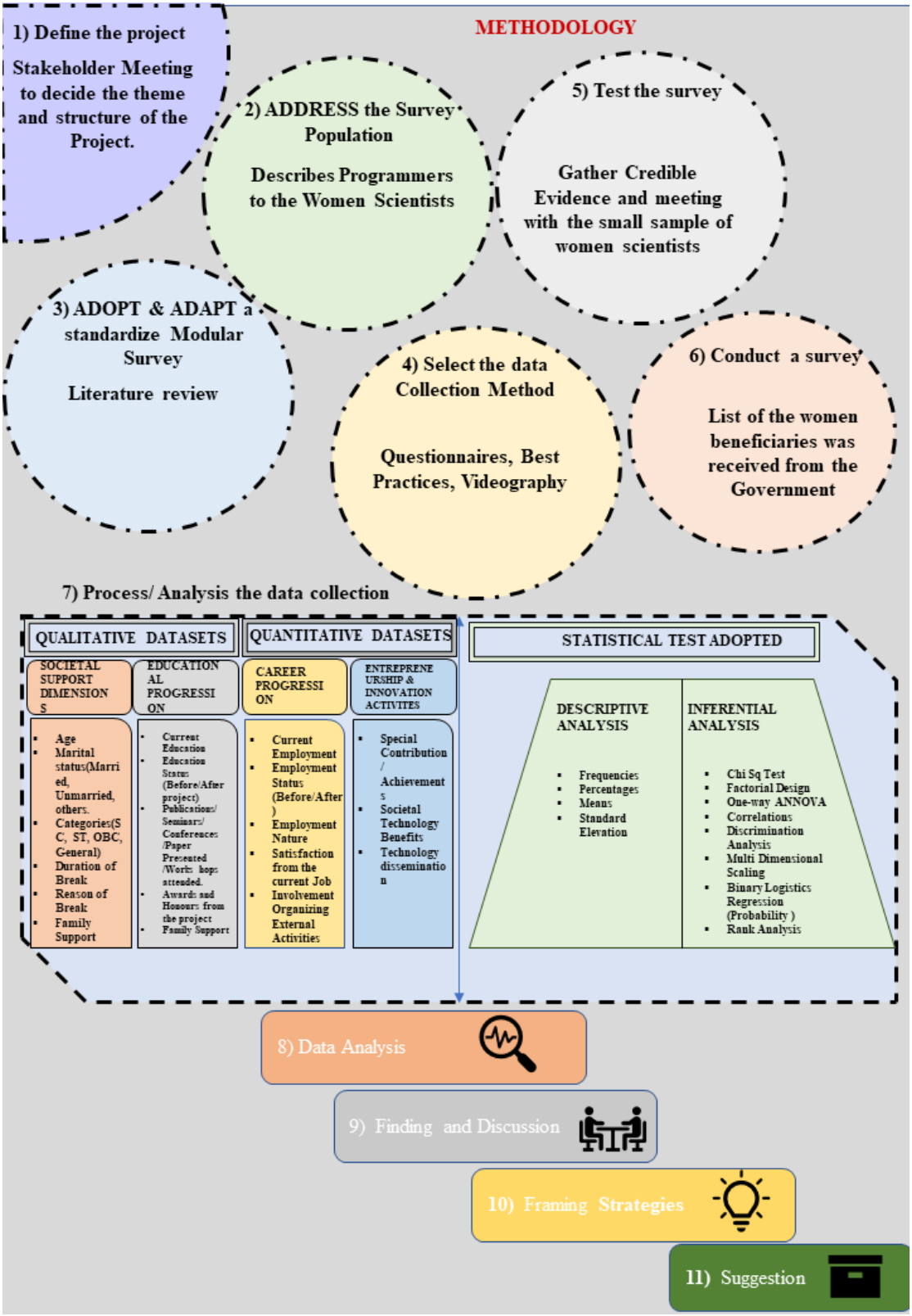


Figure 1: Methodology Chart

4 ANALYSIS

The responses of beneficiaries of women scientist schemes availed for reintegration with professional careers which may have got break due to various compulsions and responsibilities. The participants are women scientists supported by Department of Science and Technology, Government of India under various gender mainstreaming schemes. The beneficiaries were distributed across India and divided into six zones and thirteen regions identified for study and collection of details while conducting survey. The survey included obtaining responses to an online questionnaire prepared to gather information that may influence and affect their professional career growth and development. The various aspects are covered in survey such as educational enhancement, professional career building, institutional and mentor support, publications, awards and achievements, social norms and stereotypes, social backing and family support, extra-curricular involvement, entrepreneurship and innovation activities. The individual responses can collectively be analysed to obtain the specific trends, patterns, needs, challenges across the regions and zones. This may serve to build understanding and invaluable feedback on gaps and opportunities that may further be looked into by policy makers.

4.1 Descriptive Analysis

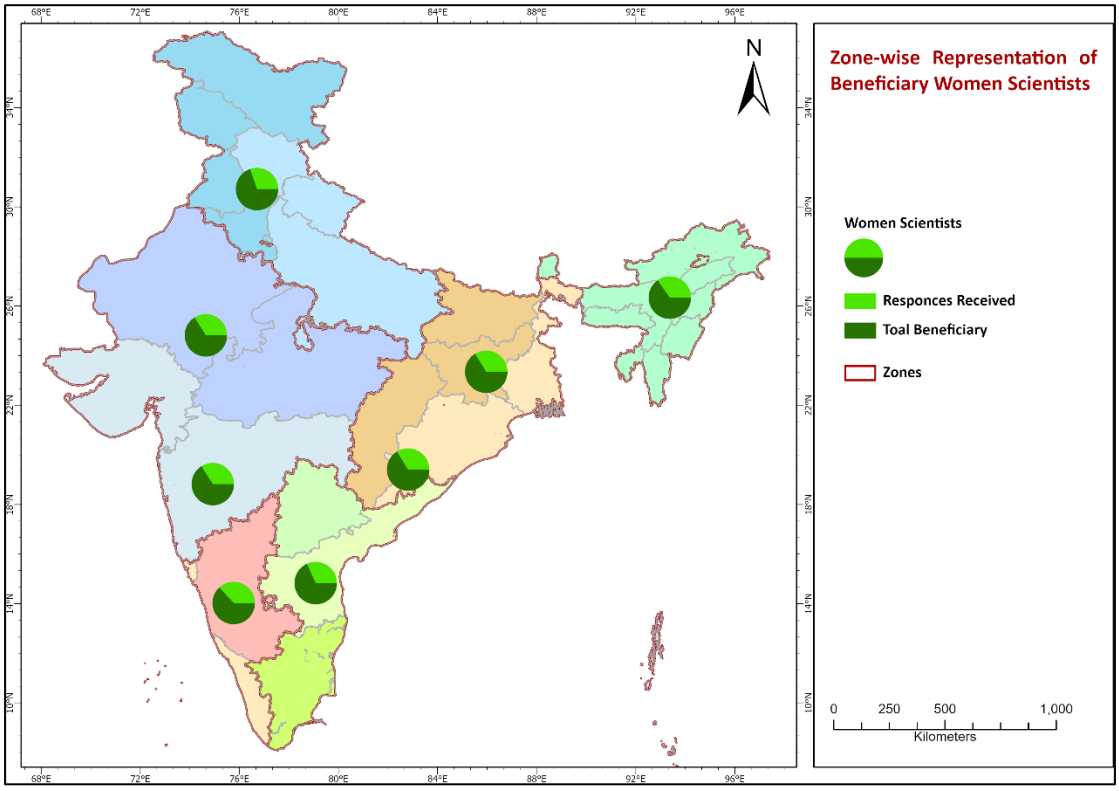
Descriptive analysis of the responses of individual questions in questionnaire survey will help summarization of patterns, structure and typology. Simple measures such as measure of central tendency, spread allow simple but meaningful interpretation of the data. Other metrics include frequencies and proportions (expressed in percent). Most information collected are related to assessment of aiding drivers and limiting barriers that women scientists in STEM experience. This kind of analysis would help understand the present status and challenges faced.

Responses Received

The online questionnaire forms were circulated to 3530 women beneficiaries who were benefited of the gender mainstreaming schemes of GOI. **Of the total 3530, about 48.5% of them, i.e.,1714 women scientists** have enthusiastically responded and filled up the questionnaire completely. The following are details of composition out of total

responses (1714-woman scientists) and decreasing order of respondent **participation percentages of each zone**: **South West Zone** with **highest zonal respondent participation rate of 59%** and constitute 13.4% (236 respondents) of total respondents (1714) received. The **second highest** was **West Zone with zonal respondent participation rate of 52%** constitute 16.7% (285 respondents) of total responses received. The **East Zone stood third with respondent participation rate 51.5%** constitute 13.1% (232 respondents), the **North-East Zone with zonal respondent participation rate 51.2%** and constitute 4.5% (78 respondents) of total responses received. The **North Zone with zonal respondent participation rate 46%** and constitute 32.5% (541 respondents) of total responses received. The **South East Zone had least zonal respondent participation rate 42%** and constitute 19.8% (342 respondents) of total responses received. The analysis was carried out on these datasets of the available responses and assumed to represent the total population of woman beneficiaries.

The Map 2 represents the detail of composition out of total responses (1714-woman scientists) and decreasing order of respondent **participation in percentages of each scheme**: The **highest was WOS-B with respondent participation rate of 56%** constitute 6.76% (116 respondents) of total responses received. The **WOS-A stood third with respondent participation rate 48.7%** constitute 6.56% (1038 respondents) of total responses received. The **BioCARe scheme had respondent participation rate 47.53%** and constitute 7.87% (135 respondents) of total responses received. WOS-C the participation rate of **38%** and constitute 16.9% (291 respondents) of total respondents (1714) received. The **UGC PDF had least respondent participation rate 21.96%** and constitute 7.81% (134 respondents) of total responses received from the women scientists.



Map 2 : Zone -Wise Representation of Beneficiary Women Scientist

4.2 Respondents Profile:

4.2.1 Age Structure of respondent Women Scientists:

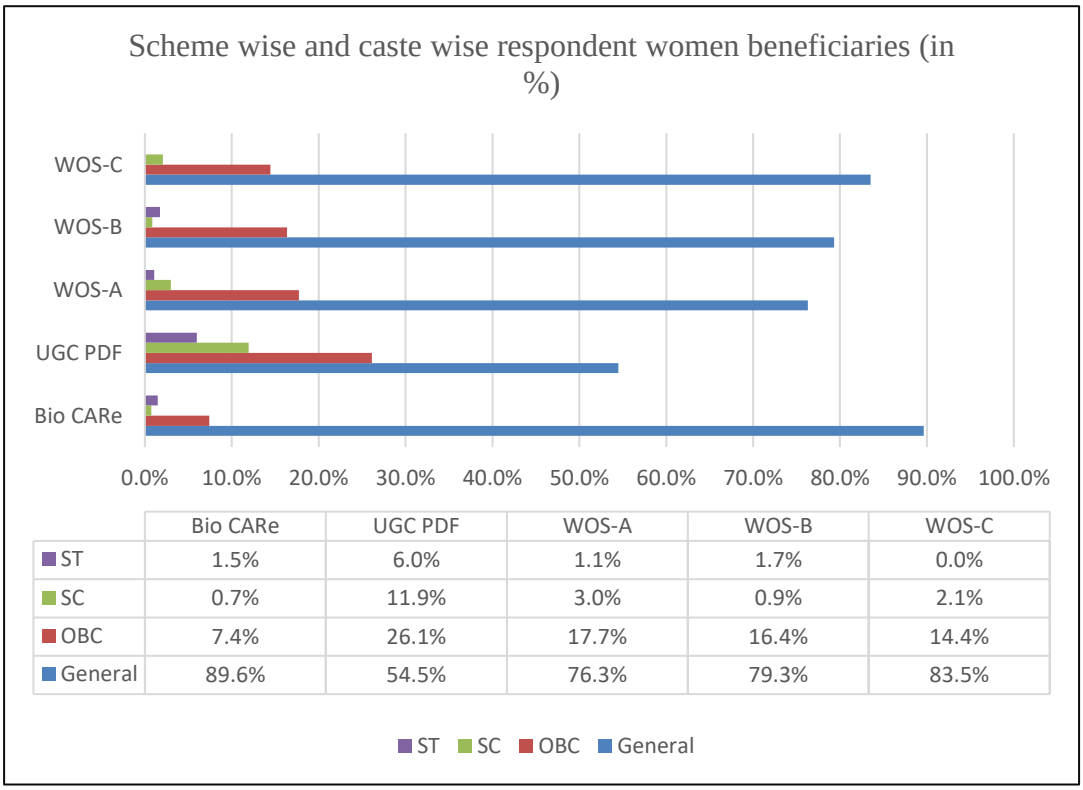
Basic statistical analysis of observed patterns was performed on basis of zone wise and scheme wise on levels of education and employment status of registered women scientists who have availed the benefits from the gender mainstreaming initiatives by the Government of India. When the participants were grouped into three age groups: below 35yrs, 35yrs to 48 yrs., and Above 48 years, it was noted that about 73% belonged to age group- between 35 and 48yrs while 14.3% were above 48yrs and 12.7% were below 35yrs of age. The average age of the women scientists was found to be 41yrs.

4.2.2 Women beneficiaries as per caste categories:

The women education inequality is not uniform across all social strata. It is obvious that within complex stratification systems in India and social categories, the relative status of women is more obscure within the more disadvantaged segments of the population. (Dunn, 1993). Several initiatives are taken by the Government of India to provide support to the researchers belonging to the Scheduled Caste and Scheduled

Tribe including the frontier areas of science and engineering. **Of total responses received 4.5% of the women scientists belonged to SC and ST category**. The percentage of women registered in SC and ST categories was lesser in all the zones in comparison to other castes except for the North East Zone. Around 10% of the total beneficiaries belonged to this category. **UGC PDF had the highest percentage (17.9%) of beneficiaries belonging to the SC and ST** category.

North-zone (89.8%) had the highest proportion of women scientist beneficiaries from general category, followed by west (84%), east (83.9%) zones. The highest representation of OBC's was found from South East (36.8%) and North-east (35.1%) zones where as the least representation was found in North (7.2%) zone followed by East (9.8%) and West (9.1%) zones. The SC category women scientist beneficiary representation was found highest in South East (6.5%) followed by West Zone (3.8%) zone, whereas least representation was found in North-east (1.3%) followed by North (1.8%) zone. The highest proportion of ST was found in North-east (9.1%) whereas least proportion of ST representation was found in West (0.3%) followed by North (0.5%) zones.



	Bio CARe	UGC PDF	WOS-A	WOS-B	WOS-C
ST	1.5%	6.0%	1.1%	1.7%	0.0%
SC	0.7%	11.9%	3.0%	0.9%	2.1%
OBC	7.4%	26.1%	17.7%	16.4%	14.4%
General	89.6%	54.5%	76.3%	79.3%	83.5%

Graph 4: Scheme wise and caste wise responded women beneficiaries

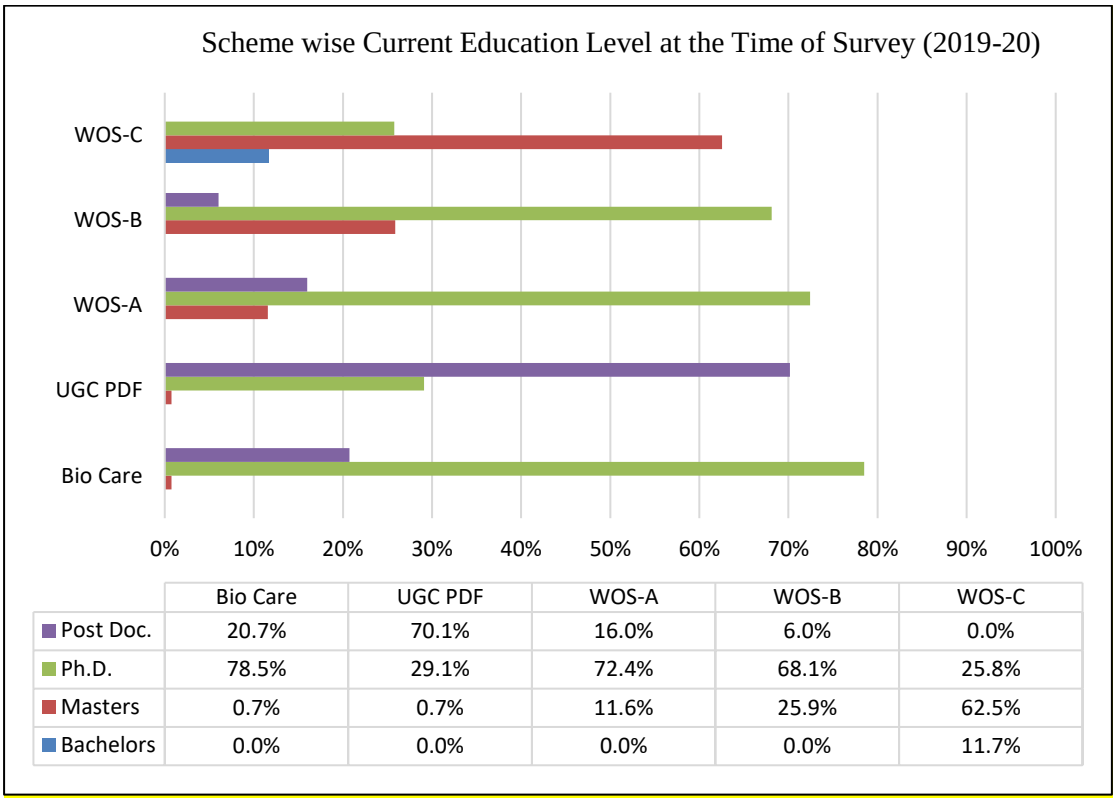
Among all the schemes (Refer Graph. 4), ST beneficiary woman scientists representation was found highest in UGC PDF (6%) followed by WOS-B (1.7%), BioCARe (1.5%), WOS-A (1.1%) whereas no representation was found in WOS-C (0%). SC woman scientist representation was found maximum in UGC PDF (11.9%) followed by WOS-A (3.0%), WOS-C (2.1%) whereas least representation was found in BioCARe (0.7%) followed by WOS-B (0.9%) schemes. More OBC (26%) beneficiaries were under UGC PDF scheme, followed by WOS-A (17.7%), WOS-B(16.4%), WOS-C (14.4%), the least number (7.4%) were under BioCARe Scheme. Highest General category woman scientist beneficiaries' representation was found in BioCARe (89.6%), followed by WOS-C (83.5%), WOS-B (79.3%) and WOS-A (76.3%), whereas least representation was found in UGC PDF (54.5%). This shows that the majority of women scientists across the schemes belong to the general category. More SC (11.9%) and ST (6%) beneficiaries were under UGC PDF scheme than other schemes.

4.2.3 Educational Level of women scientist beneficiaries

Of the total beneficiaries, 61.3% of the women scientists hold Ph.D. degree, 19.5% had master's degree in different specializations, 17.2% with post-Doctoral degree and 2% were educated till Bachelor's degree.

Zone-wise proportion of beneficiaries tabulated against their highest education levels. The women scientists of bachelor degree mostly belong to east zone (4%) followed by North Zone (2.7%) and South West Zone (2.2%) zones where as least representation was in North-east (0%) followed by South East (0.6%), West (1%) zones. More proportion of Masters' degree holders was found in South West (22.7%), closely followed by west (21.6%), north (20.3%) zones whereas nearly same proportion was found among North-east (15.6%), South East (16.8%) and east (17%) zones. The majority of the women scientists were PhD degree holders in all the zones. North-East zone (76%) has the highest proportion among zones, followed by east (71%), South East (69.1%), and least proportion of them in North (52.4%) followed by South West (59.8%) and west (58.9%) zones. North Zone (24.6%) has more proportion of Post-doctoral degree holders among zones, followed by west (18.5%), South West (15.3%),

South East (13.5%) whereas least representation of them was found in north-east (7.8%) and east (8%) zones.



	Bio Care	UGC PDF	WOS-A	WOS-B	WOS-C
Post Doc.	20.7%	70.1%	16.0%	6.0%	0.0%
Ph.D.	78.5%	29.1%	72.4%	68.1%	25.8%
Masters	0.7%	0.7%	11.6%	25.9%	62.5%
Bachelors	0.0%	0.0%	0.0%	0.0%	11.7%

Graph 5: Scheme wise current education level of the women beneficiaries

Graph 5 demonstrates the scheme-wise proportion of beneficiaries tabulated against education level. As expected, most post-doctoral candidates availed UGC PDF (70%) scheme followed by distant proportion in other schemes: BioCARe (20.7%), WOS-A (16%), WOS-B (6%). Almost no post-doctoral candidates availed WOS-C (0%). Most PhD degree holders availed BioCARe (78.5%), WOS-A (72.4%) and WOS-B (68.1%) whereas lesser number availed WOS-C (25.8%) and UGC PDF (29.1%). Most master's degree holders avail WOS-C (62.5%) with lesser opting WOS-B (25.9%), WOS-A (11.6%). From this, it can be said that large proportion of UGC PDF scheme beneficiaries (70.1%) were Post-doctoral degree holders whereas many WOS-A (72.4%) and BioCARe (78.5%) beneficiaries had PhD degree. Considering zone-wise current education of WOS-C, the Ph.D. holders were maximum (43.3%) in the South East Zone. North Zone and Ease zone represented 27.7% and 24.5% respectively. The majority (76.3%) of the master's holders were in the West Zone. South Zone with 67.7%, North Zone with 63.5% represented the next.

4.2.4 Employment Status of the Women Scientists Beneficiaries

Out of total responses, 30.7% were engaged in academics, 22.3% were employed as scientists, 17.8% were research scholars, and 5.8% were Freelancers, Vocational Instructors, Data Coordinators, Analysts, etc. The 23.3% of women were either unemployed or searching for jobs.

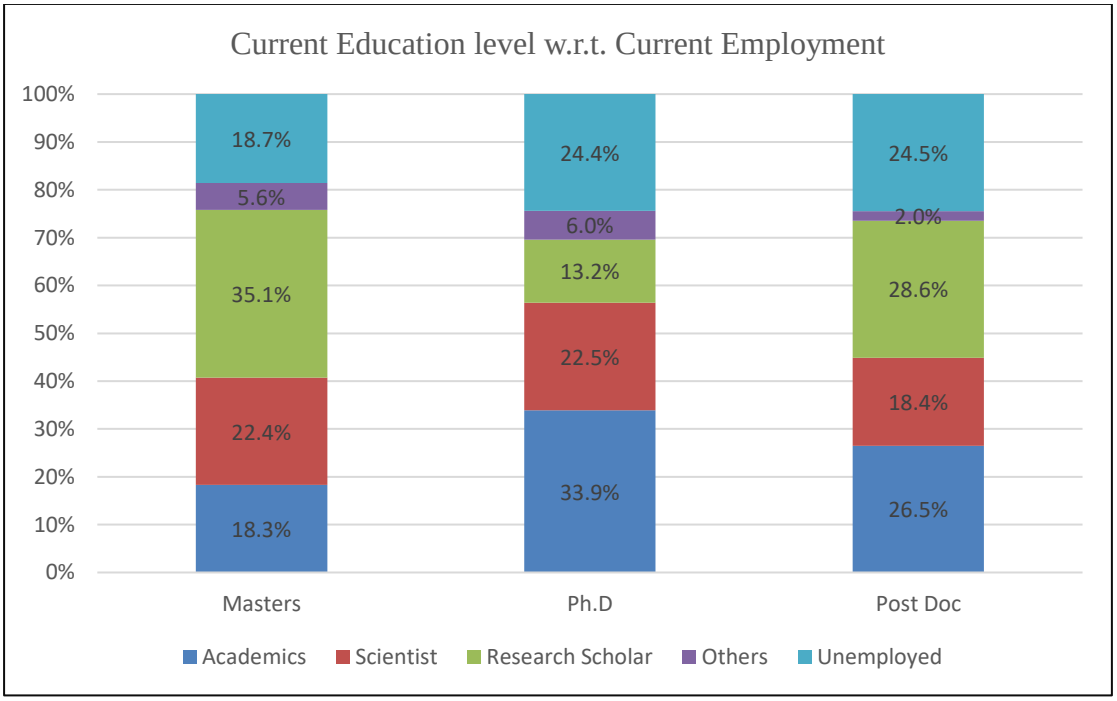
Employment status of the respondent women scientists at the time of survey. The zone-wise distribution explains their engagement in various professional field. Analysing the number of women beneficiaries employed within the zones, the most preferred profession was academics, followed by scientists and research scholars.

Among the zone-wise distribution of these women scientists, proportion of academics was maximum in South East zone (37.5%) followed by West Zone (32%) and rest other zones being nearly same as follows, north-east (29.9%), east (29%), South West (27.6%), north (27.2%). The second important profession was scientist. The scientist position constitute almost quarter of all jobs of beneficiaries in north-east (26%), west (25.5%), east (25.1%) zones followed by other zones with nearly one-fifth of total-North (22%), South West (21.6%) and South East (18.3%). Not much difference existed among zones in proportion of research scholars excepting South East (9.1%) and west (14.2%) zones where least representation was seen compared to others – South East (21.5%), South West (20.6%), north (18.3%), east (16.4%). The highest proportion of unemployed beneficiaries were in north-east (29.9%) followed by north (26.4%), South West (25.1%), east (23%), South East (20.5%) whereas least proportion of unemployed was in West Zone (18.6%). The other category included Freelancers, Vocational Instructors, Data Coordinators, Analysts, where the engagement of the women beneficiaries were less than 10%.

4.2.5 Relation of Current Education with Current Employment status of the respondent women scientists

The bifurcation of the employment status of women beneficiaries with the education status at the time of the survey(Refer Graph 5). Women beneficiaries with Ph.D. holders, the majority (33.9%) of them worked as academicians. 22.5% worked as

scientists,13.2% as Research Scholars. There were 28.6% Post-Doc qualified women beneficiaries who worked as Research Scholar, 26.5% in Academics, 18.4% as scientists. Six percent of Ph.D. holders and 2% of Post Doc qualified women beneficiaries worked in various other professions such as Analyst, Freelancers, Consultants, etc. The majority (35.1%) of the master's qualified women beneficiaries worked as Research Scholars. Around 24% of the women beneficiaries with Ph.D. and Post Doc degrees, whereas 18.7% of women with masters were unemployed.



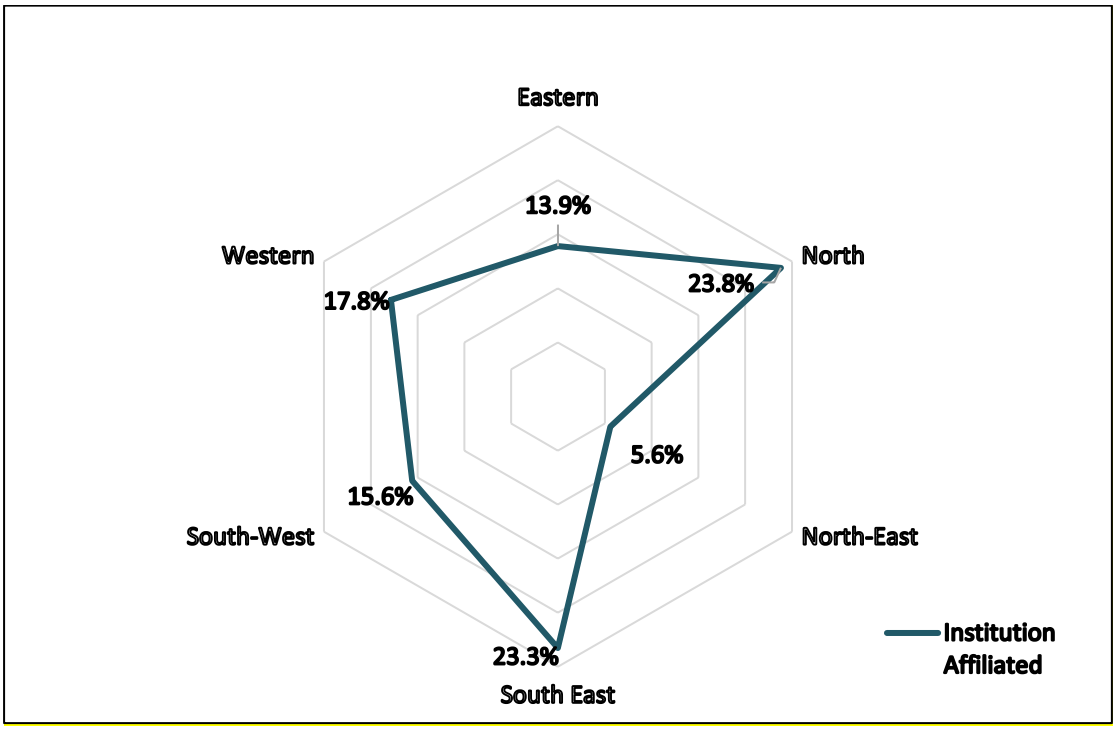
Graph 6: Relationship between Current Education and Current Employment

4.2.6 Zone-wise Representation of the Institutions the Women Beneficiaries affiliated:

The institutions and universities act as a pivotal role in endowing space to the aspirant women beneficiaries in the process of returning to the professional career. The Government of India's Gender Mainstreaming schemes can be availed by the women beneficiaries through the academic institutions, government organisations, recognised scientific institutions and laboratories.

Graph 7 below portrays the zone-wise women beneficiaries with respect to institutional affiliation. The institution affiliated was observed as 23.8% North Zone, 23.3% South East Zone, 17.8% from West Zone, the South West Zone and East zone represents

15.6% and 13.9% respectively. The North East zone remained the lowest, with 5.6% institutions.



Graph 7: Zone-wise Institutions where the Women Scientists Beneficiaries affiliated

4.2.7 Accreditation Status of the Affiliated Institutions:

On the revealing related to the status of the institutions where the women scientist beneficiaries had undertaken projects, out of the total respondents, 43.6% of the women scientist beneficiaries responded their institution had accreditation status.

4.3 Scoring Pattern for 'Support'

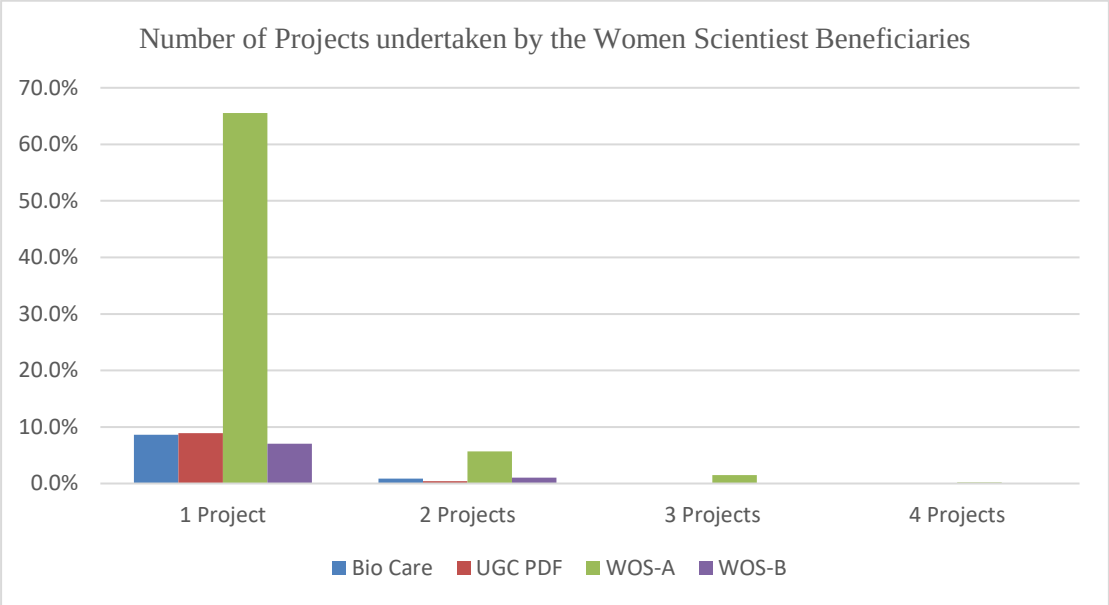
The analysis procedure accounts for all the information collected on many aspects mentioned via survey to estimate level of satisfaction among beneficiaries. The information was compiled in a tabular form. Some of the questions were asked in Likert type scale. Responses of all the questions were coded, scored and analysed with the help of sum where ever was needed

4.3.1 Support from Institutions and Society

The women scientist beneficiaries are seeking positive and good responses from the institutions they are affiliated with. They desire the similar responses from family and the society in their efforts of regaining the confidence and upgrade the calibre, with which they become stronger and effective for the acceptance received from the

professional environment. The following analysis represents this aspect in the way in which the respondent beneficiary women scientists' experiences.

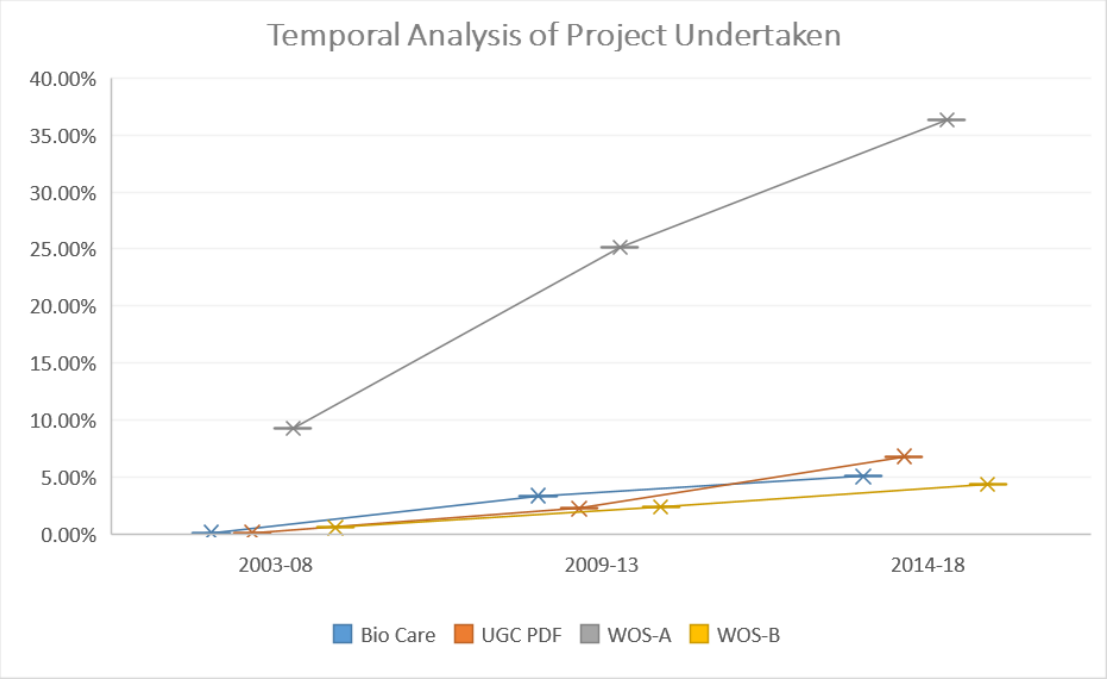
Of the total women beneficiaries 1423, 79.4% of the respondents felt extremely satisfied or highly satisfied with the support of their respective institutions. About 18.9% felt that very little support has been offered, while only 1.8 % of women felt no support has been received from their institutes affiliated.



Graph 8: Scheme-wise number of projects undertaken by the Responded women scientist.

There were few women beneficiaries who had undertaken more than one project from the schemes offered by the Government of India. Of the total respondents, 90 percent of women beneficiaries opted for one project, 8% for two projects, whereas 1.7% and 0.2% took three and four projects respectively. As per the scheme-wise statistics, the WOS-A scheme had maximum (65.6%) percentage of women beneficiaries who took up one project. Among the women beneficiaries who had one project undertaken, 8.6% were under BioCARe scheme, 8.9% under UGC PDF scheme and 7% were under WOS-B scheme. More proportion of women beneficiaries who had two projects undertaken, were under WOS-A (5.7%) than WOS-B (1.1%), BioCARe (0.8%) and UGC PDF (0.4%). The similar trend was seen for beneficiaries undertaking three and four projects respectively.

Following is the analysis carried out on the scheme-wise number of women scientists have responded, represented in the percentage.



Graph 9: Temporal Analysis of scheme-wise projects undertaken (in %)

The above Graph 8 summarises the temporal analysis on the number of projects undertaken by the women beneficiaries across the schemes. The maximum increase in the number of projects undertaken by women beneficiaries is under the WOS-A scheme. Close to threefold increase was observed in 2009-13 (25.1%) compared to 2003-08 (9.28%), whereas fourfold increase was observed in 2014-18 (36.3%) compared to 2003-08. The analysis in the study was restricted to the women beneficiaries with last year of the project sanction as 2018-19. In schemes such as BioCARe, UGC PDF, and WOS-B, there was comparatively slower increase in the percentage of women respondents availing projects under the scheme.

About 68.0% of beneficiaries had their projects complete, 27.9% had projects ongoing and extended due to global pandemic, and the remaining 4.1% of women beneficiaries had their projects incomplete and not extended. About 80.3% of the women beneficiaries were extremely satisfied with their project journey, and very satisfied with their respective mentor's support. About 10% of the women beneficiaries were moderately satisfied whereas, 9.5% of the women beneficiaries were slightly or not satisfied with their mentors' support for the project.

The majority (57.4%) of the mentors' designation was Head of the Department or Professors. Only 5.5% of the mentors were holding the position of Director or Vice-

Chancellor where as 21.4% were Assistant Professor/Chief Beneficiaries/ Principal Beneficiaries, 15.7% were program coordinators, advisors, or managers in different organizations. Among beneficiaries of Bio-care scheme, 64.4% had their mentors at various senior managerial positions, or trustees, or higher positions in the university while other schemes like UGC PDF (76.9%), WOS-A (60.8%), WOS-B (44.8%) majority of the mentors as HoDs or Professors.

4.4 Inferential Analysis

The detailed analysis is being carried out considering various parameters and different statistical methods. The name a few:

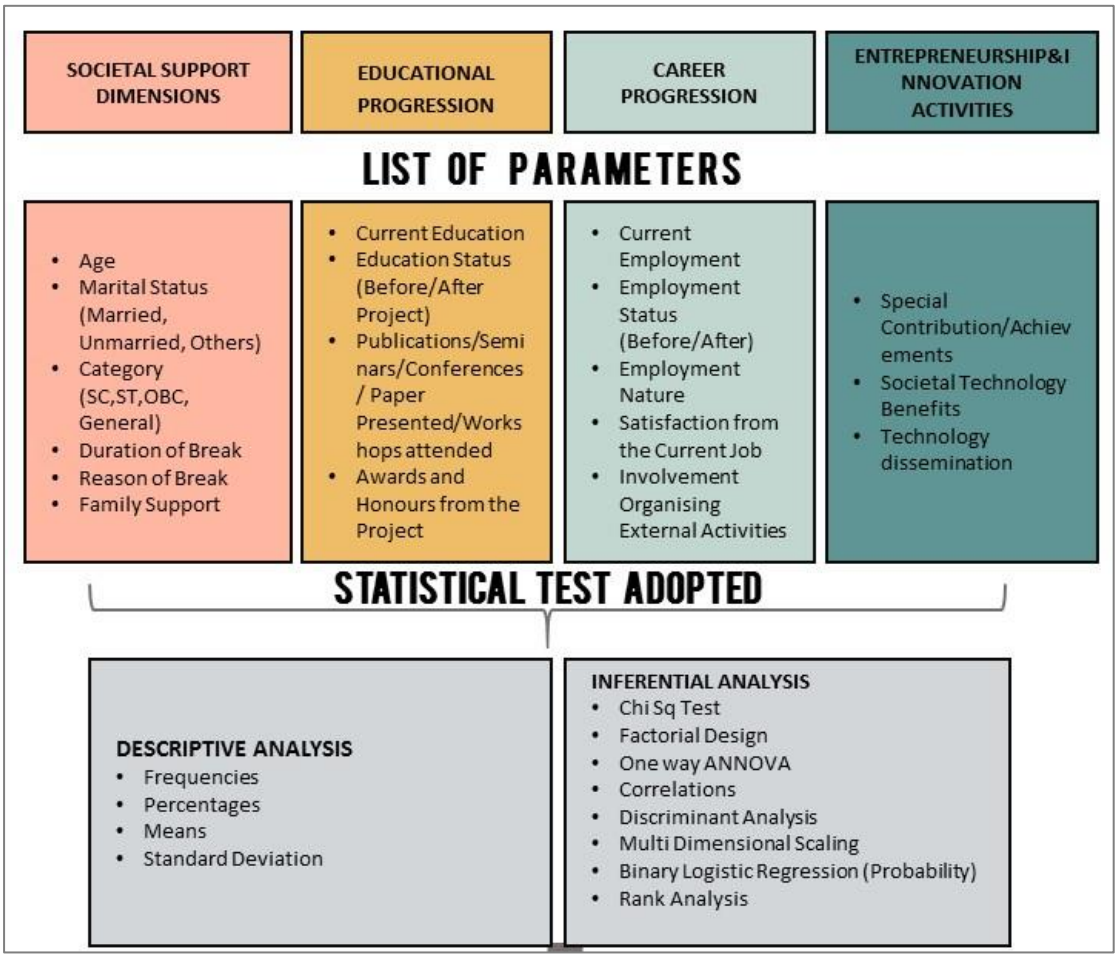


Figure 2: Parameters and Statistical Test Adopted

4.4.1 Social Support Dimensions & Social Stereotypes

Family support is an important parameter for scheme. Among zones, **beneficiaries from East zone (87.41%) had highest family** support. Among schemes, **beneficiaries from WOS-B (84.6%) had highest family support** which is reflecting in the following table:

Table 13: Zone-wise and Scheme wise score on Family Support

Zone-wise Family Support statistics					
Family Support	Score of family support (Scale of 1 to 4)				
Zones	1	2	3	4	Total
East	0.58%	0.29%	11.72%	87.41%	100.00%
North	0.61%	2.31%	17.52%	79.57%	100.00%
North-East	0.00%	3.48%	11.50%	85.02%	100.00%
South East	0.44%	2.61%	14.10%	82.85%	100.00%
South West	0.27%	2.15%	12.52%	85.06%	100.00%
West	1.37%	2.73%	17.08%	78.82%	100.00%
All Zones	0.61%	2.22%	14.88%	82.28%	100.00%
Scheme-wise family support statistics					
Family Support	Score of family support (Scale of 1 to 4)				
Schemes	1	2	3	4	
BioCARe	0.60%	2.41%	12.65%	84.34%	100.00%
UGC PDF	0.61%	3.27%	13.50%	82.62%	100.00%
WOS-A	0.66%	2.16%	15.48%	81.71%	100.00%
WOS-B	0.23%	1.38%	13.79%	84.60%	100.00%
All Schemes	0.61%	2.22%	14.88%	82.28%	100.00%

Mentor support is an important opportunity for beneficiaries to develop research aptitude. Among zones, **beneficiaries from South West Zone (68.95%) had highest Mentor support.** Among schemes, **beneficiaries from WOS-B (78.65%) had highest Mentor support.** (see tables below). BioCARe is starkly different from rest of zones as almost one-fifth have poorly rated mentor support.

Table 14: Zone wise and Scheme wise Mentor Support

Zone-wise Mentor Support statistics						
Mentor Support	Score of Mentor support (Scale of 1 to 5)					
Zones	1	2	3	4	5	Total
East	1.77%	0.82%	16.30%	20.65%	60.46%	100.00%
North	3.07%	1.84%	5.52%	22.09%	67.48%	100.00%
North-East	0.60%	0.60%	8.13%	28.92%	61.75%	100.00%
South East	0.66%	1.02%	5.26%	25.13%	67.93%	100.00%
South West	0.22%	0.67%	5.04%	25.11%	68.95%	100.00%
West	2.69%	0.80%	8.07%	22.71%	65.74%	100.00%
All Zones	1.73%	1.11%	7.29%	23.55%	66.33%	100.00%
Scheme-wise Mentor Support statistics						
Mentor Support	Score of Mentor support (Scale of 1 to 5)					
Schemes	1	2	3	4	5	Grand Total
BioCARe	21.24%	1.77%	9.73%	20.06%	47.20%	100.00%
UGC PDF	0.85%	2.04%	3.57%	20.41%	73.13%	100.00%
WOS-A	0.56%	0.98%	8.00%	25.06%	65.42%	100.00%
WOS-B	0.19%	0.75%	3.93%	16.48%	78.65%	100.00%
All Schemes	1.73%	1.11%	7.29%	23.55%	66.33%	100.00%

4.5 Social Stereotypes

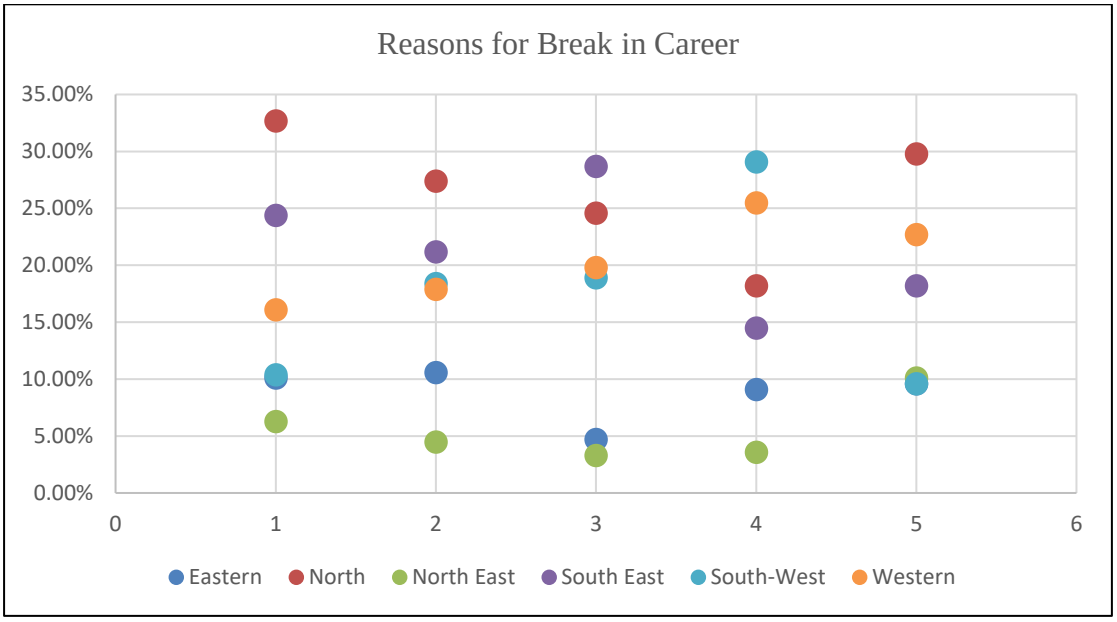
The purpose was to examine the situation of women scientists before undertaking and during the project period. The following indicators of social stereotypes were analysed: i) Age, ii) Marital Status, iii) Social category (caste of the respondent), iv) Duration and Reason for the Break in Career, v) Number of projects carried out, vi) Status of the project whether transferred to other institute or not, vii) Family support, viii) Mentor's support to the women beneficiaries and ix) Institutional support received by the respondent.

4.5.1 Pre Project-Condition of the women beneficiaries

The gender mainstreaming programs were designed to provide support to those women who desire to return to the mainstream professional career who had break in career in the past, the survey data revealed 77.1% of women beneficiaries had a career break. About, 60% of women had recorded the reasons being Maternity, Family, and Health

issues as reasons for the Break in Career. Almost 17% of women mentioned financial issues, desire for further studies, and preparing for professional competitive exams. Around 16% of the women beneficiaries took a break because of their marriage and 4.9% had a break due to mobility reasons. In the North Zone the highest career break was due to Family responsibilities (32.7%), marriage (27.4%), Financial Issues and desire for further studies (29.8%) (Refer Graph 10.). Most of the women beneficiaries in the South West Zone mentioned mobility (29.1%) as their major reason for the break-in career. The South East Zone had the 28.7% of career breaks due to maternity or health issues.

About, 60% of women had recorded the reasons being Maternity, Family, and Health issues as a reason for the Break in Career. Almost 17% of women mentioned financial issues, desire for further studies, and preparing for professional competitive exams. Around 16% of the women beneficiaries took a break because of their marriage and 4.9% had a break due to mobility reasons. In the North Zone the highest career break was due to Family responsibilities (32.7%), marriage (27.4%), Financial Issues and desire for further studies (29.8%). Most of the women beneficiaries in the South West Zone mentioned mobility (29.1%) as their major reason for the break-in career. The South East Zone had the 28.7% of career breaks due to maternity or health issues.



Graph 10 : Reasons for 'Break in Career' as responded by Women Scientists.

***Note**: 1= Family issues, 2= Marriage, 3= Maternity or Health issues, 4=Mobility, 5=Other

4.5.2 Zone-wise the duration of a break and family support:

A successful career life needs good family support. About 75.5% of the beneficiaries received motivational support from their families. Only 2.2% of women beneficiaries were not satisfied with the support received from their families. The Table 15 below shows the zone-wise averages of the duration of break (in months), and the family support on the scale of 1 to 4 (1=not satisfied, 2= Neutral, 3=moderate, 4=motivated). The number of projects is taken as continuous data.

Table 15: Zone wise averages of 'duration of break' and Family Support

Schemes	Parameters	East	North	North East	South East	South West	West
BioCARe	No. of respondents	24	56	2	14	15	24
	Avg. 'duration of break'	4.7	12.9	0	0.8	15.2	8.6
	Family Support (on a scale of 1 to 4)	3.7	3.7	4	3.4	3.8	3.5
UGC PDF	No.	21	61	4	31	8	9
	Avg. 'duration of break'	10.9	13	30	15.7	0.7	23.1
	Family Support (on a scale of 1 to 4)	3.7	3.7	3.5	3.5	3.6	3.1
WOS-A	No.	113	259	61	253	163	189
	Avg. 'duration of break'	18.7	29	30.9	27.7	30.3	31.6
	Family Support (on a scale of 1 to 4)	3.8	3.5	3.7	3.7	3.7	3.5
WOS- B	No.	25	29	10	14	13	25
	Avg. 'duration of break' (in months)	22.1	30.9	45.1	40	25.2	33.5
	Family Support (on a scale of 1 to 4)	3.7	3.7	3.6	3.7	3.8	3.8
WOS-C	No	6	101	0	27	23	36
	'duration of break' (in months)	28.5	30	0	29.3	29.6	29.7

The above-mentioned table depicts that the BioCARe scheme, the average duration of a career break for the women beneficiaries was the highest (15.2 months) in South West Zone. In North-East Zone, none of the respondent beneficiaries took a career break. Southeast Zone had the women respondents with a minimum average career break of

0.8 months. When comparing the scale of the family support received by the women beneficiaries during the project, it was observed that respondents from the North East received higher motivational support from their families. The average support received by the North and East zones was 3.7 on the scale of 1 to 4, which meant a better motivational level.

The highest average duration of 30 months of a career break was observed in the UGC PDF scheme with 3.5 as the average family support on the scale of 1 to 4 in the North-East zone. According to the North-East zone the women scientist, their families' support was more than moderate during the project period. The number of women availing the scheme benefits was the least in North East and the maximum was from North Zone. Women respondents from South West Zone had almost no break in their career. Women beneficiaries from the East and North Zone got the maximum average support score of 3.7 from their families. According to their responses, their families were motivating factors to begin professional careers.

The majority (1038) of the respondent beneficiaries were belong to WOS-A scheme. The West Zone had the highest average duration of 31.6 months of a career break for the women beneficiaries with 3.5 as the average family support on the scale of 1 to 4. The North-East zone being the second-highest number of respondents with a career break of almost 30.9 months. Women respondents from East Zone had the least break of 18.7 months in their careers. According to the North-East, East, Southeast, and South West Zone, the women beneficiaries had motivated support from their families during the project. The number of women availing the scheme benefits was the least in North East (61 respondents) and the maximum was from South East Zone (253 respondents).

The women beneficiaries belonged to the WOS-B scheme, the North-East zone had the highest average duration of 35.1 months of a career break for the women beneficiaries with 3.6 as the average family support on the scale of 1 to 4. South East zone had the second-highest number of respondents with a career break of almost 40 months. Women respondents from the East zone had the least break of 22.1 months. Across all the zones women beneficiaries were experienced motivated support from their families. The number of women availing the scheme benefits was the least in North East and the maximum from North Zone**. Across the schemes, WOS-B beneficiaries took the**

largest duration of the break-in their career. In the WOS-C scheme, the average career break was in the range of 28 to 30 months. North had the highest average career break of 30 months. South East, South West, and West Zone almost had the same duration of career break of 29 months. East Zone had an average break of 28.5 months.

4.5.3 Extension Granted by the Women Beneficiaries to complete the Project:

Of the total, 5.3% of the women beneficiary requested an extension in the project completion. The reasons for the extension were health issues, delay in receiving the grant, insufficient facilities for specific area research, or change in the institute due to relocation because of the job change. The average duration of extension was of 7.5 months.

4.5.4 Impact of the Assessment Variable: Factorial Design (Social Support Dimension)

For the analysis of 'duration of break' and related variables Factorial Design was used. In the Factorial Design, the dependent variable is the interval or the ratio scale and there are two or more independent variables which are nominal scale. The difference caused in dependent variable due to one or more independent variables (each separately) is examined and also the interaction between the independent variables. Factorial design was used here to determine whether the difference caused by selected social support dimensions over a dependent variable.

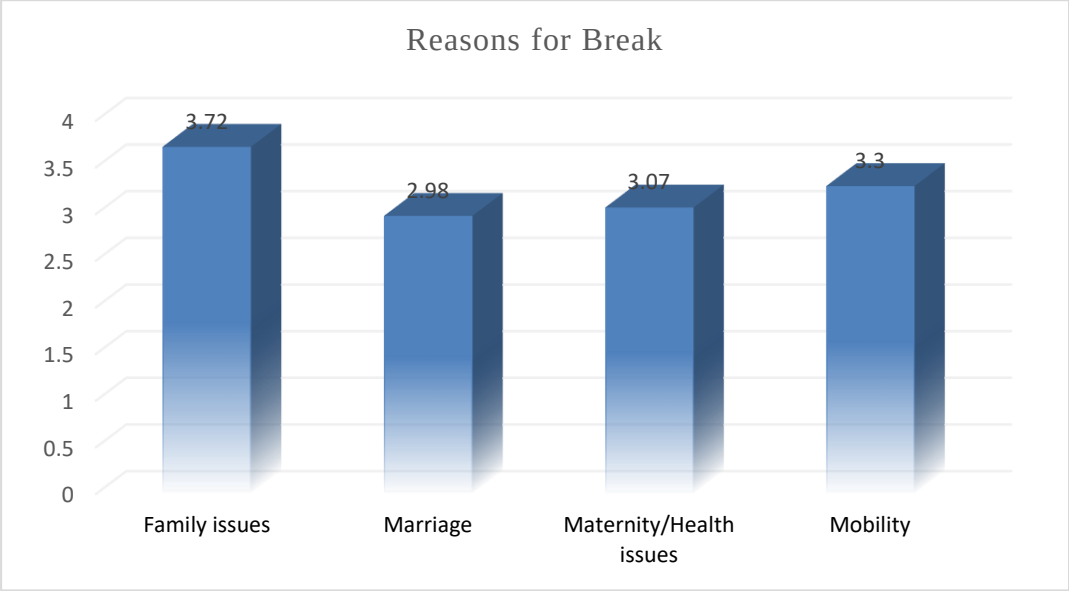
It was observed that there were differences in the 'duration of break' taken by the women beneficiaries. The variation could be attributable to 'reasons for break' for marital status. Using factor design, these underlying causal assumptions have been tested.

Table 16: Factorial Design 1 for Duration of Break (Zone Wise)

'duration of break' w.r.t. Reasons for Break and Marital Status				
Zones		**Reason of Break (RB)**	**Marital Status (MS)**	**Interaction Between (RB & MS)**
East	p-Value	0.002	0.000	0.000
	Level of Significance	Significant Difference	Significant Difference	Significant Difference
North	p-Value	0.810	0.536	0.000
	Level of Significance	No Difference	No Difference	Significant Difference
	p-Value	0.137	0.983	0.000

North East	Level of Significance	No Difference	No Difference	Significant Difference
South East	p-Value	0.000	0.838	0.707
	Level of Significance	Significant Difference	No Difference	No Difference
South West	p-Value	0.000	0.080	0.518
	Level of Significance	Significant Difference	No Difference	No Difference
West	p-Value	0.036	0.0868	0.000
	Level of Significance	Significant Difference	No Difference	Significant Difference
National	p-Value	0.003	0.602	0.000
	Level of Significance	Significant Difference	No Difference	Significant Difference

The first group for the Factorial Design 1 was about respondents nation-wide where the total number of 1423 beneficiaries were considered and results were obtained. The p-values from the output of the analysis were tabulated in Table – 16. The p-value of 'reasons for break' was less than 0.05, the Level of Significance, suggested that there was a difference in the 'duration of break' taken by the beneficiaries across the nation depending upon the reason for which they have taken a break. The reasons reported by the beneficiaries for taking a break were categorized as Family Issues, Marriage, Maternity/Health issues, and Mobility. Further, it was interesting to find the difference in the support provided by the family for different 'reasons for break'. To analyze this, One-way ANOVA between 'reasons for break' and 'family support' was carried out. Analysis of Variance is an analysis tool that measures the variance among the variables. It was used test to determine the influence of independent variables on the dependent variable.



Graph 11: One-way ANOVA (Analysis of Variance) for 'reasons for break' and Family Support

The results of ANOVA reported that there was a significant difference in the support provided by the family for different reasons for taking a break. The Family Support was measured on a scale of four where 1 = Not satisfied, 2 = Moderate, 3 = Neutral and 4 = Motivational. It was clear from Graph 11 that the maximum mean support was received by the beneficiaries having family issues as the 'Reason for Break'. This was contrasting to note that when there were family issues to the beneficiaries, the Family Support was maximum. One major social support dimension was observed from this analysis was that when women beneficiaries had a marriage related reason, the Family Support was found minimum (2.98) (Refer Graph 11).

Thus the Family Support varied with the 'reasons for break' and the reasons for break caused variation in the 'duration of break'. Hence, it could be concluded that 'Family Support' played an indirect role in the 'duration of break' women beneficiaries took.
It was also observed in Group 1 from Table 16 that the interaction between the 'Reasons for Break' and 'Marital Status' had a p-value less than 0.05 i.e. 0.00 meaning it was significant. This suggested that the difference in the Duration of a Break taken by the beneficiaries across the nation was also due to interaction between these two variables. Further to note from Table 16 that the 'reasons for break' caused a difference in the Duration of a Break taken by the beneficiaries in East, South East, South West and West Zones as the p-values were less than 0.05 in these cases. The variable 'Marital Status' caused a difference in the 'duration of break' only in the East zone. For all the other

zones the p-values were higher than 0.05 for the variable 'Marital Status'. The interaction between 'reasons for break' and 'Marital Status' affected the 'Duration of Break' in four zones – East, North, North East and West (p-values were 0.00 in each of these cases).

Table 17: Factorial Design 2 Duration of Break (Scheme Wise).

'duration of break' w.r.t. 'Reasons for Break' and 'Marital Status'				
Schemes		**Reason of Break (RB)**	**Marital Status (MS)**	**Interaction Between (RB & MS)**
BioCARe	p-Value	0.000	0.281	0.196
	Level of Significance	Significant Difference	No Difference	No Difference
UGC PDF	p-Value	0.050	0.642	0.932
	Level of Significance	No Difference	No Difference	No Difference
WOS-A	p-Value	0.017	0.622	0.000
	Level of Significance	Significant Difference	No Difference	Significant Difference
WOS-B	p-Value	0.442	0.152	0.040
	Level of Significance	No Difference	No Difference	Significant Difference
All Schemes	p-Value	0.003	0.602	0.000
	Level of Significance	Significant Difference	No Difference	Significant Difference

Similarly, the difference in the 'duration of break' regarding 'Reasons for a Break' and 'Marital Status' was also studied for all four schemes viz. BioCARe, UGC PDF, WOS-A, and WOS-B. The findings were presented in Table 17. It was concluded that the 'Reasons for a Break' caused the difference in the 'duration of break' among the beneficiaries of BioCARe and WOS-A Schemes. 'Marital Status' did not cause the difference in the beneficiaries of any schemes. However, the interaction between these two variables did cause the difference in the 'duration of break' among the beneficiaries of WOS-A and WOS-B Schemes.

Further to note here that the highest number of women beneficiaries who responded to the survey were from the North Zone and were beneficiaries of the WOS-A scheme. So, in the North Zone, as per Table 17, there was a difference in the 'duration of break' due to the interaction of the variables – 'reasons for break' and 'Marital Status'. For beneficiaries of WOS-A, it was evident that the difference in the 'duration of break' was caused due to interaction between these two variables – 'Duration of a Break' and

the 'Marital Status'. Hence, it was concluded that the **'duration of break' varied due to different reasons and Marital Status of women beneficiaries.**

The Factorial Design 2 was carried out for the 'duration of break' with the other two Independent Variables Viz. Category (Caste Category) and the status of the Project Transferred. This analysis did not show any significant p-values (i.e., less than 0.05). Hence, it was concluded that the category to which the beneficiary belonged (SC, ST, OBC, etc.) and the status of the transfer of the project– did not cause any difference in the ''duration of break'' the women beneficiaries took.

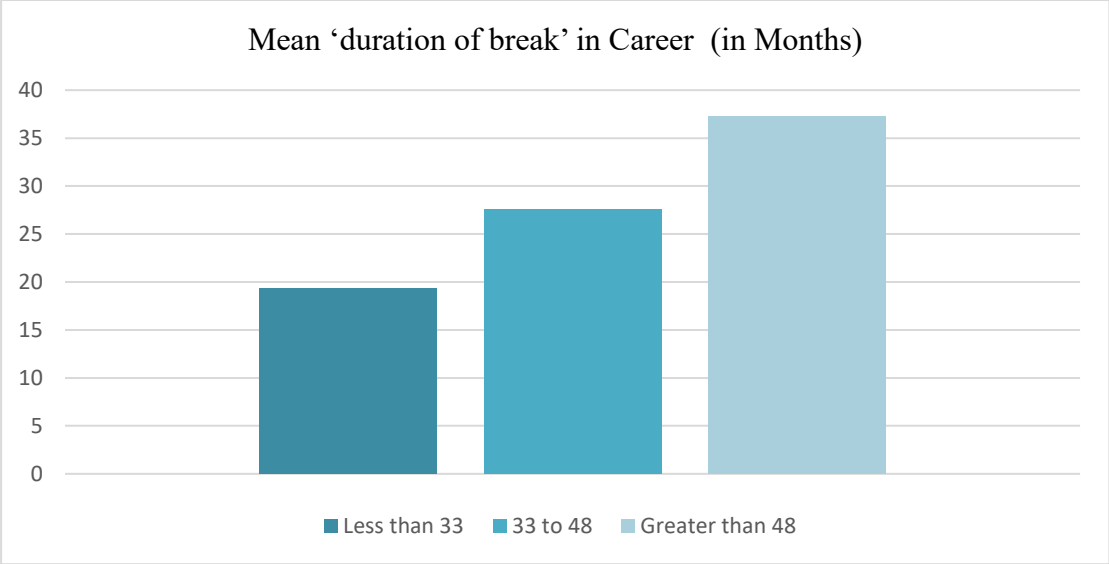
Table 18: Factorial Design 3 for Age (Zone Wise).

'duration of break' w.r.t. Reason of Break in Career and Age (Zone Wise)				
Group	IV	DV	p-Value	Inference
1	Age (East)	'reasons for break'	0.382	No difference in ''reasons for break'' due to Age
		'duration of break'	0.181	No difference in ''duration of break'' due to age
		Interaction between the two	0.967	No difference in two variables together due to 'Age'
2	Age (North)	'reasons for break'	0.027	The significant difference in ''reasons for break'' due to Age
		'duration of break'	0.004	The significant difference in ''duration of break'' due to 'Age'
		Interaction between the two	0.341	No difference in two variables together due to 'Age'
3	Age (North East)	'reasons for break'	0.145	No difference in ''reasons for break'' due to 'Age'
		'duration of break'	0.338	No difference in ''duration of break'' due to 'Age
		Interaction between the two	0.607	No difference in two variables together due to 'Age'
4	Age (South East)	'reasons for break'	0.210	No difference in ''reasons for break'' due to 'Age'
		'duration of break'	0.126	No difference in ''duration of break'' due to 'Age'
		Interaction between the two	0.006	The significant difference in both the variables together due to 'Age'
5	Age (South West)	'reasons for break'	0.852	No difference in ''reasons for break'' due to 'Age'
		'duration of break'	0.307	No difference in ''duration of break'' due to 'Age'
		Interaction between the two	0.652	No difference in two variables together due to 'Age'
6	Age (West)	'reasons for break'	0.060	No difference in ''reasons for break''due to 'Age'

		'duration of break'	0.004	The significant t difference in 'duration of break' due to Age
		Interaction between the two	0.001	The significant difference in both the variables together due to Age
7	Age (All Zones)	'reasons for break'	0.028	The significant difference in ''reasons for break'' due to Age
		'duration of break'	0.000	The significant difference in ''duration of break'' due to Age
		Interaction between the two	0.219	No difference in two variables together due to 'Age'

Age was another factor that was assumed to cause the difference in the Reasons for the Break and 'duration of break' the women beneficiaries took. To test this assumption, Factorial Design 3 was carried out. At the National level, the 'Age' was found to significantly causing the difference in the 'reasons for break' taken by the beneficiaries as the p-value was 0.028, which was less than 0.05 (Table 18). 'Age' caused a significant difference in the 'reasons for break' in North Zone ($p = 0.027$) and in the West Zone ($p = 0.004$). Meaning that among different age group, the 'reasons for break' were different in two zones viz. North Zone and West Zone.

The Factorial Design 3 A was carried out to measure the difference caused in ''duration of break'' in Reasons of Break by Age across all Schemes



Graph 12: Age group wise Mean 'duration of break' in Career (Months) for the beneficiaries

It was noted that the 'Age' did not cause the difference in either of the 'reasons for break' in any of the Schemes (i.e. BioCARe, UGC PDF, WOS-A, and WOS-B). But

Age did cause a difference in the 'duration of break' (p =0.002) among the beneficiaries of WOS-A.

Table 19 : Factorial Design 3A - for Age (Scheme Wise)

'duration of break' w.r.t. Age and Scheme				
Group	IV	DV	p-Value	Inference
1	Age (BioCARe)	'reasons for break'	0.487	No difference in ''reasons for break'' due to 'Age'
		'duration of break'	0.392	No difference in ''duration of break'' due to age
		Interaction between the two	0.347	No difference in two variables together due to 'Age'
2	Age (UGC PDF)	'reasons for break'	0.707	No difference in ''reasons for break'' due to 'Age'
		'duration of break'	0.309	No difference in 'duration of break' due to 'Age'
		Interaction between the two	0.708	No difference in two variables together due to 'Age'
3	Age (WOS-A)	'reasons for break'	0.126	No difference in ''reasons for break'' due to 'Age'
		'duration of break'	0.002	The significant difference in ''duration of break'' due to 'Age'
		Interaction between the two	0.306	No difference in two variables together due to 'Age'
4	Age (WOS-B)	'reasons for break'	0.646	No difference in ''reasons for break'' due to 'Age'
		'duration of break'	0.399	No difference in ''duration of break'' due to 'Age'
		Interaction between the two	0.553	No difference in two variables together due to 'Age'
5	Age (All Schemes)	'reasons for break'	0.028	The significant difference in ''reasons for break'' due to 'Age'
		'duration of break'	0.000	The significant difference in ''duration of break'' due to 'Age'
		Interaction between the two	0.219	No difference in two variables together due to 'Age'

Factorial Designs (4 & 4A)) were carried out to study if Mentors Support and Institutional Support varied due Category to which the beneficiaries belonged to and the transfer status of the Project. In Factorial Design analysis none of the zones suggested a significant difference in the Mentors' support due to 'Caste Category' or 'Transfer of Project'. Factorial Design 4 A suggested the same results-that there was no significant difference in Mentors' Support due to 'Caste Category' and 'Transfer of Project' for different schemes. This meant that the Scheme wise also the Mentors' support did not differ due to 'Caste Category' or 'Transfer of Project'.

During Factorial Design analysis, it was observed that there was no significant difference in the 'Institutional Support' due to 'Caste Category' or 'Transfer of Project'. It suggested the same inference for all the schemes. The 'Institutional Support' did not vary due to the 'Caste Category' of women scientist beneficiaries or the status of the 'Transfer of Project'.

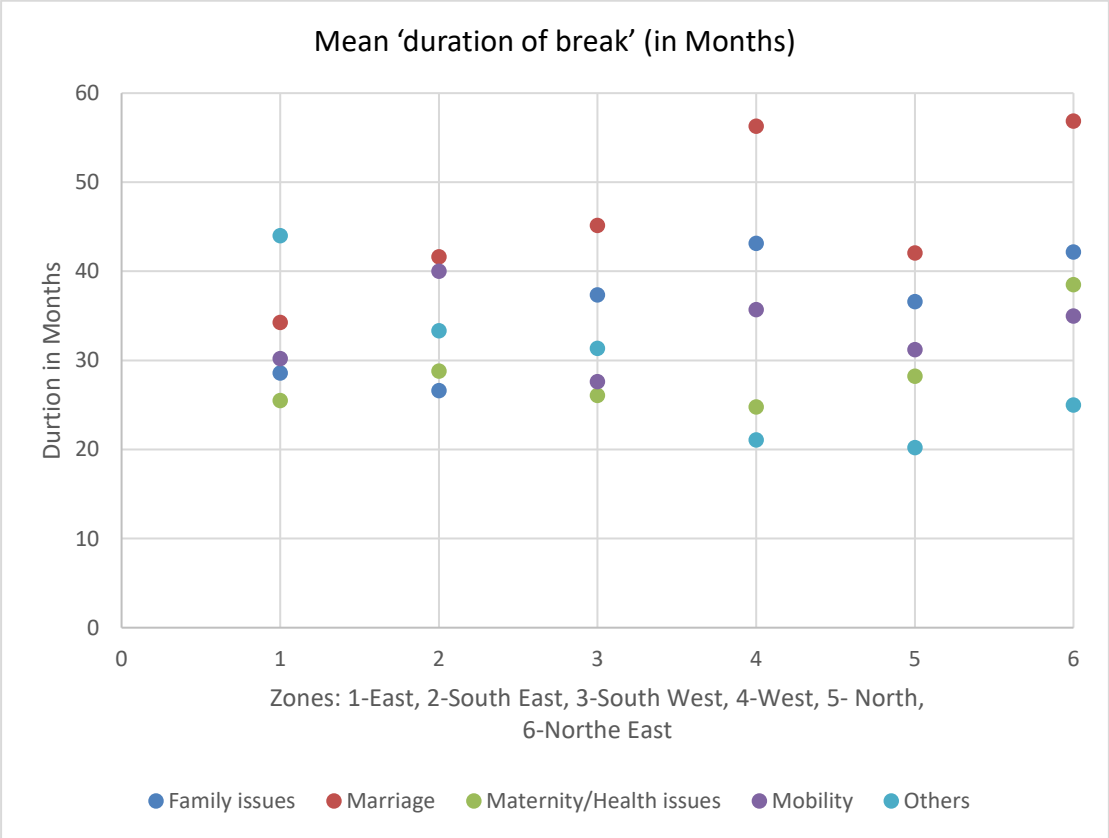
4.5.5 Observations and Recommendations

There were large variations in the 'duration of break' taken by the women scientist beneficiaries, depended upon the reasons for which they have taken break. The reasons were family issues, marriage, maternity or health related, mobility and other. A mean duration of the break was calculated which was shown in the table below. The mean duration of the break at aggregate was 26.76 months. The highest mean 'duration of break' was accorded due to the marriage and the resettling of the women beneficiaries took break in their career was 44.9 months, the mobility and family issues accounted for 34.64 and 34.86 months respectively. For the maternity and health related issues the break was 27.51 months.

Table 20: Mean 'duration of break' according to 'reasons for break's.

'Reasons for Break'	Mean Duration of 'Reasons for Break' (in months)
Family issues	34.85
Marriage	44.93
Maternity/Health issues	27.51
Mobility	34.64
Others	25.48
Total	26.76

The similar analysis for zones expressed the mean 'duration of break', the highest break was 56.31 months followed by the South West Zone (45.15 months). 'Mobility' was the other reason for the break, the mean duration was highest in the South East zone which was 40 months. The family issues accounted for 37 months in the South West Zone. The least break was 21.07 months for the other reasons. The average break for total beneficiaries of East zone was 16.49 months, South East Zone was 25.89 months, South West Zone about 27 months and West Zone was about 29 months.



Graph 13: Mean 'duration of break' according to 'reasons for break's (Zones)

The gender mainstreaming programs are about providing support to women who desire to return to the mainstream after a career break into the scientific profession. There are four predominant issues considered in the questionnaire: i) family issues, ii) maternity or health issues iii) marriage and iv) mobility as reason for break. **Out of total responses received 77.1% of women beneficiary had revealed a career break**.

The decreasing order of zonal percentages of respondents having '**family issues' as the reason for break** is as follows: **North-east (27.27%), North (27.16%), South East (26.28%), West (21.86%), East (18.58%), South West (17.89%)**. The decreasing

order of zonal percentages of respondents having '**maternity or health issues' as the reason for break** is as follows: **South West (32.16%), South East (31.09%), West (27.13%), North (20.49%), North-east (14.29%), East (26.28%)**. The decreasing order of zonal percentages of respondents having '**marriage' as the reason for break** is as follows: South West (16.58%), West (12.96%), South East (12.18%), North (12.10%), North-east (10.39%), East (10.38%). The decreasing order of zonal percentages of respondents having '**mobility' as the reason for break** is as follows: **South West (8.04%), West (5.67%), East (2.73%), North-east (2.6%), South East (2.56%), North (2.47%)**. The decreasing order of zonal percentages of respondents **who had 'no break'** is as follows: **East (49.18%), North (23.21%), North-east (19.48%), South East (16.35%), South West (16.08%), West (14.17%)**.

The decreasing order of scheme-wise percentages of respondents having '**family issues' as the reason for break** is as follows: **WOS-A (26.78%), WOS-B (23.28%), UGC PDF (14.18%), BioCARe (8.89%)**. The decreasing order of scheme-wise percentages of respondents having '**maternity or health issues' as the reason for break** is as follows: **WOS-A (26.97%), BioCARe (16.3%), WOS-B (15.52%), UGC PDF (13.43%)**. The decreasing order of scheme-wise percentages of respondents having '**marriage' as the reason for break** is as follows: WOS-B (15.52%), WOS-A (14.35%), UGC PDF (5.22%), BioCARe (3.7%). The decreasing order of scheme-wise percentages of respondents having '**mobility' as the reason for break** is as follows: **WOS-B (8.62%), WOS-A (3.85%), UGC PDF (2.24%), BioCARe (1.48%)**. The decreasing order of scheme-wise percentages of respondents **who had 'no breaks'** is as follows: **BioCARe (62.96%), UGC PDF (47.76%), WOS-B (17.24%), WOS-A (14.26)**.

The **increasing** order of zone-wise **'duration of break' in months** by the women scientists' respondents due to '**family issues' as the reason for break** is as follows: **South East (26.61), East (28.58), North (36.6), South West (37.3), North-east (42.19), West (43.12).** The increasing order of zone-wise 'duration of break' in months by respondents due to '**maternity or health issues' as the reason for break** is as follows: **West (24), East (25.5), South West (26.07), North (28.24), South East (28.79), North-east (38.54).** The increasing order of zone-wise 'duration of break' in

months by respondents due to '**marriage' as the reason for break** is as follows: **East (34.26), South East (41.64), North (42.06), South West (45.15), West (56.31), North-east (56.87).** The increasing order of zone-wise 'duration of break' in months by respondents due to '**mobility' as the reason for break** is as follows: **South West (27.62), East (30.2), North (31.2), West (35.71), South East (40), North-east (90).**
The **decreasing order of scheme-wise ''duration of break'' in months** by respondents due to **family issues as the reason for break** is as follows: **WOS-B (39.51), BioCARe (39.20), WOS-A (34.5), UGC PDF (30.52)**. The decreasing order of scheme-wise 'duration of break' in months by respondents due to '**maternity or health issues' as the reason for break** is as follows: **WOS-B (32.4), WOS-A (27.94), UGC PDF (24.66), BioCARe (20.27)**. The decreasing order of scheme-wise 'duration of break' in months by respondents due to '**marriage' as the reason for break** is as follows: **WOS-A (46.66), WOS-B (42.38), BioCARe (42), UGC PDF (16.57)**. The decreasing order of scheme-wise 'duration of break' in months by respondents due to '**mobility' as the reason for break** is as follows: **WOS-B (49.7), WOS-A (34.15), BioCARe (12), UGC PDF (6)**.

A major social stereotype was observed from the analysis, that when women beneficiaries had 'Marriage related reasons' for the break, the 'Family Support' was found minimum (2.98) (refer table-17). This may be due to the nuclear families; majority of the family members were professionally engaged; hence no support was available to the women beneficiaries. Hence, it could be concluded that 'Family Support' played an indirect role in the 'duration of break' women scientist beneficiaries were compelled to take.

The variable 'Marital Status' caused difference in the 'duration of break' only in East zone. The interaction between 'reasons for break' and 'Marital Status' affected the 'duration of break' in four zones – East, North, North East and West Zone.

The caste category to which the beneficiary belonged to (SC, ST, OBC, etc.) and the status of the 'Transfer of the Project' did not cause any difference in the 'duration of break' availed by the women scientist beneficiaries.

'Age' caused significant difference in the 'duration of break' the women beneficiaries took at National level. 'Age' caused significant difference in the 'reasons for break' in North Zone and Age caused difference in the 'duration of break' in West Zone. Analysing the scheme-wise data, the 'Age' did cause difference in the 'duration of break' among the beneficiaries of WOS-A.

There was no significant difference in the 'Mentors' Support' on the 'Caste Category' or the status of the 'Transfer of Project' across the zones. Also amongst different schemes the 'Mentors' Support' did not differ due to these two variables, 'Caste Category' or the status of the 'Transfer of Project'.

This pointed out not only the efficiency of mentors across the nation (all the zones, all the schemes) but also that the social stereo type of 'Caste Category' did not affect the mentors to support the women scientist beneficiaries. It was important to note here that the mentors support did not differ even when the project was transferred to other institutes. This was also an indication towards smooth transferring of the projects from one institute to the other and the support of both the institutes to the beneficiaries. Interesting to note further that the 'Institutional Support' did not vary due to 'Caste Category' to which the beneficiaries belong to. This was evident for all the zones and schemes. A very important finding was that, there was no difference in the patterns of 'Institutional Support' when the projects were transferred to the other institutes. This meant that the institutes continued providing the same level of support when the projects are transferred, 'Transferred Projects'. This was proved so for all the zones and schemes and an encouraging factor for women scientist beneficiaries, irrespective of the external factors that force them to move their mentoring institutions.

4.6 Education Progression

The lack of equal opportunities and the benefits of education of choice for women results in under-representation in science, technology, engineering, and mathematics (STEM) education and, therefore, in 'STEM careers'. According to the UNESCO ground-breaking report Cracking the code: Girls' and women's education in STEM, only 35% of STEM students in higher education globally are women, and differences are observed within STEM disciplines. This underrepresentation was due to several factors that negatively impact access to information, a field of study selection, retention,

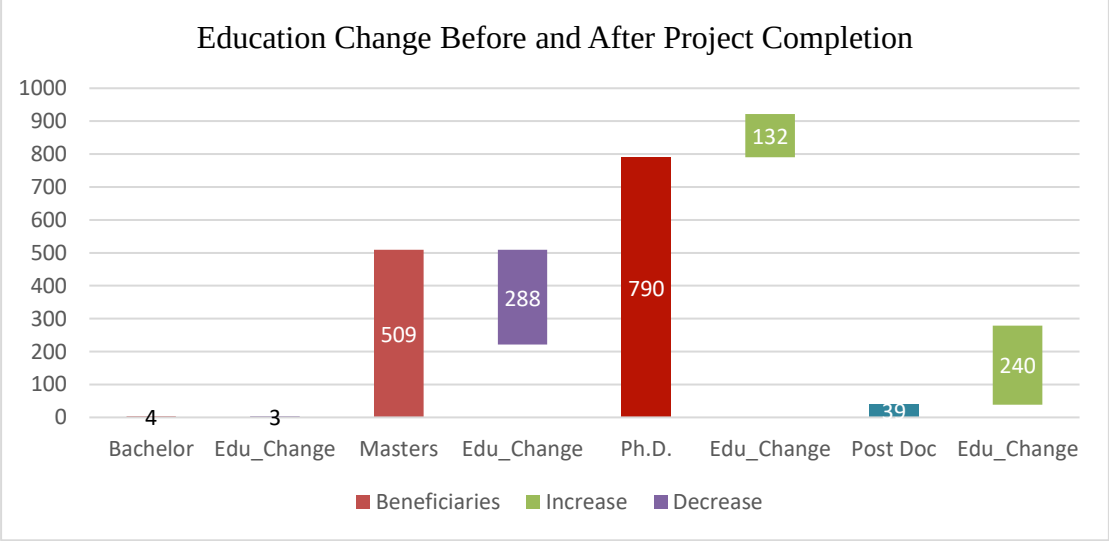
and graduation. The literature indicates that preferences, motives, values, stereotypes, and culture. norms are responsible for this situation. (Rafael Castillo, 2014)

One of the dimensions to measure the impact of assessment was the education progression of the beneficiaries. The variables included to measure the educational progression of the women beneficiaries were (Refer Table 21)

Table 21: Variables adopted for measuring Education Progression

1	Nature of Education Before the Project	2	Nature of Education After the Project
3	Current Education Nature	4	Awards and Honours Received
5	Number of Publications	6	Number of International Seminars attended
7	Number of National Seminars attended	8	Number of papers presented in International Seminars
9	Number of Papers presented in National Seminars	10	Number of International Workshops attended
11	Number of National Workshops Attended	12	Number of Papers presented in International Workshops
13	Number of Papers presented in National Workshops		

4.6.1 Change in Level of Education



Graph 14: Waterfall Chart showing change in education level 'Before and After' project completion

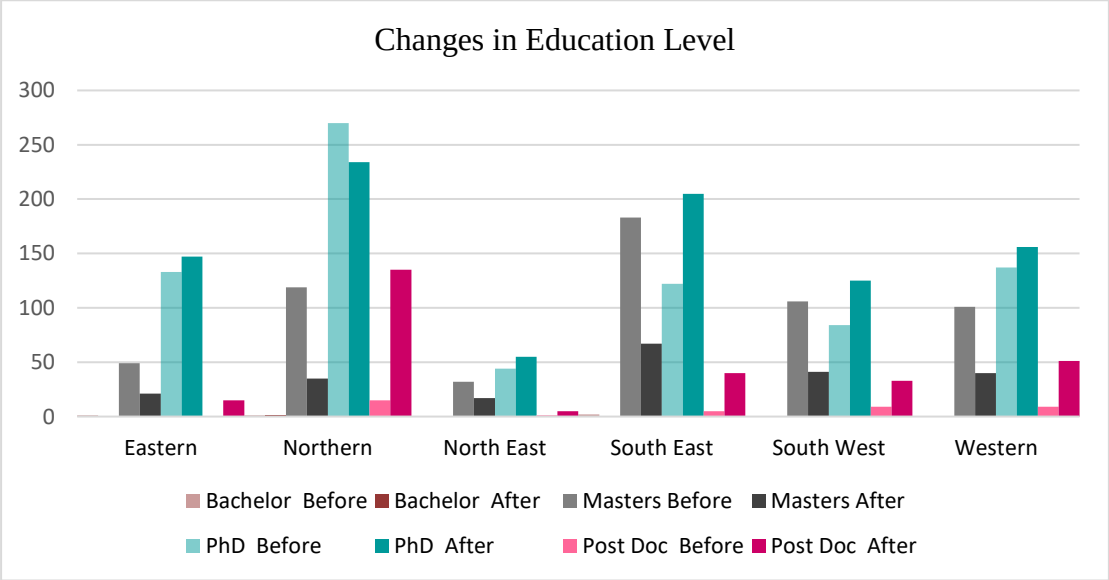
Graph 14 represents the overall change in education level 'before and after' the first project. There was an increase of 132 women beneficiaries who were Ph.D. holders. The number increased from 790 respondents to 922 after the project completion. Only 39 respondents were Post-Doc, by the end of the project, this number raised to 279.

Table 22 : Education Change 'before and after' project completion at every stage of education

Education Change		Education Level Before availing the Project				
		Bachelor	Masters	Ph.D.	Post Doc	Total
Education Level After availing the Project	Bachelor	1	2	1		4
	Masters		219	370	1	590
	Ph.D.			551	239	790
	Post Doc				39	39
	Total	1	221	922	279	1423

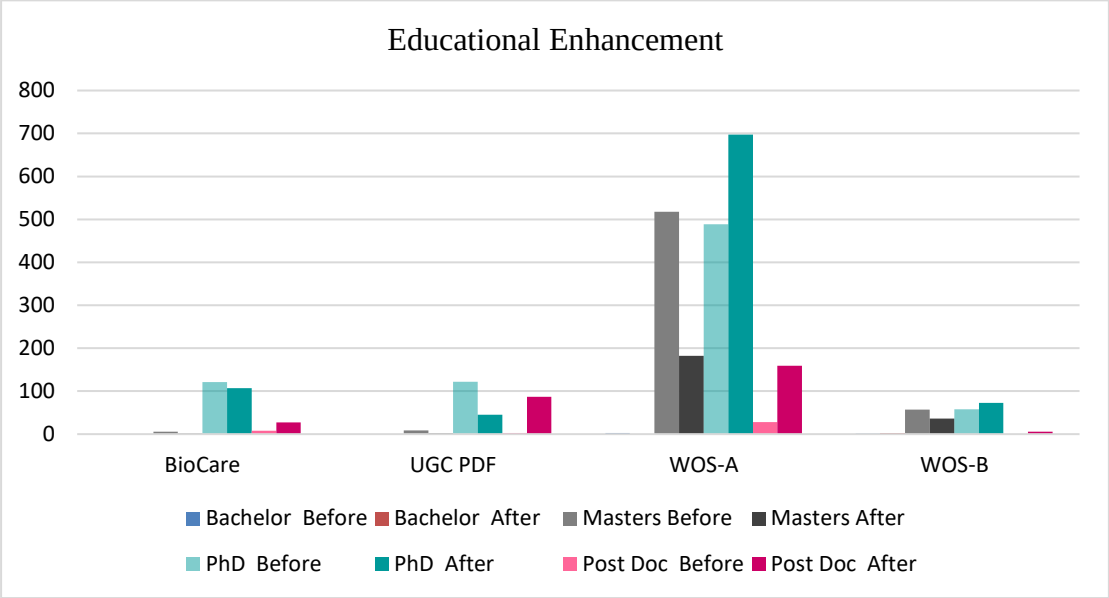
Table 22 above describes the zone-wise changes in the education level before the project was granted and 'After the Project' was completed by the women beneficiaries. There was an increase in their education levels in all the zones. The zone wise percentage increment of education level **from masters to PhD degree is North (69.75%), South East (64.48%), South West (61.32%), West (60.40%), East (57.14%), North-east (46.88%)**. Among the zones, the North Zone observed a major hike in the Ph.D. holders. The zone wise percentage increment of education level **from PhD to Post-Doc degree is North (44.07%), West (30.66%), South East (28.69%), South West (28.57%), East (11.28%), North-east (9.09%)**. As seen, there is higher increment of women beneficiaries from the North Zone to Post Doc degree holders.

The above statistics show that beneficiaries have progressed significantly in improving their level of education due the opportunity provided by these schemes and to carry out the research projects by the women scientists.



Graph 15 : Zone-wise changes in the education level.

Graph 15 explains the scheme-wise change in educational level. Across the schemes, there was an enhancement in the education status the women scientist beneficiaries. The scheme wise percentage increment of education level **from Masters to PhD degree is BioCARe (83.33%), UGC PDF (77.78%), WOS-A (65.06%), WOS-B (36.84%)**. Among the schemes, the BioCARe observed a major hike in the Ph.D. holders. The scheme wise percentage increment of education level **from PhD to Post-Doc degree is UGC PDF (68.85%), WOS-A (26.58%), BioCARe (15.70%), WOS-B (10.34%)**. As seen, there is higher increment of women beneficiaries from the BioCARe to Post Doc degree holders.



Graph 16 : Scheme Wise changes in the education level.

4.6.2 Analytical Findings

The information about 'Level of Education Before the Project' and 'Level of Education After the completion of the project' was gathered categorically, hence, the Chi-Square test was conducted to find out if there existed a significant difference in the proportion of beneficiaries for the four levels of education (Graduates, Masters, Ph.D. and Post Doc.) 'Before the Project' and 'After completion of the Project'.

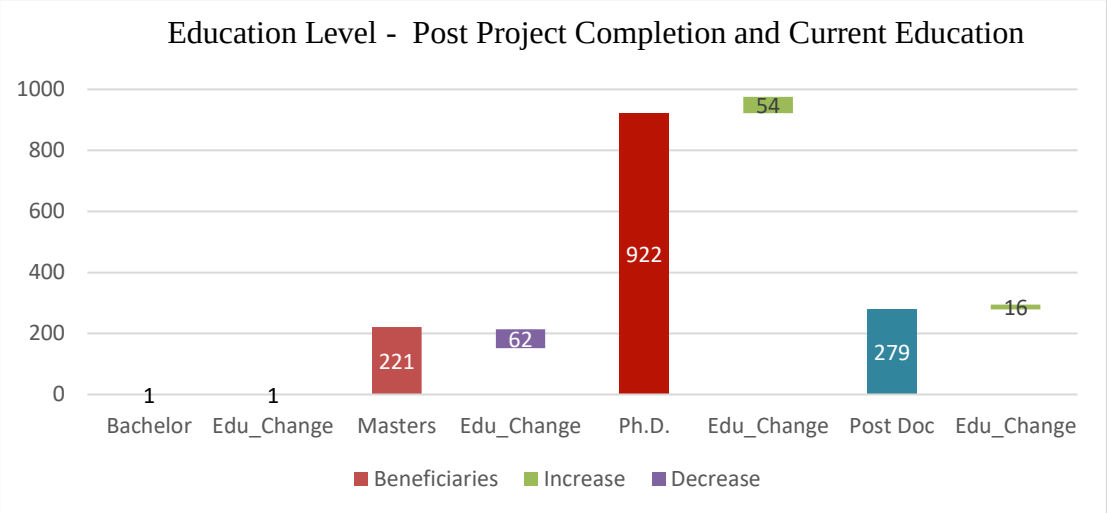
The Chi-Square test was carried out for all the women beneficiaries across the Nation, Zone wise (i.e. North, East, North East, South East, South West, and West) as well as Scheme wise (i.e. BioCARe, UGC PDF, WOS-A, and WOS-B). The results were in terms of p-values. When the p-value is less than the level of significance (0.05 for the

present study), the variables suggest a significant difference in the proportion between the levels.

It was observed that the proportion of women beneficiaries varied significantly for all the categories of education 'Before the project' and 'After the completion of the Project' across all Zone wise and Scheme wise as all the p-values were found less than 0.05 (the level of significance). This implied that the women beneficiaries progressed significantly in their level of education after completion of their **projects.** The numbers showed that 807 women beneficiaries were Ph.D. before the project and it rose to 902 after completion of the project. More interestingly, the frequency of Post-Doc beneficiaries before the project was 39 and it was increased to 282 across all the zones after the completion of their projects.

4.6.3 Education Progression with Respect to Current Education

Further, the analysis compared the current education status with the education change before and after the project was done. The comparison aimed to assess the long-term impact of the gender mainstreaming programs. The Graph 17 below demonstrated the overall change in education level after the project and at the time of survey.



Education Change		Current Education (2019-20)			
		Masters	Ph.D.	Post Doc	Grand Total
Education nature	Bachelor		1		1
	Masters	152	69		221
	Ph.D.		906	16	922
	Post Doc			279	279
	Grand Total	152	976	295	1423

Graph 17: Education Level - Post Project Completion and Current Education

The findings from the Graph 17, suggested an increase in the number of women scientist beneficiaries enhancing their education qualification even after years of completing the project. Current status showed the increase in the number of women scientist beneficiaries holding Ph.D. degrees from 922 to 976. The number of Post-Docs also increased from 279 to 295 women scientist beneficiaries. Though there was a minor increase in the numbers, these changes showed a positive impact of the schemes on the educational growth of 'women in science'.

4.7 Awards and Honours

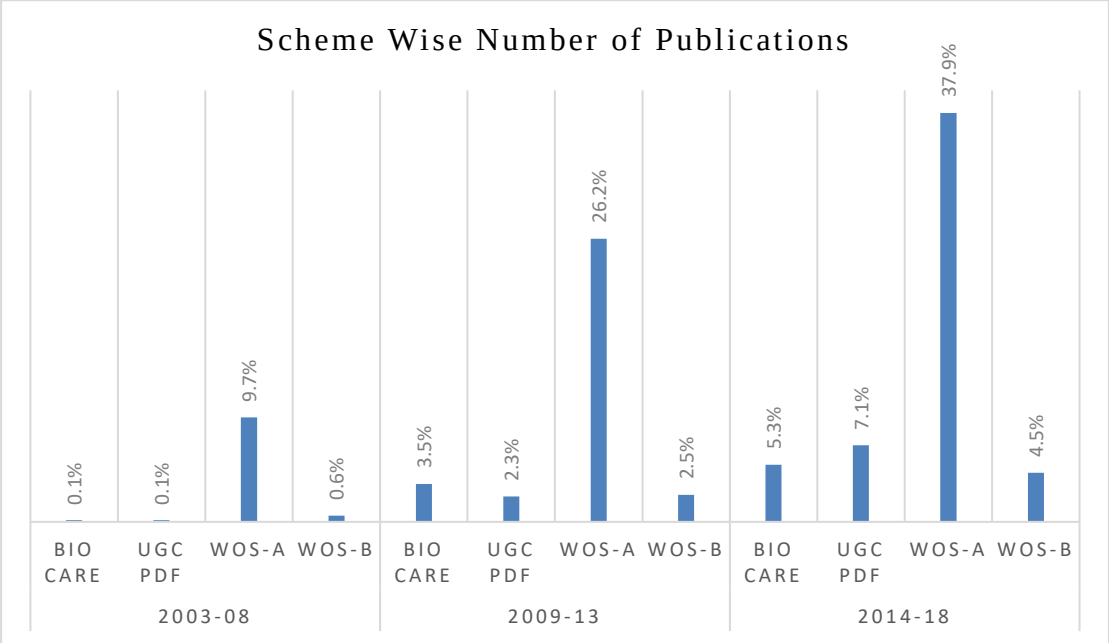
Honouring achievements helps build a legacy by validating hard work and contribution to the workplace. This boosts the worth and impact on women beneficiaries. Of the total, 31.9% received the various awards at the university level, wherein, 68.1% did not received any awards during the project period. The North Zone with the highest percentage of women scientist beneficiaries had a maximum of 28.5% awards and honours. The scheme-wise, women scientist beneficiaries registered for the WOS-A scheme had the maximum (72.9%) 'awards'.

4.7.1 Publications

'Publications' is one of the important 'achievement parameters' for the beneficiaries. The 'publication', publishing a paper, a book, or even a chapter in a book, is one of the important 'Achievement Parameters' observed here, gave scientific visibility and recognition in the area of research. Scientific discovery, publishing, and researchers' career progression are about quality. The analysis of the women scientist beneficiaries revealed the contribution of the research output of the women beneficiaries.

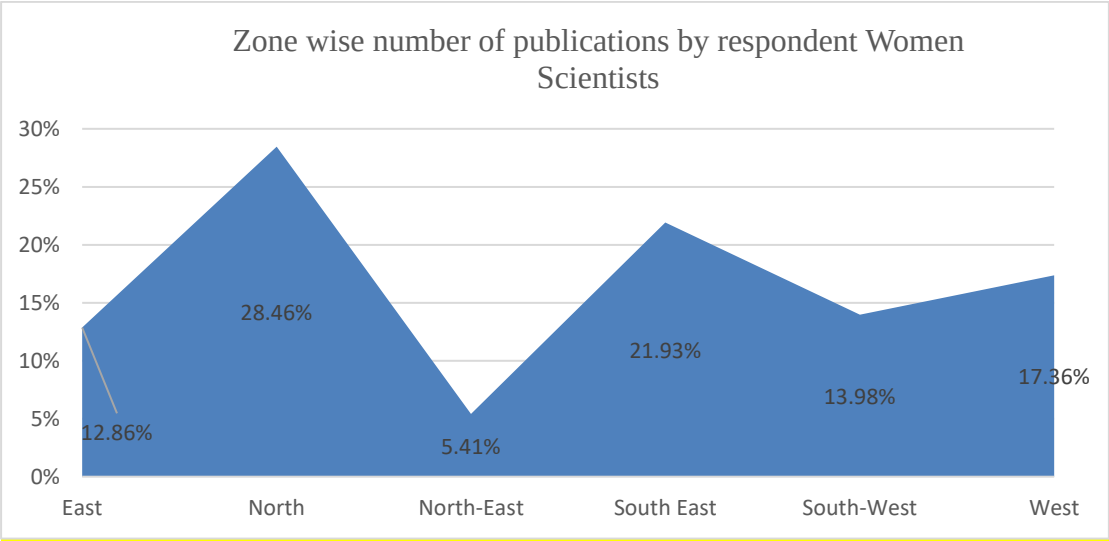
Table 23: Zone wise – Year Wise number of publications

Zone	Number of Publications						
	One	Two	Three	Four	Five	Total Ranks	Final Rank
East	1	5	2	6	4	18	3
North	6	4	3	1	1	15	2
North-east	3	1	6	4	6	20	5
South East	5	2	1	3	2	13	1
South West	2	6	5	2	5	20	5
West	4	3	4	5	3	19	4



Graph 18: Scheme wise – Year Wise number of publications (in %)

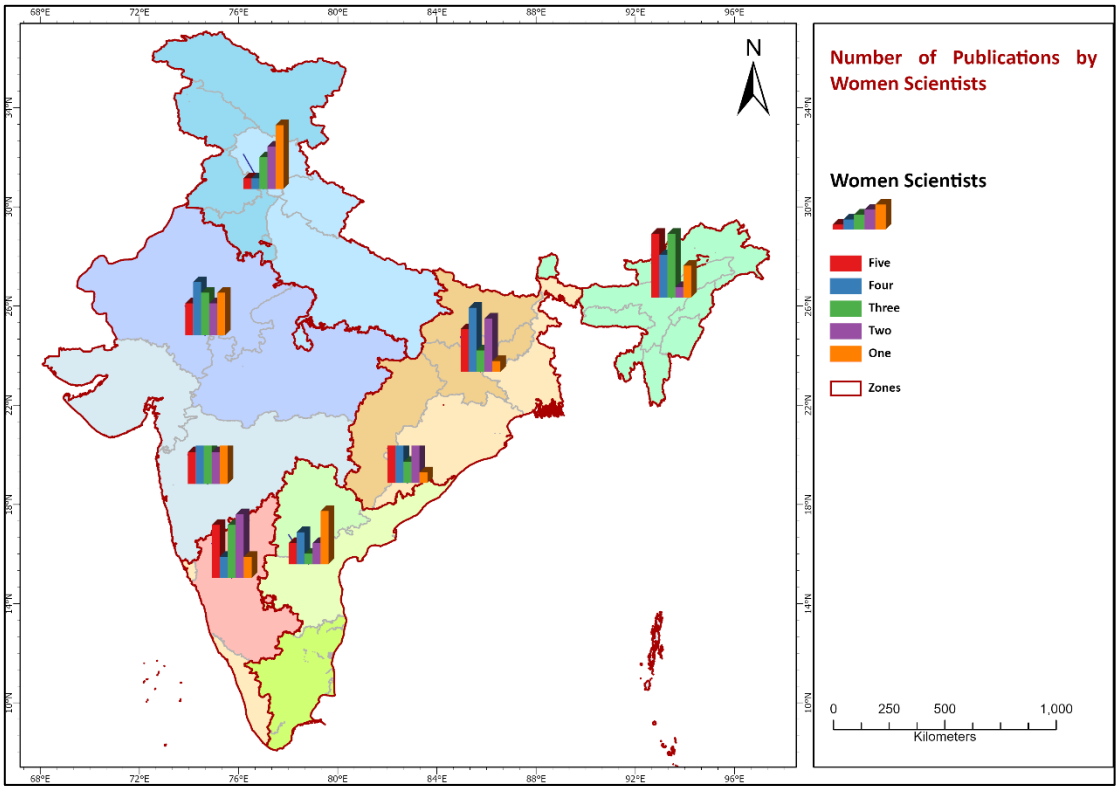
Graph 14 represents the Scheme-wise number of publications carried out, it was shown at 5 years' interval since the inception of the schemes. The maximum (37.9%) number of publications was for the WOS-A scheme during 2014-18 and minimum (4.5%) for the WOS-B scheme. The number of publications grew with the increase in the number of women beneficiaries.



Graph 19 : Zone wise number of publications by respondent Women Scientists

Graph 19 represented the zone-wise publication of the responded women scientist beneficiaries. The number of respondents' publications ranging from one to five was quantified as percentage within each respective zone. The **decreasing order of zonal**

percentages of respondents with **five publications** is as follows: **North (20.24%), South East (20.19%), West (17.81%), East (15.84%), South West (11.55%), North-east (10.39%)**. The decreasing order of zonal percentages of respondents with **four publications** is as follows: **North (10.86%), South West (10.55%), South East (8.33%), North-east (7.79%), West (6.07%), East (4.91%)**. The decreasing order of zonal percentages of respondents with **three publications** is as follows: **South East (16.98%), East (14.75%), North (14.07%), West (12.55%), South West (10.55%), North-east (10.38%)**. The decreasing order of zonal percentages of respondents with **two publications** is as follows: **North-east (20.78%), South East (18.91%), West (18.22%), North (16.54%), East (16.39%), South West (13.57%)**. The decreasing order of zonal percentages of respondents with **one publication** is as follows: **East (24.04%), South West (23.11%), North-east (22.07%), West (19.83%), South East (16.98%), North (16.79%)**. The decreasing order of zonal percentages of respondents with **no publications** is as follows: **South West (30.65%), North-east (28.57%), West (25.51%), East (24.04%), North (21.48%), South East (18.59%).**



Map 3: Zone Wise Number of Publication

The above Map 3 represents the decreasing order of **scheme-wise** percentages of respondents with **five publications** is as follows: **UGC PDF (30.59%), WOS-A**

(17.91%), WOS-B (10.34 %), BioCARe (7.4%). The decreasing order of **scheme-wise** percentages of respondents with **four publications** is as follows: **UGC PDF (11.94%), WOS-A (8.76%), BioCARe (6.66%), WOS-B (4.31%)**. The decreasing order of **scheme-wise** percentages of respondents with **three publications** is as follows: **UGC PDF (15.67%), WOS-A (14.45%), BioCARe (13.33%), WOS-B (6.89%)**. The decreasing order of **scheme-wise** percentages of respondents with **two publications** is as follows: **WOS-A (17.63%), WOS-B (17.24%), BioCARe (17.04%), UGC PDF (13.43%)**. The decreasing order of **scheme-wise** percentages of respondents with **one publication** is as follows: **BioCARe (25.18%), WOS-B (21.55%), WOS-A (19.17%), UGC PDF (14.17%)**. The decreasing order of **scheme-wise** percentages of respondents with **no publication** is as follows: **WOS-B (39.66%), BioCARe (30.37%), WOS-A (22.06%), UGC PDF (14.18%)**. There was a positive significant correlation of the 'Age' and 'Number of Publications' observed, with an increase in the age, there was an increase in number of publications.

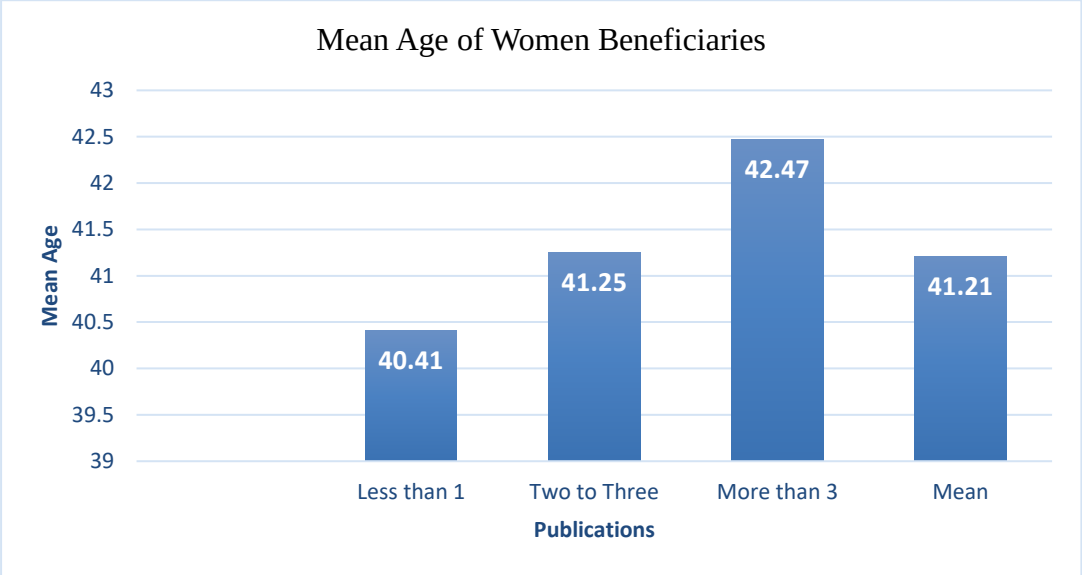
4.7.2 Correlation Analysis

Pearson's Product Moment correlation was applied between two parameters – 'Age' and 'Number of Publications'.

Table 24 : Pearson's Product Moment correlation– 'Age' and 'Number of Publications'

		Age	Number of Publications
Age	Pearson Correlation	1	.137**
	Sig. (2-tailed)		.000
	N	1423	1423
Number of Publications	Pearson Correlation	.137**	1
	Sig. (2-tailed)	.000	
	N	1423	1423
**. Correlation is significant at the 0.01 level (2-tailed).			

The above Table 24 showed a significant correlation between 'Age and the Number of Publications' by the beneficiaries of all the 6 zones. This implied that the higher the age of the beneficiaries more is the papers published. More publications may be attributed to the education, experience, and maturity along with the number of projects availed by the women beneficiaries.



Graph 20: Mean Age of Respondent Women Scientists with respect to No of Publications

The women beneficiaries of the average age around 42 yrs. had more than 3 publications and these number of publications were found to be decreasing with the decrease age of the beneficiaries. This was indicative of either education or experience playing role in the ability required to have more publications.

Table 25: Mean Age of Responded Women Scientists beneficiaries with respect to No of Publications. (Zone Wise)

Zone	Mean Age	No. of Publications
East	43.25	1.73
North	40.75	1.93
North East	41.77	1.68
South East	40.35	1.93
South West	41.50	1.68
West	41.13	1.79
Total	41.21	1.83

While bifurcating 'Age' and 'no of Publications', it was important to be noted, that the highest 'mean Age' of the women scientist beneficiaries was found in the East zone whereas, the highest average numbers of publications were found among the women scientist beneficiaries of the West Zone.

Table 26 : Mean Age of Responded Women Scientists beneficiaries with respect to No of Publications. (Scheme Wise).

Scheme	Mean Age	Mean No of Publications
BioCARe	42.27	1.59
UGC PDF	40.11	2.14
WOS-A	41.27	1.85
WOS-B	40.71	1.53
Total	41.21	1.83

Understanding the relationship of women scientist beneficiaries', 'Age' and the 'Number of Publications' at scheme-wise, BioCARe scheme where the highest average age (42.27 yrs.) whereas, beneficiaries of UGC PDF had the highest average number of publications (2.14).

4.7.3 Seminars and Workshops

Seminars, workshops and conferences are of great importance to individuals. These are platforms not only for learning new aspects, the perspectives of others, and the latest information, but also a good way of networking. The presentation of papers at seminars and workshops at international and national levels contribute to the achievement and development of the beneficiaries. Data on their presentation and participation were collected and analysed according to zones and schemes.

4.7.4 One-Way ANOVA Analysis

One-way ANOVA was performed to compare means of selected variables ('Number of International Seminars attended', 'Number of National Seminars attended', 'Number of papers presented in International Seminars', 'Number of Papers presented in National Seminars', 'Number of International Workshops attended', 'Number of National Workshops Attended', 'Number of Papers presented in International Workshops', 'Number of Papers presented in National Workshops') between the zones and the schemes. This analysis showed if the mean number of papers presented and seminars attended by the women scientist beneficiaries in six zones were significantly different from each other or not. It was found out whether the mean number of papers

presented and seminars attended were **significantly different** in each of the four schemes.

The Table 27 clearly showed that the variables – 'Papers presented in International Seminars' (0.007), 'International Seminars attended' (0.03), 'Papers Presented in National Seminars' (0.00) and 'National Seminars Attended' (0.009) were significantly different zone-wise.

At an aggregate of six zones, 40.4% beneficiaries presented more than two papers, 33.4% women scientist beneficiaries presented 1 paper, and then 26.2% presented 2 papers in the international seminars and conferences. **More proportion of beneficiaries (40.4%) across the nation presenting more than two papers in the international seminars was one of the strong points of the schemes.**

Table 27 : ANOVA (Analysis of Variance) for paper presented and Workshop/Conferences/ Seminar Attended (Zonal Level).

Categories	Between Groups	Within Groups	F	Sig
	Mean Square Values			
Papers Presented in International Seminars/Conferences	9.781	9.339	3.189	0.007
International Seminars/Conferences Attended	25.568	10.288	2.485	0.030
Papers Presented in National Seminars/Conferences	80.161	16.019	4.982	0.000
National Seminars/Conferences Attended	33.116	10.786	3.070	0.009
Papers Presented in International Workshops	4.919	2.417	2.035	0.071
International Workshops Attended	1.222	1.013	1.207	0.303
Papers Presented in National Workshops	3.885	2.459	1.580	0.163
National Workshops Attended	7.419	5.412	1.371	0.232

Across the nation 44.7% of women scientist beneficiaries attended more than 2 international seminars, 31.3% beneficiaries attended 1 international seminar, and

24.1% beneficiaries attended 2 international seminars. Analysing this zone-wise, it was noted that there were the highest women scientist beneficiaries from South West (20.6%) and also from North (20.5%) who attended 1 international seminar. Of all those who attended 2 international seminars, the highest proportion was from South East (17.9%). Of all those who attended more than 2 international seminars, the highest proportion was from the West Zone (26.4%). **More beneficiaries (44.7%) attended more than 2 international seminars across the nation suggested strong points of the schemes.**

At an aggregate of all zones, Nation-wide, 43.5% women scientist beneficiaries presented more than 2 papers, there were 34.5% who presented 1 paper and there were 22.4% women scientist beneficiaries who presented 2 papers in national seminars. There was the highest proportion (28.6%) from the North-East zone who presented 1 paper. There were 18.6% from the South West Zone who presented 2 papers, which was the highest proportion. There were 35% of women scientist beneficiaries from the East zone – which was the highest proportion – who presented more than 2 papers in National Seminars.

Table 28 : ANOVA (Analysis of Variance) for 'papers presented' and 'Workshop/Conferences/ Seminar Attended'

		Sum of Squares	Mean Square	Sig.
Papers Presented in International Seminars/Conferences	Between Groups	397.709	132.570	.000
	Within Groups	12984.841	9.151	
	Total	13382.550		
International Seminars/Conferences Attended	Between Groups	244.285	81.428	.000
	Within Groups	14461.926	10.192	
	Total	14706.211		
Papers Presented in National Seminars/Conferences	Between Groups	738.888	246.296	.000
	Within Groups	22462.875	15.830	
	Total	23201.762		
National Seminars/Conferences Attended	Between Groups	315.293	105.098	.000
	Within Groups	15134.204	10.665	
	Total	15449.497		
Papers Presented in International Workshops	Between Groups	11.839	3.946	.181
	Within Groups	3437.031	2.422	

	Total	3448.870		
International Workshops Attended	Between Groups	15.235	5.078	.002
	Within Groups	1425.672	1.005	
	Total	1440.907		
Papers Presented in National Workshops	Between Groups	45.499	15.166	.000
	Within Groups	3457.639	2.437	
	Total	3503.138		
National Workshops Attended	Between Groups	115.203	38.401	.000
	Within Groups	7591.194	5.350	
	Total	7706.396		

One-way ANOVA was carried out to know if a significant difference existed in the selected variables between the schemes. All the selected variables ('Number of International Seminars attended', 'Number of National Seminars attended', 'Number of papers presented in International Seminars', 'Number of Papers presented in National Seminars', 'Number of International Workshops attended', 'Number of National Workshops Attended', 'Number of Papers presented in National Workshops') **except** 'Papers presented in International Workshops' showed a significant difference in the mean according to schemes.

The highest proportion of the women scientist beneficiaries of the BioCARe scheme attended 1 national seminar (23%) also they were highest in attending 2 national seminars (17.8%). There was the highest proportion of women scientist beneficiaries of UGC PDF (46.3%) who attended more than 2 national seminars. There were 26.7% women scientist beneficiaries of the BioCARe scheme – which was the highest proportion – who presented 1 paper in the national seminar. Among those who presented 2 papers in national seminars, the beneficiaries of UGC PDF (15.7%) were the highest. Also, these women scientist beneficiaries were highest (49.3%) in presenting more than 2 papers in national seminars.

Among all those who attended 1 international seminar, the women scientist beneficiaries of WOS-B (20.7%) were the highest. Among those who attended 2 international seminars, those of the BioCARe scheme (14.8%) were the highest. And among the other who attended more than 2 international seminars, the women scientist beneficiaries of UGC PDF (46.3%) were the highest. Considering the papers presented

at international seminars, it was clear that among those who presented 1 paper in international seminars, the women scientist beneficiaries of BioCARe (25.2%) were the highest. The women scientist beneficiaries of UGC PDF were highest in both the categories – presented 2 papers (14.9%) and more than 2 papers (46.3%) in the international seminars.

Overall it was evident from the analysis that more proportion of the women scientist beneficiaries presented more than 2 papers at national/international seminars/conferences and also that more number of who attended more than 2 national/international seminars/conferences. **The participation in the seminars, workshops and paper publication are very appreciative conditions introduced by these schemes.**

4.8 Career Progression

The rate of women's education is increasing, globally and locally. Their professional involvement has increased too. The following chart showed the education ladder and career progression in a generic manner.

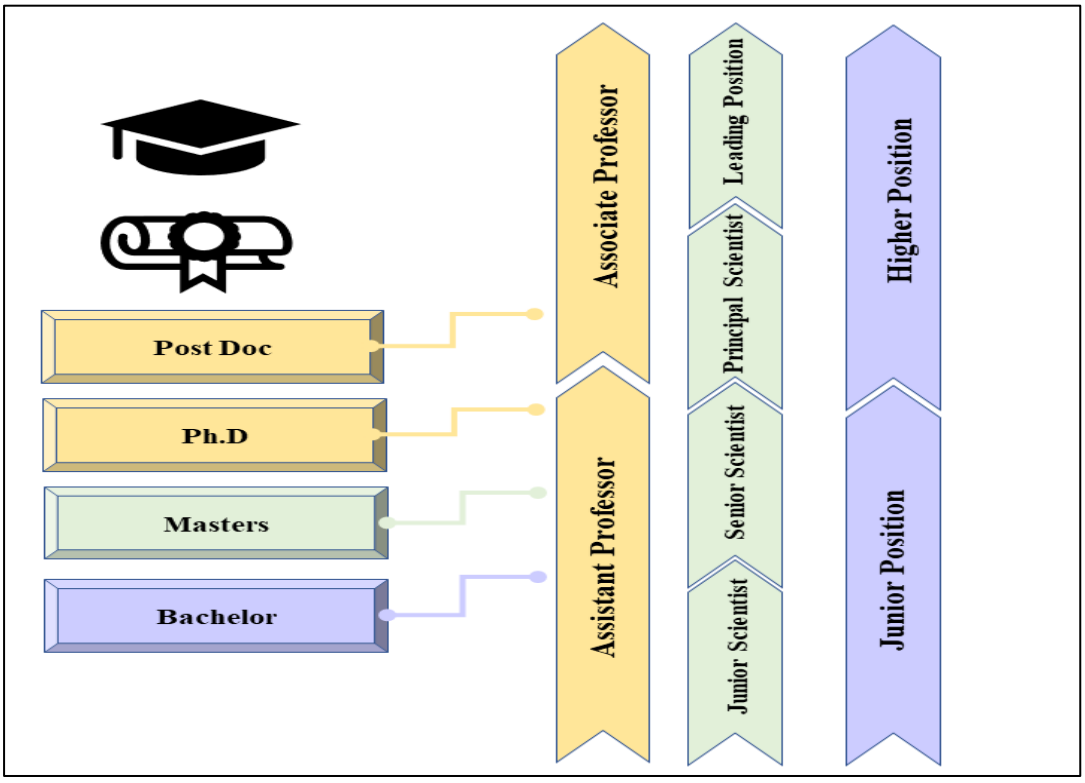


Figure 3 : Scientific Career Progression Diagram

Post-studies the women have to overcome several barriers to enter to the professional careers. Some of the barriers are biased recruitment and hiring procedures, restrictive regulations, biased promotion practices, lack of access to networks, stereotypes, work-life balance issues, and evaluation practices. These barriers affect women's access to STEM fields, hiring and promotion opportunities, retention, and career success. (Evaluating the Impacts of Grants on Women Scientists Careers: The Curriculum Vitae as a Tool for Research Assessment., 2003)

4.8.1 Nature of Employment

To study the career progression and advancement of the beneficiaries, the nature of the employment of the respondent women scientists was analysed. The beneficiaries were asked about the nature of their employment in terms of 'Employed' or 'Unemployed' 'before the project' and also 'at the time of filling up the questionnaire, meaning current position'. Thus the data received about 'Employment Nature Before' and 'Current Employment' were the two variables were selected to decide the advancement in their employment.

By the end of the project availed, 64% of women beneficiaries were employed. Of the surveyed population, around 30.7% worked in academics, 22.3% as scientists, 17.8% were research scholars, and 5.8% were Freelancers, Vocational Instructors, Data Coordinators, Analysts, etc. The remaining 23.3% of women were unemployed who were either 'searching for jobs' or were 'housewives'. It was interesting to note here that the **average level of satisfaction of job was found maximum among Scientists (3.86 out of 4 scale) and Academicians (3.85 out of 4 scale)**. These averages indicated more than 'Good' level of satisfaction among Scientists and Academicians. The average of level of satisfaction was found relatively less among Research Scholars (3.67 out of 4 scale).

Based on the data about 'Employment Before' and 'Current Employment' the beneficiaries were divided into four categories: (Refer Table 29).

Table 29: Employment Scenario of 'Before' and 'After' of Responded Women Scientist

	Categories	Characteristics & Status
1	Unemployed to Employed	Enhanced Employment Nature
2	Unemployed to Unemployed	No Change
3	Employed to Employed	Maintained Employment Nature
4	Employed to Unemployed	Narrowed Employment Nature

633 out of total 1423 beneficiaries, which was 44.5% maintained their nature of employment. These beneficiaries were employed before the project and they were employed at the time of the survey too.

a) Unemployed to Employed: The women scientist beneficiaries were unemployed before the project but they were employed at the time of the survey. There was a change noted in their nature of employment which suggested enhanced nature of their employment and professional progress in their career. While analyzing these beneficiaries, it was found that **across the nation, 18.5% of beneficiaries could enhance their nature of employment.** The highest proportion of beneficiaries was from the **North Zone (20.2%) who enhanced their nature of employment.**

While focusing on the highest proportion of women scientist beneficiaries one could note that in the East zone 68.6% of WOS-A enhanced their nature of employment. In North Zone 75.6%, in the North-East zone it was 92.3%, in the South East zone 92.1%, in the South West Zone 77.4% and in the West Zone 81.6% of women scientist beneficiaries (all belong to the WOS-A scheme) were employed at the time of survey who were not having any jobs in hand before taking up the project. **This was one of the achievements of these schemes that it could employ the ones who were not employed before the project.**

b) Unemployed to Unemployed: These were the women scientist beneficiaries who were unemployed before the project and did not get employment after the project, until during the time of the survey. They did not show any change in their nature of employment. Overall, 18.3% of women scientist beneficiaries did not have any change in their nature of employment. In this category, the **highest proportion of women scientist beneficiaries was from the East zone (27.9%) and lowest from the West Zone (14.5%); however, in the West Zone, the highest were from WOS-A (88.9%) who did not show any change in their nature of employment.**

c) Employed to Employed: This category included the women scientist beneficiaries who did not have any change in employment. This meant that those were employed before the project and they were employed at the time of survey too. Taking a look at the data from the table, scheme-wise one could observe that there were a majority of the women scientist beneficiaries who maintained their nature of employment belonged

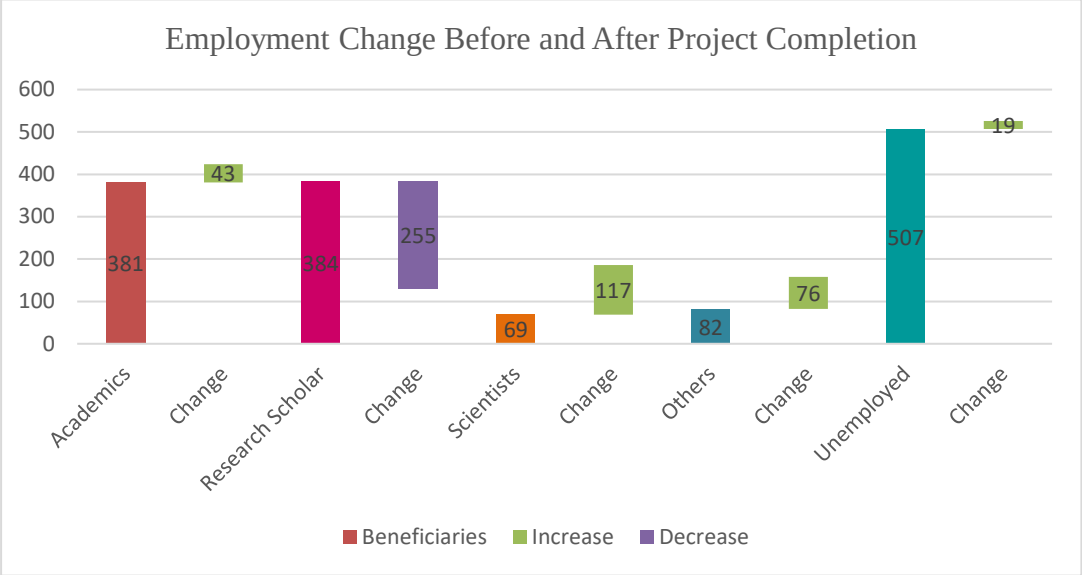
to WOS-A scheme in all six zones because the women beneficiaries formed the majority in the total sample as well. Although considering the proportion of the beneficiaries from the total WOS-A zone-wise, it was analyzed that the highest proportion of beneficiaries from South West (55.2%) were continued as the employed. **44.5% of the women beneficiaries across the nation did not have any change in their nature of employment.** This was the highest proportion observed amongst all the four categories on the status of the employment. **This inferred the strength of the schemes that it aided most of the women scientist beneficiaries to maintain their employment nature.** Here, the purpose of the scheme to bridge the gap in the career of women scientist beneficiaries was found to serve to a great extent.

d) Employed to Unemployed: There were 18.6% women scientist beneficiaries who did not have the employment after the project completion. They were employed before the project but did not have employment at the time of the survey. There were 67.9% of the women beneficiaries from the total WOS-A schemes who did not have employment at the time of survey but they were employed before taking up the project.

4.8.2 Chi-Square Test Analysis

To find out if a significant difference existed in the nature of employment between the zones a Chi-Square test was carried out and p-values were observed (Table 29). According to p–values (p–values less than 0.05 i.e. level of significance) the nature of employment varied in the North Zone (0.000), South East Zone (0.043) and West (0.001) zone. This suggested that in the North Zone, the women scientist beneficiaries belonging to the category 'Employed to Employed' were significantly higher than other categories. Hence, it can be said that **in all these three zones (North, South East and West Zone), the schemes were effective to the extent that it helped the women scientist beneficiaries to maintain their nature of employment.**

4.8.3 Status of Employment



Employment Change		Employment Status Before availing of the Project					
		Academics	Research Scholar	Scientist	Others	Unemployed	Grand Total
Employment Status after Completion of the Project	Academics	207	87	6	7	117	424
	Research Scholar	26	60	4	7	32	129
	Scientist	27	68	35	8	48	186
	Others	35	35	10	24	54	158
	Unemployed	86	134	14	36	256	526
	Grand Total	381	384	69	82	507	1423

Graph 21: Change in Employment Status Before and After Project Completion

Graph 21 illustrated the change in employment before and after the project completion by the respondent women scientist beneficiaries. Overall, 64% of those got employment after availing of the project. Women scientist beneficiaries employed as a scientist increased to 8.2%. The number increased from 69 to 186 women scientist beneficiaries. The number of those working in academics grew by 3% from 381 to 424. As a result of the completion of the project, the women beneficiaries got the better opportunity from Research Assistant's job to a Research Scholar and other opportunities such as jobs in different categories like Project Assistant, Consultant, Analyst, Technical Assistant, Manager, etc.

Table 30 : Zone -Wise Employment Scenario of 'Before' and 'After' of Responded Women Scientist

Employment Status	Change in Employ	Zone					
		East	North	North-East	South East	South West	West

	ment Status						
Academics	Before	19.1%	22.2%	10.4%	43.6%	23.1%	26.7%
	After	29.5%	27.4%	14.3%	40.1%	27.1%	27.9%
	Increase/ Decrease	10.4%	5.2%	3.9%	-3.5%	4.0%	1.2%
Research Scholar	Before	16.9%	30.4%	37.7%	20.5%	34.2%	27.9%
	After	6.0%	11.1%	7.8%	8.0%	11.6%	7.7%
	Increase/ Decrease	-10.9%	-19.3%	-29.9%	-12.5%	22.6%	-20.2%
Scientist	Before	3.8%	6.2%	3.9%	2.6%	7.0%	4.9%
	After	10.9%	15.8%	13.0%	7.1%	16.6%	15.0%
	Increase/ Decrease	7.1%	9.6%	9.1%	4.5%	9.5%	10.1%
Unemployed	Before	55.2%	38.0%	41.6%	27.2%	29.6%	30.8%
	After	46.4%	33.3%	55.8%	35.9%	31.2%	36.0%
	Increase/ Decrease	-8.7%	-4.7%	14.3%	8.7%	1.5%	5.3%
Others	Before	4.9%	3.2%	6.5%	6.1%	6.0%	9.7%
	After	7.1%	12.3%	9.1%	9.0%	13.6%	13.4%
	Increase/ Decrease	2.2%	9.1%	2.6%	2.9%	7.5%	3.6%

The above Table 30 presented the variations within the employment status across the six zones. East zone had the maximum increase of 10.4% of women beneficiaries working as academicians. The number had increased from 35 to 54. On the contrary, in the South East zone, there was a decrease of 3.5% as the women academicians. The highest increase of 10.1% percentage working as beneficiaries was in the West Zone. The change was from 12 to 34 women scientist beneficiaries. Northern Zone had the highest amount of those working in varied professions such as Program Officer, Abstracting and Indexing associate, Device Technologist, Technical Assistant, etc.

The employment growth details the after project completion of the beneficiary for each zone and the scheme were compared.

Table 31 : Zone-wise Employment Growth After Project Completion(%)

Zone	After project
East	20.98
North	9.31
North-east	-22.73
South East	-11.5
South West	-0.725
West	-2.46

The east zone (20.98%) recorded highest percentage of respondents who gained employment growth among all zones after their project completion.

Across the zones, except for the South West Zone there was a reduction in the women working as Research Scholars after the project completion. The North-East zone had the highest reduction of 29.9% in the Research Scholars. One of the reasons for this decrease could be that project completion provided various better job opportunities to the women beneficiaries. East and West Zones were the only two zones that revealed an increase in the employment rate by 8.7% and 4.7% whereas, the remaining zones showed a decline in the employment rate. North-East had the highest unemployment rate of 14.3% followed by South East (8.7%), West (5.3%), and South West Zone (1.5%).

Table 32 : Scheme -Wise Employment Scenario of 'Before' and 'After' of Responded Women Scientist

Employment Status	Change in Employment Status	SCHEMES			
		Bio-Care	UGC PDF	WOS-A	WOS-B
Academics	After	48.1%	26.1%	29.8%	12.9%
	Before	43.7%	31.3%	24.6%	21.6%
	Increase/Decrease	4%	-5%	5%	-9%
Research Scholar	After	1.5%	10.4%	9.4%	12.9%
	Before	25.2%	21.6%	28.4%	22.4%
	Increase/Decrease	-24%	-11%	-19%	-9%
Scientist	After	22.2%	4.5%	12.9%	13.8%
	Before	12.6%	3.0%	4.3%	2.6%
	Increase/Decrease	10%	1%	9%	11%
Unemployed	After	8.9%	6.7%	11.5%	15.5%
	Before	4.4%	6.0%	5.1%	12.9%
	Increase/Decrease	4%	1%	6%	3%
Others	After	19.3%	52.2%	36.4%	44.8%
	Before	14.1%	38.1%	37.6%	40.5%
	Increase/Decrease	5%	14%	-1%	4%

After observing the zone-wise variation in the employment status Table 32 explained the scheme-wise changes. There was a course of positive changes for women working as academicians for Bio-Care (4%) and WOS-A (5%) beneficiaries and negative change for UGC PDF (5%) and WOS-B (9%). A maximum increase of 11% was for the women beneficiaries from the WOS-B scheme. A decline of 24% was among the Bio-Care beneficiaries working as Research Scholars. From 34 beneficiaries, the number dropped

to 2 women beneficiaries working at the position of a Research Scholar. The responses received reflected the variation in the trend of nature of employment. The figures signified, after the project completion it enhanced the option of job flexibility among women beneficiaries for various professions. WOS-A had a rise of 6% of women working as Project Coordinators, Analysts, Consultants, etc. The number of respondents increased from 59 beneficiaries to 119. Surprisingly, the rate of unemployment increased across the schemes except for the WOS-A scheme. The highest (14%) unemployment rate was for the beneficiaries after UGC Post-Doctoral Fellowship, followed by 5% in BioCARe and 4% in WOS-B.

Table 33: Scheme-wise Employment Growth After Project Completion (%)

Scheme-wise	After project
BioCARe	-6.03
UGC PDF	-21.95
WOS-A	4.43
WOS-B	-5.88

WOS-A (4.43%) recorded highest percentage of respondents who gained employment among all zones after their project completion.

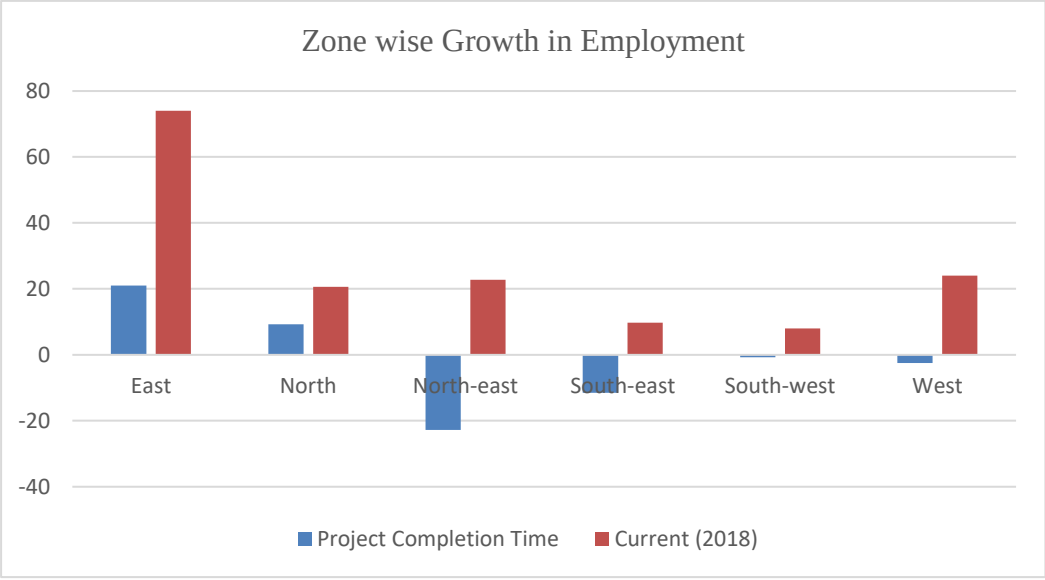
4.8.4 Current Scenario:

The employment details the time of survey (in 2018-19) were collected. **Among the schemes** in decreasing order**, as of 2018-19, about 42.64% women who have been beneficiaries under WOS-B scheme have gained highest employment growth** with change in number and change percent of positions as academicians 25 to 29 (16%), research scholars 26 down to 21 (-19.23%), scientists 3 to 37 (1133.33%) and others 15 to 10 (-33.33%) as compared to before scheme. **About 23.89% of Women who have been beneficiaries under WOS-A scheme have gained employment growth** with change in number and change percent of positions as academicians 255 to 312 (22.35%), research scholars 295 to 174 (-41.01%), scientists 45 to 239 (431.11%) and others 53 to 58 (9.43%) as compared to before scheme. **About 13.41% women who have been beneficiaries under UGC PDF scheme have gained employment growth** with change in number and change percent of positions as academicians 42 to 30 (-

28.57%), research scholars 29 to 50 (72.41%), scientists 4 to 6 (50%) and others 8 to 7 (-12.5%) as compared to before scheme. **About 1.72% Women who have been beneficiaries under BioCARe scheme have gained employment growth** with change in number and change percent of positions as academicians 59 to 66 (11.86%), research scholars 34 to 9 (-73.52%), scientists 17 to 36 (111.76%) and others 6 to 7 (16.7%) as compared to before scheme.

Table 34 : Zone-wise and Scheme-wise Employment Growth Current Scenario (%)

Zone	Current (2019-20)
East	74.07
North	20.64
North-east	22.72
South East	9.73
South West	7.97
West	24.07
Scheme-wise	Current (2019-20)
BioCARe	1.72
UGC PDF	13.41
WOS-A	23.89
WOS-B	42.64



Graph 22: : Zone-wise Employment Growth at the time of Project Completion and Current Scenario (year 2019-20) (%)

Among the zones in decreasing order**, as of 2019-20, about 74.07% women who belong to East zone have gained highest employment** growth with change in number and change percent of positions as academicians 35 to 53 (51.42%), research scholars 31 to 30 (-3.22%), scientists 7 to 46 (557.14%) and others 9 to 12 (33.3%) compared to

before scheme. **About 24.07% women who belong to West Zone have gained employment** growth with change in number and change percent of positions as academicians 66 to 79 (19.69%), research scholars 69 to 35 (-49.27%), scientists 12 to 63 (425%) and others no change in 24 (0%) as compared to before scheme. **About 22.72% women who belong to North-east zone have gained employment growth** with change in number and change percent of positions as academicians 8 to 23 (187.5%), research scholars 29 to 7 (-75.86%), scientists 3 to 20 (566.67%) and others 5 to 4 (-20%) as compared to before scheme. **About 20.64% women who belong to North Zone have gained employment** growth with change in number and change percent of positions as academicians 90 to 110 (22.22%), research scholars 123 to 74 (-39.83%), scientists 25 to 89 (256%) and others 13 to 25 (92.3%) as compared to before scheme. **About 9.73% women who belong to South East zone have gained employment** growth with change in number and change percent of positions as academicians 136 to 117 (-13.97%), research scholars 64 to 67 (4.68%), scientists 8 to 57 (612.5%) and others 19 to 7 (-63.2%) as compared to before scheme. **About 7.97% women who belong to South West Zone have gained employment** growth with change in number and change percent of positions as academicians 46 to 55 (19.56%), research scholars 68 to 41 (-39.70%), scientists 14 to 43 (207.14%) and others 12 to 10 (-16.7%) as compared to before scheme.

4.8.5 Change in Education status v/s Change in Employment status (before/After the Project scenario)

As discussed earlier, various gender mainstreaming initiatives undertaken by the Government of India led to the education and employment progression among women in science. Around 41% of the women scientist beneficiaries (590 respondents) with a Masters' degree enhanced their education grade during the project journey. This percentage dropped to 15.5% (221 respondents) after the completion of the project. Likewise, there was a reduction in women beneficiaries by 17.9% working as Research Associates before availing the project. Previously, 384 respondents who worked as Research Scholars at various organizations decreased to 129 beneficiaries. Though currently, the maximum (30.7%) proportion of women scientist beneficiaries were working in academics, there was a decline of 3% from 29.8% in women beneficiaries in the sector after completing the project. At the same time, there was an increase of 9.2% of Ph.D. holders. There were 132 women scientist beneficiaries enhanced their

education grade to Ph.D., and 240 achieved a Post Doc degree after the project. Almost 76 (5.3%) women scientist beneficiaries changed their profession to various other streams.

4.9 Skill Development

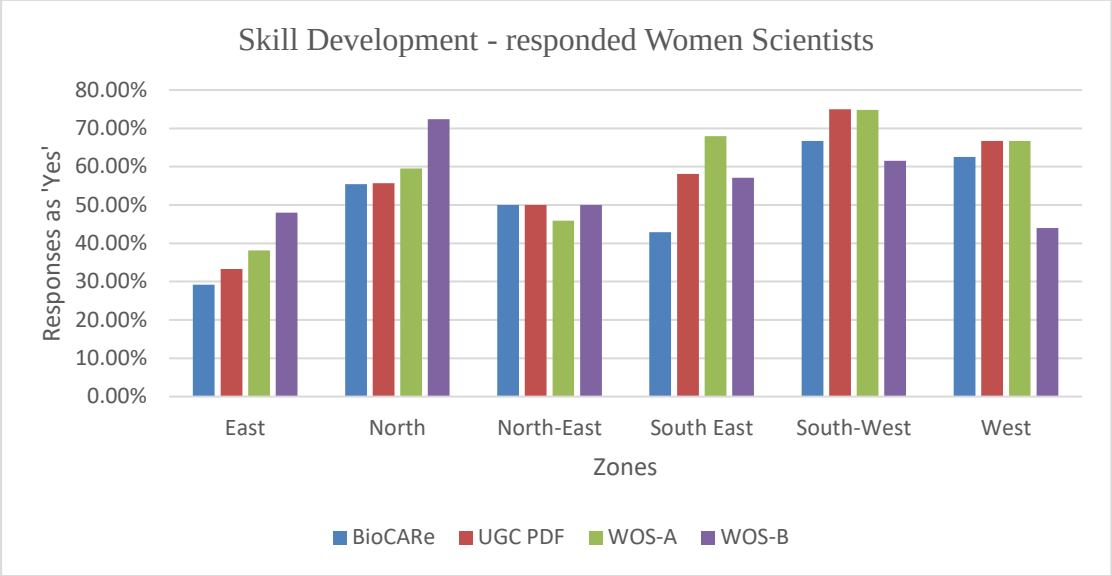
The socio-economic development of any society builds on women's enablement and self-assurance. Women need to identify themselves with self-confidence and esteem. The main aspect of empowerment is to enhance their internal strength. Women are participating in various fields, such as education, art and culture, service sector, sports, politics, media, and science and technology. They form a substantial part of the workforce, but the working percentage rate of women in the total labour force is declining. This represents a lack of employment opportunities and skills for the women workforce. There is a need to enhance the skill of the large population of women. The concept of training and skill development with more focus on literacy, numeracy, political, and life skills have improved in the current modern era. (The Impact of Skill Development on Women Empowerment, 2018).

The questionnaire consisted of binary question which is qualitative in nature with 'Yes/No' reply from beneficiary regarding whether the project under the scheme contributed to skill development (such as. From the overall responses received, 59.9% of women scientist beneficiaries had replied with a 'Yes' indicating an enhancement in their skillsets after availing the projects under gender mainstreaming programmes. The skill development among the six zones ranged between 59.3% and 73.4%. Women scientist beneficiaries from the South West Zone recorded the highest (73.4%) while the East zone recorded the minimum (37.7%) skill development.

4.9.1 'Skill development' in relation to the 'Employment After Project Completion'

Of the total, 59.9% (853 women scientist beneficiaries) developed skills, 30.8% of the those were employed as academicians after the project completion. Almost 13% were scientists, 9% of them were Research Scholars in universities, and 11.1% were at various employment scales. Around 35% of women scientist beneficiaries were

unemployed after c00ompleting the project. The majority of those had responded positively to the question of skill enhancement while undertaking the project under any schemes.



Graph 23: Zone Wise and Scheme Wise Skills Development (%)

Of the 1423 responses received, 853 (59.9%) women beneficiaries revealed the enhancement in respective skills. South West Zone represented the maximum (73.4%) and East zone the minimum percentage (37.7%) of positive responses from the women scientist beneficiaries. Across the schemes, WOS-A had the majority (62.1%) of beneficiaries. Of 1038, 645 beneficiaries felt advancement in their existing skillsets. The minority of 51% of the women scientist beneficiaries availing the benefits through the BioCARe scheme felt the skill enrichment. (Refer Graph 23)

In East (48%) and North Zone (72.4%), the WOS-B scheme had the maximum women scientist beneficiaries who felt confident about their skill enhancement. A minimum of 29.2% and 55.4% those was from BioCARe Scheme. In the North-East zone, 50% of the women scientist beneficiaries from BioCARe, UGC PDF, and WOS-B scheme had skill enhancement after the project. About 68% of WOS-A scheme from South East Zone, 75% of UGC PDF Scheme from Southwest and 66.7% from UGC PDF and WOS-A Scheme had majority women scientist beneficiaries who felt the growth in their skillsets after the project completion.

Analytical Findings on Skill Development

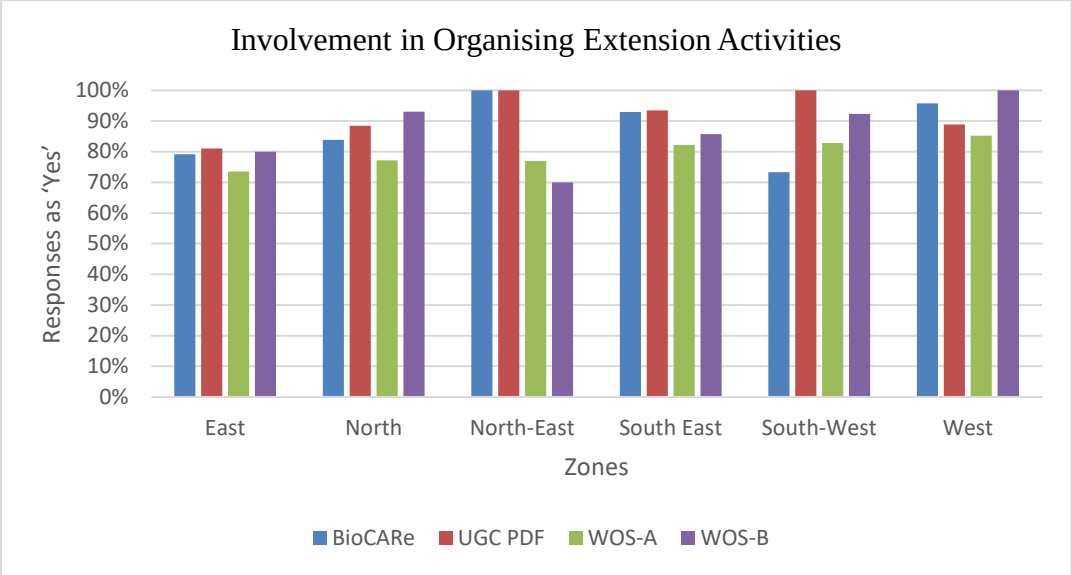
Table 35: Chi-Square Test for SWOT

	Chi-Square Tests (Strength)			Chi-Square Tests (Opportunity)		
	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.000[a]	25	0.224	30.000[a]	25	0.224
Likelihood Ratio	21.501	25	0.664	21.501	25	0.664
N of Valid Cases	6			6		
	Chi-Square Tests (Threat)			**Chi-Square Tests (Weakness)**		
	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.000[a]	20	0.242	30.000[a]	25	0.224
Likelihood Ratio	18.729	20	0.54	21.501	25	0.664
N of Valid Cases	6			6		

Skill development among the beneficiaries was analyze SWOT in terms of the difference between the zones. The Chi-Square test results did not show significant p-values for any zones for showing the difference. **Hence it was concluded that there existed a no significant difference in the development of skills among the women scientist beneficiaries of different zones.**

4.10 Involvement Organising Extension Activities

As revealed from the Graph 24 of the total 1423, 1172 (82.4%) women scientist beneficiaries participated in extension activities. Across the zones, the West Zone had the maximum beneficiaries (87.9%) and the East zone had minimum (76%) beneficiaries. South East, Southwest, North, and North-East zone had 84%, 83.4%, 81%, and 77.9% women scientist beneficiaries. About 89% of those were from the UGC PDF scheme and the lowest participation in activities (80.3%) were from the WOS-A scheme.



Graph 24 : Involvement in Organising Extension Activities (Zone-wise and Scheme-wise)

In the East zone, of 183 respondents of total women scientist beneficiaries, 139 women participated in the organizing level of the activities. The highest 81% was from the UGC PDF scheme, and the lowest participation of 73.5% was from WOS-A. In the North Zone, 405 beneficiaries responded to the questionnaires. Of which 328 women responded to their involvement in extracurricular activities. The maximum participation was 93% from WOS-B, and the minimum (77.2%) was from the WOS-A scheme. North East Zone received responses from 77 women scientist beneficiaries that accounts for 5.4% of the total responses. Sixty women contributed to organizing extension activities. BioCARe and UGC PDF had 100% involvement of the women beneficiaries. South East zone contributes to 21.9% of the total respondents. 93.5% association was from UGC PDF beneficiaries, whereas 82.2% women were associated with WOS-A schemes. UGC PDF and WOS-B scheme of Southwest and West Zone had 100% women scientist beneficiaries' participation in organizing extension activities.

4.10.1 Skill development v/s involvement organising extension activities – Chi Square

From the responses received, 82.4% of the women scientist beneficiaries (1172 respondents) stated their involvement in organizing extension activities. Out of which 63.6% believed that they had improved skills due to the aforementioned participation.

Table 36: Relation between Skill Development and involvement in Extension Activities

Zone		Value	df	Asymp. Sig. (2-sided)
East	Pearson Chi-Square	1.035	3	.793
	Likelihood Ratio	1.055	3	.788
	N of Valid Cases	183		
North	Pearson Chi-Square	7.717	3	.052
	Likelihood Ratio	8.621	3	.035
	N of Valid Cases	405		
North-East	Pearson Chi-Square	2.092	3	.554
	Likelihood Ratio	3.359	3	.340
	N of Valid Cases	77		
South East	Pearson Chi-Square	3.547	3	.315
	Likelihood Ratio	4.220	3	.239
	N of Valid Cases	312		
South West	Pearson Chi-Square	3.478	3	.324
	Likelihood Ratio	4.803	3	.187
	N of Valid Cases	199		
West	Pearson Chi-Square	6.159	3	.104
	Likelihood Ratio	9.533	3	.023
	N of Valid Cases	247		
Total	Pearson Chi-Square	11.713	3	.008
	Likelihood Ratio	12.716	3	.005
	N of Valid Cases	1423		

To study the differences in the involvement of the women scientist beneficiaries in extension activities in the six zones, Chi-Square test was applied. The results (Refer Table 36) depict that there was no significant difference in the involvement in extension activities. **This implied that the beneficiaries in different zones did not much difference in the involvement of extension activities. Hence, location and the zonal characteristics did not influence the women scientist beneficiaries' participation in the extension activities, these were neutral to the candidates.** Although when analysed the involvement in extension activities amongst the total beneficiaries responded, the Chi-Square test results suggested a significant difference (p-value = 0.00

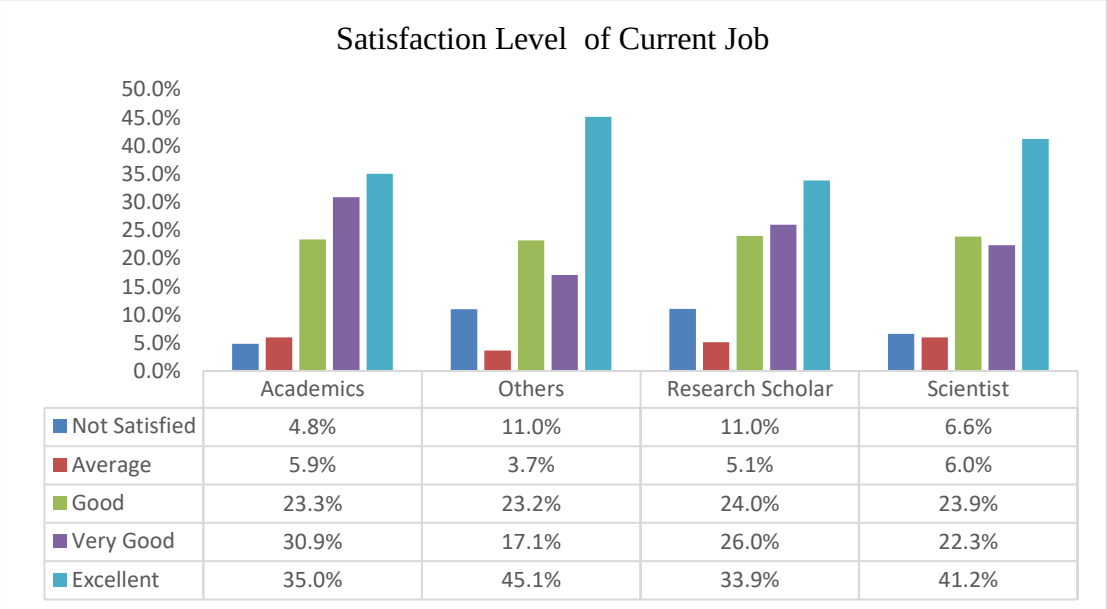
< 0.05 i.e. level of significance**). This indicated that 'Zone' was not the differentiating factor**.

4.10.2 Satisfaction of the Current Job

Job satisfaction is an important variable in research while evaluating the level and success related to career development and on advancement achieved. Most scales that were used to measure career satisfaction have one or more items dealing with the progress of women scientist beneficiaries over time in key areas such as income and job position and the development in knowledge, skills, and abilities. In most areas of satisfaction, the assessment of job satisfaction usually involves consideration of current versus desired or expected level of experience. In present analysis for assessing the career progression, a scale adopted was 5 to 1 (Excellent=5, Very Good=4, Good=3, Average=2, Not Satisfied=1).

4.10.3 Satisfaction of the Job v/s Current Position

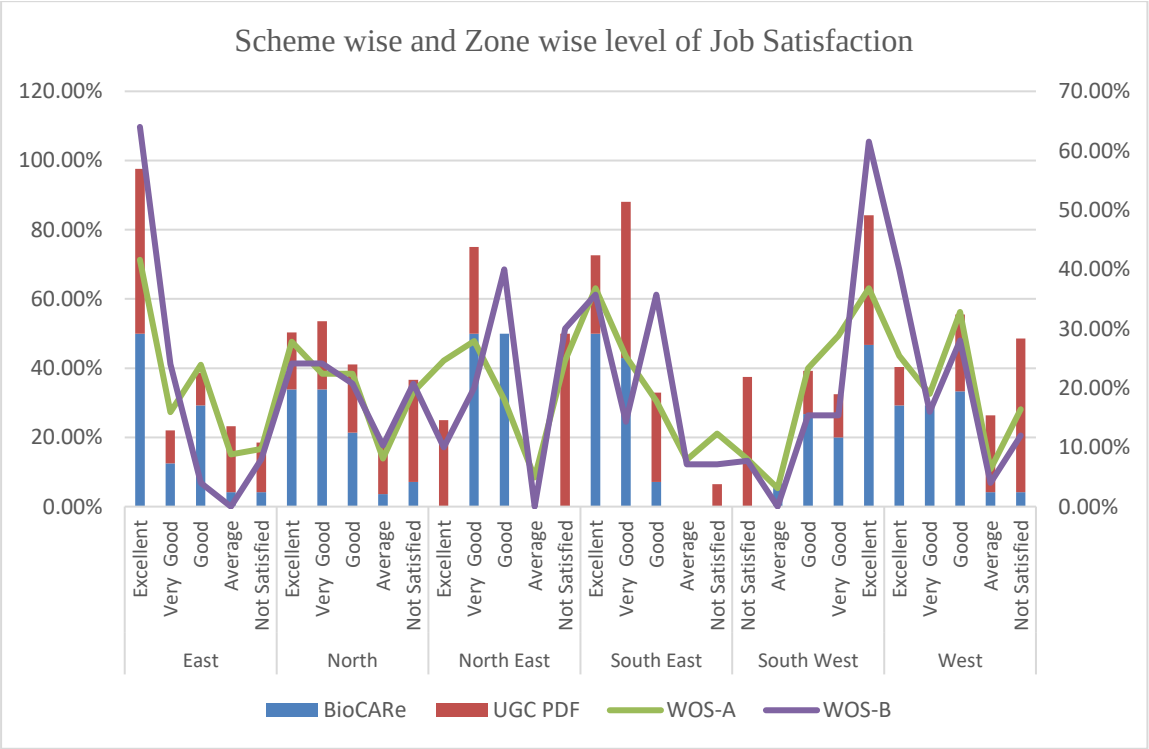
Of the total respondents, 56% of the women scientist beneficiaries had Excellent or Very Good experience from their current job. 22.8% felt good working in their present organization, whereas 21.1% of women were average or not satisfied with their current job profile.



	Academics	Others	Research Scholar	Scientist
Not Satisfied	4.8%	11.0%	11.0%	6.6%
Average	5.9%	3.7%	5.1%	6.0%
Good	23.3%	23.2%	24.0%	23.9%
Very Good	30.9%	17.1%	26.0%	22.3%
Excellent	35.0%	45.1%	33.9%	41.2%

Graph 25: Satisfaction Level of Current job as responded by women Scientist

Of the 437 respondents working as academicians, 35% (153 women beneficiaries) felt an excellent satisfaction with their present job. About 30% beneficiaries expressed 'Very Good' satisfaction, 23.3% 'Good', 5.9% 'Average', and 4.8% were 'Not Satisfied'. Of 318 women scientist beneficiaries, 63.5% had excellent and Very Good working experience, 23.9 considered a good level of satisfaction, whereas only, 12.6% women felt average and not satisfied with the work environment. 45.1% of women from various employment scales and 33.9% working as Research Scholar had excellent work environment.



Graph 26 : Scheme wise and Zone wise level of Job Satisfaction

Of 1423 respondents, 466 women scientist (32.7%) beneficiaries had 'Excellent'; 322 beneficiaries (23.3%) 'Very Good'; 324 beneficiaries (22.8%) 'Good'; 96 beneficiaries (6.7%) 'Average' and 205 beneficiaries 'Not Satisfied' with their current job. The majority of the women, 40.5% in WOS-B, 38.5% in BioCARe, 32.3% in WOS-A, and 23.9% UGC PDF scheme felt excellent satisfaction in the job. Across the schemes, a maximum of 23.9% of women from the UGC PDF scheme was not satisfied with their job. Across the zones, the majority of beneficiaries felt 'Excellent' satisfaction from the East zone. The 'Not Satisfaction' from the current job was highest (26%) in the North-East zone.

The Majority of women scientist beneficiaries in the East zone, 46.4% of the women and 64% women from the WOS-B scheme felt 'Excellent' satisfaction level from their job. The 'Not Satisfaction' level among the schemes was highest in the UGC PDF scheme. In the North Zone, the BioCARe scheme had the maximum (33.9%) number of women with 'Excellent' job satisfaction whereas, the UGC PDF had the majority of women feeling 'Not Satisfied' with the current job. In the Northeast zone, no women beneficiaries under the BioCARe scheme felt 'Not Satisfied' or 'Average' job satisfaction level. Almost all the respondents felt 'Very Good' and 'Good' in their current job. About 50% of the UGC PDF respondents were 'Not Satisfied' in their current job. In the southeast and South West Zone, 'no' beneficiaries under the BioCARe scheme felt 'Not Satisfied' with their job. About 50% and 46.7% of women felt 'Excellent' satisfaction level in their job. The Majority (12.3%) of women scientist beneficiaries from WOS-A in the southeast zone felt 'Not Satisfied'. The Southwest and West Zone maximum of 37.5% and 44.4% of women scientist beneficiaries from the UGC PDF scheme were 'Not Satisfied'. About 40% of the WOS-B scheme from the West Zone had an 'Excellent' satisfaction level.

4.10.4 Level of Satisfaction with Current Employment – Chi Square Test Analysis

Table 37 : ANOVA (Analysis of Variance) for Level of Satisfaction with Current Employment (Zonal Level)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	86.517	5	17.303	9.352	.000
Within Groups	2621.713	1417	1.850		
Total	2708.230	1422			

To study the difference that existed among the six zones related to the level of satisfaction with current employment, the Chi-Square test was applied to the data. The results suggested that the difference in the satisfaction level with the current employment was not significantly different in different zones. This implied that the beneficiaries in different zones had not many variations in the level of satisfaction with current employment. Although when analysed the satisfaction level amongst all the women scientist beneficiaries aggregate of six zones, the Chi-Square test results suggested a significant difference (p-value = 0.00 < 0.05 i.e. level of significance) in the satisfaction level with the current employment. **This indicated that 'Zone' was not the differentiating factor.**

Table 38 : Zone Wise Satisfaction Level of Current Employment

Zone	Satisfaction Level (1-5) with Current Employment
East	3.82
North	3.30
North-East	3.16
South East	3.71
South West	3.85
West	3.34
Total	3.53

Table 39: ANOVA (Analysis of Variance) for Satisfaction Level with Current Employment (Schemes)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	48.494	3	16.165	8.624	.000
Within Groups	2659.736	1419	1.874		
Total	2708.230	1422			

Table 40 : Scheme Wise Level of Satisfaction with Current Employment (Schemes)

Schemes	Satisfaction Level (1-5) with Current Employment
BioCARe	3.93
UGC PDF	3.11
WOS-A	3.52
WOS-B	3.69
Total	3.53

Women scientist beneficiaries' satisfaction with current employment was analysed with reference to different variables to get in-depth insight. To know if there was a difference in the level of satisfaction among the beneficiaries having different employment status, Pearson's Product Moment Correlation One-way ANOVA was performed.

Table 41 : Corelation between Age and Satisfaction with Current Employment

		Satisfaction Level with current job	Age
Satisfaction Level with Current job	Pearson Correlation	1	-.027
	Sig. (2-tailed)		.300
	N	1423	1423
Age	Pearson Correlation	-.027	1
	Sig. (2-tailed)	.300	
	N	1423	1423

Pearson's Product Moment Correlation was calculated to know if there was any relationship existed between the age of the women scientist beneficiaries and the level of their satisfaction with their current job. The 'r' value (-0.027) which was less than 0.6, suggested there was no relationship existed. However, it was noteworthy here that 'r' value showed a negative sign. This implied that if the relationship existed, it would have been inverse relation, for example, as the age would increase the level of satisfaction with the current job would decrease.

4.10.5 Current Employment Status and Satisfaction with Current Employment

The result of ANOVA suggested that there existed a difference in the level of satisfaction among the beneficiaries having different employment status ($p = 0.00 < 0.05$, Table 42).

Table 42 : ANOVA (Analysis of Variance) on Current Employment Status and Satisfaction Level with Current Employment

Current Employment Status	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	315.732	4	78.933	35.422	.000
Within Groups	3159.793	1418	2.228		
Total	3475.525	1422			

Table 43: Average of Satisfaction level with reference to Current Employment Status

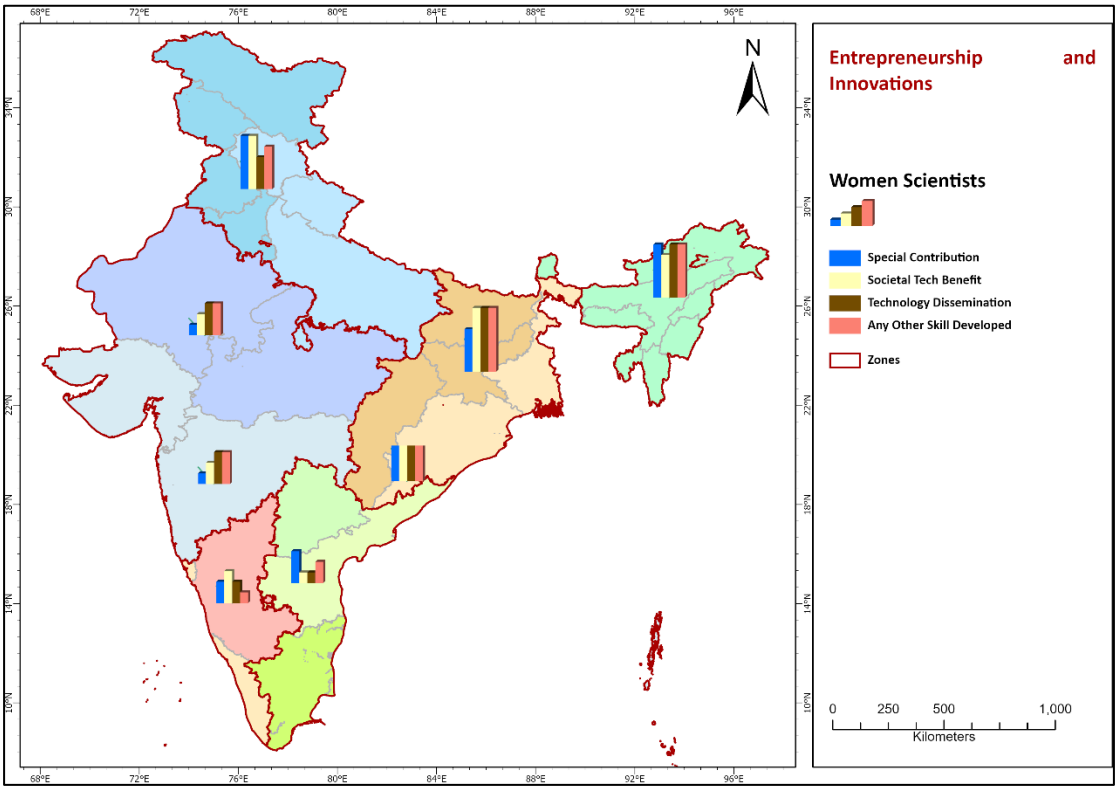
Current Employment Status	Satisfaction Level (1-5) with Current Employment
Academics	3.85
Others	3.82
Research Scholar	3.67
Scientist	3.86
Unemployed	2.63
Total	3.53

The level of satisfaction was measured on a 5 points scale which had the range as 1 = Not satisfied, 2 = Average, 3 = Good, 4 = Very Good and 5 = Excellent. It was interesting to note here that the average level of satisfaction was found maximum among Scientists (3.86) and Academicians (3.85). These averages of satisfaction

indicated more than 'Good' level of satisfaction. The average level of satisfaction was found relatively lesser among the Research Scholars (3.67).

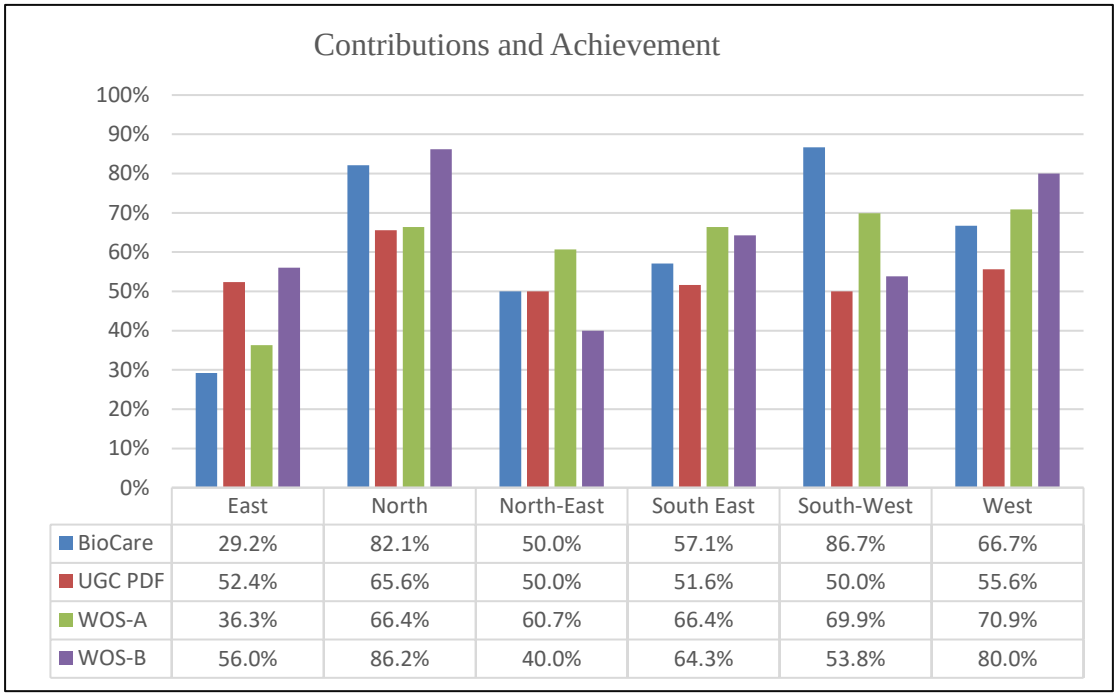
4.11 Entrepreneurship and Innovation Activities

Of the 247 respondents, 175 women scientist beneficiaries responded positively to the contribution towards achieving special achievement. The lowest percentage of 39.9% was for the East Zone. In the South West and North Zone, 69% had special contribution in achievement. South East had 64.4%, and 57.1% women in North East that considered to be involved in contributing in achievements. Refer Map 4 below.



Map 4: Entrepreneurship and Innovations

4.11.1 Special Contribution and Achievements



	East	North	North-East	South East	South-West	West
BioCare	29.2%	82.1%	50.0%	57.1%	86.7%	66.7%
UGC PDF	52.4%	65.6%	50.0%	51.6%	50.0%	55.6%
WOS-A	36.3%	66.4%	60.7%	66.4%	69.9%	70.9%
WOS-B	56.0%	86.2%	40.0%	64.3%	53.8%	80.0%

Graph 27 : Zone wise and Scheme wise Achievement Special Contribution

About **64.23% beneficiaries** out of total responded positively to the **special contributions/achievements** by them as result of their research. **West Zone had the highest (70.85%) and North Zone had the lowest (58.20%) beneficiaries** who claimed special contributions/achievements. **Across the schemes, WOS-B had the highest (68.1%) and UGC PDF had the lowest (58.20%) beneficiaries** who claimed the special contributions/achievements.

4.11.2 Societal Technology Benefits

The term 'Societal technology benefits' mean the social impact that the work can potentially have through scientific and technological interventions. Science generates solutions for everyday life and helps us to answer the great mysteries of the universe. In other words, science is one of the most important channels of knowledge. It has a specific role, as well as a variety of functions for the benefit of our society: creating new knowledge, improving education, and increasing the quality of our lives. Of the total 1423 respondents, 664 women scientist beneficiaries (46.7%) registered a positive response for societal benefits from the schemes. Across the Schemes, WOS-B had the highest (75.9%) number of women respondents that availed the projects providing technology contribution for the society. The scheme with a minimum of 35.6%

percentage of respondent women was from BioCARe. WOS-A and UGC PDF had 41% and 45.6% of responded beneficiaries. Within the zones, the West had the majority (53.8%) of women, and the East had the minimum (27.9%) beneficiaries Southeast 52.2%, Southwest 48.2%, North with 47.4%, and Northeast had 37.7% women responded with societal benefits.

Table 44 : Contribution to Societal Technology Benefits (Zones and Schemes)

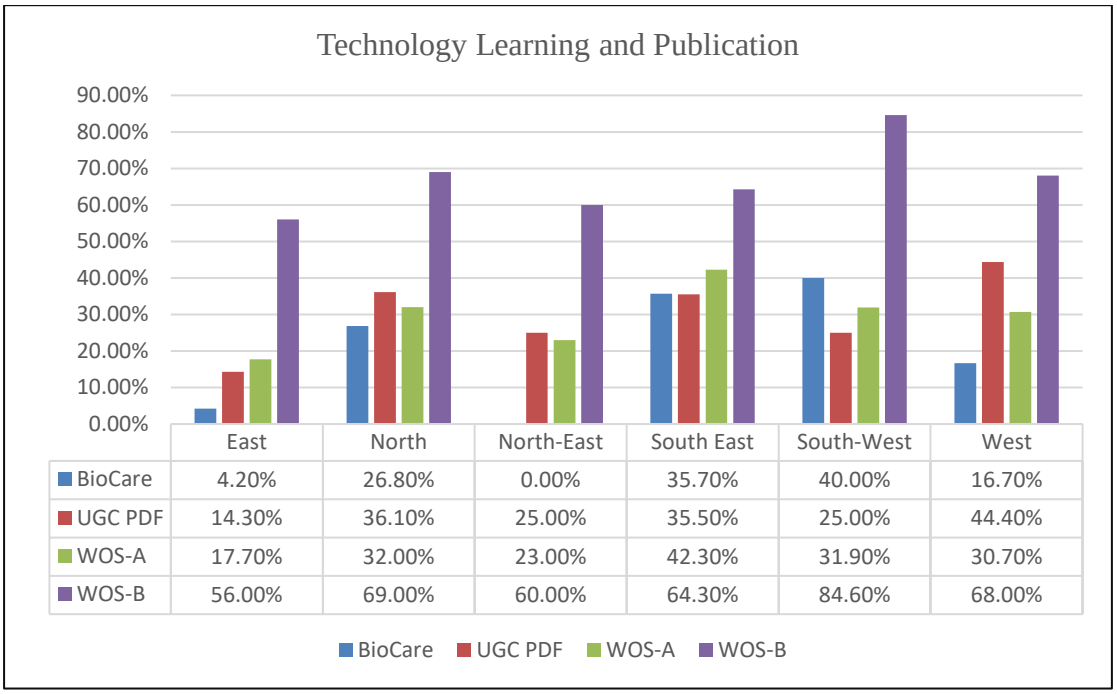
Scheme			Zone						Total
			East	North	North-East	South East	South West	West	
BioCARe	No	Count	23	30	2	8	8	16	87
		% within Zone	95.80 %	53.60%	100.00%	57.10 %	53.30 %	66.70 %	64.40 %
	Yes	Count	1	26	0	6	7	8	48
		% within Zone	4.20%	46.40%	0.00%	42.90 %	46.70 %	33.30 %	35.60 %
UGC PDF	No	Count	14	34	3	19	4	5	79
		% within Zone	66.70 %	55.70%	75.00%	61.30 %	50.00 %	55.60 %	59.00 %
	Yes	Count	7	27	1	12	4	4	55
		% within Zone	33.30 %	44.30%	25.00%	38.70 %	50.00 %	44.40 %	41.00 %
WOS-A	No	Count	85	143	39	119	88	91	565
		% within Zone	75.20 %	55.20%	63.90%	47.00 %	54.00 %	48.10 %	54.40 %
	Yes	Count	28	116	22	134	75	98	473
		% within Zone	24.80 %	44.80%	36.10%	53.00 %	46.00 %	51.90 %	45.60 %
WOS-B	No	Count	10	6	4	3	3	2	28
		% within Zone	40.00 %	20.70%	40.00%	21.40 %	23.10 %	8.00%	24.10 %
	Yes	Count	15	23	6	11	10	23	88
		% within Zone	60.00 %	79.30%	60.00%	78.60 %	76.90 %	92.00 %	Total
Total	No	Count	132	213	48	149	103	114	759
		% within Zone	72.10 %	52.60%	62.30%	47.80 %	51.80 %	46.20 %	53.30 %
	Yes	Count	51	192	29	163	96	133	664
		% within Zone	27.90 %	47.40%	37.70%	52.20 %	48.20 %	53.80 %	46.70 %

Science is one of the most important channels of knowledge. It has a specific role, as well as a variety of functions for the benefit of our society: creating new knowledge, improving education, and increasing the quality of our lives. About **46.7% beneficiaries** out of total responded positively to the research that led to **societal technology benefits** as result of their research. **South East zone had the highest (75.86%) and East zone had the lowest (35.55%) beneficiaries** who claimed contributing to society through technology research. **Across the schemes, WOS-B had the highest (75.86%) and BioCARe had the lowest (35.55%) beneficiaries** who claimed contributing to society through technology research.

4.11.3 Technology Dissemination

The responsibility of allowing 'spread of scientific knowledge and research information' lies with the science educators at all levels, with women scientist beneficiaries, and print and electronic media. It is necessary to find new and innovative ways of mass communication to disseminate scientific information to the public. Usually, the dissemination of scientific information is done through research papers published in scientific journals.

About **34% beneficiaries** out of total responded positively to the research that led to **technology dissemination** of science and technology. **South East zone had the highest (42.3%) and East zone had the lowest (20.76%) beneficiaries** who claimed contributing to the technology dissemination. **Across the schemes, WOS-B had the highest (66.4%) and BioCARe had the lowest (22.96%) beneficiaries** who claimed contributing to the technology dissemination. In BioCARe Scheme, the SouthWest Zone had the highest (40%) beneficiaries responding positively for societal technology dissemination. **It was noted that the northeast had no beneficiaries with such researches.** North, Southeast, and West had 26.8%, 16.7%, and 35.7% of the women scientist respondents. The minimum with 4.2% women scientist beneficiaries was from East Zone.



	East	North	North-East	South East	South-West	West
BioCare	4.20%	26.80%	0.00%	35.70%	40.00%	16.70%
UGC PDF	14.30%	36.10%	25.00%	35.50%	25.00%	44.40%
WOS-A	17.70%	32.00%	23.00%	42.30%	31.90%	30.70%
WOS-B	56.00%	69.00%	60.00%	64.30%	84.60%	68.00%

Graph 28 : Technology Learning and Publications Across the Zones and Schemes

In UGC PDF Scheme, the West Zone had the highest (44.4%), and the East zone had the minimum (14.3%) women scientist beneficiaries responded positively for societal technology dissemination through their research. Northeast and SouthWest Zone had 25% of respondents. North and Southeast had 36.1% and 35.1% of the women contributing to the dissemination. WOS-A scheme, with the highest number of respondents, had a northeast zone with 42.3% of beneficiaries responding positively for the technology dissemination through their research. The minimum (17.7%) beneficiaries were recorded in the east zone. North, Northeast, South, and West Zone had 32%, 23%, 31.9%, and 30.7% women beneficiaries who responded positively. In the WOS-B scheme, where the highest number of respondents were for technology dissemination, the South West Zone recorded the maximum number of women scientist beneficiaries. The minimum (56%) beneficiaries were recorded in the east zone. Other zones were in the range of 60% to 68% women with such contributions.

4.11.4 Skills Developed

About **59% beneficiaries**, out of total responded positively to **skill development** as a result of project under scheme. **South West Zone had the highest (73.36%) and East zone had the lowest (37.70%) beneficiaries who claimed skill development**. **Across the schemes, WOS-A had the highest (62.13%) and BioCARe had the lowest (51.85%) beneficiaries who claimed skill development.**

4.11.5 Overall comments on Entrepreneurship and Innovation Activities

Table 45: Entrepreneurship and Innovation Activities Across the Zones and Schemes

Entrepreneurship and Innovation Activities						
zones	Special Contribution	Societal & Tech Benefit	Technology Dissemination	Any Skill Developed	Average	Final Rank
East	67.4%	35.55%	20.76%	37.70%	40.35%	6
North	58.2%	41.04%	34.56%	59.25%	48.26%	4
North East	64.16%	45.56%	27.27%	46.75%	45.94%	5
South East	68.10%	75.86%	42.30%	65.38%	62.91%	1
South West	69.34%	48.24%	35.67%	73.36%	56.65%	2
Schemes	Special Contribution	Societal Tech Benefit	Technology Dissemination	Any Skill Developed	Average	Final Rank
BioCARe	67.4%	35.55%	22.96%	51.85%	44.44%	3
UGC PDF	58.2%	41.04%	32.08%	54.47%	46.45%	4
WOS-A	64.16 %	45.56%	32.17%	62.13%	51.01%	2
WOS-B	38.10 %	75.86%	66.37%	56.03%	59.09%	1

Overall, the decreasing order of best ranking of zones averaging the four parameters of entrepreneurship and innovation activities from what is claimed by respondents is as follows: South East, South West, West, North, North east, East. Similarly, the decreasing order of best ranking of schemes averaging the four parameters of entrepreneurship and innovation activities from what is claimed by respondents is as follows: WOS-B, WOS-A, BioCARe and UGC PDF. (*Note: this ranking is based solely on the responses from beneficiaries related to their contribution in entrepreneurship and innovation activities. Any unrealistic responses from beneficiaries may lead to biased results.)*

5 SWOT ANALYSIS

SWOT Analysis helps in decision making and is a popular tool for evaluation of the strategic position of an organization, enterprises, local and national governments, programmes and policies to implement. SWOT Analysis for the gender mainstreaming programme of the Government of India was intended to identify beneficiaries as well as programme related factors that were favourable and unfavourable to the success of the programme. The SWOT analysis would not only promote or inhibit the successful implementation of necessary strategic changes but would also help assess the use and distribution of available resources.

5.1 Levels of Achievements and Satisfaction

To carry out SWOT analysis for the present study, two variables were considered: i) Achievements of beneficiaries and ii) Satisfaction (of beneficiaries) with the programme. To quantify the achievement of beneficiaries, scores of the following variables from the questionnaire were selected:

Table 46 : Variable adopted for Identification of Level of Achievement.

No	Questions/Variables	No	Questions/Variables
1	Awards/Honours received	2	No. of publications
3	No. of International Seminars Attended	4	Papers Presented in International Seminars
5	No. of National Seminars Attended	6	Papers Presented in National Seminars
7	No. of International Workshops attended	8	Papers Presented in International Workshops
9	No. of National Workshops Attended	10	Papers presented in National Workshops
11	H index	All are continuous Data	Score: Yes = 1 No = 2

The range of the sum of scores for the Achievement of Beneficiaries varied between 0-79, with mean score of 14.51 and Std. Dev. of 14.46. Further, to construct the categories of 'High Achievement' and 'Low Achievement', the score was divided into two categories. As the data was skewed and mean was leaning towards higher values, median was used as cut-off point to categorize the 'Achievement' scores as 'High' and 'Low'. **Thus beneficiaries scoring 'Above 11' were categorized as 'High Achievers' and those who scored '11 and Below' were categorized as 'Low Achievers' as the median was calculated as 11.**

The other variable for SWOT Analysis was 'Satisfaction with the Programme'. Following two variables from the questionnaire were summed to derive the total score:(Table 47)

Table 47 : Variable adopted for Identification of Level of Satisfaction with the Programme

No.	Question/Variable
1	Satisfaction with the Programme
2	Your Rating on Programme
Level of Satisfaction: Range from 1 to 5 1 being Not satisfied to 5 as Excellent level of satisfaction [1 = Not Satisfied; 2 = Average; 3 = Good; 4 = Very Good; 5 = Excellent]	

The total score ranged from 2-10 with the mean of 8.6 and Std. Dev. of 1.7. The data was found to be normally distributed hence; mean was used to form two categories: 'High Satisfaction' and 'Low Satisfaction'. **The beneficiaries scoring '9 and Below' were categorized as 'Low Satisfaction' and beneficiaries scoring 'Above 9' were categorized as 'High Satisfaction'.**

5.2 SWOT Matrix

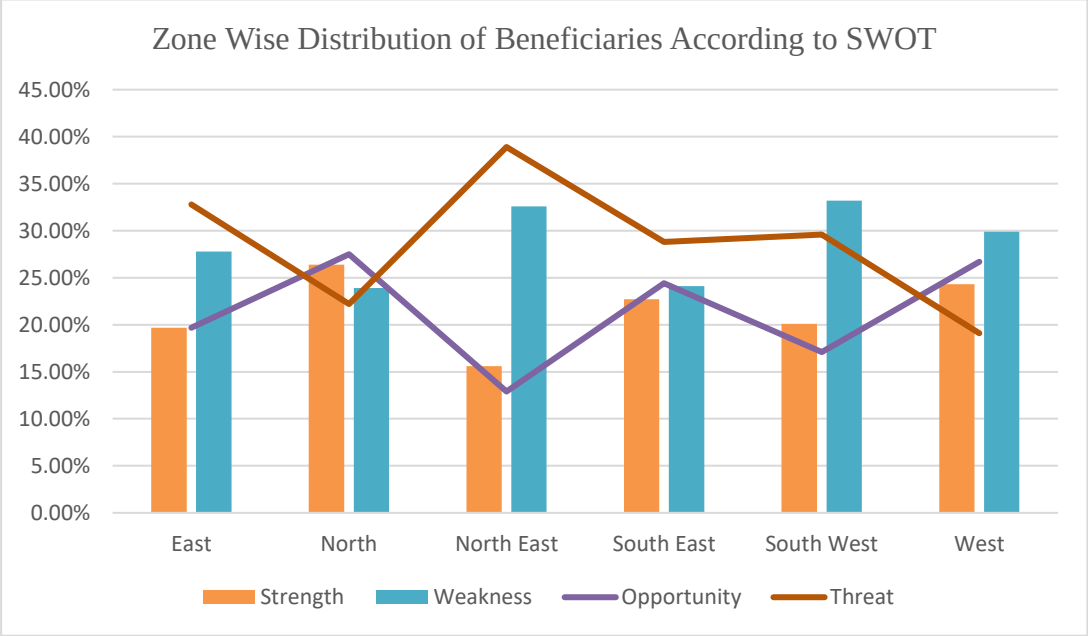
Using these two variables – 'Achievement of Beneficiaries' and 'Satisfaction with the Programme', a SWOT Matrix was developed as Below (Refer Table 48):

Table 48 : SWOT Matrix

Strength High Achievement but Low Satisfaction	***Opportunity*** High Achievement and High Satisfaction
The cases where the Satisfaction with the Programme was less but the Beneficiaries were high achievers. These types of Beneficiaries tend to attract other women to opt for.	The cases where Satisfaction with the Programme was more and also the Beneficiaries were high achievers. There lied the opportunity to expand considering similar or other such factors for existing or new projects.
Weakness Low Achievement and Low Satisfaction	***Threat*** Low Achievement but High Satisfaction
The cases where the Satisfaction with the Programme was less and also the Beneficiaries were low achievers. These were the cases where lied the weakness in the project and also some individual factors that affected the Beneficiaries' achievements.	The cases where the Satisfaction with the Programme was more but the Beneficiaries were low achievers. This was the threat region for the project as it might not attract more Beneficiaries.

According to the above mentioned description of Strength, Weakness, Opportunity and Threat cross table of 'Achievement of Beneficiaries' and 'Satisfaction with the Programme' was prepared which revealed the frequency and percentage of beneficiaries in each of the SWOT category.

Further, the detailed categorization of beneficiaries according to zones was discussed with the help of Graph 29.



Graph 29: Zone Wise Distribution of Beneficiaries According to SWOT

In East (32.8%), North East (38.9%) and South East (28.8%) zones the highest proportion of women scientist beneficiaries were in the 'Threat' category where they expressed 'High Satisfaction' with the programme but they were Low Achievers. ***Efforts must be made to encourage the women scientists to achieve higher targets from the schemes they opt for.***

In North Zone 27. 5% beneficiaries – comprising the highest proportion – formed the category of 'Opportunity'. These beneficiaries not only expressed 'High Satisfaction' with the programme but they were also high achievers. **They set an example for the rest of the beneficiaries to reach to that level**. ***The variables contributing towards this combination of 'High Achievement' and 'High Satisfaction' must be recommended for the beneficiaries of the rest of the country.*** In South West (33.2%) and West (29.9%) zones highest percentage of beneficiaries were from 'Weakness' category. **They had 'Low Achievement' and also expressed 'Low Satisfaction' with**

the programme. ***These zones call for special attention in order to improve upon not only the achievement of beneficiaries but also their satisfaction with the programme.*** In BioCARe (28.1%) and WOS-B (32.8%) it was evident that majority – consisting highest number/proportion of beneficiaries were in the 'Threat' quadrant. There were 37.3% of beneficiaries of UGC PDF who were in the 'Opportunity' quadrant. There were 28.6% of beneficiaries of WOS-A who were in the quadrant of 'Weakness'. It was noteworthy here that, similar to this, 27.3% beneficiaries were in the 'Threat' quadrant.

6 MULTI DIMENSION SCALING

Multi Dimension Scaling (MDS) plots the variable in order to condense the data by creating visual representations based on the similarities or dissimilarities of data on a spatial map. Its underlying assumption is that human beings compare objects, subjects, parameters, brands, products and so on. The map dimensions are hypothesized to be the attributes or features that the researcher uses to form certain impressions about the variable. MDS usually involves a comparison of sorts to create a relative position of the considered variable. The comparison could be made on the defined dimensions or the apparent basis of comparison. However, people usually make their own perceived dimensions to make comparisons. In the present study, the dimensions of making comparisons were defined dimensions 'Achievement of Beneficiaries' and 'Satisfaction with the Programme'.

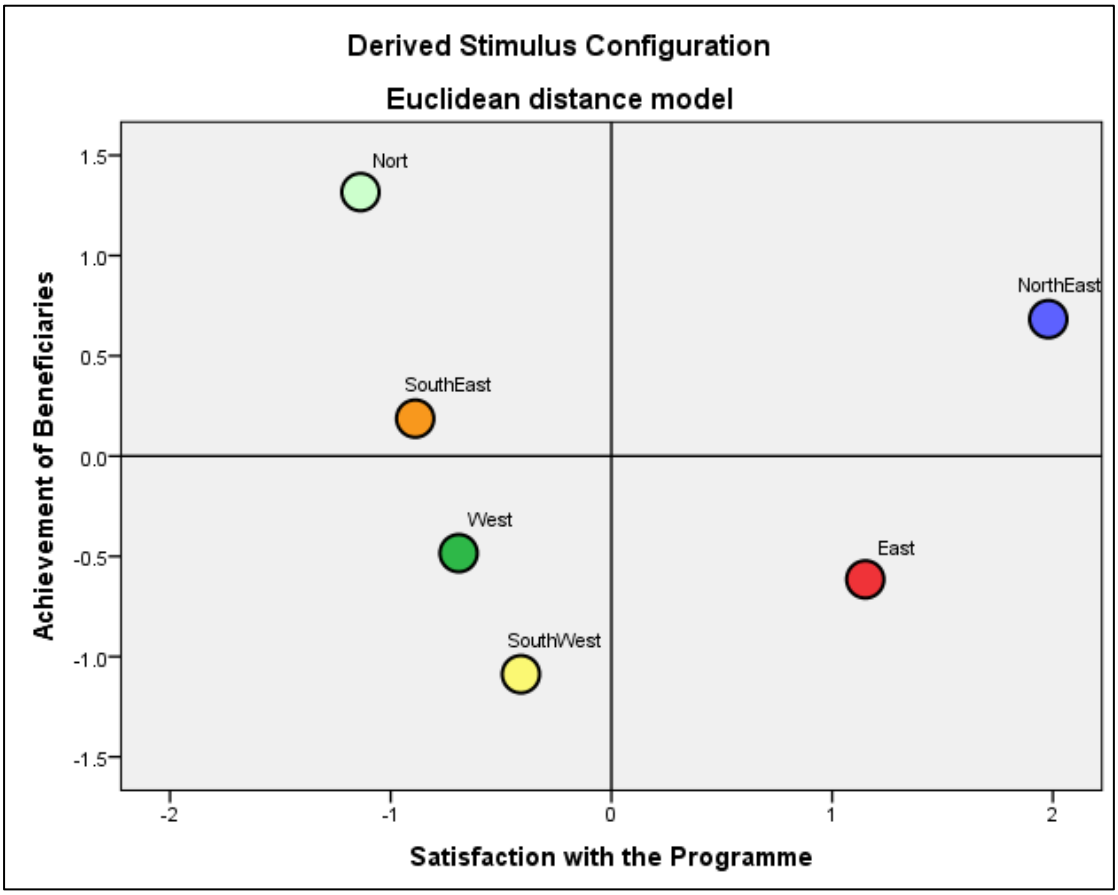
The scores were summed up and coded for MDS. Based on the evaluation of dimensionality, a spatial map with the help of SPSS was generated which was shown below (Graph 30). This map explained the distance of each zone - and there by the position – from the other zone and also from the centre i.e. the point of origin. The MDS plots distances by considering not only the majority values of a variable but also the other values. Thus, it creates an overall, cumulative presentation of the zones under consideration. It was clear through this map that North and South East Zone belonged to the 'Strength' quadrant of the map, North East belonged to the 'Opportunity' quadrant of the map, West and South West belonged to the 'Weakness' and East belonged to the 'Threat' quadrant of the map.

6.1 Zone wise Level of Achievements Analysis

The position of North and South East Zones suggested that **'High Achievement' of women scientist beneficiaries in these regions would fetch more beneficiaries.** This was the strength of these regions. Though this region, being in the range of **'Low Satisfaction' from the Programme, it needed to plan out strategies to improve satisfaction level of the women scientist beneficiaries.**

West and South West Zones were positioned in the 'Weakness' quadrant. This indicated that the beneficiaries from these zones Achieved low and were Less satisfied with

programme. These pointed out two things: **one that beneficiaries in these zones need guidance (writing and presentation skills can be targeted through workshops on 'report writing' etc.) and motivation to achieve more through publications and presentations. This in turn would lead them to bring more beneficiaries in for the programme. Secondly, there might require modification in the programme policies to ensure more satisfaction of the beneficiaries.**



Graph 30 : Multi Dimension Scaling according to SWOT for Zones

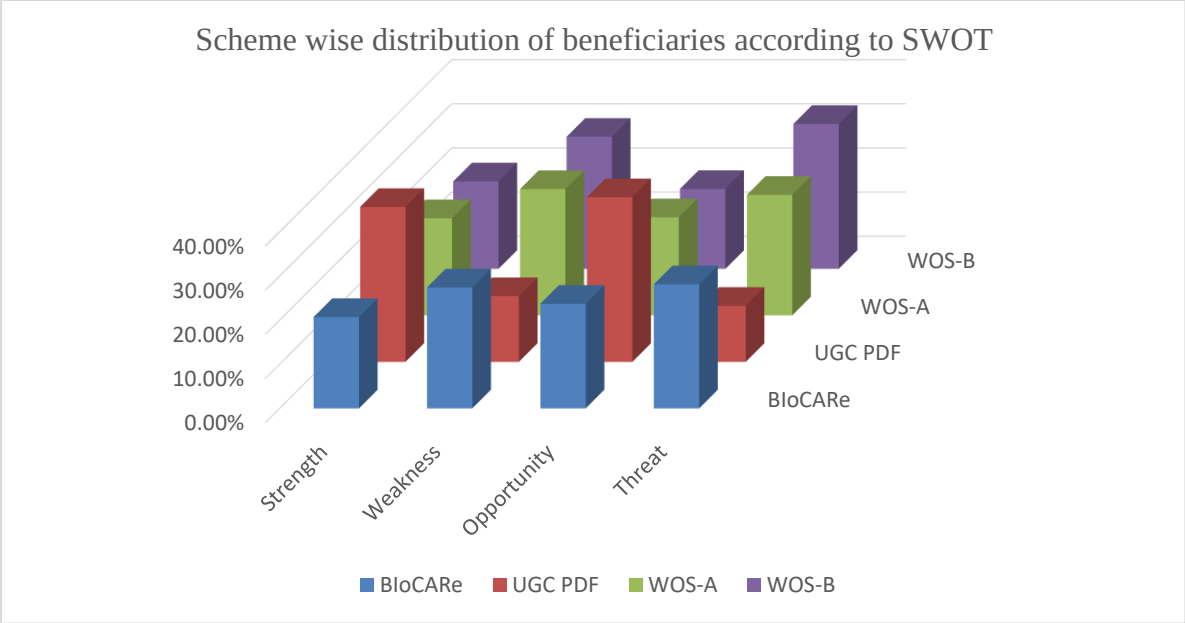
North East zone lied in the quadrant of 'Opportunity' where it was found that beneficiaries were high achievers and highly satisfied with the programme. **The achievement and satisfaction levels of this zone might help to design and float more such programmes.**

In the quadrant of 'Threat', there was East zone. Here, the Achievement of the Beneficiaries was found low but the Satisfaction with the Programme was high. This suggested that beneficiaries liked the programme even though they could not achieve

significantly. **If the achievement of these beneficiaries goes up, the zone would tend to move to the 'Opportunity' quadrant.**

6.2 Chi-Square Analysis for Significance Level

The Chi-Square test was carried out to know if a significant difference existed in the proportion of beneficiaries of different quadrants between the zones. No significant difference was found (as all the p-values were more than 0.05 i.e. the level of significance in the proportion of beneficiaries of different quadrants in all the six zones. This was one reason why Euclidean Model of distance did not show where the majority of the beneficiaries lied but it took the values it prefers to differentiate between the zone. Another reason why the model did not present the majority was that, it maps out the relative distance between the zones and the distance from the point of origin.



Graph 31 : Scheme Wise Distribution of Beneficiaries According to SWOT

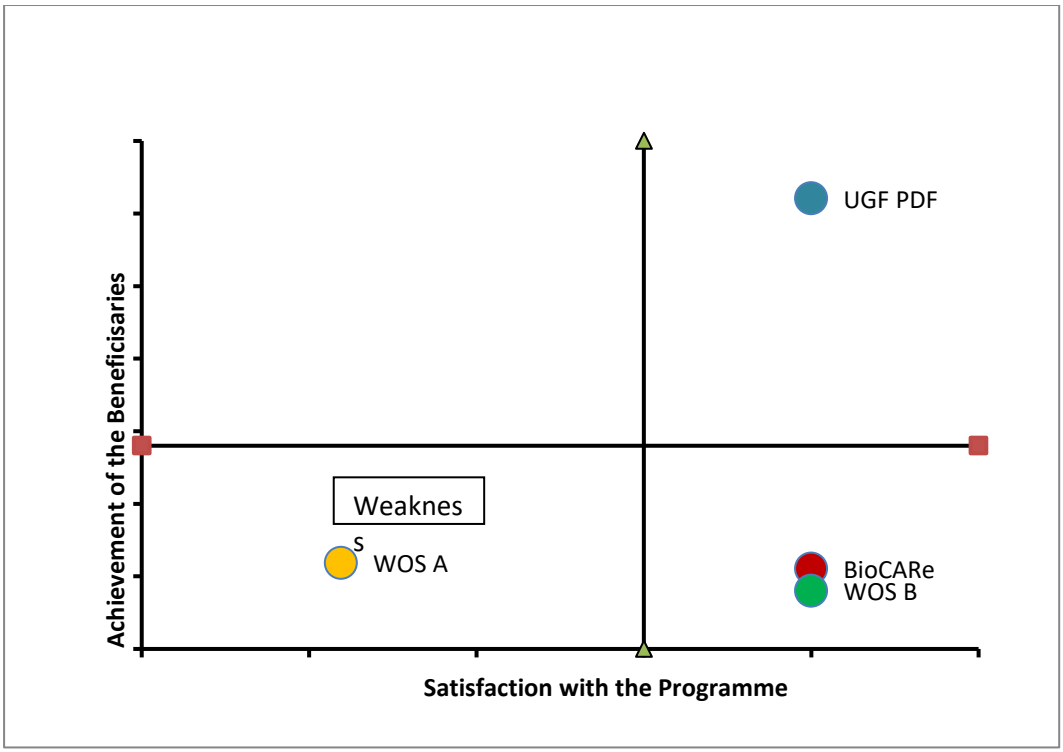
Above Graph 31 presented scheme wise distribution of women scientist beneficiaries into four quadrants of SWOT. In BioCARe (28.1%) and also in WOS-B (32.8%) it was evident that majority – consisting highest number/proportion of women scientist beneficiaries were in the 'Threat' quadrant. This implied that these beneficiaries had 'High Satisfaction' with the programme but their achievements were low. **The women scientist beneficiaries should be guided and motivated to have more publications and thereby increase in their achievements.** They represent 'Threat' with 'Low

Achievement' as these might induce poor feedback among others about opting for this scheme. **Higher satisfaction with the programme among these beneficiaries was the strong point about the scheme.**

There were 37.3% of women scientist beneficiaries (which were the highest in this scheme) of UGC PDF who were in the 'Opportunity' quadrant. This suggested that they were high achievers and also they had higher level of satisfaction with the scheme – UGC PDF. **The skills of presentation/writing, motivation/guidance provided to them, publications they had etc. were the examples to be replicated for other schemes as well.**

There were 28.6% of women scientist beneficiaries of WOS-A who were in the quadrant of 'Weakness'. It was noteworthy here that, similar to this, 27.3% beneficiaries were in the 'Threat' quadrant. In both these quadrants, beneficiaries happened to be low achievers. **Hence, there was a strong need to raise the level of publications among the women scientist beneficiaries of WOS-A.** The beneficiaries falling in the 'Weakness' quadrant also represent low level of satisfaction which **indicated towards perhaps the need to modify the framework of the scheme.** Here, the 'low level of achievement' and 'low level of satisfaction' was the serious point of concern as majority of the total beneficiaries (1038/1423) were from WOS-A.

6.3 Distance Model



Graph 32 : Scheme wise Distance Model according to SWOT

Further 'Distance Model' was created for these four schemes. It represented diagrammatically the distance between the schemes and also their distances from the centre – the point of origin. It was pleasing to note here that UGC PDF scored far well in the 'Opportunity' quadrant, adding more weightage to its better performance. It is also obvious from the Graph 32 that BioCARe and WOS-B are not distant from each other in their performances. Both these schemes require equal attention and remedial measures for improving achievement level of their beneficiaries.

7 PROBABILITY FOR INDEPENDENT VARIABLE IN LOGISTIC REGRESSION

Logistic regression (LR) is a statistical method similar to *Linear Regression (LR)* since LR finds an equation that predicts an outcome for a binary variable, *Y,* from one or more response variables, *X*. However, unlike linear regression the response variables can be categorical *or* continuous, as the model does not strictly require continuous data. To predict group membership, LR uses the log odds ratio rather than probabilities and an iterative maximum likelihood method rather than a *Least Squares* to fit the final model. This means the researcher has more freedom when using LR and the method may be more appropriate for skewed data or when the samples have unequal covariance matrices as was the case in the present study. Logistic regression assumes independence among variables. After deriving the LR equation, in SPSS, the log odds were converted into probabilities with the help of Excel.

7.1 Probability Calculation - Cut off Point

The LR method was used to calculate the probability of a beneficiary achieving score higher than 11 (cut off point to move to higher quadrant of SWOT). This would help the researcher to predict and decide about the value of the variable that would take the beneficiary to the higher quadrant. E.g. one would be interested to know what would be the probability for a particular number of papers when presented by the beneficiary in International Seminars/Workshops that would lead her to achieve higher score (i.e. more than 11). Based on the calculated probability for 'Number of papers presented in International Seminars', one can decide this.

Table 49 lists all the probabilities calculated with the help of Binary Logistic Regression and Log odds. All the Achievement related variables were considered here. One of the variables to derive the total Achievement Score (which was used in SWOT Analysis) was 'Number of Publications'. More the publications, better was the achievement of the beneficiary. It can be noted that with '1' publication there would be 28% probability for any beneficiary to move to the higher quadrant of SWOT. Similarly, when any beneficiary has '5' publications, she would have 85% chance to move to higher quadrant of SWOT.

Table 49: Result of the Probability Analysis for enhancing the Level of Achievement

.	Variable	Variable value	% of Probability that the beneficiary will Achieve Higher
1	No. of Publications	1	28
		2	43
		3	60
		4	74
		5	85
		6	91
		7	95
		8	98
2	No. of Papers presented in International Seminars/Workshops	1	33
		2	61
		3	83
		4	94
3	No. of International Seminars and Workshops attended	1	31
		2	55
		3	77
		4	90
		5	96
4	No. of Papers presented in national Seminars/Workshops	1	31
		2	46
		3	63
		4	77
		5	86
		6	93
5	No. of National Seminars and Workshops attended	1	21
		2	37
		3	57
		4	75
		5	87
		6	94

Similarly, any beneficiary's chances to achieve higher score and thereby **move to higher quadrant would be 94% when a women scientist presents 4 papers in international Seminars/Workshops.**

7.2 Related to SWOT Level of Achievement:

The Logistic Regression (LR) method was used to statistically fit logit function and calculate the probability of occurrence of event which in our case is that beneficiary can move to higher quadrants of SWOT, i.e., have higher **score of achievement**. There were eleven parameters that were used in SWOT analysis for calculating achievement score of each respondent, score of 11 being median of observation has been taken as a threshold for achievement. The Logistic Regression is more suitable in this achievement dataset because the distribution of scores is more skewed. **The method calculates the probability of a beneficiary to ascend to what can be called an achievement and sets as qualification criteria for each of eleven parameters or their optimum combination.** For example, the higher achievement score (i.e. higher than 11 points) could also be realized with the different values of the single parameter namely 'Number of Publications' or a combination of parameters to assess research output of an individual. **For example**, from the table below, assume a certain case of beneficiary with 'No. of Publications' equal to 1 yields 28% achievement probability, 'No. of Papers presented in International Seminars/Workshops' presented equal to 1 yields 33% achievement probability and 'No. of National Seminars/Workshops' attended equal to 2 yields 37% achievement probability. Hence, summing them up, with a total of 98% Probability, higher achievement may be fructified. **The probabilities of a parameter from table below are additive in case of combinations of parameters**. **This would help to decide the policy makers to develop such a combination of the probabilities for different variables that would lead to higher achievement scores by the beneficiaries availing the schemes and ascend to higher quadrants (along axis of achievements) in SWOT.**

7.3 Score of Satisfaction:

It was also tried to calculate probabilities with respect to **score of satisfaction** of beneficiaries. The variables such as Age, Family support, Mentors' support, Institutional support, 'duration of break', No. of projects done, change in their Employment were entered in to Logistic Regression model. **None of the above-mentioned variables turned out to be significantly related with the satisfaction of**

the beneficiaries. Hence, it was not feasible to predict the probability associated with the increase in the satisfaction level.

This would help to decide the policy makers to develop such a combination of the probabilities for different variables that would lead to the total probability near one for the women scientist beneficiary to move to the higher quadrant. Here is the explanation with example:

> No. of Publications (for 1 publication) = 28% Probability + No. of Papers presented in International Seminars/Workshops (for 1 paper presentation) = 33% Probability + No. of National Seminars/Workshops attended (for 2 seminars attended) = 37%. Hence, the total = 98% Probability. Thus, there is 98% probability that a women scientist beneficiary would move to the higher achievement quadrant of SWOT when she would have one publication and one paper presented in International Seminar/Workshop and two papers presented in National seminar/Workshops.
>
> Another combination would be:
> 2 Publications (43%) + 1 Paper in National Semi/WS (31%) + 1 National Semi/WS attended (21%) = Total 95% chances to achieve higher score.

Many other interesting, practical and tailor-made combinations could be prepared with its exact probability to help beneficiaries to achieve higher.

It was also tried to calculate probabilities attached with satisfaction of beneficiaries. The variables such as Age, Family support, Mentors' support, Institutional support, 'duration of break', No. of projects done, change in their Employment etc. were entered in the Logistic Regression model. None of the above mentioned variables turned out to be significantly related with the satisfaction of the beneficiaries. Hence, it was not feasible to predict the probability associated with the increase in the satisfaction level. Further to establish cause-and-effect relationship between major independent and dependent variables, correlation was performed which was presented in Table 50 below:

Table 50: Cause-and-Effect Relationship between selected variables

	Significant cause-and-effect relationship bet. the variables	Inference drawn
1	Mentor Support and No. of Projects done (0.059*)	As the Mentors support increased the No of projects done by the beneficiaries also increased
2	'duration of break' and Mentor support (0.103**)	As 'duration of break's increased, more Mentor support was found
3	No. Projects done and 'duration of break' (0.111**)	More number of projects done, more was the 'duration of break'
4	Age and No. of Projects done (0.287**)	As the Age of the beneficiaries increased, the Number of Projects done also increased
5	Age and 'duration of break' (0.192**)	There was an increase in 'duration of break' with the increase in Age
6	Age and Change in Employment Nature (0.138**)	With the increase in age there found the increase in the Change in Employment Nature
7	Age and Achievement of beneficiaries (0.115**)	The Achievement of beneficiaries increased with the increase in age
8	No of Projects done and Change in Employment nature (0.086*)	More no. of projects done, more Change in Employment nature
9	'duration of break' and Change in Employment nature (-0.070**)	With the increased 'duration of break' there was a decrease in the Change of Employment nature
10	No of Projects done and Achievement (0.236**)	Increase in No of Projects done increased the Achievement of beneficiaries

** Significant at 0.05 level of significance, ** significant at 0.01 level of significance*

7.4 Performance of Zones with the help of Rank Analysis

In present survey, different variables were studied to understand Social Support Dimensions, Educational Progression, Career Progression and Entrepreneurial and Innovation Activities of the women scientist beneficiaries. The average score of the variables associated with these above-mentioned aspects were analysed and ranks were assigned to these averages. Higher/favourable the average better was the rank assigned. E.g., For no. of projects done or for mentor support, higher the average better was the ranks assigned. But for the 'duration of break' lower the average, better was the rank assigned because less 'duration of break' was the preferred outcome. The highest average score was given the '1st rank'. Thus the 1st rank position showed better performance for that variable. These ranks were assigned and observed across the zones. With the help of weighted average, the final position of each zone/scheme was presented.

Table 51: Zone Wise Performance and 'Ranks' for Social Support Dimensions

Social Support Dimensions							
zones	Break Duration	No of projects	Mentor support	Institutional support	Family support	Rank Total	Final Rank
East	1	5	5	6	1	18	4
North	2	1	5	3	4	15	2
North East	6	4	3	4	2	19	3
South East	3	5	2	2	3	15	2
South West	4	3	1	1	2	11	1
West	5	2	4	5	5	21	5
Schemes							
BioCARe	1	3	4	4	2	14	3
UGC PDF	2	4	3	2	4	15	4
WOS A	3	2	2	3	3	13	2
WOS B	4	1	1	1	1	8	1

Among the Social Support Dimensions, the average 'duration of break' was lowest in BioCARe hence, it was ranked as no. 1. The average number of projects done was found highest among the beneficiaries of WOS-B so, it was ranked as number 1 for the said variable. Similarly, the averages of Mentor support, Institutional support and Family support was found highest in WOS-B therefore it stood as rank 1 for these three variables as well. To find out the final rank for the scheme, weighted average was used where weight (i.e. the rank) was assigned to the number of times a scheme has got that rank. E.g. BioCARe = 1(1)+1(2)+1(3)+2(4)= 14. Lower the total better would be the rank for that scheme. Based on this, one can observe from Table 51 that WOS-B was ranked as number one scheme for Social Support Dimensions.

For the zones, according to Table 51 East zone was ranked 1 for the 'duration of break' as it had lowest average 'duration of break' amongst all zones. North Zone was ranked as numbe1 for 'No. of Projects done' as it had highest average number of projects done amongst all the six zones. Since South West Zone showed highest average Mentor and Institutional Support, it was ranked as number 1 for both these variables. East zone showed highest average family support amongst all the zones so, it was ranked as '1' for this variable. Calculating overall rank position, one can find that (Map 5, Table 54) South West Zone was ranked one zone followed by North and South East both on 2nd position.

Table 52 : Zone Wise Performance and 'Ranks' for Education Progression

Education Progression						
zones	Current Education	Masters to PhD	PhD to Post-Doc	Achievements	Rank Total	Final Rank
East	2	5	5	4	16	4
North	1	1	1	1	4	1
North East	3	6	6	6	21	6
South East	5	2	3	3	13	3
South West	6	3	4	5	18	5
West	4	4	2	2	12	2
Schemes						
BioCARe	2	1	2	2	7	2
UGC PDF	1	2	1	1	5	1
WOS A	3	3	3	3	12	3
WOS B	4	4	4	4	16	4

The other aspect of evaluating the schemes was Educational Progression of the women scientist beneficiaries. Four variables were considered here for ranking the schemes and zones as well. These were: current Education (i.e., the education of the beneficiaries at the time of survey), Education Before (the project), Education After (the project) and Total Achievement (of beneficiaries which was the sum of number of publications, number of national (and international) seminars and workshops attended, number of papers presented in national (and international) seminars and workshops). For all the variables under consideration here, higher the average, better was the rank. It was observed that the Current education (i.e. the education at the time of survey) was highest among the beneficiaries of UGC PDF among all hence, rank 1. For the 'Education Before the project', BioCARe was ranked as '1' as it had the highest average. For Education 'After the project' and the Total Achievement, again UGC PDF stood at the first position. Calculating the overall rank for the Educational Progression variables, UGC PDF was found to be the best scheme of all.

For zones, it was observed that for all the four variables associated with Educational Progression, North Zone had the highest average; therefore, it was at the first position in all these four variables. This implied that the North Zone secured first position for overall ranking also. Here, East zone and West Zone shared second position.

To compare Career Progression of the beneficiaries of different schemes and zones, ranks were assigned to these schemes and zones. For this, the variables considered

were: Satisfaction with current job, nature of 'Employment before' (the project), nature of 'Employment after' (the project) and Involvement in Extension Activities. Based on the averages, the ranks were given to the schemes and zones. Higher the average better was the rank assigned. Table 53 displayed the ranks for schemes and zones for career progression.

Table 53 : Zone Wise Performance and 'Ranks' for Career Progression

Career Progression						
Zones	Satisfaction with current employment	Employment before the project	Employment after the project	Involvement in Extension Activities	Rank Total	Final Rank
East	2	1	1	6	10	1
North	5	2	4	4	15	4
North East	6	6	3	5	20	6
South East	3	5	5	2	15	4
South West	1	3	6	3	13	3
West	4	4	2	1	11	2
Schemes						
BioCARe	1	1	1	3	6	1
UGC PDF	4	2	4	1	11	3
WOS A	3	2	2	4	11	3
WOS B	2	3	3	2	10	2

The BioCARe secured 1st rank for the variables 'Satisfaction with Current Job', 'Employment Before' and 'Employment After' as it had highest average amongst all the four schemes for these variables. For 'Involvement in Extension Activities' UGC PDF performed better as it had the highest average for this variable and thus the scheme was on the 1st position for this variable. To sum up, it can be concluded that BioCARe was at 1st rank and WOS-B was found placed at 2nd rank for the variables related to 'Career Progression'.

Further the aspect named 'Entrepreneurship and Innovation Activities' was analysed with the help of ranks. For this, the variables considered were: 'Special Contribution', 'Societal Technological Benefit', 'Technology Dissemination' and 'Any other Skills Developed'. The average of these variables was considered, where higher the average better was the rank assigned.

Table 54 : Zone Wise Performance and 'Ranks' for Entrepreneurship & Innovation Activities

Entrepreneurship and Innovation Activities						
zones	Special Contribution	Societal Benefit	Technology Dissemination	Any other Skills Developed	Rank Total	Final Rank
East	4	6	6	6	22	6
North	5	5	3	4	17	4
North East	5	4	5	5	19	5
South East	3	1	1	2	7	1
South West	2	3	2	1	8	2
West	1	2	3	3	9	3
Schemes						
BioCARe	2	4	3	1	10	3
UGC PDF	4	3	2	3	12	4
WOS A	3	2	2	1	8	2
WOS B	1	1	1	2	5	1

The scheme WOS-B had highest average for three variables 'Special Contribution', 'Societal Technological Benefit' and 'Technology Dissemination' due to which WOS-B was ranked 1st for all these three variables. For the skill developed by the women scientist beneficiaries, BioCARe showed highest average among the four schemes. Hence, it was ranked the first. To have overall picture, it was clear that WOS-B was at the first position for 'Entrepreneurship and Innovation Activities' and the second position was achieved by WOS-A.

For the zones, one can see the distribution of ranks according to the averages from the Table 54. It was interesting to note here that after calculating the individual ranks for different variables, South East Zone ranks first in Societal Technology Benefits and Technology Dissemination; West Zone ranks first in special contribution; the South West Zones ranks first in Any Other Skills Development. Considering the overall ranking with respect to Entrepreneurship and Innovation Activities, South East Zone ranks first, South West second, West Zone third, Norh, North east and east zone ranks 4, 5 and 6 respectively.

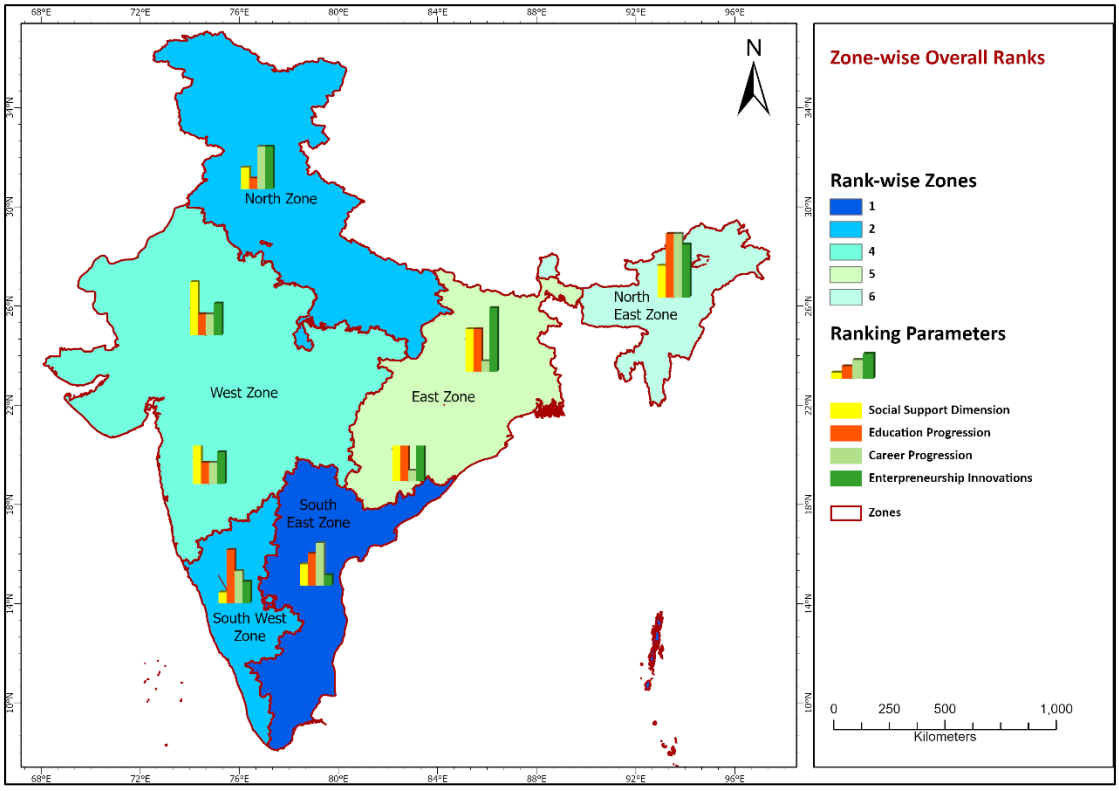
After analysing four schemes and six zones according to four different aspects – Social Support Dimensions, Educational Progression, Career Progression and Entrepreneurship and Innovation Activities, it was interesting to see the overall -final- position of these schemes and zones. To find out this, the average of the ranks obtained

by these schemes and zones for the above mentioned four aspects (Tables 51 to 54) was calculated and final rank achieved were compiled in the following tables. Again, lower the average better was the position.

Table 55 : Overall Zonal Ranking

Overall Ranking						
zones	Social Support Dimension	Education Progression	Career Progression	Entrepreneurship and Innovation Activities	Rank Total	Final Rank
East	4	4	1	6	15	5
North	2	1	4	4	11	2
North East	3	6	6	5	20	6
South East	2	3	4	1	10	1
South West	1	5	3	2	11	2
West	5	2	2	3	12	4
Schemes						
BioCARe	3	2	1	3	9	2
UGC PDF	4	1	3	4	12	4
WOS A	2	3	3	2	10	3
WOS B	1	4	2	1	8	1

The overall ranking position for six different zones can be seen in Table 55. South East zone stood first overall in ranking mainly driven by strong entrepreneurship and innovation activities as well as social support dimensions. North Zone stood second mainly driven by education progression and social support dimensions. South West



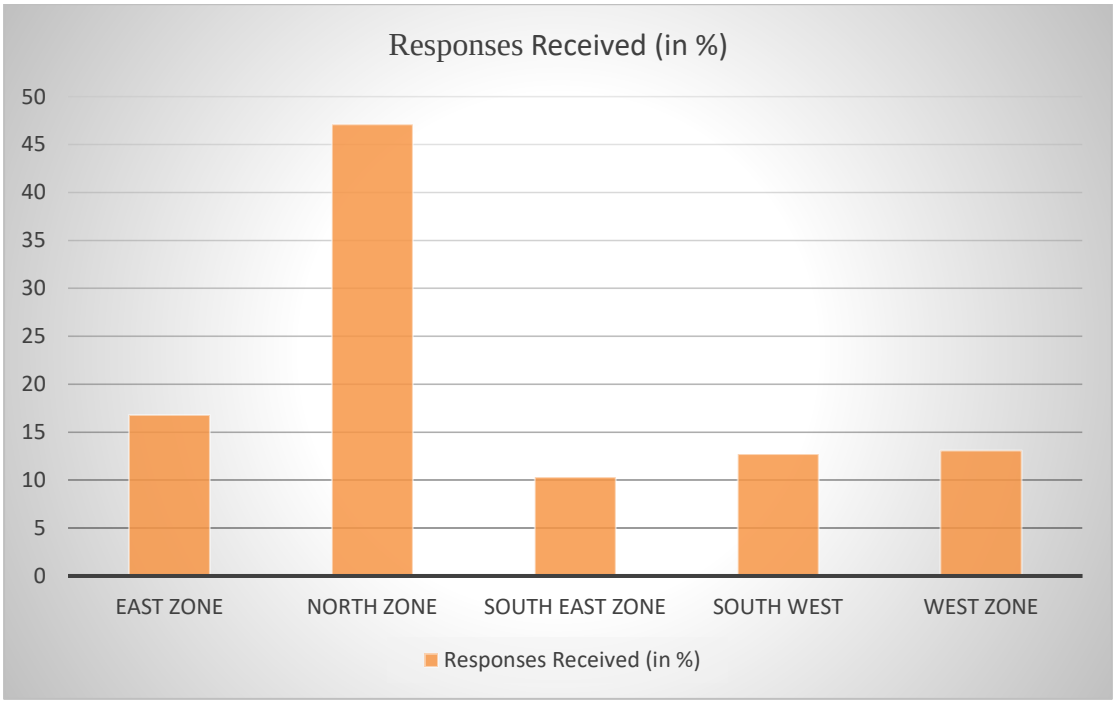
Map 5 : Over All Rank wise Performance of Zones

zone also stood second overall in ranking mainly driven by social support dimensions and entrepreneurship and innovation activities. West Zone stood fourth mainly driven by education progression and career progression. East zone stood fifth mainly driven by career progression. North-east is stood sixth driven by social support dimensions.

8 ANALYSIS OF WOMEN SCIENTIST SCHEME – (WOS-C)

8.1 Respondents Profile

The on-line questionnaires WOS-C were circulated to 760 women scientists across the country, of which 291 responses were received. The participation percentages of each zone was : North Zone with highest zonal respondent participation rate of 47.1 % (137 respondents), East zone with second highest zonal respondent participation rate of 16.8 %(49 respondents), The West Zone stood third with respondents participation rate 13.1% (38 respondents), the South West Zone with respondents participation rate 12.7% (37 respondents), the South West with lowest respondent participation rate 10.3% (30 respondents).



Graph 33: Zone Responses Received

Across the zones majority, (47.1%)of the responses from the WOS-C beneficiaries were from the North Zone. The east zone received 16.8%, the West Zone 13.1%, the Southwest with 12.7% and 16.8% responses were received from the South East Zone. Uttar Pradesh in the North Zone had the maximum (27.5%) responses from the beneficiaries availing the benefit of the WOS-C scheme. West Bengal from the East zone had 11.7% responses and 10.6 % were from Delhi in the North Zone.

Graph 34: Zone wise age group of respondent Women Scientists (in %):

8.1.1 Zone wise Age groups of the respondent Women Scientists

Out of total 291 respondent women scientists under the WOS-C scheme, the majority, 45.4% belonged to the 31 to 35 years of age, followed by 28.87% in the 36 to 40 years of age group. The age-group represented 41 to 45 represented 15.12%. **Almost 89% of the respondent women scientists falls under the age between 31 to 45**. The age group of less than 31yrs, 46 to 55 together represented 10.65%. Among the zones, the highest representation was from the North Zone i.e., 47.98%, East zone and West Zones represented 16.84% and 13.06% respectively. South West Zone with 12.71% and South East with 10.31% in all age group. Since **North Zone has larger number of women scientists' representation, the highest number were from 31 to 35 and 36 to 40 age groups.**

Table 56: Zone-wise Age-wise Distribution of the Women Scientists representation in WOS-C

Zones	Less than 31	31 to 35	36 to 40	41 to 45	46 to 50	51 to 55	Total No
East Zone	8.16	34.69	30.61	22.45	2.04	2.04	49
North Zone	7.30	48.18	26.28	15.33	1.46	1.46	137
South East	10.00	36.67	36.67	16.67	0.00	0.00	30
South West	2.70	56.76	27.03	10.81	2.70	0.00	37
West Zone	13.16	44.74	31.58	7.89	2.63	0.00	38
All Zones	7.90	45.36	28.87	15.12	1.72	1.03	**291**
Total No	**23**	**132**	**84**	**44**	**5**	**3**	

Further considering the representation from the respective zone-wise, each zone represented the maximum participation from 31 to 35, followed by 36 to 40-year age group. The highest participation in East zone was from 31 to 35 (34.69%), followed by 36 to 40 age group (30.61%). 22.45% were from 41 to 45 age group. Similar pattern observed in the other zones with minor variations in the percentages.

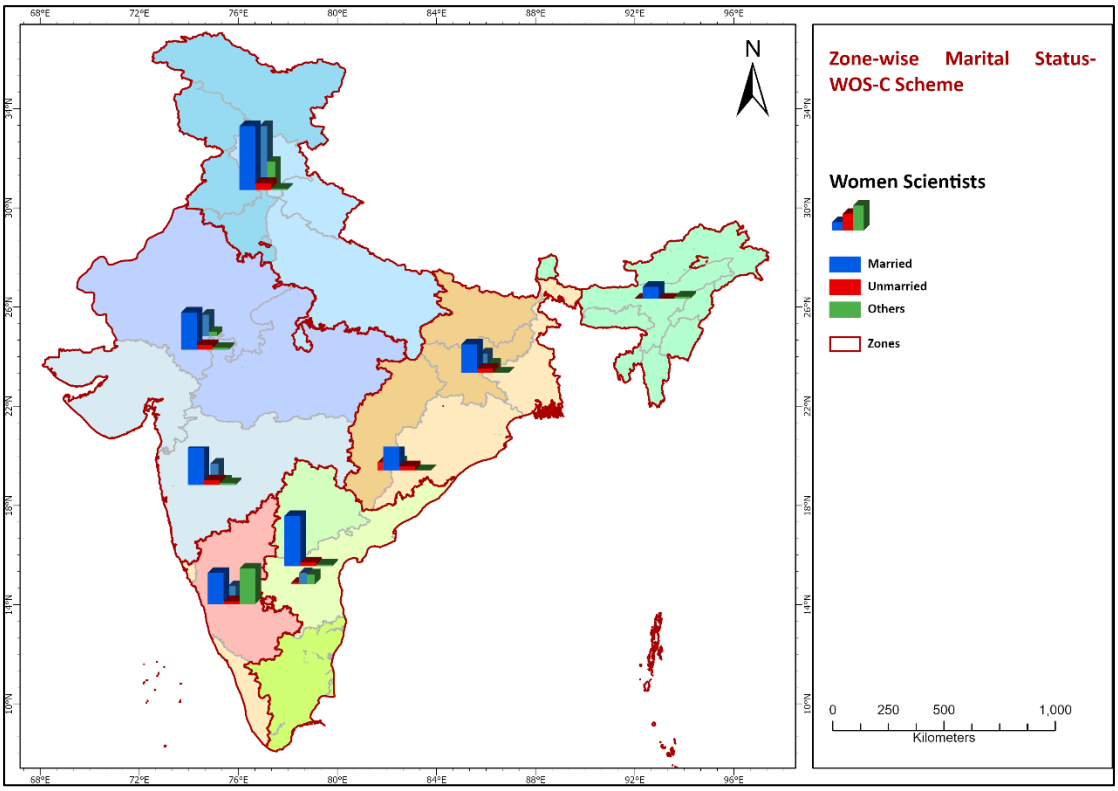
8.1.2 Zone wise and Zone-wise Marital Status of the respondent Women Scientists

As per the eligibility criteria of the gender mainstreaming programs, age of 27 years is the minimum age limit to avail of the benefits. Out of the total responses received, 86.2 % of respondents reported were married, 11.4% of respondents reported they were single and, a small percentage (2.4%) reported being divorced, separated, or widow.

Table 57: Zone wise & Age-wise marital status of the Respondent Women Scientists

	Age Group						
Zone & Marital Status	**Less than 31**	**31 to 35**	**36 to 40**	**41 to 45**	**46 to 50**	**51 to 55**	**Zone-wise Total**
East Zone	**4**	**17**	**15**	**11**	**1**	**1**	**49**
Married	25.00	76.47	93.33	81.82	100.00	100.00	79.59
Unmarried	75.00	23.53	6.67	18.18	0.00	0.00	25.64
North Zone	**10**	**66**	**36**	**21**	**2**	**2**	**137**
Married	60.00	75.76	94.44	80.95	100.00	50.00	80.29
Unmarried	40.00	24.24	5.56	9.52	0.00	50.00	18.25
Other	0.00	0.00	0.00	9.52	0.00	0.00	1.46
South East Zone	**3**	**11**	**11**	**5**	**0**	**0**	**30**
Married	100.00	72.73	100.00	80.00	0.00	0.00	86.67
Unmarried	0.00	27.27	0.00	0.00	0.00	0.00	10.00
Other	0.00	0.00	0.00	20.00	0.00	0.00	3.33
South West	**1**	**21**	**10**	**4**	**1**	**0**	**37**
Married	0.00	80.95	80.00	100.00	100.00	0.00	81.08
Unmarried	100.00	19.05	20.00	0.00	0.00	0.00	18.92
West Zone	**5**	**17**	**12**	**3**	**1**	**0**	**38**
Married	40.00	47.06	83.33	100.00	100.00	0.00	63.16
Unmarried	60.00	52.94	16.67	0.00	0.00	0.00	36.84
All Zones	**7.90%**	**45.36%**	**28.87 %**	**15.12%**	**1.72%**	**1.03%**	**100.00 %**
Married	52.17	72.73	91.67	84.09	100.00	66.67	78.69
Unmarried	47.83	27.27	8.33	9.09	0.00	33.33	20.27
Other	0.00	0.00	0.00	6.82	0.00	0.00	1.03

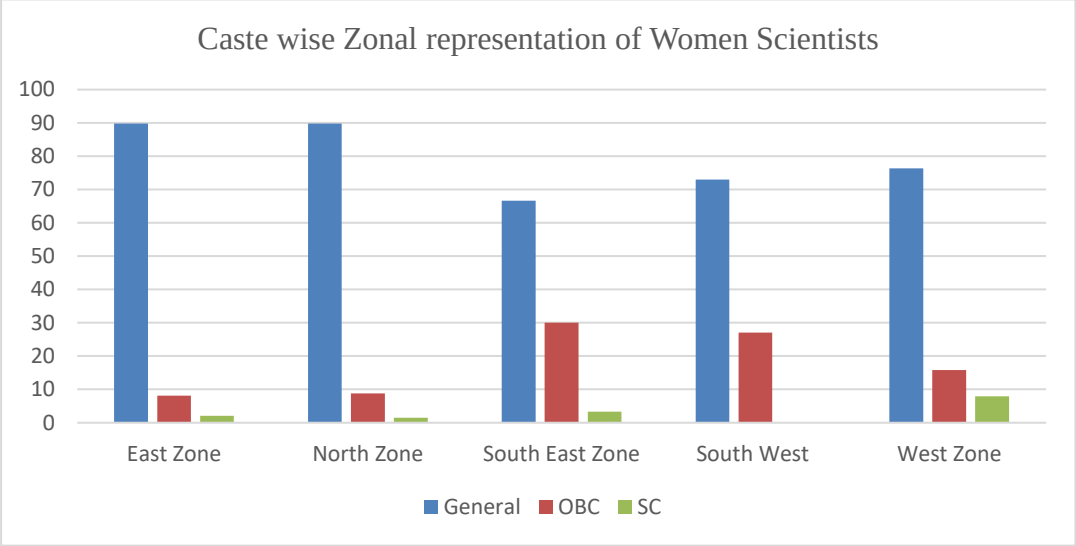
Out of total respondent women scientists of WOS-C scheme about 78.69% were married, 20.27% were unmarried, 1.03% from other status includes widow, divorcee. Across the zones, the South East Zone had the majority (87.67%) of women beneficiaries married. South West Zone with 81.08% and North Zone 80.29% represented married. **Except East zone with 25.64% unmarried women scientists, majorly of the zones the representation of the women scientists remained around 80% and more.** Above table reflects the marital status of the respondent women scientists. Above the age of 46, in all the zones the proportion of the married women is



Map 6 : Zone-Wise Marital Status

100%. North, East and West Zones the percentage of the women scientists being unmarried is higher in the less than 31 years of age.

8.1.3 Zone wise Caste Category of the respondent Women Scientists



Graph 35: Caste wise Zonal representation of Women Scientists

The majority (83.51%) of the women beneficiaries who participated in the survey belonged to the general category. About 14.09% were from the OBC category and 2.41% from SC. Out of total respondent women scientists from the respective zones, around 90% belong to the general category in East and North Zones. The women scientists belong to the general category, 76% in West Zone 73% South Zone and 67% South East Zone. The respondent women scientists belong to the OBC, the South East Zone had the maximum percent, 30% followed by the South West Zone with 27%. The maximum representation of the SC in West Zone with 8%, wherein the other zones represented 1% to 3% respectively for South East Zone, North Zone and east zone.

8.1.4 Zone wise Current (2019-20) Education Level of the respondent Women Scientists

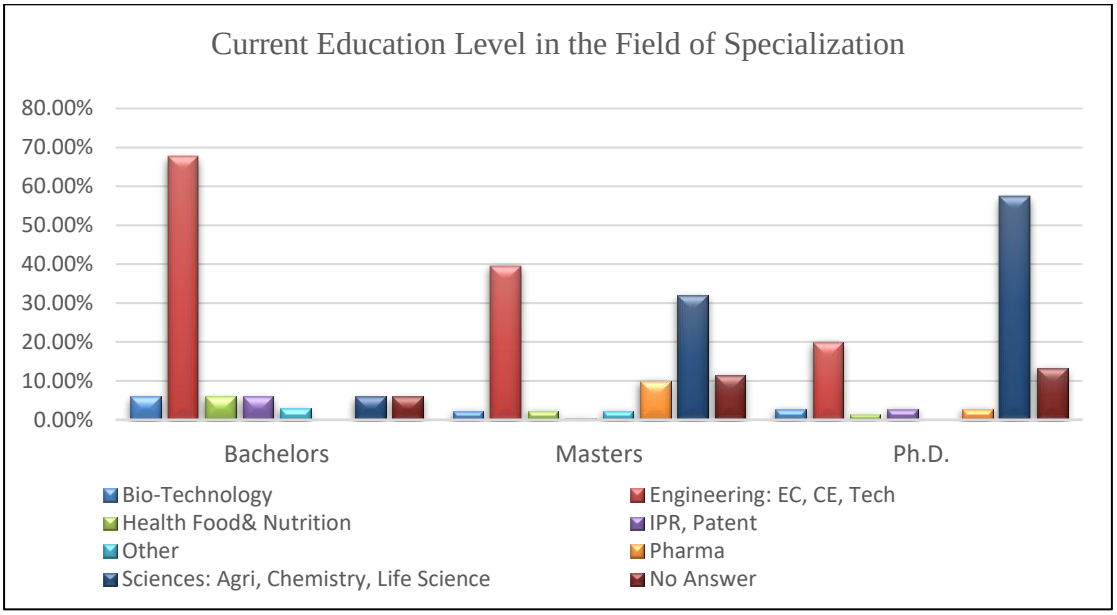
Table 58 : Zone wise Current Education wise distribution of respondent Women Scientists

Zone	Bachelors	Masters	Ph.D.	Total
East Zone	11	26	12	49
Zone wise %	22.45	53.06	24.49	100.00
Education wise %	32.35	14.29	16.00	**16.84**
North Zone	12	87	38	137
Zone wise %	8.76	63.50	27.74	100.00
Education wise %	35.29	47.80	50.67	**47.08**
South East Zone	2	15	13	30
Zone wise %	6.67	50.00	43.33	100.00
Education wise %	5.88	8.24	17.33	**10.31**
South West	6	25	6	37

Zone wise %	16.22	67.57	16.22	100.00
Education wise %	17.65	13.74	8.00	**12.71**
West Zone	3	29	6	38
Zone wise %	7.89	76.32	15.79	100.00
Education wise %	8.82	15.93	8.00	**13.06**
No of WOS-C	**34**	**182**	**75**	**291**
Education wise %	**11.68**	**62.54**	**25.77**	**100.00**

Out of total respondent women scientists, 62.54% were Masters, 25.77% were Ph.D. holders, and 11.68% were bachelors as their current education status. The Ph.D. holders were maximum (43.3%) in the South East Zone. North Zone and Ease zone represented 27.7% and 24.5% respectively. The majority (76.3%) of the master's holders were in the West Zone. South Zone with 67.7%, North Zone with 63.5% represented the next.

8.1.5 Zone wise Field of Education & Specialisation of the respondent Women Scientists



Graph 36: Current Education level in the Field of Specialization

The majority (35-37%) of women scientists of WOS-C scheme completed their specialization in Engineering: EC, CE, Tech, and Sciences: Agriculture, Chemistry, Life science domain. About 1.7% of women beneficiaries had IPR and Patent specialization in the course of their education. 57% of the women scientists with current education as Ph.D. were majorly specialized in Science domain. About 39.6% women scientists with masters and 64.6% bachelors had Engineering: EC CE, Tech as their field of specialization.

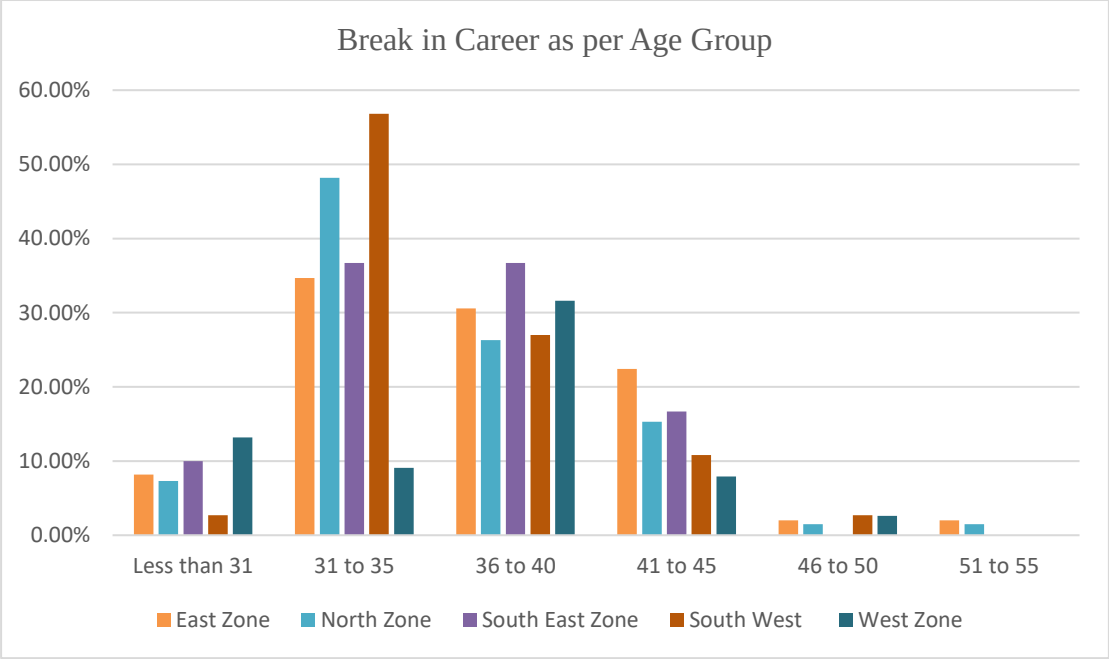
8.1.6 Zone wise Current Employment & respective Designations

Table 59 : Zone wise details of the Current Employment with respective Designations

Zones	Designation – Current Employment						
	Academician	Consultant, Patent Associate	Director, HoD, Manager	Government Officer	Other Job	Scientists	**Grand Total**
East	33.30%	13.30%	20.00 %	6.70%	13.30 %	13.30%	**100.00 %**
North Zone	37.20%	24.50%	18.10 %	2.10%	4.30%	13.80%	**100.00 %**
South East	25.00%	30.00%	20.00 %	10.00%	0.00%	15.00%	**100.00 %**
South West	13.00%	34.80%	39.10 %	0.00%	4.30%	8.70%	**100.00 %**
West	17.40%	17.40%	30.40 %	13.00%	4.30%	17.40%	**100.00 %**
All Zones	29.70%	24.60%	22.90 %	4.60%	4.60%	13.70%	**100.00 %**

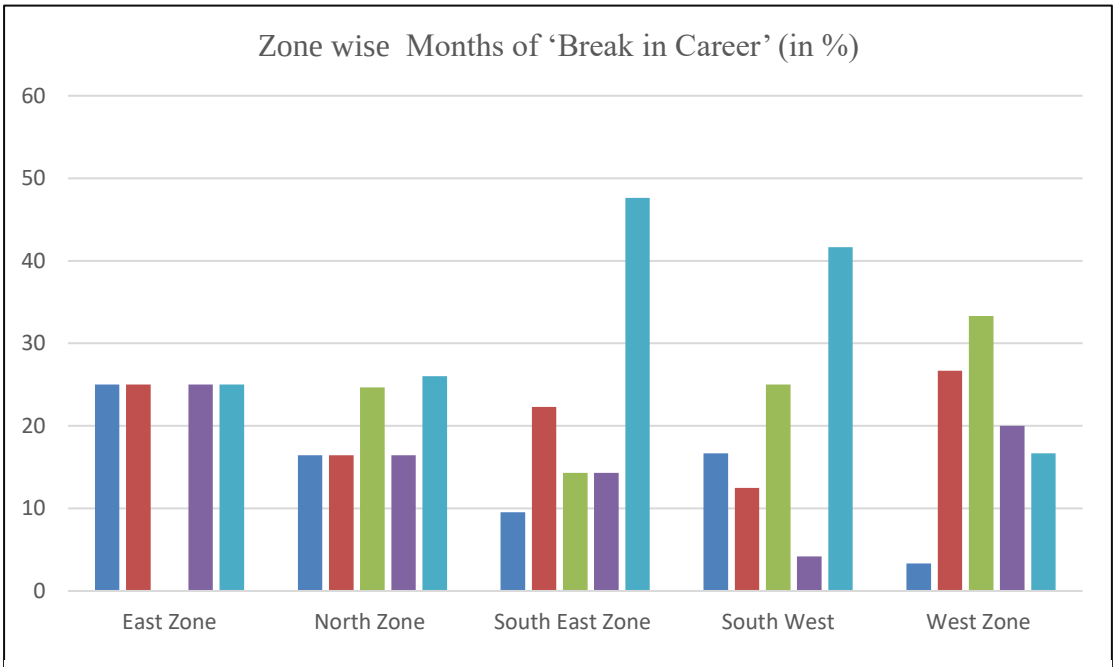
Of the surveyed women beneficiaries, 29.7% women worked as academicians, 24.6% were a consultant and patent associates, 22.9% were at the director, HODs or manager positions, 13.7% were scientists and 4.6% were government officers. In the East and North Zone, the majority of women worked as academicians. In the South East Zone, 30% women were consultants or patent associates. In the South West and West Zones, the current designation of the majority of women were HODs, Managers, or Director of some organizations.

8.2 Analysis: Age Group wise Break in Career



Graph 37: Zone wise and Age-Group wise 'Break in Career' (in %)

About 66.3% of beneficiaries had a career break. All the women registered with the age group 51-55yrs had a career break. Almost 80% of women of 46-50 age had a break. Zone wise break in career is observed with the higher age group women scientists. **100% or higher percentage of the break in career is responded by the women scientists belong to the higher age group (41 years and above). Wherein, t**he women



Graph 38: Zone wise Months of 'Break in Career'

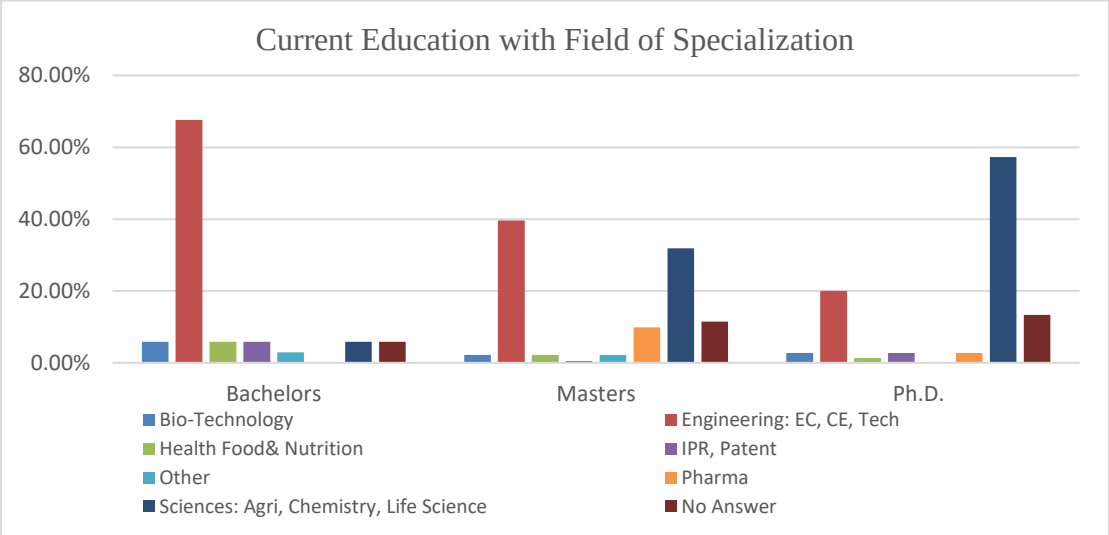
scientists represented the age group of 36-40yr, had responded 58.3% followed by the age group 41 to 50 (59.10%) a break in career, which is the least in percentage. About 90.9% of women of 31-35yr and 36-40yr had a career break. **All the women scientists (100%) from the South and West Zone of 41-45yr and 46-50yr had a career break.**

Out of total women scientists (291) 53.06% had responded. Among those highest response was received from the North Zone (25.09%), South Zone (13.46%), West Zone (10.31%), South West Zone (8.25%), and East zone (5.13%), which is the least. Among them who had more than 36 months of break were 29.49% (46 respondents). The South East and South West Zones comprised of 47.62% (10 respondents) and 41.67% (10 respondents) respectively, followed by North Zone 26.03% (19 respondents), East zone 25% (2 respondents) and West Zone, the least 16.67% (5 respondents) had more than 36 months of break. The respondent women scientists observed break between one and two years, out of 23.72% (37 respondents) West Zone had 33.33% (10 respondents), South Zone 25% (6 respondents), North Zone 24.66% (18 respondents), and South East Zone 14.29% (3 respondents). Among 13.46% (21 respondents) who observed less than six months of break, East zone 25% (2 respondents), South West Zone 16.67% (4 respondents), North Zone 16.44% (12 respondents) South East Zone 9.52% (2 respondents) and West Zone 3.33% (1 respondent).

Out of total respondents (291), 156 women scientists have responded to this question on the suggestion for the duration of the training in months. A maximum number of the women scientists wants the duration of training may be 36 months or higher. Even 36 number of women scientists revealed their desire for a longer duration of one to two years. **Many women scientists (83 number) have suggested training for a longer duration, i.e., 2 to 3 years. Longer duration of the training may definitely enhance the knowledge and develop the skill to equip as a Patent Agent, or self-employed.** Of course, but this suggestion is almost a 'degree' level training, and may be thought about at the certification level of training.

8.3 Zone wise Current Education of respondent Women Scientists:

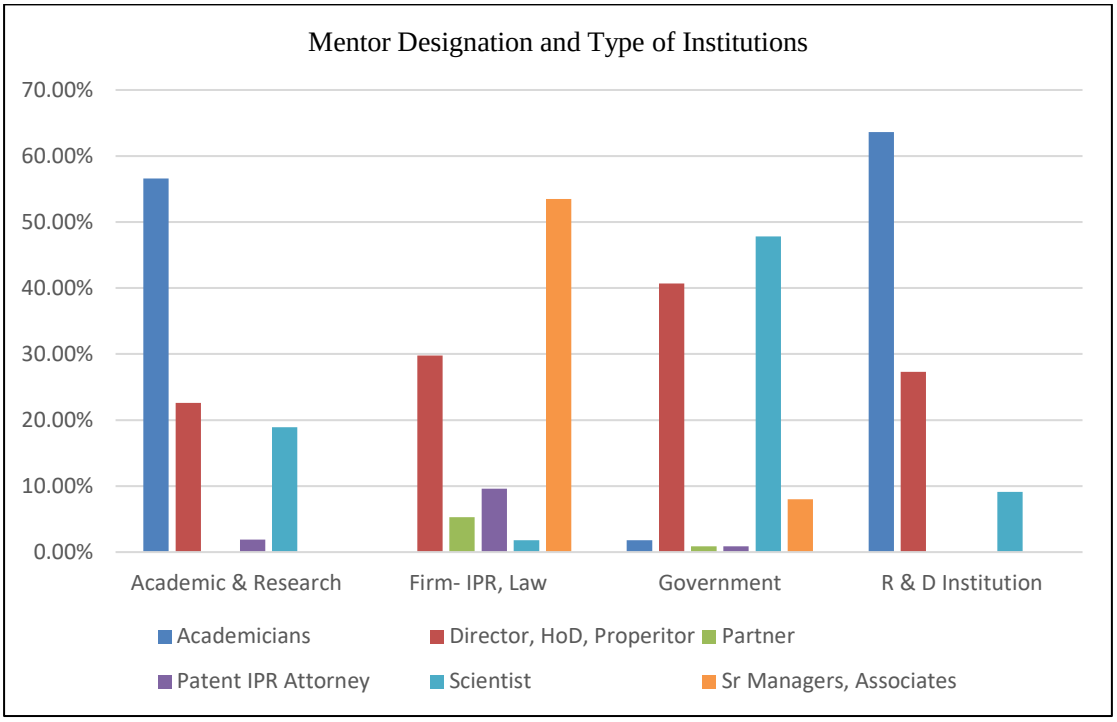
Out of total respondent 291, women scientists, 62.54% (182) responded were Masters, 25.77% (75) responded were Ph.D. holders, and 11.68% (34) responded were bachelors as their current education status. The Ph.D. holders were maximum (43.3%) in the South East Zone. North Zone and Ease zone represented 27.7% and 24.5% respectively. The majority (76.3%) of the master's holders were in the West Zone. South Zone with 67.7%, North Zone with 63.5% represented the next.



Graph 39: Current Education with Field of Specialization

The majority (35-37%) of women scientists of WOS-C scheme completed their specialization in Engineering: EC, CE, Tech, and Sciences: Agriculture, Chemistry, Life science domain. About 1.7% of women beneficiaries had IPR and Patent specialization in the course of their education. 57% of the women scientists with current education as Ph.D. were majorly specialized in science domain. About 39.6% women scientists with masters and 64.6% bachelors had Engineering: EC CE, Tech as their field of specialization.

8.3.1 Mentors Designation & Types of Institutions



Graph 40: Mentor Designation and Type of Institutions

Findings from the surveys revealed that 32.6% of the women beneficiaries had mentors as the designation of Directors, HoDs and Proprietors. 24% had Senior managers and associates, 23% as scientists, and 13% Academicians as their mentors. The remaining 6.9% of women were mentored by Patent IPR attorneys and Partners.

8.3.2 Internship Specialization with institution type

About 63.6% of women beneficiaries were mentored by academicians did internship in R & D institutions. 40% of women with mentor designation as Director, HODs, Proprietor, and Scientists completed their internships with Government Institutes. Around 5.3%, 9.6% and 53.5% women did internships from Firm-IPR, Law had their mentors with Partner, Patent IPR Attorney, Senior Managers and Associates.

Table 60: Details of the Internship Specialization with institution type

Internship Specialization	Type of Institutes				
	Academic & Research	Firm-IPR, Law	Government	R & D Institution	Grand Total
IPR Prosecution, Trademark, Copyright	0.0%	11.4%	3.5%	18.2%	6.5%
Other	3.8%	0.0%	1.8%	9.1%	1.7%
Patent Search, Filing & Drafting	96.2%	88.6%	94.7%	72.7%	91.8%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

From the surveys, 91.8% of the women beneficiaries were specialized in the Patent search, Filling, and Drafting in their internship, among this from the academic and research institution and the Government organisation represented 96.2% and 94.7% respectively. 6.5% had internship specialization in IPR Prosecution, Trademark and Copyright with the majority represented R & d Institutions (18.2%) and Firm: IPR, Law institutes 11.4%.

Table 61 : Zone wise details of the Internship Specialization and type of institutions

Internship Specialization With types of Institutes	Zones					
	East Zone	North Zone	South East Zone	South West	West Zone	Grand Total
IPR Prosecution, Trademark, Copyright	**0.0%**	**10.9%**	**0.0%**	**5.4%**	**5.3%**	**6.5%**
Firm- IPR, Law		60.0%		100.0%	100.0%	68.4%
Government		26.7%		0.0%	0.0%	21.1%
R & D Institution		13.3%		0.0%	0.0%	10.5%
Patent Search, Filing & Draftng	**98.0%**	**86.1%**	**100.0%**	**94.6%**	**94.7%**	**91.8%**
Academic & Research	66.7%	5.9%	3.3%	22.9%	8.3%	19.1%
Firm- IPR, Law	10.4%	49.2%	53.3%	48.6%	13.9%	37.8%
Government	8.3%	44.9%	43.3%	28.6%	75.0%	40.1%
R & D Institution	14.6%	0.0%	0.0%	0.0%	2.8%	3.0%
Other	**2.0%**	**2.9%**	**0.0%**	**0.0%**	**0.0%**	**1.7%**
Academic & Research	0.0%	50.0%				40.0%
Government	100.0%	25.0%				40.0%
R & D Institution	0.0%	25.0%				20.0%
Grand Total	**100.0%**	**100.0 %**	**100.0%**	**100.0 %**	**100.0 %**	**100.0 %**

The Southeast Zone, all the women specialized in Patent Search, filing & drafting majority (53.3%) from Firm: IPR, Law institutes. About 66.7% of women did internships from academic institutions in the North Zone (98%) with a patent search, Filing and Drafting as the specialization. In the West Zone, 75% of the women beneficiaries of the total specialized (91.8%) for Patent Search, Filing & Drafting completed their internships from government institutions. 49% women from north and 48.6% from southwest Zone did internship from Firm: IPR, Law under Patent search, filing & drafting specialization. No women scientists in the east zone and the southeast zone were specialized in IPR Prosecution, Trademark, and copyright.

8.4 Employment Before and After the Project

Table 62 : Employment Status with respect to 'Before/After' availing the scheme:

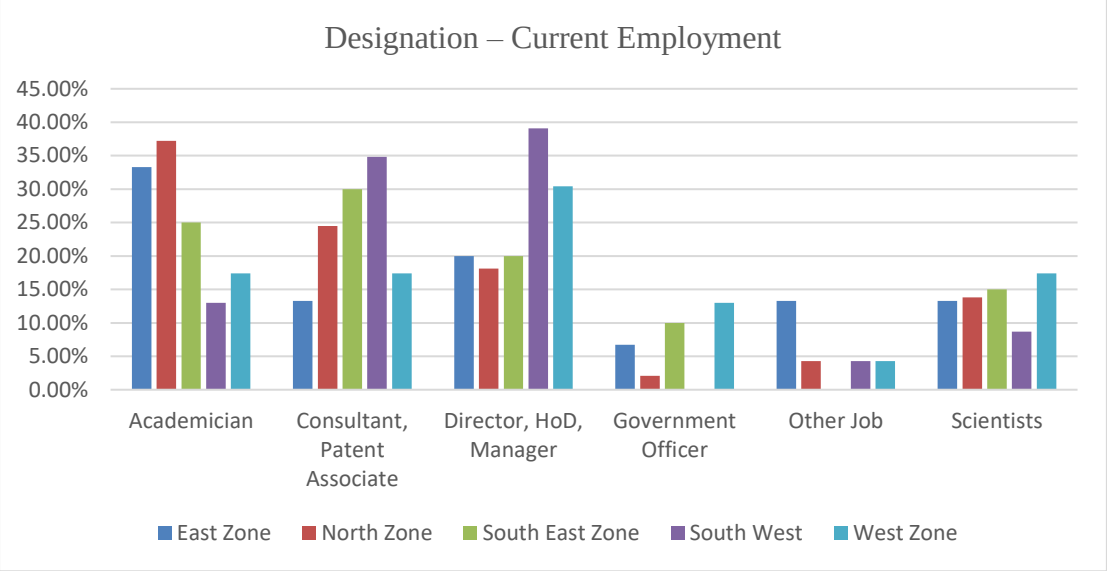
Employment Status: Before	Employment Status: After				Grand Total	
	Employed		Unemployed			
Employed	68	89.5%	8	10.5%	76	26%
Unemployed	108	50.23%	107	49.77%	215	74%
Grand Total	176	60.48%	115	39.52%	291	100%

There was an increase in the employment status before and after completing the internship. Before the internship, only 76 (26%) women beneficiaries were employed. But after completing the internship, the employment number raised to 176 (60.48%) women. **The increase in the employment status was 34.3%. Of the 176 employed after the internship, 23 (13.1%) women were self-employed.** Of the total employed women beneficiaries, 88.2% of women got jobs in less than 1 yr. Around 33.6% of women were employed in their mentor institutes after receiving the training under the WOS-C scheme.

Graph 41: Zone wise Status of Employment (after)

Among a total of 60.5% employment after the training, 52.6% were employed wherein 7.9% were self-employed. The highest employed were in the South West Zone (62.2%). The East zone had the highest percentage of unemployment status of the women

beneficiaries (69.4%). The maximum (13%) self-employed women scientists were in the Southeast and West Zone.



Graph 42: Zone wise details of the Current Employment with respective Designations of respondent Women Scientists

Of the surveyed women beneficiaries, 29.7% women worked as academicians, 24.6% were a consultant and patent associates, 22.9% were at the director, HoDs or manager positions, 13.7% were scientists and 4.6% were government officers. In the East and North Zone, the majority of women worked as academicians. In the South East Zone, 30% women were consultants or patent associates. In the South West and West Zones, the current designation of the majority of women were HoDs, Managers, or Director of some organizations.

8.5 Level of Satisfaction with Current Employment and Work Profile

Table 63: Satisfaction with the current employment and the work profile

Satisfaction with Current Employment & work Profile	Zones					
	East Zone	North Zone	South East Zone	South West	West Zone	Grand Total
Yes	95.9%	92.0%	100.0%	91.9%	89.5%	93.1%
No	4.1%	8.0%	0.0%	8.1%	10.5%	6.9%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0 %**	**100.0 %**	**100.0 %**

From the responses received, 93.1% of the women beneficiaries of the WOS-C were satisfied with their current employment and work profile. A maximum level of

satisfaction was observed in the South East Zone where all the women beneficiaries were satisfied in their current jobs. The East zone, North Zone and South West Zones with 95.9%, 92%and 91.9% respectively.

8.6 Achievements and Recognition

Of the surveyed women beneficiaries, 36.4% of women received achievements and recognition. About 24.5% of women participated in organizing seminars. 17.9% were certified Patent Agents, 9.4% received awards and achieved IPR skills. 38% of women received other accomplishments after the training. In the West Zone, 23.5% received awards, 22.8% women from the North Zone were certified patent agents, 20% achieved IPR skills and 60% participated in organizing seminars in the east zone.

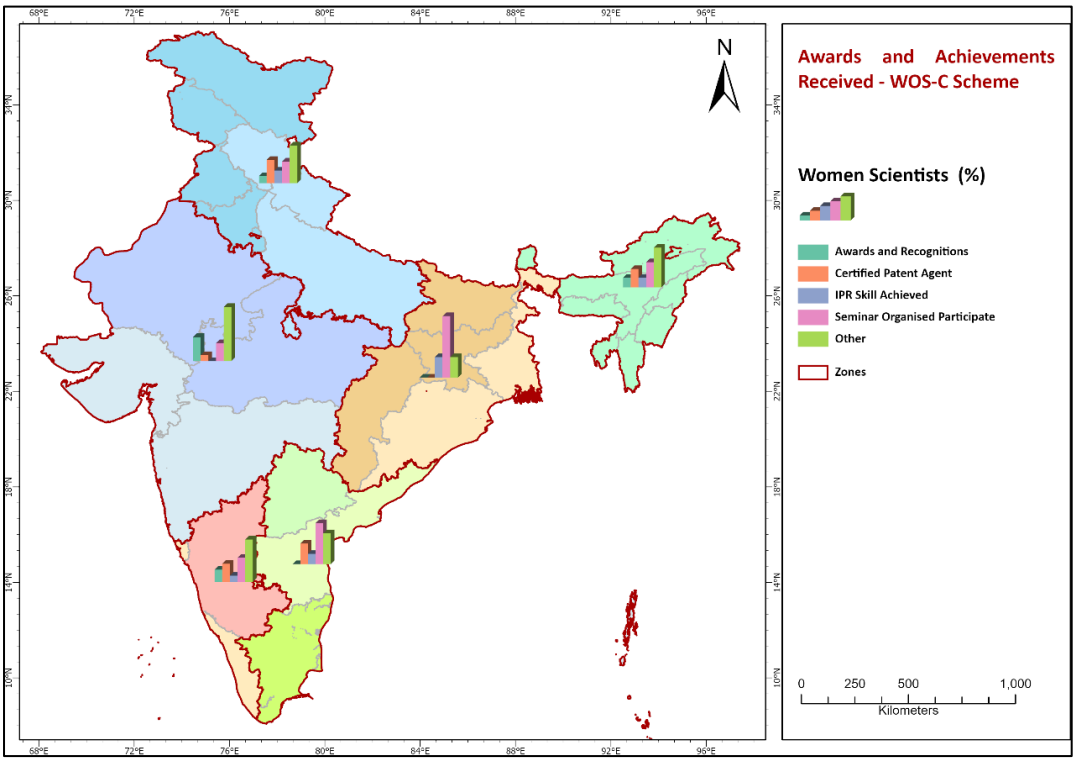
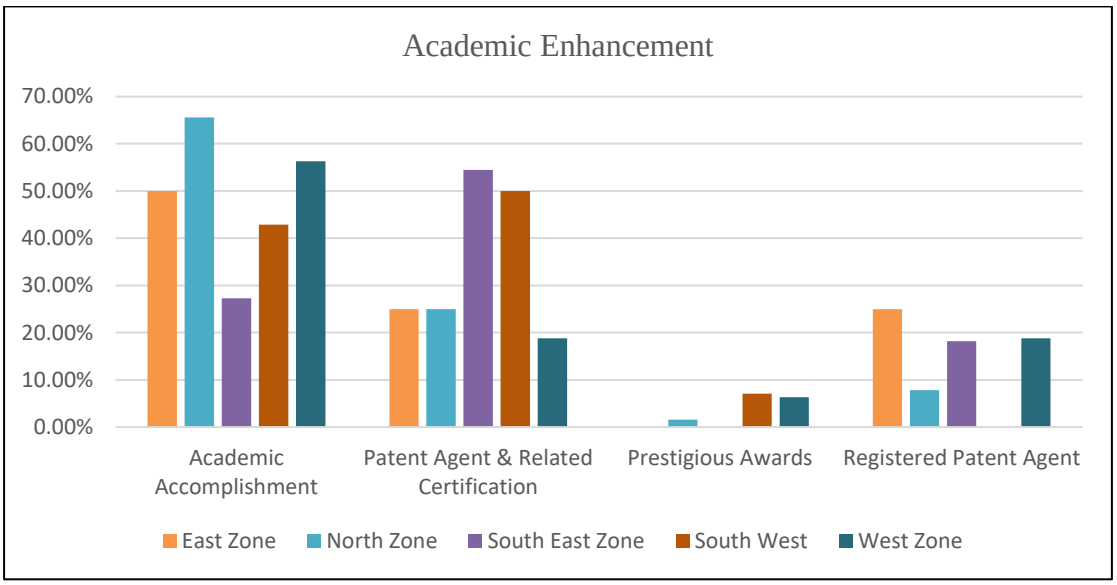


Table 64: Zone wise details of the Academic Enhancement:

Academic Enhancement	Zones					
	East Zone	North Zone	South East Zone	South West	West Zone	All Zones
Academic Accomplishment	50.0%	65.6%	27.3%	42.9%	56.3%	56.9%
Patent Agent & Related Certification	25.0%	25.0%	54.5%	50.0%	18.8%	30.3%
Prestigious Awards	0.0%	1.6%	0.0%	7.1%	6.3%	2.8%
Registered Patent Agent	25.0%	7.80%	18.2%	0.0%	18.8%	10.1%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**



Graph 43: Zone wise details of the Academic Enhancement

About 44.8% of women beneficiaries of the WOS-C scheme felt the enhancement in their academics. Out of those, 56.9% of women had various academic accomplishments, 30.3% were Patent agents and related certification, 10.1% were registered patent agents and 2.8% had prestigious awards. In the West Zone, 56.3% of the women had academic accomplishments. 54% of beneficiaries in the South East Zone were patent agents and had related certification. About 7% in the South West Zone received prestigious awards, and 25% of women from the East zone had registered patent agents.

8.7 Feedback received from the respondent Women Scientists:

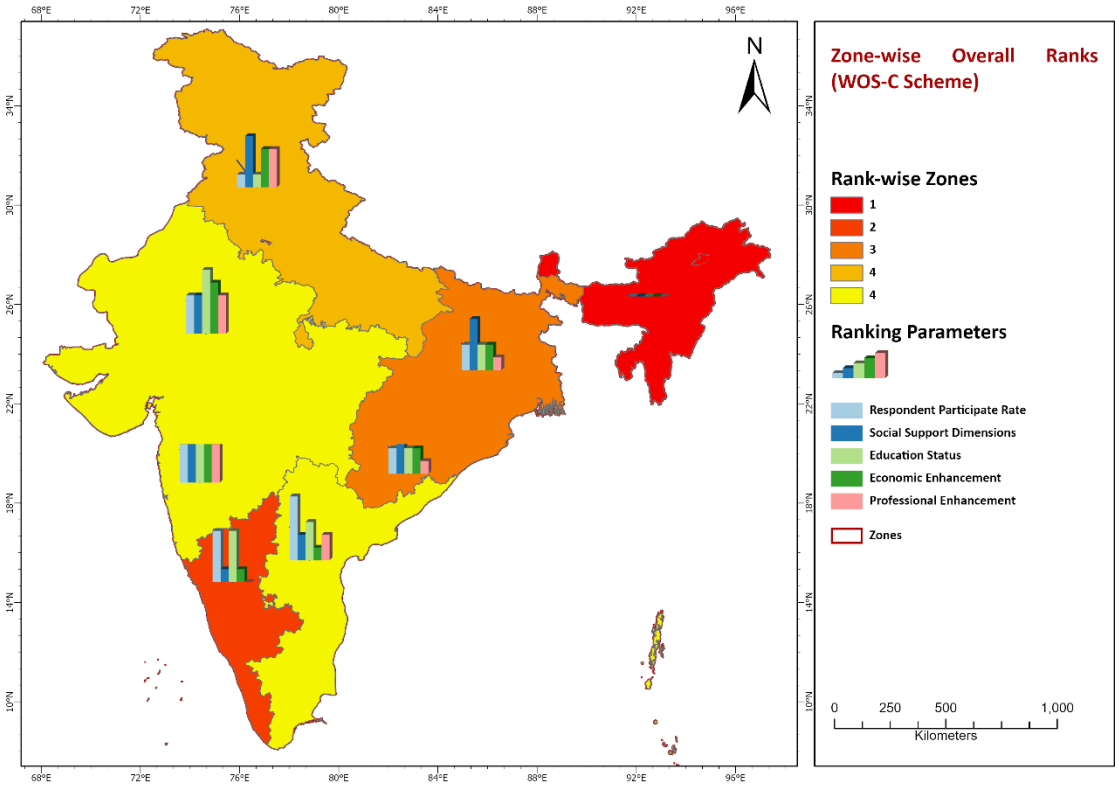
Of the total responses (291) received from the women beneficiaries, 55.7% women felt training very helpful in getting jobs, 37.5% felt helpful and 6.9% felt not helpful. Almost 95.1% of women were satisfied with the duration of the training program. Of the Women who were not satisfied with the training duration, 41% of women suggested 13-24 months training duration, 33.3% suggested up to 12 months and 25% felt training should be for 25 & above months.

An onion was sought on Level of satisfaction of the scheme. Out of total responses 46% of women scientist rated the training Excellent, 30.6% Very good, 19.9% good, 2.1% average and only 0.7% were not satisfied with the program. Around 41.2% of women

rated excellent satisfaction level of program/scheme, 52.8% rated very good and good, 4.5% average and 1.4% as not satisfied.

8.8 Rank Analysis

The overall ranking for the 5 different zones for the WOS-C scheme is shown in Map 8. The parameters ranked were respondent participation rate, social support dimension, education status, economic enhancement and professional enhancement. Across the zones, a maximum number of the respondents were from the North Zone followed by the east, west, southwest and southeast zone. Women beneficiaries from the southWest



Map 7: Rank wise Performance of Zones from the Selected Indicators

Zone, ranked the highest in the social support dimension whereas, the east zone and the North Zone ranked last. Women from the North Zone had the maximum change in the education status. The southeast zone and the South West Zone had the highest economic enhancement. The professional enhancement was highest in the east and South West Zone. The North Zone and the West Zone ranked last in terms of professional growth. After calculating the overall ranking of the five parameters, the South West Zone stood first among the five zones. The east zone and the North Zone ranked second, the southeast fourth and the West Zone stood fifth in the overall ranking.

9 CONCLUSION & DISCUSSION

Women have made considerable progress over years as their representation in field of S&T has steadily risen. This progress is at par with men only in early educational levels and difference emerges at levels of employment. The family responsibilities undertaken by women are often overlooked and not accounted for professional and educational environment. This often causes career breaks among women for whom Government of India's schemes aimed at gender mainstreaming is a second opportunity to revive their career.

In order to strengthen the focus on the work supporting gender equality and gender advancements in India and provide the most beneficial assistance to the nation to improve the status of women in STEM, an 'Assessment of Government of India's Gender mainstreaming program for women in science' project launched in 2018. It is a network mode project catalysed and supported by the CHORD (NSTMIS) Division, Department of Science & Technology, Government of India.

The cross-sectional study used a mixed-method research design approach i.e. quantitative followed by qualitative to comprehend the situation of women scientists and the role of gender-positive policies for promoting women in science careers. Descriptive and Inferential Analysis statistical techniques were used on the data collected through a nationwide data survey. The analysis addressed the nature of support, programme specific areas, geographical spread, affiliated institutes, and improvement in the project deliverables. The success stories of women scientists were selected based on the parameters such as their achievement level, societal contribution, their education, and professional growth. Compilation of these success stories served as a driver of inspiration for aspiring young women scientists.

Of the total 3530, about 48.5% of them, i.e.,1714 women scientists have enthusiastically responded and filled up the questionnaire completely. The geographic depiction of proportion of responded (1714) woman scientists speared across zones: North Zone 32.5% (541 respondents), East Zone, 13.1% (232 respondents), West Zone 16.7% (285 respondents), North-East Zone 4.5% (78 respondents), 13.4% (236 respondents) South West Zone and 19.8% (342 respondents) South East Zone.

It was noted that about 73% belonged to age group- between 35 and 48 yrs, while the average age of the women scientists was found to be 41yrs. Out of the total responses received, 86.2 % of respondents reported were married. The gender mainstreaming programs are about providing support to women who desire to return to the mainstream after a career break into the scientific profession. The survey data revealed 77.1% of women beneficiary took a career break while remaining 22.9% had no career break. Of the beneficiaries with career break, majority (60.9%) of the beneficiaries responded maternity, family, and health issues as a reason for the break in career. Almost 17.6% of women with career break mentioned desire for further studies, and preparing for professional competitive exams as the reason. Around 16.6% of the women beneficiaries took a break due to marriage, 4.9% had a break due to mobility reasons.

9.1 Analytical Inferences

The Factorial Design was carried out for 'duration of break' with other three variables 'reasons for break', 'Age' and 'Marital Status'. The Factorial Design for 'reasons for break' suggested that 'Family support' played an indirect role in the 'duration of break' for the women beneficiaries. About 75% of the beneficiaries received motivational support from their families. In Eastern, South East, South West and West Zones the 'duration of break' was significantly different for different 'reasons for break'. In East Zone the 'duration of break' was significantly different among beneficiaries of different 'Marital Status'. It was concluded that the 'reasons for break' caused difference in the 'duration of break' among the beneficiaries of BioCARe and WOS-A Schemes and 'Marital Status' did not cause difference in the beneficiaries of any schemes. Hence, 'duration of break' varied due to reason for which women beneficiaries took break but not due to their 'Marital Status'. In West Zone the 'duration of break' taken by the beneficiaries was different according to the different Age groups. In North Zone the 'Reasons of Break' were different among different Age group of beneficiaries.

There was an increase of 132 respondents in Ph.D. holders. The number increased from 790 respondents to 922 respondents. At the Post Doc level, there were 39 respondents at that level before project, which soon after the project completion raised to 279 respondents with Post Doc qualifications. This implied that the beneficiaries progressed significantly in their level of education after completion of project. 'Publications' was one of the important 'achievement parameters' for the beneficiaries. It was observed

that there was an increase in the number of publications since 2003 contributed by DST scheme beneficiaries. The highest average number of publications was found among the beneficiaries of West Zone whereas, among the schemes, beneficiaries of UGC PDF had highest average number of publications. There was a positive significant correlation between Age and Number of Publications by the beneficiaries across the nation so, with the increase in age group, there was an increase in number of publications.

The beneficiaries were asked about the nature of their employment in terms of 'Employed' or 'Unemployed' before the project and also at the time of filling up the questionnaire. While analysing these beneficiaries, it was found that, 18.5% of beneficiaries changed their employment nature from unemployed to employed. The largest chunk of such beneficiaries out of total were from the North Zone (20.2%). About 18.3% percentage of total beneficiaries continued to be unemployed both before and after the project. Overall 44.5% of the women beneficiaries have reported the continual of employment before and after the project. It could be inferred that the schemes aided most of the beneficiaries to maintain their employment nature.

Of the total 291 responses received from the women beneficiaries, 55.7% women felt training very helpful in getting jobs, 37.5% felt helpful and 6.9% felt not helpful. Almost 95.1% of women were satisfied with the duration of the training program. Of the people who were not satisfied with the training duration, 41% of women suggested 13-24 months training duration, 33.3% suggested up to 12 months and 25% felt training should be for 25 & above months.

46% of women rated Excellent, 30.6% Very good, 19.9% good, 2.1% average and 0.7% were not satisfied with the program. Around 41.2% of women rated excellent satisfaction level of program/scheme, 52.8% rated very good and good, 4.5% average and 1.4% as not satisfied.

9.1.1 SWOT Analysis

SWOT Analysis for the gender mainstreaming programme of Government of India was intended to identify beneficiaries related as well as programme related factors that were favourable and unfavourable to the success and growth of the programme. It was

observed that highest proportion (27.2%) of beneficiaries of North Zone was found in the category of 'Opportunity', i.e., have high achievements and high satisfaction. The North (26 %) and West (24%) zones had highest proportion of beneficiaries in 'Strength' zone, i.e., have high achievements and low satisfaction. In East (32.8%), North East (38.9%) and South East (28.8%) zones the highest proportion of beneficiaries were in the 'Threat' category, i.e., have least achievements and high satisfaction. In South West (33.2%) and West (29.9%) zones highest percentage of beneficiaries were from 'Weakness' category, i.e., have low achievements and low satisfaction.

In BioCARe (28.1%) and WOS-B (32.8%) it was evident that majority – consisting highest number/proportion of beneficiaries were in the 'Threat' quadrant, i.e., have least achievements and high satisfaction. There were 37.3% of beneficiaries of UGC PDF who were in the 'Opportunity' quadrant, i.e., have high achievements and high satisfaction. There were 28.6% of beneficiaries of WOS-A who were in the quadrant of 'Weakness'. It was noteworthy here that, similar to this, 27.3% beneficiaries were in the 'Threat' quadrant, i.e., have low achievements and high satisfaction.

9.1.2 Logistic Regression and Probability Analysis

The Logistic Regression (LR) method was used to calculate the probability of a beneficiary reaching to achievements score derived using variables – 'Number of publications', 'No. of Papers presented in International Seminars/Workshops', 'No. of International Seminars and Workshops attended', 'No. of Papers presented in national Seminars/Workshops', 'No. of National Seminars and Workshops attended'. A score of 11 (cut off point to move to higher quadrant of SWOT) was considered as threshold to achievement. The probability associated with this achievement score (i.e. higher than 11) was calculated for the different values of the variable. LR suggested that with maximum of '8' publications the beneficiary has 98% chances to achieve higher score. Similarly, the probability to move to higher quadrant would be 94% when the beneficiary presents 4 papers in international Seminars/Workshops. The values of the variables 'No. of International Seminars and Workshops attended', 'No. of Papers presented in national Seminars/Workshops' and 'No. of National Seminars and Workshops attended' were also found out for which the beneficiaries would have more

than 90% probabilities to achieve higher scores. This kind of analysis will help the policy makers to develop and set a criterion for targets to researchers to improve India in research output globally. Besides, such a combination of the probabilities for different variables leads beneficiary to achieve higher score and thereby to move to the higher quadrant of strength and opportunity.

9.1.3 Ranking the Zones

Rank analysis was carried out for the zones and schemes separately to have an interesting look at the relative positions of zones and schemes. The average score of the variables associated with these above mentioned aspects were analysed and ranks were assigned to these averages. Higher/favourable the average better was the rank assigned. Among the Social Support Dimensions, South West Zone was ranked the best followed by North and South East both on 2nd position.

Calculating the overall rank for the Educational Progression variables, North Zone secured first position and West Zone secured second position. For the variables related to Career Progression, it was observed that East zone was at 1st position, West on 2nd and South West Zone was at the third position. South East Zone secured first position for Entrepreneurship and Innovation Activities, South West secured second position, and West Zone stood third in position. For the overall ranking position for six different zones, South East Zone was on the 1st position. The second position was shared by South West and North Zone, the fourth rank secured by the West Zone.

For the variables related to Career Progression, it was observed that South West Zone was at 1st position, South West on 2nd and West Zone was at the third position. BioCARe was at 1st rank and WOS-B was found placed at 2nd rank for the variables related to Career Progression. Three zones shared first position for Entrepreneurship and Innovation Activities: South East, South West and West. North Zone stood on the second position. WOS-B was at the first position for Entrepreneurship and Innovation Activities and the second position was achieved by WOS-A. For the overall ranking position for six different zones, South West Zone was on the 1st position. On second, third and fourth positions, there were South East, North and West Zones respectively with very little difference in the averages they scored. For the schemes, WOS-B secured

1st position for overall ranking. BioCARe stood at the 2nd position with very little difference in the averages with WOS-B. WOS-A stood at the third position which did not have much difference in the average with the scheme at second position i.e. BioCARe. UGC PDF was found at the fourth position overall.

9.2 Discussion:

In the above analysis, the variations across zones as well as schemes-wise were clearly reflected. Especially the regional imbalances of researchers were visible across the zones. East zone had a demography with tremendous potential for growth in scientific research and tops in terms of family support and employment gain but needed improvement in i) education progression, ii) research outputs and iii) Entrepreneurship and Innovation Activities. The researchers required more employment opportunities. The growth of educational, research and development institutions may thrust the opportunities for research and development in private sector as well. The WOS-B had women with more 'duration of break' than others with WOS-A being only second from it. The age differences reflect clearly in terms of aspirations and research outputs. **The younger generation in WOS-B are ambitious and have zeal to contribute to the society through their research whereas scheme like UGC PDF have more experienced and mature researchers who are adept to making significant contributions in terms of research outputs like scientific publications.**

Publication of research papers enhance the visibility and network among the subject fraternity. Indirectly this may help in career enhancement and professional progression. It may be suggested that the women beneficiaries 'must' attend the 'writing workshop' at least twice in case of three-year duration of the project. **The 'writing workshop' may be arranged by the DST periodically, one in six months by the eminent and expert institutions or the established publishers like, Springer, Francis & Tylor or any other.** Emphasise may also be given in regard to the improvement in the quality research, similar to the 'writing workshop' with the help of IITs and other universities a 'research methodology workshop' may also be made mandatory to be attended by the project awardee women scientists.

There is need for **regional level** sensitization workshops covering larger part of the nation to attract young talent in regions that need improvement**.** Such initiatives are needed for talented young women scientists who are prospective or aspiring candidates, can draw more candidates where more participation is needed in certain schemes. The same may be organised periodically in close **collaboration with institutions** and with **a robust mechanism for talent identification** to make sure that schemes are availed to the most deserving women scientists.

The **committees and teams of experts** who can provide in valuable inputs to bring in more awareness in young women scientists in institutions from **two-tier and three-tier cities** will pave for much difference in their further careers. The successful women scientists can be enabled to act as **ambassadors for promoting research** in science and technology. Besides, this will improve the participation **from areas which have been traditionally lagging due** to various reasons. The larger mass of the young women scientists may be **made aware of research facilities, utilities and their availabilities** that can be useful for their research studies.

Research training can act as an important means of equipping the woman scientists with necessary skills and knowledge helpful in carrying out research and develop **research writing useful for publishing** as well as skills needed presenting their work. The woman scientists may be familiarized with publication practices and requirements. The **guidelines and manuals** will be resource that can help solve the bottlenecks in research methodology. The material may be prepared for research ethics and practices. The **coffee-table books** consist of best practices, success stories adding with common mistakes and expert guidance will help allaying misunderstandings and doubts. Encouraging **the active presentation and speaking in conferences** can support the researcher in taking suggestions, crucial observations of others. The productivity of the work is directly affected by these skills which once learned can score points to further advance and rise in research field.

The **professional and scientific societies and associations** which are actively organising science and technology related activities may be encouraged to conduct programmes **at national and regional level** targeting increase in women representation

in research. Very specific emphasis may be given to the project awardee women scientists. This enhances the spread, outreach motivated by collective conscience for gender balance in scientific research and professional involvement in India with renewed vigour.

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