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CONTENTS

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DIGITAL LITERACY AND WORKING WOMEN IN ORGANIZED SECTOR: A STUDY OF KOPPAL DISTRICT

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Digital literacy has emerged as a crucial factor influencing the participation, productivity, and empowerment of working women in the organized sector. The present study examines the impact of digital literacy on working women in the organized sector in Koppal District of Karnataka. The study is based on primary data collected through a structured questionnaire from working women employed in various organized sectors across different taluks of Koppal District. The analysis focuses on socio-economic characteristics, educational qualifications, work experience, access to digital devices, and levels of digital skills. Statistical tools such as percentage analysis and appropriate inferential techniques were employed to assess the relationship between digital literacy and employment-related outcomes. The findings reveal that higher levels of digital literacy significantly enhance job efficiency, access to information, career advancement opportunities, and confidence among working women. The study also identifies gaps in digital skills among women with lower educational attainment and limited work experience. The study concludes that strengthening digital literacy through targeted training programs and policy interventions is essential for promoting inclusive growth and improving the status of working women in the organized sector of Koppal District.

KEYWORDS: ***Digital Literacy, Working Women, Organized Sector, Women Empowerment.***

1. INTRODUCTION

Digital literacy has become a critical determinant of employability, efficiency, and career advancement in the modern organized sector, where information and communication technologies are integral to workplace functioning. With the increasing participation of women in organized employment, digital skills play a vital role in enhancing their job performance, access to information, and professional confidence. However, disparities in educational background, access to technology, and training opportunities continue to affect the level of digital literacy among working women, particularly in semi-urban and developing regions. Koppal District of Karnataka provides an important context for examining these issues due to its evolving socio-economic structure, expanding organized sector employment, and varying levels of digital infrastructure across its taluks. Despite growing opportunities, many working women face challenges in effectively utilizing digital tools in their professional roles. In this context, the present study examines the impact of digital literacy on working women in the organized sector of Koppal District, with a focus on understanding how digital skills influence employment outcomes, productivity, and empowerment, and aims to provide insights for policy interventions and skill development initiatives to promote inclusive growth.

2. REVIEW OF LITERATURE

Studies by Agarwal and Rao (2019) and Singh (2020) reveal that digital literacy significantly enhances employability, work efficiency, and career advancement among working women in the organized sector. Kumar and Devi (2021) emphasize that digital skills contribute to women's economic empowerment by improving access to information and professional opportunities. However, Rani and Suresh (2022) point out that inadequate digital training and limited access to technology continue to restrict women's full participation in organized employment. More recently, Patil (2023) highlights that structured digital skill development programs improve productivity, confidence, and adaptability among women employees. These studies collectively underline the importance of digital literacy while justifying the need for a region-specific analysis in Koppal District.

3. RESEARCH GAP

Although numerous studies highlight the importance of digital literacy in improving employability, work efficiency, economic empowerment, and professional confidence among women,

most research focuses on urban or national contexts. There is limited investigation into the region-specific impact of digital literacy on working women in smaller districts like Koppal, where infrastructure, socio-economic conditions, and cultural norms may affect access to and use of digital technologies. This gap emphasizes the need for localized research to understand the challenges and opportunities for enhancing digital literacy among women in the organized sector in Koppal District.

4. RESEARCH METHODOLOGY

This study uses a descriptive research design to examine the impact of digital literacy on working women in the organized sector in Koppal District. Primary data were collected from 383 respondents using a structured questionnaire, which included both closed-ended and Likert-scale questions on digital skills, technology use, and workplace benefits. The data were analyzed using descriptive statistics frequency, percentages and Chi-Square test to assess variations in digital literacy based on demographic factors and work experience. This approach provides insights into how digital literacy influences professional efficiency and empowerment among women in the district.

5. OBJECTIVES

1. To assess the digital literacy levels of working women in Koppal District.
2. To identify the digital tools and technologies used at work.
3. To examine the impact of digital literacy on work efficiency and career growth.
4. To identify challenges faced by women in using digital technologies at work.

6. HYPOTHESIS

H_0 : There is no significant relationship between the age of working women and their overall digital literacy in the organized sector in Koppal District.

H_1: There is a significant relationship between the age of working women and their overall digital literacy in the organized sector in Koppal District.

7. DATA ANALYSIS AND INTERPRETATION

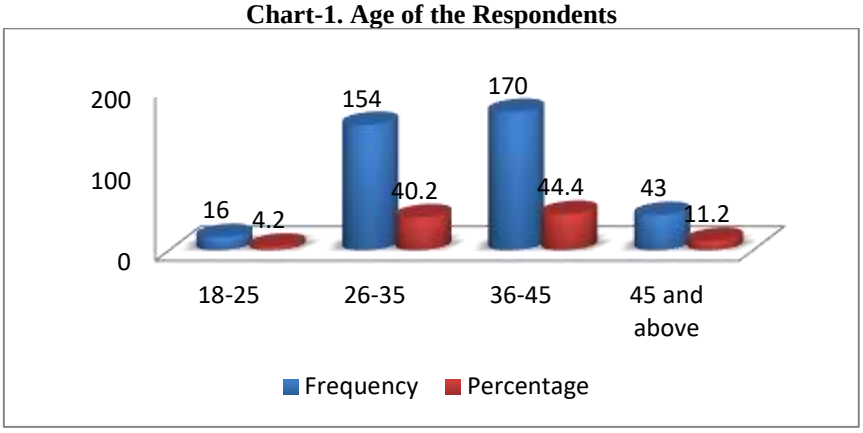
Data Analysis and Interpretation is the process of organizing and examining the collected data to draw meaningful insights. It helps in understanding how digital literacy affects the skills, efficiency, and performance of working women.

Table 1. Age of the Respondents

Age	Frequency	Percentage
18-25	16	4.2
26-35	154	40.2
36-45	170	44.4
45 and above	43	11.2
Total	383	100.0

Source: Field Survey

Chart-1. Age of the Respondents



Source: Field Survey

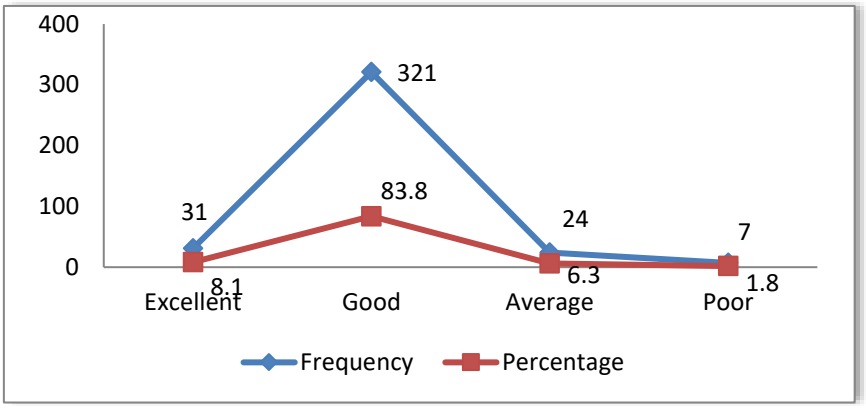
The age distribution of the 383 respondents shows that the majority of working women in Koppal District are between 26-45 years**,** with 40.2% in the 26-35 age group and 44.4% in the 36-45 age group. Only 4.2% are aged 18-25, while 11.2% are 45 years and above. This indicates that the organized sector workforce is predominantly composed of middle-aged women.

Table 2. How would you rate overall Digital Literacy?

Overall Digital Literacy	Frequency	Percentage
Excellent	31	8.1
Good	321	83.8
Average	24	6.3
Poor	7	1.8
Total	383	100.0

Source: Field Survey

Chart – 2 How would you rate overall Digital Literacy?



Source: Field Survey

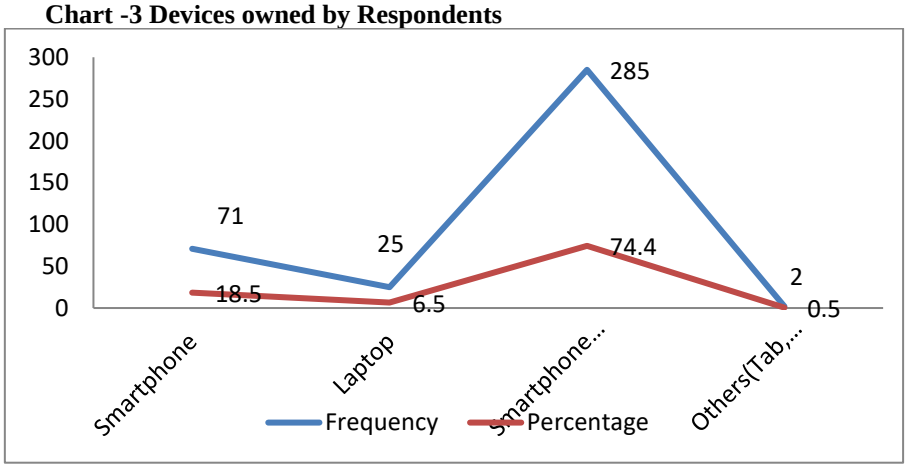
The analysis of overall digital literacy among the 383 respondents reveals that a majority of women (83.8%) possess a good level of digital literacy, while 8.1% demonstrate an excellent level. Only 6.3% have an average level, and a minimal 1.8% are at a poor level. This indicates that most working women in Koppal District are reasonably competent in using digital technologies.

Table 3. Devices owned by Respondents

Devices	Frequency	Percentage
Smartphone	71	18.5
Laptop	25	6.5
Smartphone & Laptop	285	74.4
Others(Tab,Printer etc)	2	.5
Total	383	100.0

Source: Field Survey

Chart -3 Devices owned by Respondents



Source: Field Survey

The data on device ownership among the 383 respondents shows that the majority (74.4%) use both a smartphone and a laptop, while 18.5% use only a smartphone and 6.5% use only a laptop. A very small proportion **(**0.5%**)** use other devices like tablets or printers. This indicates that most working women in Koppal District rely on multiple digital devices for their professional tasks.

8. RESULTS OF TESTING HYPOTHESIS

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.225[a]	9	.033
Likelihood Ratio	15.852	9	.070
Linear-by-Linear Association	6.128	1	.013
N of Valid Cases	383		

a. 8 cells (50.0%) have expected count less than 5. The minimum expected count is .29.

The Chi-Square test results show a Pearson Chi-Square value of 18.225 with 9 degrees of freedom and a p-value of 0.033, which is less than 0.05, indicating a significant relationship between age and overall digital literacy among working women in Koppal District. The Linear-by-Linear Association value of 6.128 (p = 0.013) further confirms a significant association. Although 50% of cells have expected counts less than 5, the

results suggest that age influences digital literacy levels, supporting the rejection of the null hypothesis.

9. MAJOR FINDINGS

- The majority of working women (83.8%) possess a good level of digital literacy, indicating overall competence in using digital technologies for professional purposes.
- Chi-Square analysis shows a significant relationship between age and overall digital literacy, suggesting that younger and middle-aged women are more digitally skilled compared to older employees.
- Most respondents (74.4%) use both smartphones and laptops, reflecting a reliance on multiple devices to perform work-related tasks efficiently.
- Women with higher digital literacy demonstrate improved productivity, confidence, and adaptability, highlighting the positive role of digital skills in enhancing work performance.
- Despite high digital literacy levels, some respondents face challenges such as limited access to advanced technology, lack of structured training programs, and occasional difficulties in adopting new digital tools.

10.SUGGESTIONS

1. Conduct regular workshops and training sessions to enhance digital literacy and update women on emerging technologies.
2. Ensure access to essential digital devices like laptops, smartphones, and reliable internet connectivity.
3. Promote the adoption of productivity and communication tools to improve efficiency and workplace performance.
4. Design digital skill development programs considering the specific needs of different age groups to bridge the generational digital gap.
5. Implement workplace policies that encourage continuous digital learning and provide technical support for employees.
6. Conduct awareness programs emphasizing the benefits of digital literacy for career growth and professional empowerment.

11.CONCLUSION

The study reveals that the majority of working women in Koppal District possess a good level of digital literacy, which positively influences their work efficiency, productivity, and confidence. Age and access to digital devices play a significant role in determining digital competence. Despite these strengths, some challenges such as limited access to advanced technology and inadequate training persist. Enhancing digital skills through targeted programs and supportive workplace policies can further empower women in the organized sector. Overall, digital literacy emerges as a key factor in professional growth and workplace effectiveness.

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Research Paper

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ENTREPRENEURIAL ASPIRATIONS OF ARTS AND SCIENCE COLLEGE STUDENTS IN RAJAPALAYAM: A YOUTH PERSPECTIVE

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Entrepreneurship is the process of identifying opportunities, taking risks, and creating new products or services to meet the needs of society. An entrepreneur is a person who starts, organizes, and manages a business with the aim of earning profit while contributing to economic growth. Entrepreneurship plays a vital role in the development of a country by generating employment, encouraging innovation, and improving living standards. The study adopted a *descriptive research design* ***to examine the entrepreneurial aspirations of Arts and Science college students in Rajapalayam. The research used both*** *primary and secondary data.* ***Primary data is collected directly from students through a structured questionnaire to capture their views, aspirations, and perceived barriers. Secondary data is gathered from books, research journals, government reports, websites, and previous studies related to entrepreneurship and youth development. A sample size of*** *120 Arts and Science college students* ***is selected for the study. The study used*** *simple random sampling technique****, ensuring that every student in the population has an equal chance of being selected. This method reduced bias and improves the reliability of the findings. The target population of the study consists of*** *Arts and Science college students studying in various colleges located in Rajapalayam****.***

KEYWORDS: ***Entrepreneur, Challenges, Barriers, Students and Arts and Science Colleges.***

1. INTRODUCTION

Entrepreneurs are known for their creativity, leadership, and willingness to take risks. They identify problems in the market and turn them into business opportunities. Some key characteristics of successful entrepreneurs include self-confidence, decision-making ability, hard work, adaptability, and strong vision. Entrepreneurship is not limited to starting new businesses; it also includes improving existing businesses through innovation and better management. There are different types of entrepreneurship, such as small-scale entrepreneurship, social entrepreneurship, and corporate entrepreneurship. Small-scale entrepreneurs run local businesses, social entrepreneurs focus on solving social problems, and corporate entrepreneurs innovate within large organizations. In today's world, entrepreneurship is especially important due to technological advancements and globalization. Governments and institutions support entrepreneurship through training programs, financial assistance, and startup policies. Overall, entrepreneurship helps in economic development, promotes innovation, and encourages individuals to become self-reliant and proactive members of society.

2. CONCEPT OF ENTREPRENEURSHIP

The concept of entrepreneurship refers to the process of identifying business opportunities and transforming innovative ideas into successful ventures. It involves starting, organizing, and managing an enterprise with the aim of earning profit while taking calculated risks. Entrepreneurs play a key role in introducing new products, services, and technologies that satisfy the changing needs of consumers and society. Entrepreneurship is built on creativity, innovation, and vision. An entrepreneur must be able to recognize market gaps, make effective decisions, and use available resources efficiently. Other important aspects of entrepreneurship include leadership, planning, problem-solving, and adaptability to change. Entrepreneurs are not only profit-oriented but also contribute to social and economic development.

The concept of entrepreneurship also emphasizes value creation and wealth generation. By establishing new businesses, entrepreneurs create employment opportunities and promote industrial growth. In developing economies, entrepreneurship helps reduce poverty and encourages self-employment.

Governments and institutions support entrepreneurship through education, training, financial assistance, and startup policies.

3. RESEARCH OBJECTIVES

- To examine the role of educational background and institutional support in shaping entrepreneurial aspirations.
- To analyze the challenges and barriers perceived by students in pursuing entrepreneurship as a career option.

4. RESEARCH QUESTIONS

- How do educational background and institutional support influence the entrepreneurial aspirations of Arts and Science college students?
- What challenges and barriers do students perceive in pursuing entrepreneurship as a career option?

5. STATEMENT OF THE PROBLEM

Entrepreneurship is increasingly recognized as a key driver of economic growth, innovation, and employment generation, particularly among youth. College students represent a vital segment of potential entrepreneurs, as their aspirations and career choices shape the future workforce. Despite the growing emphasis on entrepreneurship education and startup promotion, many Arts and Science college students continue to show limited inclination toward entrepreneurial careers. This raises concerns about the effectiveness of educational background and institutional support systems in nurturing entrepreneurial aspirations. Educational factors such as curriculum design, exposure to entrepreneurial training, skill development programs, and mentorship play a crucial role in shaping students' entrepreneurial mindset. Similarly, institutional support in the form of incubation centers, career guidance, financial assistance, and industry linkages can significantly influence students' willingness to pursue entrepreneurship. However, the extent to which these factors actually impact students' aspirations remains unclear.

Moreover, students often perceive various challenges and barriers, including lack of capital, fear of failure, inadequate knowledge, social pressure, and limited institutional encouragement, which may discourage them from choosing entrepreneurship as a career. Understanding these perceived obstacles is essential to address gaps in existing support mechanisms. Therefore, the present study seeks to examine the role of educational background and institutional support in shaping entrepreneurial aspirations and to analyze the challenges and barriers perceived by students in pursuing entrepreneurship as a career option.

6. IMPORTANCE OF THE RESEARCH

The importance of the present research lies in its focus on understanding the factors that shape entrepreneurial aspirations among college students, who represent the future workforce and potential entrepreneurs of the nation. By examining the role of educational background and institutional support, the study highlights how academic curriculum, training programs, mentorship, and institutional facilities influence students' interest in entrepreneurship. This understanding can help educational institutions design more effective entrepreneurship-oriented courses and support systems that encourage innovative thinking and self-employment.

The research is also significant in identifying the challenges and barriers perceived by students in pursuing entrepreneurship as a career option. Recognizing these obstacles, such as lack of financial resources, inadequate guidance, fear of risk, and limited institutional encouragement, provides valuable insights for policymakers, educators, and administrators. Addressing these challenges can help reduce hesitation among students and promote a more supportive entrepreneurial environment.

Furthermore, the findings of this study can assist colleges, universities, and government agencies in formulating policies and programs that foster entrepreneurial culture among youth. By bridging the gap between education and entrepreneurial practice, the research contributes to employment generation, economic development, and youth empowerment. Overall, this study is important for strengthening entrepreneurship education and encouraging students to view entrepreneurship as a viable and attractive career choice.

7. SCOPE OF THE RESEARCH

The scope of the present research is centered on examining the entrepreneurial aspirations of Arts and Science college students with specific reference to the role of educational background and institutional support. The study focuses on understanding how factors such as curriculum content, entrepreneurship education, skill development programs, training, and mentoring provided by institutions influence students' interest in entrepreneurship. It also explores the availability and effectiveness of institutional facilities such as career guidance cells, incubation centers, and start-ups support mechanisms.

In addition, the research scope includes the identification and analysis of challenges and barriers perceived by students in pursuing entrepreneurship as a career option. These challenges may include financial constraints, lack of practical knowledge, fear of failure, social and family pressure, and limited access to resources and guidance. By capturing students' perceptions, the study aims to provide a comprehensive view of the difficulties faced by aspiring entrepreneurs. The research is limited to Arts and Science college students and does not include students from professional or technical institutions. It is also geographically confined to the selected study area, making the findings context-specific. Nevertheless, the study offers valuable insights that can serve as a reference for educators, institutions, and policymakers seeking to strengthen entrepreneurship education and support systems among college students.

8. REVIEW OF LITERATURE

Sathya, A., & Velmurugan, V. P. (2021) identified that the factors that influence entrepreneurial aspirations among arts and science college students. The structure questionnaire was used to collect primary data about creative thinking, leadership, commitment, communication skills, and achievement motivation factors determining entrepreneurial aspirations for this study. All data was collected and analysed using a five-point Likert scale, with 1 representing "strongly disagree" and 5 representing "strongly agree." For this study, the researcher employed the purposive sampling technique. The sample size for this study was 150 college students from the arts and sciences. It is concluded that the factors of creative thinking, leadership, commitment, communication skills, and achievement motivation influence the entrepreneurial aspirations of Kanyakumari district arts and science college

students. It has been discovered that the variables creative thinking, leadership, commitment, communication skills, and achievement motivation are closely related and have an impact on the entrepreneurial aspirations of Kanyakumari district arts and science college students. The study's findings will assist planners and policymakers in taking the necessary steps to promote entrepreneurial intelligence among arts and science college students. Key-words: Entrepreneurial Aspiration.

Mani, A., & Manoharan, G. (2025) opined that in the dynamic higher education environment, youth entrepreneurship is increasingly seen as a source of innovation and economic progress. This article discusses how an entrepreneurial attitude leads to huge career and personal success and how it affects college students' futures. It examines curriculum design, institutional assistance, and young entrepreneurs who have turned unique ideas into successful enterprises. In this article, researchers examine student entrepreneurs' financing challenges, academic obligations, and market competitiveness. We also examined how emerging technologies are elevating entrepreneurship, the importance of mentorship and support networks, and college student business models. We do so to show how enabling the next generation of entrepreneurs boosts job prospects and societal and economic advancement.

Suresh, G., & Krishnamurthy, S. (2014) analysed that developing entrepreneurial skills among youth is more important for the growth of an economy like India. It will create employment opportunities and increase the country's exports, which in turn will lead to improvement in the standard of living. The important skill with regard to the development of entrepreneurs is the entrepreneurial traits. The present paper analyzes whether the entrepreneurial traits among the commerce students of Arts and Science colleges in Theni district play an important role in developing their own establishments. The study also seeks to find out if there is any relationship between socioeconomic factors and the level of entrepreneurial traits. The paper concludes that entrepreneurial traits are important factors in developing prospective entrepreneurs and creating new ventures, and the educational institutions as well as the government should lend a helping hand to the students in this regard.

9. RESEARCH HYPOTHESES

- There is a significant relationship between educational background, institutional support, and the entrepreneurial aspirations of students.
- The perceived challenges and barriers have a significant impact on students' intention to pursue entrepreneurship as a career option.

10. RESEARCH METHODOLOGY

Research methodology refers to the systematic framework used to plan, conduct, and analyze research. It explains how data is collected, measured, and interpreted to answer research questions or test hypotheses. The study adopted a descriptive research design to examine the entrepreneurial aspirations of Arts and Science college students in Rajapalayam. The research used both primary and secondary data. Primary data is collected directly from students through a structured questionnaire to capture their views, aspirations, and perceived barriers. Secondary data is gathered from books, research journals, government reports, websites, and previous studies related to entrepreneurship and youth development. A sample size of 120 Arts and Science college students is selected for the study. The study used simple random sampling technique, ensuring that every student in the population has an equal chance of being selected. This method reduced bias and improves the reliability of the findings. The target population of the study consists of Arts and Science college students studying in various colleges located in Rajapalayam. The focus is on undergraduate students, as they are at a crucial stage of career decision-making and entrepreneurial development.

11. SCALING TECHNIQUE

A structured questionnaire is prepared with statements covering areas such as students' interest in entrepreneurship, influence of educational background, institutional support, and perceived barriers. Respondents have indicated their level of agreement on a **five-point scale**:

- 5 – Strongly Agree
- 4 – Agree
- 3 – Neutral
- 2 – Disagree
- 1 – Strongly Disagree

12. STATISTICAL TESTS

- Exploratory Factor Analysis
- Multiple Regression Analysis

13. DATA ANALYSIS AND RESULTS DISCUSSION

13.1 Exploratory Factor Analysis in relation to Role of Educational Background and Institutional Support in shaping Entrepreneurial Aspirations

Exploratory Factor Analysis (EFA) is a statistical technique used to identify the underlying structure of relationships among a large set of observed variables. It helps reduce data complexity by grouping correlated variables into factors that represent latent constructs. EFA is commonly used in scale development and theory building when the factor structure is unknown. The suitability of the data for factor analysis was assessed using the Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity**.**

Table 1(a)
KMO and Bartlett's Test in relation to Role of Educational Background and Institutional Support in shaping Entrepreneurial Aspirations

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.805
Bartlett's Test of Sphericity	Approx. Chi-Square	349.415
	df	6
	Sig.	.000

The KMO value of 0.805 indicates a high level of sampling adequacy. According to Kaiser's classification, KMO values between 0.80 and 0.89 are considered "meritorious," suggesting that the patterns of correlations among the variables are sufficiently compact and reliable for factor analysis. This implies that the variables related to educational background and institutional support share enough common variance to justify the extraction of underlying factors influencing entrepreneurial aspirations. Bartlett's Test of Sphericity further supports this conclusion. The test yielded a Chi-square value of 349.415 with 6 degrees of freedom, which is statistically significant (p = .000)**.** This significant result indicates that the correlation matrix is not an identity matrix, meaning that the variables are significantly correlated with one another. In other words, the relationships among educational background, institutional support, and entrepreneurial aspirations are strong enough to proceed with factor analysis.

Table 1(b) presents the communalities of the research variables measuring the role of educational background and institutional support in shaping entrepreneurial aspirations**,** extracted using the Principal Component Analysis (PCA) method. Communalities represent the proportion of variance in each observed variable that is accounted for by the extracted component(s). The initial communalities for all variables are 1.000, which is typical in PCA and indicates that the full variance of each variable was considered prior to extraction.

Table 1 (b)
Communalities

Research Variables of the Role of Educational Background and Institutional Support in shaping Entrepreneurial Aspirations	**Initial**	**Extraction**
My educational background has helped me develop skills necessary for entrepreneurship.	1.000	.690
Courses offered by my institution encourage students to consider entrepreneurship as a career.	1.000	.891
Faculty members provide guidance and motivation for entrepreneurial activities.	1.000	.767
Institutional support such as incubation centers or workshops influences my interest in starting a business.	1.000	.803

After extraction, the communalities show relatively high values, ranging from 0.690 to 0.891**,** indicating that a substantial amount of variance in each variable is explained by the extracted component(s). The variable *"Courses offered by my institution encourage students to consider entrepreneurship as a career"* exhibits the highest extraction value (0.891), suggesting that institutional curriculum plays a particularly strong role in influencing entrepreneurial aspirations. This implies that structured academic courses significantly contribute to developing an entrepreneurial mindset among students. The statement *"Institutional support such as incubation centers or workshops influences my interest in starting a business"* records a high extraction value of 0.803, highlighting the importance of institutional infrastructure and support mechanisms in fostering entrepreneurial interest. This finding underscores the role of practical exposure and support systems provided by institutions in shaping students' inclination toward entrepreneurship.

Similarly, the variable *"Faculty members provide guidance and motivation for entrepreneurial activities"* has an extraction value of 0.767, indicating that faculty mentorship and encouragement are well represented by the extracted component(s). This suggests that faculty involvement plays a meaningful role in motivating students and enhancing their entrepreneurial aspirations. The variable *"My educational background has helped me develop skills necessary for entrepreneurship"* shows an extraction value of 0.690, which, although comparatively lower than the other variables, still reflects a strong contribution. This indicates that general educational background significantly supports the development of entrepreneurial skills, even if its influence is slightly less direct than targeted institutional initiatives.

Table 1(c) presents the Total Variance Explained by the components extracted through Principal Component Analysis (PCA) in examining the role of educational background and institutional support in shaping entrepreneurial aspirations. This table provides information on the eigenvalues, percentage of variance explained by each component, and the cumulative variance explained.

Table 1(c)
Total Variance Explained in relation to Role of Educational Background and Institutional Support in shaping Entrepreneurial Aspirations

Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	3.151	78.786	78.786	3.151	78.786	78.786
2	.414	10.356	89.142			
3	.310	7.756	96.898			
4	.124	3.102	100.000			

The results show that Component 1 has an eigenvalue of 3.151, which is substantially higher than the commonly accepted criterion of 1.00 for factor retention (Kaiser's criterion). This single component explains 78.786% of the total variance, indicating that a very large proportion of the information contained in the original variables is captured by this component. The high percentage of variance suggests that the variables related to educational background and institutional support are strongly interrelated and collectively represent a dominant underlying construct influencing entrepreneurial aspirations. In contrast, Components 2, 3, and 4 have eigenvalues of 0.414, 0.310, and 0.124, respectively, all of which are well below 1.00. Although these components together account for additional variance, their individual contributions are relatively small (10.356%, 7.756%, and 3.102%, respectively) and do not meet the criterion for meaningful factor extraction. As a result, these components

were not retained for further analysis, reinforcing the decision to extract only one principal component.

The extraction sums of squared loadings further confirm this outcome, as only one component was extracted, explaining the same 78.786% of the total variance with a cumulative variance of 78.786%**.** This indicates that the extracted component adequately summarizes the shared variance among the observed variables related to educational background, institutional curriculum, faculty support, and institutional facilities.

Table 1(d) presents the Component Matrix derived from Principal Component Analysis (PCA), illustrating the factor loadings of the research variables related to the role of educational background and institutional support in shaping entrepreneurial aspirations. Factor loadings represent the strength and direction of the relationship between each observed variable and the extracted component. Higher loadings indicate a stronger contribution of the variable to the underlying component.

Table 1(d)
Component Matrix

Research Variables of the Role of Educational Background and Institutional Support in shaping Entrepreneurial Aspirations	**Component 1**
My educational background has helped me develop skills necessary for entrepreneurship.	.831
Courses offered by my institution encourage students to consider entrepreneurship as a career.	.944
Faculty members provide guidance and motivation for entrepreneurial activities.	.876
Institutional support such as incubation centers or workshops influences my interest in starting a business.	.896

The results show that only one component was extracted, confirming the unidimensional nature of the construct. All four variables load strongly on Component 1, with factor loadings ranging from 0.831 to 0.944, which are well above the commonly accepted minimum threshold of 0.50. This indicates that each variable makes a substantial contribution to the component and is closely associated with the underlying factor influencing entrepreneurial aspirations. Among the variables, *"Courses offered by my institution encourage students to consider entrepreneurship as a career"* exhibits the highest factor loading (0.944)**.** This suggests that institutional curriculum plays the most influential role in defining the extracted component, highlighting the importance of entrepreneurship-oriented courses in fostering students' entrepreneurial aspirations. The variable *"Institutional support such as incubation centers or workshops influences my interest in starting a business"* shows a strong loading of 0.896, emphasizing the critical role of institutional infrastructure and support mechanisms in stimulating interest in entrepreneurship. This reflects the impact of practical exposure and experiential learning opportunities provided by educational institutions. Similarly, *"Faculty members provide guidance and motivation for entrepreneurial activities"* has a high loading of 0.876, indicating that faculty mentorship and encouragement are integral elements of the underlying construct. This finding underscores the importance of academic guidance and motivational support in nurturing entrepreneurial intentions.

The statement *"My educational background has helped me develop skills necessary for entrepreneurship"* records a loading of 0.831, which, although comparatively lower than the others, still represents a strong relationship with the extracted component. This suggests that general educational experiences contribute significantly to the development of entrepreneurial skills and aspirations.

13.2 Exploratory Factor Analysis in relation to Challenges and Barriers perceived by Students in pursuing Entrepreneurship as a Career Option

Table 2(a) presents the results of the Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity conducted to assess the suitability of the data for factor analysis in relation to the challenges and barriers perceived by students in pursuing entrepreneurship as a career option.

Table 2(a)
KMO and Bartlett's Test in relation to Challenges and Barriers perceived by Students in pursuing Entrepreneurship as a Career Option

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.737
Bartlett's Test of Sphericity	Approx. Chi-Square	284.449
	df	6
	Sig.	.000

The KMO value of 0.737 indicates a good level of sampling adequacy. According to established guidelines, KMO values between 0.70 and 0.79 are considered acceptable to good, suggesting that the correlations among the variables are sufficiently strong for factor analysis. This implies that the items measuring perceived challenges and barriers share adequate common variance and are appropriate for identifying underlying factors influencing students' entrepreneurial career choices. Bartlett's Test of Sphericity further confirms the appropriateness of factor analysis. The test yields an approximate Chi-square value of 284.449 with 6 degrees of freedom**,** which is statistically significant (p = .000)**.** This significant result indicates that the correlation matrix is not an identity matrix, meaning that the variables are significantly correlated with one another. Hence, the observed relationships among the perceived challenges and barriers are strong enough to justify the application of factor analysis.

Table 2(b) presents the communalities of the research variables measuring the challenges and barriers perceived by students in pursuing entrepreneurship as a career option, extracted using Principal Component Analysis (PCA)**.** Communalities indicate

the proportion of variance in each variable that is explained by the extracted component(s). As is standard in PCA, the initial communalities for all variables are 1.000, reflecting that the total variance of each variable was considered before extraction.

Table 2(b)
Communalities

Research Variables of Challenges and Barriers perceived by Students in pursuing Entrepreneurship as a Career Option	Initial	Extraction
Lack of financial resources discourages me from choosing entrepreneurship as a career.	1.000	.060
Fear of failure is a major barrier to starting my own business.	1.000	.883
Insufficient practical knowledge makes entrepreneurship difficult to pursue.	1.000	.802
Family and social expectations make entrepreneurship a less preferred career choice.	1.000	.892

After extraction, the communalities reveal notable variation among the variables. The statement *"Fear of failure is a major barrier to starting my own business"* shows a very high extraction value of 0.883, indicating that approximately 88.3% of its variance is explained by the extracted component(s). This suggests that fear of failure is a strongly represented and central barrier influencing students' perceptions of entrepreneurship as a career choice. Similarly, the variable *"Family and social expectations make entrepreneurship a less preferred career choice"* has the highest extraction value of 0.892, implying that social and familial pressures are a dominant and well-captured barrier within the underlying factor structure. This highlights the significant role played by societal norms and expectations in shaping students' reluctance toward entrepreneurial careers.

The statement *"Insufficient practical knowledge makes entrepreneurship difficult to pursue"* records a high extraction value of 0.802, indicating that a substantial proportion of variance in this variable is explained by the extracted component(s). This finding underscores the importance of practical skills and experiential knowledge, suggesting that the perceived lack of hands-on expertise is a major obstacle for students considering entrepreneurship. In contrast, the variable *"Lack of financial resources discourages me from choosing entrepreneurship as a career"* shows a very low extraction value of 0.060. This indicates that only 6% of the variance in this variable is explained by the extracted component(s), suggesting that it is poorly represented in the current factor solution. This may imply that financial constraints operate as an independent concern or are perceived differently by students compared to psychological, social, and knowledge-based barriers. From a methodological perspective, such a low communality raises concerns about the suitability of this item for inclusion in the factor structure and suggests that it may need to be reviewed, reworded, or excluded in subsequent analyses.

Table 2(c) presents the Total Variance Explained by the components extracted through Principal Component Analysis (PCA) in relation to the challenges and barriers perceived by students in pursuing entrepreneurship as a career option. This table reports the eigenvalues, percentage of variance explained by each component, and the cumulative variance accounted for by the components.

Table 2(c)
Total Variance Explained in relation to Challenges and Barriers perceived by Students in pursuing Entrepreneurship as a Career Option

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.637	65.914	65.914	2.637	65.914	65.914
2	.968	24.210	90.124			
3	.266	6.651	96.775			
4	.129	3.225	100.000			

The results indicate that Component 1 has an eigenvalue of 2.637, which exceeds the recommended threshold value of 1.00 used for factor retention under Kaiser's criterion. This component alone explains 65.914% of the total variance, suggesting that a substantial proportion of the variance in students' perceptions of challenges and barriers is captured by a single dominant factor. The high percentage of variance explained indicates that the major perceived barriers to entrepreneurship are strongly interrelated and can be represented by a common underlying dimension. The remaining components—Component 2 (eigenvalue = 0.968), Component 3 (eigenvalue = 0.266), and Component 4 (eigenvalue = 0.129)—all have eigenvalues below 1.00. Although Component 2 accounts for an additional 24.210% of the variance, it does not meet the criterion for retention and therefore was not extracted. Components 3 and 4 contribute relatively small proportions of variance (6.651% and 3.225%, respectively), indicating limited explanatory power.

The extraction sums of squared loadings further confirm that only one component was retained, explaining 65.914% of the total variance, with the cumulative variance also reaching 65.914%. This demonstrates that the extracted component adequately summarizes the shared variance among the observed variables related to perceived challenges and barriers.

Table 2(d) presents the Component Matrix obtained through Principal Component Analysis (PCA) for the variables measuring the challenges and barriers perceived by students in pursuing entrepreneurship as a career option. The component matrix displays the factor loadings, which indicate the strength and direction of the relationship between each observed variable and the extracted component. In this analysis, one

component was extracted, suggesting that the perceived challenges and barriers form a largely unidimensional construct.

Table 2(d)
Component Matrix

Research Variables of Challenges and Barriers perceived by Students in pursuing Entrepreneurship as a Career Option.	**Component 1**
Lack of financial resources discourages me from choosing entrepreneurship as a career.	-.244
Fear of failure is a major barrier to starting my own business.	.940
Insufficient practical knowledge makes entrepreneurship difficult to pursue.	.895
Family and social expectations make entrepreneurship a less preferred career choice.	.945

The results show that three variables load very strongly and positively on Component 1. The variable *"Family and social expectations make entrepreneurship a less preferred career choice"* has the highest factor loading (0.945), indicating that social and familial pressures are the most influential barriers shaping students' reluctance toward entrepreneurship. This finding highlights the powerful role of societal norms and expectations in influencing career decisions.

Similarly, *"Fear of failure is a major barrier to starting my own business"* exhibits a very high loading of 0.940, suggesting that psychological factors, particularly risk aversion and fear of unsuccessful outcomes, are central to students' perceptions of entrepreneurial barriers. This indicates that emotional and cognitive concerns strongly influence students' willingness to pursue entrepreneurship.

The variable *"Insufficient practical knowledge makes entrepreneurship difficult to pursue"* also shows a high positive loading (0.895), demonstrating that a perceived lack of hands-on skills and real-world experience is a significant obstacle. This underscores the importance of practical training and experiential learning in reducing perceived barriers to entrepreneurship. In contrast, the statement *"Lack of financial resources discourages me from choosing entrepreneurship as a career"* has a negative and very weak loading (-0.244) on the extracted component. This suggests that financial constraints do not align strongly with the dominant underlying factor representing perceived barriers in this study. The weak and negative loading indicates that financial limitations may be viewed differently by students or may operate as a separate dimension not captured by the extracted component. This result is also consistent with the very low communality observed for this variable in the earlier analysis.

13.3 Multiple Regression Analysis in relation to Entrepreneurial Aspirations of Arts and Science College Students in Rajapalayam

Multiple regression analysis is a statistical method used to examine the relationship between one dependent variable and two or more independent variables. It estimates the unique contribution of each predictor while controlling for others, and is widely used for prediction, explanation, and hypothesis testing. The Model Summary table presents the results of a **simple** linear regression analysis conducted to examine the influence of challenges and barriers perceived by students in pursuing entrepreneurship as a career option on the role of educational background and institutional support in shaping entrepreneurial aspirations **among** Arts and Science college students in Rajapalayam**.**

Table 3(a)
Model Summary with regard to Entrepreneurial Aspirations of Arts and Science College Students in Rajapalayam

Model 1	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Durbin-Watson**
	.632[a]	.399	.394	2.12981	1.967

The value of the correlation coefficient (R = 0.632) indicates a moderate to strong relationship between the predictor variable (challenges and barriers) and the dependent variable (educational background and institutional support shaping entrepreneurial aspirations). This suggests that students' perceptions of challenges and barriers are meaningfully associated with how they perceive the role of their educational background and institutional support in influencing their entrepreneurial aspirations. The R Square value of 0.399 indicates that 39.9% of the variance in the dependent variable is explained by the predictor variable. In other words, challenges and barriers perceived by students account for nearly 40% of the variation in how educational background and institutional support shape entrepreneurial aspirations. This represents a substantial explanatory power for a social science model, indicating that perceived barriers play an important role in influencing students' entrepreneurial outlook. The Adjusted R Square value of 0.394, which adjusts for sample size and number of predictors, is only slightly lower than the R Square value. This minimal difference suggests that the model is stable and reliable, with little inflation in the explained variance. It confirms that the predictor variable contributes meaningfully to the model and that the results are not due to chance.

The Standard Error of the Estimate (2.12981) reflects the average distance that the observed values fall from the regression line. A relatively low standard error indicates that the model's predictions are reasonably accurate and that the observed values of entrepreneurial aspirations are fairly close to the values predicted by the regression equation. Finally, the Durbin–Watson statistic of 1.967 is very close to the ideal value of 2. This indicates the absence of autocorrelation among the residuals, satisfying one of the key assumptions of regression analysis and confirming that the model is statistically sound.

Table 3(b) presents the results of the ANOVA (Analysis of Variance) for the regression model examining the effect of challenges and barriers perceived by students in pursuing

entrepreneurship as a career option on the role of educational background and institutional support in shaping entrepreneurial aspirations among Arts and Science college students in Rajapalayam. ANOVA in regression is used to test whether the overall regression model is statistically significant and whether the predictor variable reliably explains variation in the dependent variable.

Table 3(b)
ANOVA

Model 1	Sum of Squares	df	Mean Square	F	Sig.
Regression	355.065	1	355.065	78.275	.000[b]
Residual	535.260	118	4.536		
Total	890.325	119			

The regression sum of squares (355.065) represents the portion of the total variance in entrepreneurial aspirations that is explained by the predictor variable—perceived challenges and barriers. The residual sum of squares (535.260) represents the variance that remains unexplained by the model. The total sum of squares (890.325) is the sum of the regression and residual sums of squares, representing the total variability in the dependent variable.

With 1 degree of freedom for the regression and 118 degrees of freedom for the residuals, the mean square for regression (355.065) is much higher than the mean square for residuals (4.536). This results in a computed F-value of 78.275, which tests the null hypothesis that the regression coefficient is equal to zero (i.e., that the predictor variable has no effect on the dependent variable). The associated p-value (Sig. = 0.000) is less than the conventional threshold of 0.05, indicating that the regression model is highly statistically significant. In practical terms, this means that challenges and barriers perceived by students have a significant effect on the role of educational background and institutional support in shaping their entrepreneurial aspirations. The high F-value reflects the strength of this effect and confirms that the model provides a meaningful explanation of the variance in the dependent variable.

Table 3(c) presents the regression coefficients for the model examining the impact of challenges and barriers perceived by students in pursuing entrepreneurship as a career option on the role of educational background and institutional support in shaping entrepreneurial aspirations**.** The coefficients provide detailed information about the strength, direction, and significance of the relationship between the predictor and the dependent variable.

Table 3(c)
Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.530	1.498		2.356	.020
	Challenges and Barriers perceived by Students in pursuing Entrepreneurship as a Career Option.	.788	.089	.632	8.847	.000

The unstandardized coefficient (B) for the constant **is** 3.530, with a standard error of 1.498**.** This value represents the predicted level of entrepreneurial aspirations shaped by educational background and institutional support when the perceived challenges and barriers are zero. The associated t-value **(**2.356**)** and p-value (0.020) indicate that the constant is significantly different from zero, establishing a meaningful baseline level of the dependent variable. The unstandardized coefficient (B) for the predictor variable—challenges and barriers perceived by students—is 0.788 with a standard error of 0.089. This positive coefficient indicates that for every one-unit increase in perceived challenges and barriers, the role of educational background and institutional support in shaping entrepreneurial aspirations increases by 0.788 units, holding all else constant. The positive direction of the relationship suggests that higher awareness or perception of challenges may be associated with greater reliance on educational and institutional support to pursue entrepreneurship.

The standardized coefficient (Beta = 0.632) indicates the strength of the relationship in standardized terms, allowing comparison across variables. A Beta value of 0.632 represents a moderately strong effect, suggesting that perceived challenges and barriers are an important determinant of how students perceive the influence of educational background and institutional support on their entrepreneurial aspirations. The t-value of 8.847 and the p-value of 0.000 indicate that the relationship is highly statistically significant**,** meaning the effect of perceived challenges and barriers on entrepreneurial aspirations is unlikely to have occurred by chance.

14. FINDINGS

- The factor analysis results indicate the presence of a single dominant underlying component influencing entrepreneurial aspirations. Component 1, with an eigenvalue of 3.151, satisfies Kaiser's criterion and accounts for a substantial 78.786% of the total variance, demonstrating that the variables related to educational background, institutional curriculum, faculty guidance, and institutional support are highly interrelated and collectively reflect one strong construct. The remaining components have eigenvalues well below 1.00 and explain only marginal proportions of variance, making them unsuitable for retention. The extraction of a single component therefore provides an efficient and robust summary of the shared variance among the variables, confirming that entrepreneurial aspirations are primarily shaped by a unified educational and institutional support dimension rather than multiple distinct factors.
- The factor loading results confirm that entrepreneurial aspirations are explained by a single, unidimensional

construct related to educational and institutional support. All four variables load strongly on the extracted component, with factor loadings well above the acceptable threshold, indicating that each variable is a significant and reliable indicator of the underlying factor. Institutional curriculum emerges as the most influential element, as entrepreneurship-oriented courses show the highest loading, highlighting their central role in shaping students' entrepreneurial aspirations. Institutional support mechanisms and faculty guidance also demonstrate strong contributions, emphasizing the importance of practical infrastructure and mentorship in fostering entrepreneurial interest. Although slightly lower, the strong loading of educational background confirms that foundational education remains an essential contributor. Overall, the findings demonstrate that entrepreneurial aspirations are predominantly driven by a cohesive combination of curriculum design, institutional support, faculty involvement, and educational experience.

- The findings reveal that students' perceived challenges and barriers to entrepreneurship are dominated by a single underlying factor. Component 1, with an eigenvalue of 2.637, satisfies Kaiser's criterion and explains a substantial 65.914% of the total variance, indicating that the various perceived barriers are highly interrelated and collectively form a common dimension. The remaining components, despite accounting for additional variance, have eigenvalues below the acceptable threshold and therefore lack sufficient explanatory power for retention. The extraction of only one component confirms the unidimensional structure of perceived entrepreneurial challenges, suggesting that these barriers are best understood as a cohesive set of interrelated constraints rather than as multiple independent factors.
- The factor loading results indicate that perceived barriers to entrepreneurship are primarily driven by social, psychological, and skill-related factors. Family and social expectations emerge as the most influential barrier, followed closely by fear of failure, highlighting the strong impact of societal pressure and psychological risk perceptions on students' entrepreneurial intentions. Insufficient practical knowledge also loads strongly on the extracted component, emphasizing that lack of hands-on experience and applied skills significantly constrains students' willingness to pursue entrepreneurship. In contrast, financial constraints show a weak and negative association with the dominant factor, suggesting that access to finance is not a central or unifying barrier for students in this study and may represent a separate or less salient concern. Overall, the findings suggest that non-financial barriers—particularly social norms, fear of failure, and skill deficiencies—play a more critical role than financial limitations in shaping students' perceptions of entrepreneurial challenges.
- The regression results demonstrate a statistically significant and positive relationship between perceived challenges and barriers and the role of educational background and institutional support in shaping entrepreneurial aspirations. The significant constant indicates a meaningful baseline level of entrepreneurial aspirations even in the absence of perceived barriers. More importantly, the positive and substantial regression coefficient shows that as students' awareness of challenges and barriers increases, the influence of educational background and institutional support on their entrepreneurial aspirations becomes stronger. The moderately strong standardized effect confirms that perceived challenges are a key determinant in shaping how students rely on education and institutional mechanisms when considering entrepreneurship. Overall, the findings suggest that educational institutions play a crucial compensatory role, becoming increasingly important in supporting entrepreneurial aspirations as students encounter greater perceived obstacles.

15. SUGGESTIONS AND RECOMMENDATIONS

- Since institutional curriculum emerged as the most influential factor shaping entrepreneurial aspirations, higher education institutions should integrate entrepreneurship-focused courses across disciplines. These courses should emphasize opportunity recognition, innovation, business planning, and problem-solving to systematically build entrepreneurial mindsets among students.
- The strong role of institutional support highlights the need to expand and strengthen incubation centers, entrepreneurship cells, startup labs, and regular workshops. Providing structured platforms for idea development, mentoring, and startup experimentation can effectively translate entrepreneurial intentions into action.
- Faculty guidance significantly contributes to entrepreneurial aspirations. Institutions should encourage faculty-led mentorship programs, industry collaborations, and experiential teaching methods. Training faculty in entrepreneurship education can further enhance their capacity to motivate and guide aspiring student entrepreneurs.
- Given the dominance of family expectations and fear of failure as key barriers, institutions should implement awareness programs, counseling sessions, and success-story seminars to normalize entrepreneurial career paths. Creating a culture that views failure as a learning opportunity can reduce psychological resistance toward entrepreneurship.
- The strong influence of insufficient practical knowledge suggests the need for hands-on learning opportunities such as internships with startups, live projects, business simulations, and startup boot camps. These initiatives can reduce skill-related barriers and increase students' confidence in pursuing entrepreneurship.

16. CONCLUSION

The study on *"Entrepreneurial Aspirations of Arts and Science College Students in Rajapalayam: A Youth Perspective"* highlights the growing interest among students to explore entrepreneurship as a viable career option. The research reveals that educational background, exposure to entrepreneurship education, and institutional support play a significant role in shaping students' entrepreneurial mindset. Students who receive guidance, mentorship, and skill development opportunities show higher levels of aspiration toward starting their own ventures. At the same time, the study identifies several challenges and barriers, including lack of financial resources, fear of failure, limited practical experience, and social pressures, which can deter students from pursuing entrepreneurship. Addressing these obstacles through improved

institutional support, awareness programs, and financial assistance is essential to nurture entrepreneurial talent among youth. Overall, promoting entrepreneurship among college students not only empowers them to become self-reliant but also contributes to economic growth, innovation, and employment generation in the region.

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SMART FINANCING STRATEGIES FOR RESILIENT WATER AND ENERGY INFRASTRUCTURE

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ABSTRACT **DOI No: 10.36713/epra26103** **Article DOI: https://doi.org/10.36713/epra26103**

The increasing effects of climate change, in the form of frequent droughts, extreme flooding, and ever-increasing temperatures, are threatening the working conditions of the world's water and energy infrastructure, as well as its sustainability in the future. Conventional financial tools have not been suitable to meet the scale and urgency of the resilience demand, particularly in areas with limited fiscal power that are the worst hit by climatic perturbations. This review challenges the modern financing principles that combine sustainability requirements, technological advancement, and inclusive governance systems into the investment blueprints. Basing the analysis on the theoretical basis of sustainable finance, resilience economics, and innovation systems, the instruments (green bonds, blended finance vehicles, ESG-grounded capital, and blockchain-enabled transaction platforms) are evaluated in their ability to attract private capital and, at the same time, achieve transparency and accountability. Case studies of the regions, based on the African, Asian, and American continents, shed light on the fact that successful patterns rely on multisectoral collaboration, reorganization of institutions, and the digital revolution. However, the barriers such as poor governance systems, data deficiencies, and deep-seated socio-economic imbalances are still there. The concept of smart financing, therefore, can only be viewed as a framework of governance that combines ethical, financial, and technological principles to foster adaptive, equitable, and performance-based infrastructure. The further development of these strategies will require strengthened policy coordination, harmonized data infrastructures, and inclusive governance to ensure that climate finance towards resilient water and energy systems is adequate, efficient, and fair.

KEYWORDS: ***Smart Financing; Climate Resilience; Water-Energy Nexus; Blended Finance; ESG Investment; Sustainable Infrastructure***

1. INTRODUCTION

The effects of climate risks are increasingly imposing on water and energy infrastructures all over the world, thus threatening their dependability and sustainability. Droughts, floods, and heat waves disrupt supply chains and destroy assets and undermine the quality of service (Ayyub & Hill, 2019). In most developing and climate-prone areas, there is still a lack of the financial and institutional resources required to build adaptive systems (Songwe, Stern, & Bhattacharya, 2022). Due to the significant gap between the investments needed to achieve climate resilience and the means that can be made available by the governmental budgets, innovative financing methods have become essential.

Smart financing is a new generation of processes that unites sustainability, technology, and inclusiveness as part of infrastructure investment (Yasar, 2022). These systems not only combine funding to quantifiable social and environmental results, but also draw in private financing, as well as use digital technologies to improve transparency and performance measurement (Sosa & Ivanova, 2025). The best examples are green bonds, blended finance, and models of impact investment that are based on environmental, social, and governance (ESG) principles (Benedetti et al., 2025).

At that, the global adaptation finance gap is still significant. According to the estimates by the United Nations, the cost of adaptation might not exceed USD 160 billion and USD 340 billion a year by 2030, and the existing financial flows are only a third of these needs. In other parts of the world, like sub-Saharan Africa and South Asia, access to credit and currency volatility, as well as governmental issues, limit capital to resilient infrastructure (Mbiyozo & Monyani, 2024). Another instance is the example of the United States, which showed that integrated policy and finance (public programs and state partnerships) can increase community resilience (Plastrik et al., 2020).

The review is a synthesis of theoretical and practical information regarding the idea of smart financing of resilient water and energy systems. It questions the ability of different financial models to enhance infrastructure adaptation, especially in climate-vulnerable regions. The research has three main objectives: to map current financial mechanisms that

assist in infrastructure adaptation, to find barriers that hinder the mobilization of climate finance, and in order to give evidence-based policy and practice recommendations to policymakers and practitioners. This review advances the idea of finance, technology, and governance convergence to gain insights into ways in which investment structures can be used to achieve long-term sustainability. The experience of African, Asian, and American regions teaches about the importance of cooperation between the governments, investors, and development partners.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

The idea of smart financing is based on 3 underlying theories, which include sustainable finance, resilience economics, and innovation systems theory. Sustainable finance is focused on aligning the financial choices with the long-term environmental and social goals (Ali & Kamraju, 2025). Resilience economics is concerned with the ability of systems to take in shock, and how these systems continue to perform necessary functions under stress (Meraj & Hashimoto, 2025). The innovation systems theory clarifies the mechanism of interaction between technological change and institutional adaptation to encourage development (Kapilashrami et al., 2024).

Altogether, these structures demonstrate the way financial instruments, systems of governance, and technological potential might intersect to create robust results. Sustainable financing encourages efficiency, inclusion, and stable returns in the short-term. The investments emphasize resilience, which is flexible and risk-managed (Chen, 2023), whereas digital transformation increases accountability using real-time monitoring and performance-driven incentives (Sosa & Ivanova, 2025). Smart financing in climate-vulnerable places has to navigate through complex risks such as climate uncertainty, socioeconomic and institutional frailty (Nor, 2025). Diversification and risk-sharing are assisted by such tools as resilience bonds, ESG-related credit, and green investment platforms (Sakyi et al., 2024). In this regard, smart financing is not just a financial instrument but a dynamic governance device that engages parties that have common resilience targets and sustainable development objectives.

3. GLOBAL ENVIRONMENT: CLIMATE CHANGE RISK AND INFRASTRUCTURE PROBLEMS

The effects of climate change are uneven, though it increases the strain on water and energy systems in most of the world. Poor underinvestment is chronic in developing areas and at the same time faces more climate risks that are becoming worse and more frequent (Songwe et al., 2022). This will require an annual investment of USD trillion and above to create universal access to resilient infrastructures, whereas current investments are nowhere near the goal. Climatic variability is known to be very prone to water systems. Increased salinity and droughts, and floods reduce the supply of water and destroy infrastructure (Granata & Di Nunno, 2025). Similarly, numerous energy infrastructure relies on the old grids and fossil-fuel supply networks, which are not designed to withstand extreme weather conditions (Elci et al., 2025). These issues highlight the importance of combining these strategies using financial innovation, sound governance, and advanced technology.

In the United States, a more developed resilience-financing paradigm combines federal funds with the motivation of the business. The Infrastructure Investment and Jobs Act is providing billions of dollars to climate-resilient infrastructure (Plastrik et al., 2020). States such as California and New York use resilience bonds and green banks to attract personal investments to renewable energy and water-efficient projects (Chen, 2023).In Europe, initiatives are undertaken to encourage sustainable transport, renewable energy, and circular economic development. The example of regional governance in terms of scaling up adaptation finance is the European Union structural and green transition funds (Bocaneala et al., 2024).

In Africa and Asia, but more so, funding is still highly dependent on international support, with chronic gaps. In sub-Saharan Africa, less than 12% of overall climate finance goes into infrastructure (Mbiyozo & Monyani, 2024). In South Asia, the process is hindered by a disjointed government and the availability of limited credit (Zen & Saputra, 2023). There are new blended-finance frameworks based on the World Bank, African Development Bank, and Green Climate Fund that are beginning to respond to such problems that focus on local governance and involvement of the private sector (Abdenur, 2026). There are challenges and opportunities in the water-energy nexus. Shared benefits can be generated in projects that increase the efficiency of water management through energy efficiency or through desalination that uses renewable power. However, according to Nor (2025), misaligned policies and financial siloing are a significant challenge. The trend is towards adaptive and performance-based financing globally, with the use of such tools as ESG-linked bonds, digital finance platforms, and AI-driven risk models (Sosa and Ivanova, 2025). However, the lack of data and poor governance remain ongoing problems that can hinder development.

4. FINANCING MECHANISM TYPOLOGY

Developing resilient water and energy systems entails varying financing systems that can raise significant capital while also dealing with climate risk. A study reveals that there are four significant forms of financing, including models of public, private, blended, and digital/ESG-related financing, each presupposing a specific structure, incentives, and design of risk-sharing. The role of financing by the private sector, which finances infrastructure through corporate investments, project finance, and institutional capital, becomes increasingly significant in the context of sustainable infrastructure. Whereas innovation and efficiency are mostly guaranteed by private investors, it needs predictable returns and proper regulatory structures.

Green bonds have been effective, especially among private tools. Such tools appeal to investors who appreciate quantifiable environmental outputs and offer governments with huge-scale resources of capital mobilization. According to Skyaki et al. (2024), green and resilience bonds are on the rise in Asia and Africa, but they are still largely confined to middle-income countries. Impact investing is another upcoming field where investors seek to obtain a combination of financial and beneficial environmental/social impact. The ESG-based funds are now mainstreamed, as they combine ethical principles with high-financial results (Benedetti et al., 2025). Mupa et al. (2024) showed that the inclusion of ESG factors in the decision-

making process of renewable energy investment could improve the performance and resilience of the project.

However, resilience-based financing by the private sector remains limited due to the perceived risk and lack of reliable project data. Guarantees and insurance products are other instruments that can mitigate these issues and bring in institutional investors (Ali & Kamraju, 2025). Blended finance combines both the resources of the government and the private sector and is equal in risk and ease of scale. It best applies when social returns are high and commercial returns are unknown. Project risk can be mitigated with concessional donor or government financing in order to attract greater amounts of private capital.

Public-private partnerships (PPPs) are a typical blended model whereby governments and the private entities share their roles and risks (Owotemu, 2025). PPPs, when properly organized, enhance efficiency and innovativeness. India and some of the countries in sub-Saharan Africa have introduced PPPs in renewable energy, water, and transport (Akanbi, 2025). Blended finance forms are also used by the Green Climate Fund and multilateral development banks, which provide concessional loans and equity co-investments to lure institutional investors (Songwe et al., 2022). But poorly designed PPPs may transfer an excessive risk to governments and leave them with long-term liabilities (Akomea-Frimpong et al., 2024). This is to be avoided through transparency in governance and performance-based contracts.

The advantages of each model are that the public finance is equitable, but constrained by the financial limit. The issue of private finance is that it brings in innovation but requires powerful institutions. Blended finance represents an intermediate between the two, where public resources are used to unlock private ones. The mechanisms increase transparency and monitoring, which are technology-driven. It is a merging of these models, and it is a global trend to hybrid financing that is a combination of financial innovation, good governance, and equity. Mohieldin et al. (2026) state that climate finance should be sufficient, efficient, and just, a balance between profit, inclusion, and sustainability.

5. INTELLIGENT FINANCING INNOVATIONS

The development of smart financing is a sign of the shift to systems that combine digital technology, sustainability requirements, and performance-based accountability. These strategies aid capital flows, climate resilience, and inclusive development, as well as enhancing transparency. There is an ever-growing number of mechanisms that utilize AI, blockchain, and ESG metrics to make investment decisions that can be measured to have an impact (Sosa & Ivanova, 2025).

5.1 Blockchain and Digital Finance

Blockchain is also making changes in the way money is being monitored and verified, and providing both decentralized and uncensored evidence that minimizes instances of misallocation. According to Sosa and Ivanova (2025), blockchain has the potential to facilitate the process of verification of green bonds or resilience-linked loans because it automatically documents environmental performance. Decentralized finance (DeFi) systems and payment systems allow communities and small investors to finance infrastructure projects. Mobile payment systems are also useful in Africa and Southeast Asia to finance renewable energy and water initiatives through crowdfunding (Chilambe et al., 2024). Smart contracts based on blockchain are being used in the United States to release funds automatically after resilience criteria are achieved to enhance efficiency and accountability (Nsama, 2025).

5.2 ESG Metrics and Impact

The concept of ESG integration is now established as a pillar of modern-day investment. The integration of environmental, social, and governance priorities into financial decision-making is a strategy that allows investors to make sure that infrastructure helps to achieve more sustainable objectives (Mupa et al., 2024). Portfolios are now analyzed using standardized ESG indicators. An example of rating can be seen in the case of energy projects; it is rated based on carbon intensity, labor practices, and governance standards. The implementation of ESG principles into a circular economy framework can balance growth with resource efficiency (Kandpal et al., 2024). Finance initiated by ESG is also directed at the investment in climate adaptation in vulnerable regions (Benedetti et al., 2025). However, irregular resilience indicators are a problem, and this explains the importance of worldwide harmonization in ESG reporting.

5.3 Digital Innovation in Finance

Digital tools increase financial inclusion so that small businesses and marginalised communities are able to get funds to adapt. According to Nor (2025), digital finance will be able to decrease the inequality in rural-urban areas and empower communities to invest in the local climate projects. There is also the direct financing of solar installations and community-owned water systems, which are now possible on mobile platforms (Mbiyozo, 2022). Such decentralised processes promote joint ownership and local empowerment. Smart financing illustrates the coming together of technology, governance, and finance. AI helps to improve monitoring, blockchain helps to promote transparency, ESG metrics help to be accountable, and the use of digital tools helps to expand participation. However, according to Mohieldin et al. (2026), technology should be accompanied by an effective and inclusive government to avoid inequality.

6. COMBINED FINANCING SOLUTIONS

Projects financed through integrated finance led to the creation of resilience benefits in multiple sectors. Blended finance and PPPs are some of the mechanisms that promote cross-sector cooperation. In Europe, the European Green Deal is an initiative that fosters the co-finance of hydropower and wastewater energy recovery (Bocaneala et al., 2024). In the developing world, the projects that are decentralized, like solar-powered irrigation in East Africa, may connect energy access to agricultural productivity to be financed by green bonds and climate funds (Chilambe et al., 2024).

In this section, the analysis of various institutions involved in the project will be carried out using a framework that examines the connection between the state and market (Vygotsky, 2005). The connection between the state and the market (Vygotsky, 2005) will be used in this section to analyze various institutions involved in the project. Integrated financing is successful when

there is coordination between ministries and agencies. The prevailing nature of siloed institutions and hindering the collaboration of initiatives is observed in many countries (Meraj & Hashimoto, 2025). The Nexus Project Framework (Rhouma et al., 2025) is one of the frameworks that promotes collaboration and efficiency via alignment of policies, shared measures, and shared responsibility.

6.1 Nexus Financing and Equity

There is also a need to promote social equity through the financing models. The rural and peri-urban population usually does not have access to clean water and stable energy. Combining the different sectors contributes to curbing inequality and building livelihoods (Nor, 2025). Ownership and sustainability are built through communal involvement, either by cooperatives or revolving funds (Mbiyozo, 2022). With smart grids and IoT systems, performance-based financing is supported by the possibility of monitoring water and energy consumption in real-time (Sosa & Ivanova, 2025). Data-sharing platforms enhance coordination across ministries and investors, as well as local actors, which form adaptive, cross-sector ecosystems.

7. REGIONAL CASE STUDIES

In the experience of the region, it is clear that approaches differ, yet innovation, good governance, and inclusiveness lead to success. Long-term tendencies of chronic vulnerabilities of Sub-Saharan Africa droughts, floods, and energy deficits have been met with ingenuity in community-based models and blended models. Solar irrigation projects like the Green Climate Fund initiatives in Kenya are the projects that connect food security to solar irrigation (Chilambe et al., 2024). Adaptation finance is now introduced alongside livelihood protection as part of regional programs via considering migration as a resilience strategy (Mbiyozo & Monyani, 2024).

The banks and investors are interested in off-grid solar in PPPs in Nigeria and Ghana (Owotemu, 2025). Nevertheless, institutional flaws and a lack of insurance cover are a hindrance. In Latin America, the threats posed by climate include drought and floods. The green bond programs and ESG-related governance reforms have been implemented in countries (Bocaneala et al., 2024). Blended finance has been implemented in Brazil and Mexico in renewable and water projects (Songwe, Stern, & Bhattacharya, 2022).

The cities, including Bogotá and São Paulo, have been issuing bonds pegged on resilience to finance flood management and transport systems. Political turnover and fiscal instability do pose a threat to continuity, however. Pacific Islands and Small Island developing states (SIDS) experience financing gaps owing to their small size and isolation. The concessional funding is being invested in renewable energy in Seychelles and other islands (Elci, Galindo & Sarcina, 2025). Fiji and Samoa have established climate trust funds that are a mix of donor and domestic funds (Abdenur, 2026). The Pacific Islands Forum enhances regional collaboration in terms of sharing funds and knowledge.

8. BARRIERS AND CHALLENGES

There are still major limitations to innovation. There are four categories of barriers, which include institutional, technological, socioeconomic, and political. The progress is undermined by weak governance, inconsistency in regulations, and the absence of data (Meraj & Hashimoto, 2025; Chen, 2023). The lack of data constrains the economic capacity of investors to price risk (Muthio Muoki et al., 2025), and digital divides rule out poorer areas (Nor, 2025). Long-term investment is deterring political instability and corruption (Zen & Saputra, 2023). The other barriers to equitable financing include gender and social inequality (Mbiyozo, 2022). In general, smart financing needs structural transformation in the form of robust institutions, sound data, and decentralized governance to attain sufficiency, efficiency, and justice (Mohieldin et al., 2026).

9. POLICYMAKING AND GOVERNING CONSEQUENCES

Good governance and proper policy are critical to translating smart financing into actual resilience outcomes. Constant regulation encourages investor confidence. The governments are to issue foreseeable regulations on tariffs, subsidies, and compliance (Owotemu, 2025). Green investments have national taxonomies that bring about clarifications (Ali & Kamraju, 2025). Duplication is minimized through institutional reforms, which include the merging of energy and water ministries and finance ministries (Meraj & Hashimoto, 2025). The tracking system is based on blockchains and can improve accountability (Sosa & Ivanova, 2025).

9.1 Fiscal Innovation and Incentives

Performance-based budgeting is a fiscal policy that is linked to resilience performance (Chen, 2023). Adaptation benefits are granted through tax incentives and resilience bonds to verified beneficiaries (Songwe, Stern, and Bhattacharya, 2022). The public investment bank can offer guarantees and concessional loans, which can trigger private capital (Zen & Saputra, 2023).

9.2The International and Regional Cooperation

The resilience financing gap can be resolved through global and regional cooperation (Abdenur, 2026). Risk and resources are pooled in regional coalitions like the Green Infrastructure Investment Coalition in Africa. The harmonization of reporting standards enhances the coordination between the recipient and donors (Mohieldin, Elbahtimy, & Shehata, 2026). Good policy implies matching the financial systems with the adaptation objectives. Open establishments, organized chiefship, and creative financial instruments promote responsibility and stability.

10. LIMITATIONS OF DATA AND MEASUREMENTS

Absence of standard data is one of the greatest bottlenecks. The restrictive nature of most financial reporting is based on the reduction of emissions as opposed to adaptive capacity (Chen, 2023). AI applications have the potential to improve risk modelling, although they demand a lot of data (Muthio Muoki et al., 2025). Research in the future needs to focus on harmonized resilience measures, such as social equity and ecosystem benefits. There is minimal research evaluating the adaptation finance beneficiary. There are no gender-sensitive frameworks in particular (Mbiyozo, 2022; Mbiyozo & Monyani, 2024).

Inclusive credit systems and participatory budgeting are some of the tools that can be used to encourage fairness (Nor, 2025). There is a lack of evidence regarding the impact of governance

reforms on financial performance (Akomea-Frimpong et al., 2024). Longitudinal and comparative studies would help to make clear the systems that would best meet resilience objectives. Work Integration of the Water-Energy Nexus in Research. The water-energy nexus has scarce research into financing. The economic and environmental benefits of integrated projects need to be measured in future work (Granata & Di ñunno, 2025; Rhouma et al., 2025). To fill these research gaps, it is important that interdisciplinary approaches that include finance, data science, and social policy are used. More effective and inclusive climate finance will be achieved through the availability of stronger data and equity frameworks.

11. CONCLUSION

One of the most urgent issues in the century is financing climate-resilient water and energy systems. Conventional processes cannot be effective because climate risks are increasing. Innovation, digital tools, and governance reform are the drivers of Smart financing that provide a way forward. This review has reviewed four pillars of financing, which include the public, the private, the blended, and the technology-driven pillars of financing. The public money guarantees equity; personal capital is associated with efficiency. Blended models provide the balance between, whereas emerging technologies like AI, blockchain, and ESG systems increase transparency.

The examples of Africa, with its blended models, and the models of Latin America, with their municipal bonds and their Pacific Island trust funds, prove that success depends on the context. The existing obstacles, including governance, insufficient data, and inequality, remain to deter gains. Fiscal policies, as well as transparency and inclusion, need systemic reforms. Finally, the idea of smart financing is not only a technical innovation but a process of transformation that involves ethics and finance, as well as governance. The future of climate finance should be adequate, effective, and equitable through cooperation between governments, investors, and communities.

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TOURISM DEVELOPMENT IN KARNATAKA: CHALLENGES, PROSPECTS AND GOVERNMENT INITIATIVES

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Tourism is one of the fastest-growing industries in the world and plays a significant role in economic development, employment generation, and cultural exchange. Among the various states, Karnataka holds a prominent position due to its rich cultural heritage, diverse geography, and historical significance. Tourism development in Karnataka has gained importance in recent years due to its potential to generate revenue, create employment opportunities, and promote regional development. Karnataka, with its rich cultural heritage, diverse geography, and historical significance, occupies a prominent position in India's tourism landscape. Tourist arrivals in Karnataka have shown remarkable growth, reaching a record 35.31 crore in 2024, reflecting strong recovery post-pandemic and the impact of proactive government policies. Despite its vast potential, the tourism sector in Karnataka faces several challenges, including inadequate infrastructure, poor administration, weak marketing strategies, safety concerns, and skill shortages. To address these issues, the Government of Karnataka has introduced successive tourism policies, most recently the *Karnataka Tourism Policy 2024–29****, which aims to position the state among the top three destinations in India by 2029. In this context, the present study examines the status of tourism in Karnataka, identifies key challenges hindering its growth, and evaluates government initiatives designed to overcome these barriers. It highlights the prospects of tourism as a driver of socio-economic development, foreign exchange earnings, and community empowerment. The findings suggest that with improved governance, infrastructure development, heritage conservation, and effective promotion strategies, Karnataka can transform into a global tourism hub and leverage its diverse resources for inclusive and sustainable growth.***

KEYWORDS: ***Tourism development, Tourists, Heritage, Karnataka and India.***

I. INTRODUCTION

Tourism has become one of the largest and fastest-growing industries globally, generating substantial social, economic, and environmental impacts (Razzaq et al. 2023). People moving to locations other than their usual place of residence, mostly for leisure and recreation, is a social, cultural, and economic phenomenon known as tourism. In essence, tourism is a demand-driven concept because it involves short-term visits. The choice of tourists to travel increases demand for products and services, which can be obtained through imports or domestic manufacturing. Therefore, even though demand drives tourism, it has a big impact on the economy's supply side. Consequently, even though it is a demand-based concept, tourism can also be seen from a supply-side perspective. One of the globally recognized service sectors, tourism is now one of the main forces behind socioeconomic development by generating jobs, businesses, infrastructure development and huge foreign exchange resources. According to the Global Destination Cities Index (2019), tourism is an important economic sector and a major tool for economic development and has contributed heavily to the economy of various countries.

Tourism is one of the fastest-growing industries in the world and plays a significant role in economic development, employment generation, and cultural exchange. Globally, tourism contributes approximately 3.2% to world GDP and about 3.8% to total employment. As per the Economic Survey of India (2024-25), the tourism sector in India has strongly rebounded, contributing 5.52% to the GDP and providing support for 13.3% of total employment, which equates to approximately 8.46 crore jobs in FY24. Among the various states, Karnataka holds a prominent position due to its rich cultural heritage, diverse geography, and historical significance. Karnataka is known for its unique blend of ancient monuments, wildlife sanctuaries, scenic landscapes, beaches, hill stations, and religious centers. The state is home to UNESCO World Heritage Sites such as Hampi and Pattadakal, world-famous wildlife reserves like Bandipur and Nagarahole, and popular tourist destinations such as Mysuru, Coorg, Chikkamagaluru, and Gokarna. This diversity makes Karnataka one of the most attractive tourism destinations in India. Tourism has been declared an industry in Karnataka since 1988, and successive tourism policies have provided incentives, concessions, and subsidies to attract both public and private investment.

Tourist arrivals in Karnataka increased significantly from 3.67 crore in 2006 to over 35 crores in 2024, and further growth has been observed in recent years (Economic Survey of Karnataka, 2024-25). Tourism plays a crucial role in socio-economic development by generating employment for both skilled and unskilled workers and stimulating growth in related sectors such as transport, hospitality, horticulture, handicrafts, and small-scale enterprises.

II. OBJECTIVES OF THE STUDY

The study is based on the following objectives:

1. To understand the present status of the tourism industry in Karnataka.
2. To examine the major challenges faced by the tourism sector in Karnataka.
3. To review key policy initiatives undertaken by the state government for tourism development.

III. SOURCES OF DATA AND INFORMATION

The study is based entirely on secondary data. The data have been collected from various sources such as:

- Annual Reports of the Ministry of Tourism, Government of India.
- Reports of the Department of Tourism, Government of Karnataka.
- Economic Survey of Karnataka (2017–18 & 2025-26).
- Regional Tourism Satellite Account Karnataka (2009–10).
- Books, journals, research articles, magazines, brochures, and official websites.

Internet sources have also been extensively used for collecting updated statistical and policy-related information.

IV. PRESENT STATUS OF TOURISM INDUSTRY AND ITS KEY ROLE IN KARNATAKA ECONOMY

Karnataka is home to diverse tourist attractions ranging from heritage monuments and wildlife sanctuaries to beaches, hill stations, adventure tourism, and spiritual destinations. The growth of tourism is closely linked to tourist arrivals. Higher tourist inflow generates economic activity, employment opportunities, and infrastructural improvements in destinations. The impact is measurable at a particular destination comparing with its previous position. Road connectivity, Electrical Connection, water supply, Handicrafts and various other related sectors also improve in particular destination. Growth of Community Development in particular area can also be attributed to growth of Tourism.

Tourism as an Economic Activity

Karnataka Tourism Vision Group report envisaged that during the policy period 2015-20 Rs. 54000 crore investments will be made which will generate around 30 lakhs employment. More investment expected from the private sector or under PPP. As per estimation, approximately 8 to 11 percent of the world population gets direct or indirect livelihood through Tourism sector.

Income from Revenue Earnings

Tourism earns foreign exchange. The revenue generated by the Tourism is both by direct and indirect. World Travel and Tourism Council reports says tourism sector accounts for 9.3% of India's GDP. Tourism sector supported 40.3 million jobs in 2016 which ranks India second in the world in terms of total employment. Tourism sector accounts for 9.3 of the country's total jobs. The contribution of tourism sector to economic growth in the form of job creation, domestic capacity building depends on the following factors:

1) Extent to which the tourism sector is integrated into the national economy through linkages with other sectors and integration into regional and global value chains.
2) The extent to which revenue generated by tourism, including foreign exchange is used to finance infrastructure development support local enterprises in particular small and medium size enterprises to create a vibrate local economy.
3) The policies and strategies adopted by government should encourage domestic and foreign investment in tourism to promote labour intensive activities.
4) National efforts to ensure that tourism activities are carried out sustainably and meet economic, social and environment objectives.

V. TRENDS IN DOMESTIC AND FOREIGN TOURIST'S ARRIVAL IN KARNATAKA

Karnataka has been attracting both domestic and foreign tourists for decades. The trends in domestic and foreign tourist arrivals in Karnataka from 2013 to 2024 are shown in Table 1. Tourist arrivals showed steady growth from 2013 to 2019, reaching a peak of 28.93 crore visitors in 2019. The COVID-19 pandemic caused a sharp decline in 2020–21. However, strong recovery was observed post-2022, and total arrivals reached a record 35.31 crore in 2024. Domestic arrivals grew from 9.8 crore in 2013 to 30.46 crore in 2024 (211% increase), reflecting policies like 2024-29 promoting regional circuits. Foreign arrivals fluctuated but rebounded to near-2019 levels by 2024, aligning with infrastructure pushes under recent tourism policies. Domestic Indian arrivals surged 211% from 9.8 crore in 2013 to 30.46 crore in 2024, accelerating post-2022 due to policy incentives like circuits and amenities. Total visitors hit a record 35.31 crore in 2024, up 22% from 2023 and 22% above 2019's peak.

Table 1: Trends in Tourist's Arrival from 2013 to 2024 in Karnataka (in Crores)

Year	Indians	Foreigners	Total
2013	9.8	6.36	16.16
2014	11.82	5.61	17.43
2015	11.98	6.36	18.34
2016	12.97	4.62	17.59
2017	17.99	4.98	22.97
2018	21.45	5.44	26.89
2019	22.85	6.08	28.93
2020	7.74	1.65	9.39
2021	8.13	0.73	8.86
2022	18.26	1.28	19.54
2023	28.35	4.01	32.36
2024	30.46	4.85	35.31
Total	**201.8**	**51.97**	**253.77**

(Source: Department of Tourism (2025), Govt. of Karnataka)

VI. NEW INITIATIVES: KARNATAKA TOURISM POLICY 2024–29

The Karnataka Tourism Policy 2024–29 is the latest strategic framework aimed at strengthening tourism growth and positioning Karnataka among the top three tourism destinations in India by 2029. The state government's strategic framework to strengthen tourism growth, attract investment, generate jobs, and position the state as a leading travel destination in India and abroad. The policy promotes themes like adventure, agri-tourism, caravan, coastal/beach, cuisine, cultural, eco, education, film, golf, sports, tribal, weddings, and health tourism across 46 projects including hotels, aquariums, and amusement parks. Strategies feature market-specific campaigns, prioritized promotions by 2029, infrastructure like amenities and connectivity, skill development for youth, and single-window clearances. The Karnataka Tourism Policy 2024-29 aims to make the state a top-three Indian destination by 2029, targeting 50 crore domestic visitors and 20 lakh foreign tourists, with a focus on coastal, eco, and heritage tourism. It plans to attract ₹8,000 crore investment, develop 20 mega projects, and implement "One District, One Destination" for 30 locations (Indian Express, 2025).

The policy focuses on:

1. Attracting Investment and Economic Growth
    - Targeting approximately Rs.8,000 crore in direct investment into tourism by 2029.
    - Allocating Rs.1,350 crore budget for policy implementation.
2. Job Creation and Skill Development
    - Aims to generate around 1.5 lakh new jobs in tourism and allied sectors.
    - Emphasis on skill development for local youth and hospitality professionals.
3. Sustainable and Responsible Tourism
    - Promoting environmentally responsible tourism practices.
    - Supporting community involvement and rural tourism.
4. Infrastructure and Destination Development
    - Developing tourism infrastructure including roads, signage, amenities, and quality facilities at destinations.
    - Enhancing tourist comfort and safety.
5. Global and Domestic Marketing
    - Promoting Karnataka tourism internationally and domestically with campaigns like *"One State, Many Worlds"*.

VII. MAJOR CHALLENGES OF TOURISM SECTOR IN KARNATAKA

The Karnataka government's "one state many world" tourism campaign and the information technology growth in Karnataka have been attracting millions of foreign tourists and business tourists to Karnataka. Medical tourism has also recently mushroomed in Karnataka Tourism industry is a big foreign exchange earner in Karnataka, yet the industry still is hampered by several problems like –

- Poor administration and management in tourist destinations.
- Lack of infrastructure and other basic facilities.
- Poor transportation and communication networks.
- Lack of marketing and promotion strategies for domestic products at tourist destinations.
- Lack of security and safety.
- Lack of passionate and trained professionals for guiding new arrival tourists.
- Excessive formalities for an issue of special permit to view restricted areas sites.
- More Administrative and Political bottlenecks in tourism development.

VIII. POLICY SUGGESTIONS TO IMPROVE THE TOURISM SECTOR IN KARNATAKA

1. State government should encourage the key private stakeholders to invest more on hotel and accommodation, transport and communication development at most popular tourist places in order to provide good infrastructure facilities to the arrivals.
2. Government should develop basic infrastructure and other amenities in all tourist places to transfer Karnataka state into a global tourist destination is necessarily important.
3. Adequate steps to be taken to provide hygiene and sanitation facilities at tourist destination.
4. State government shall form the Tourist police Task Force to ensure safety and security of tourists.

Conclusion

Thus, it is evident from the forgoing analysis that the Karnataka is attracting both foreign and international tourists for the last many decades. Tourism has emerged as a major service industry with significant potential to generate income and employment. Karnataka, with its vast natural and cultural resources, holds immense potential to become a global tourism hub. The state government's proactive policies, including the Karnataka Tourism Policy 2024–29, aim to accelerate investment, infrastructure development, and employment generation. However, sustained growth requires improved governance, infrastructure expansion, heritage conservation, and effective digital promotion strategies. With proper planning and coordinated efforts, tourism can become a powerful instrument for socio-economic development and inclusive growth in Karnataka.

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A COMPARATIVE ASSESSMENT OF DEMOGRAPHIC TRANSITION AND OLD-AGE DEPENDENCY IN UTTARAKHAND AND HIMACHAL PRADESH

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The demography of India is in a period of change with declining fertility and rising life expectancy and an increasing number of elderly population. Uttarakhand and Himachal Pradesh, in this respect, present unique demographic and economic patterns as the geographical and socio-economic conditions are unique in these hill states. The paper will discuss the demographic transition dynamics and the old dependence in these two states in terms of economics. The paper investigates the trends of economic independence, aged sources of finance, and trends of old-age dependency ratio with reference to Census reports, National Sample Survey Office (NSSO) rounds (2004 and 2017-18) as well as other Indiastat data. The findings indicate that the economic self-reliance is declining, and there are rising rates of old-age dependency, particularly in older women and rural regions. To secure economic well-being amidst the demographic change, this paper highlights the importance of state-specific policy responses to ensure promotion of inclusive social security, active aging, and pension cover.

KEYWORDS: ***Demographic Transition, Old-age Dependency, Economic Independence, Aging Population, Uttarakhand, Himachal Pradesh***

INTRODUCTION

India is currently experiencing a deep demographic transition, that is, a systematic change in fertility and mortality rates, initially to high levels and then to lower ones, which results in excessive population growth and finally in stabilization. It is currently at the third stage of the demographic transition model and population projections reveal that there is a high possibility that the population might reach its peak between 2065 and 2070. At the same time, the group aged 1819 will experience its highest proportion at approximately 2030, which will offer a demographic opportunity that can be enormous in terms of economic impact, should it be properly supported by investing in education, health, and work (Lonarkar, 2018; Ram & Ram, 2021; Purohit, 2023). However, the rate and trend of demographic transition is disproportionate amongst the states of India. Although in some regions (Uttar Pradesh, Bihar, Madhya Pradesh, and Rajasthan) fertility and mortality levels remain high, some southern states are approaching or have reached replacement-level fertility, leading to steep regional differences in population growth and age composition (Ram & Ram, 2021; Kumar, 2013; Bongaarts and Sinding, 2011). This demographic change creates both new societal problems and economic prospects. On the one hand, having been accompanied by prudent investments in human capital and the creation of jobs, an increasing share of the working-age population opens the prospect of accelerating the growth of the economy (Bongaarts and Sinding, 2011; Chakraborty, 2020). Nonetheless, these benefits may be offset and lead to the social or political instability due to such problems as gender inequality, increasing populations of the elderly, constant child mortality in certain regions, and unequal access to the benefits of demographic change (Bongaarts and Sinding, 2011; Lonarkar, 2018; Antony et al., 2011). The need to adjust the policies and business practices of India to fit the increased demands of older people and take the full advantage of the presence of the young labor force is supported by comparative evidence of other nations with developed aging populations (Antony et al. , 2011; Chakraborty, 2020). One of the most important consequences of such demographic change is the increase in old-age dependency. The old age dependency ratios (OADR) of the percent of people of age 60 and above to the age 15-59 is around 0. 14, and the old age economic dependency ratios (OAEDR) is even greater at 0. 23 (J. A. & Nair, 2021). Older populations are especially susceptible in the states like Kerala, Punjab and Haryana since the unemployment rates are very high, as well as because the economic readiness there is low (J. A. & Nair, 2021; Rani et al. , 2023). Besides, families with high dependency ratio are exposed to higher risks of

disastrous health spending, especially in rural and low-income areas, and the available health insurance plans are not sufficient to offer adequate financial risk coverage (Mohanty et al. , 2022). Still, because of a low percentage of the population being under official pension schemes, almost three-quarters of all older Indians remain economically dependent on either social support networks or on their families (Kumar & Kumar, 2019; Pandey and Sharma, 2024). The economic factor, however, is not the only factor considered when discussing the physical, psychological, and social aspects of old-age dependency which vary greatly between states and demographic groups (Marbaniang & Chungkham, 2024; Bhagat and Unisa, 2006). With such facts in mind, healthcare, labor market, social security mechanisms of India need to be reinforced as soon as possible to address the multifaceted problems, which compel the aging of the population (J. A. & Nair, 2021; Mohanty et al., 2022; Kumar and Kumar, 2019).

The hilly states of Uttarakhand and Himachal Pradesh are unique in the demographic trends in this wider national context. They are both in the late phases of demographic transition as indicated by the reduction of fertility and mortality rates and the gradual rise in the number of the elderly population. The economic and social impacts of these changes are far-reaching in their implications, especially in regard to the issue of old-age dependency and the sufficiency of the institutional and community-based support systems. An example of this is Himachal Pradesh, which is already registering 10. 2% of the total population of 60 and above as exceeding the national average and is expected to soon become an aged society, just like Kerala (Kumar et al., 2020; Roy et al., 2024). Demographic aging in both states is caused by the reduction of fertility, the improvement of life expectancy, and the high level of out-migration of younger generations, especially in Uttarakhand, where the growing elderly population of villages is caused by depopulation efforts (Sati, 2021; Lal et al., 2021; Awasthi and Mehta, 2020). Even though old age dependency ratio (OADR) is ever-increasing, the standard measures can exaggerate the figure of the economic pressure. Individually, as an example, in Himachal Pradesh, OADR is rather high (0.19), but Economic Adjusted Old Age Dependency Ratio (EAODR) is much lower (8.8), which indicates that many older adults are not retired but not all working-age citizens work (Rani et al., 2023). However, a significant percentage of older people can be partially or completely dependent on others, as they do not always have stable incomes or families (Kumar et al., 2020). The low percentage of the covered by the pension, as well as insufficient institutional care services, also increases economic and social vulnerability (Kumar et al., 2020; Rani et al., 2023). The increasing rate of out-migration, and in particular the Uttarakhand state, and evolving family structures in both states have both increased the pressure on organized systems of elderly care and social protection (Kumar et al., 2020; Sati, 2021; Lal et al., 2021; Awasthi and Mehta, 2020). Also, the concept of feminization of aging, which implies a greater number of older individuals who are women and the illiteracy rates that remain high in the age groups, exacerbate the problem of dependency and care delivery.

METHODOLOGY

The demographic transition and old-age dependency in the hill states of Uttarakhand and Himachal Pradesh are examined in this paper using secondary data and a descriptive research design is adopted. The main objectives of this paper are *to analyse the demographic transition and old-age dependency trends and patterns in Uttarakhand and Himachal Pradesh*, as well as *to look at the elderly populations' sources of financial support and degree of economic independence in both states*. Key indicators such as the old-age dependency ratio (by sex and residence), financial support and economic independence, and the typical activity status of older adults are the focus of the analysis. Secondary data is derived from authentic government sources, including the Census of India (1961–2011) with projections up to 2031, National Sample Survey Office (NSSO) rounds (2004 and 2017–18), and reports from the Ministry of Statistics and Programme Implementation (MOSPI), and the Ministry of Social Justice and Empowerment (MoSJE). Descriptive statistical techniques, trend analysis, tabular and graphical methods are applied to assess variations in elderly dependency and economic activity between 2004 and 2017, while projections up to 2031 are used to anticipate future demographic challenges. The study area, comprising Uttarakhand and Himachal Pradesh, has been selected due to their advanced stages of demographic transition, reflected in declining fertility, rising life expectancy, and substantial out-migration, all of which contribute to increasing old-age dependency and evolving socioeconomic implications.

Operational Definitions and Measures

- **Old-Age Dependency Ratio (OADR)**
$$OADR = \left(\frac{\text{Population aged 60+}}{\text{Population aged 15–59}}\right) \times 10$$
- **Young-Age Dependency Ratio (YADR)**
$$YADR = \left(\frac{\text{Population aged 0–14}}{\text{Population aged 15–59}}\right) \times 100$$
- **Total Dependency Ratio (TDR)**
$$TDR = OADR + YADR$$
- **Economic Independence** is measured using NSS classification into:
    - Economically independent
    - Partially dependent
    - Fully dependent
- **Usual Status** refers to NSS categorization of principal activity status of individuals

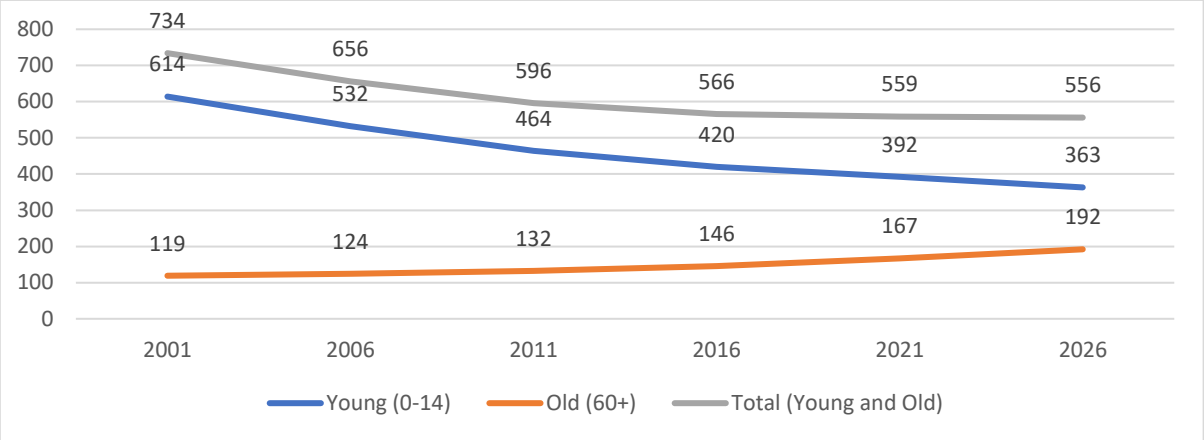
RESULTS AND DISCUSSION

This section of the paper shows the results derived from different data sources. Results and Discussion section is further divided into subsections of Transition in Dependency Ratio, Economic independency of Elderly people and Employment of Elderly People.

A. Transition in Dependency Ratio

Transition in Dependency Ratio is analysed by Old Age (60+) and Young Age Dependency ratio with Projection up to 2026 later it was analysed in Himachal Pradesh and Uttarakhand. And finally old age dependency is analysed in Himachal Pradesh and Uttarakhand based on Sex and Place of Residence.

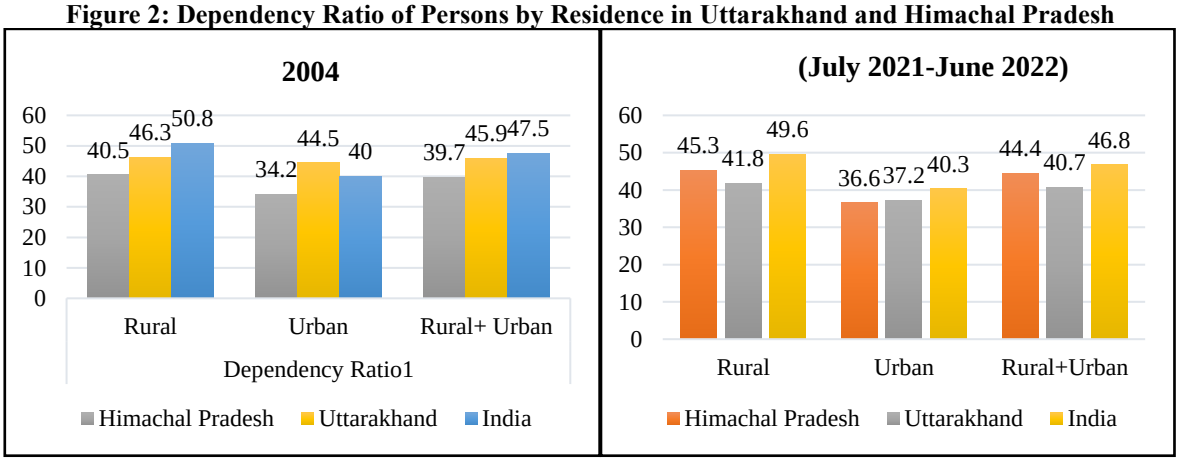
Figure 1: Trends in Old Age (60+) and Young Age (0-14) Dependency Ratio in India



Source: Census of India, 2011; Elderly Care Report, MOSPI.

The dependency ratios in India, as illustrated in Figure 1, reveal a significant demographic transition between 2001 and 2026. The young-age dependency ratio (0–14 years) shows a consistent decline from **615 in 2001** to **392 in 2026**, indicating a reduction in the proportion of children dependent on the working-age population. However, the old-age dependency ratio (60+ years) exhibits a steady increase from **119 in 2001** to **192 in 2026**, reflecting the gradual ageing of the population. Although the total dependency ratio decreases from **734 to 556** during the same period, suggesting a reduced overall dependency burden, the rising share of elderly dependents underscores a structural shift toward an ageing society.

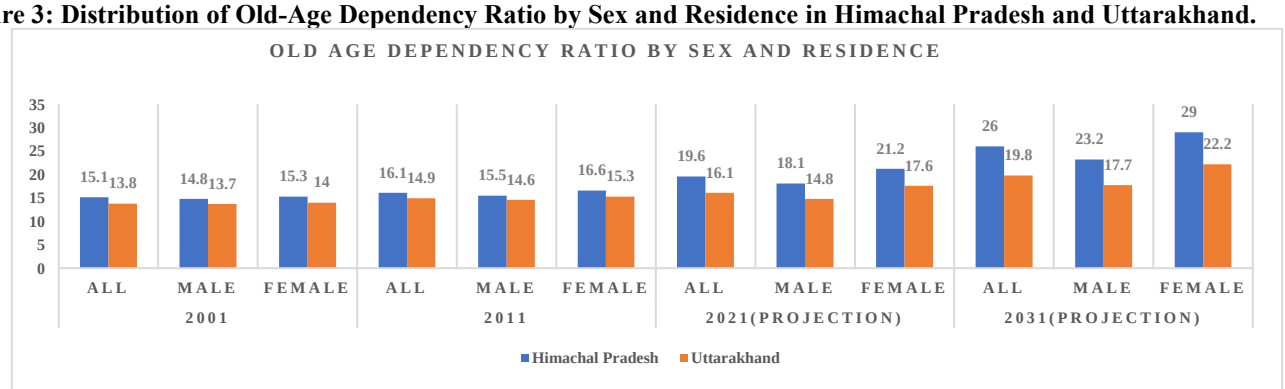
Figure 2: Dependency Ratio of Persons by Residence in Uttarakhand and Himachal Pradesh



Source: India Ageing Report.

Figure 2 illustrates that Rural Dependency Ratio in Himachal Pradesh is significantly increased from 2004 to 2021 whereas in Uttarakhand it has been decreasing in nature. Similarly Urban Dependency Ratio has also shown increasing trends and in Uttarakhand it has also shown decreased. Hence, overall trends also shown similar results. This is probably due to more migration trends in Uttarakhand than Himachal Pradesh.

Figure 3: Distribution of Old-Age Dependency Ratio by Sex and Residence in Himachal Pradesh and Uttarakhand.



Source: Elderly in India Report, Ministry of Statistics and Programme Implementation, Government of India, 2021

The old-age dependency ratio by sex and residence, as shown in Figure 3, exhibits a gradual but consistent increase in both Himachal Pradesh and Uttarakhand, indicating the advancing pace of population ageing in these hill states. In 2001, the

overall old-age dependency ratio was 15.1% in Himachal Pradesh and 13. 8% in Uttarakhand, with minimal gender differences 14.9% for males and 15.3% for females in Himachal Pradesh, and 13.7% for males and 14.0% for females in Uttarakhand. By 2011, the ratio increased slightly to 16. 1% and 14. 9% in the two states, respectively. The projected estimates for 2021 show a sharper rise, reaching 19. 6% in Himachal Pradesh and 16. 1% in Uttarakhand, and are expected to further increase to 26% and 19. 8% by 2031. Notably, female old-age dependency remains higher than that of males in both states, with the gap widening over time by 2031, female dependency is projected to reach 29% in Himachal Pradesh and 22. 2% in Uttarakhand, compared to 23. 2% and 17. 7% among males, respectively.

B. Status of Economic Independence in Uttarakhand and Himachal Pradesh.

Table 1: Percentage distribution of persons aged 60 years & above by state of economic independence (2004)

		Male			Female			Person		
	Residence	Not dependent	Partially dependent	Fully dependent	Not dependent	Partially dependent	Fully dependent	Not dependent	Partially dependent	Fully dependent
Himachal Pradesh	Rural	59	29	11	16	36	47	36	33	31
	Urban	82	14	3	13	26	62	43	21	36
Uttarakhand	Rural	65	20	15	6	24	69	34	22	43
	Urban	68	8	24	3	33	64	37	20	43

Source: Elderly in India Report, Ministry of Statistics and Programme Implementation, Government of India, 2021

Table 2: Percentage distribution of persons aged 60 years & above by state of economic independence (2017)

		Male			Female			Person		
States	Residence	Not dependent	Partially dependent	Fully dependent	Not dependent	Partially dependent	Fully dependent	Not dependent	Partially dependent	Fully dependent
Himachal Pradesh	Rural	58	18	22	18	15	64	38	17	43
	Urban	72	8	20	30	14	55	50	11	38
Uttarakhand	Rural	62	5	28	35	5	59	50	5	42
	urban	83	6	11	19	7	71	47	7	45

Source: Elderly in India Report, Ministry of Statistics and Programme Implementation, Government of India, 2021

The comparative analysis of economic independence among persons aged 60 years and above in Himachal Pradesh and Uttarakhand between 2004 and 2017, based on data from the *Elderly in India Report (2021)* published by the Ministry of Statistics and Programme Implementation, Government of India, reveals a general decline or stagnation in financial autonomy, with pronounced gender and rural–urban disparities. While elderly males, particularly urban males in Uttarakhand, exhibited relatively higher levels of economic independence—with urban male independence increasing from 68 per cent in 2004 to 83 per cent in 2017—most other groups experienced either marginal improvement or worsening conditions. Female elderly remain the most economically vulnerable category; for instance, fully dependent rural females in Himachal Pradesh increased from 47 per cent to 64 per cent, and urban females in Uttarakhand remained highly dependent at 71 per cent in 2017. Rural areas in both states show persistently high or rising levels of full dependency, reflecting limited access to pensionable employment, continued reliance on informal agriculture, and weakening family support due to migration. At the aggregate level, the proportion of fully dependent elderly persons increased in several categories, particularly in rural Himachal Pradesh, indicating growing financial vulnerability. Overall, the findings suggest that demographic ageing, gender inequality in lifetime employment opportunities, and inadequate social security coverage have contributed to the increasing economic dependence of the elderly population, underscoring the need for targeted pension reforms and inclusive social protection policies in hill states.

Table 3: Percentage distribution of economically dependent aged persons financially supported by (Rural)

		Rural-2004			Rural 2017		
		Uttarakhand	Himachal Pradesh	India	Uttarakhand	Himachal Pradesh	India
Male	Spouse	10	3	7	0	1	4
	Own Children	84	86	85	93	89	92
	Grand Children	4	2	2	0	6	1
	Others	2	9	6	7	3	3
	All	100	100	100	100	100	100
Female	Spouse	21	18	16	41	31	21
	Own Children	75	75	75	52	59	72
	Grand Children	3	3	3	7	6	3
	Others	1	4	6	0	4	5

	All	100	100	100	100	100	100
Person	Spouse	17	13	13	35	22	15
	Own Children	72	79	78	58	68	79
	Grand Children	2	2	3	6	6	2
	Others	8	6	6	1	4	4
	All	100	100	100	100	100	100

Source: Elderly in India Report, Ministry of Statistics and Programme Implementation, Government of India, 2021

Table 4: Percentage distribution of economically dependent aged persons financially supported by (Urban)

		Urban -2004			Urban-2017-18		
		Uttarakhand	**Himachal Pradesh**	**India**	**Uttarakhand**	**Himachal Pradesh**	**India**
Male	Spouse	0	0	6	0	1	4
	Own Children	93	94	87	93	66	91
	Grand Children	0	0	2	0	25	1
	Others	7	6	6	7	8	4
	All	100	100	100	100	100	100
Female	Spouse	41	23	19	41	31	24
	Own Children	52	73	71	52	63	70
	Grand Children	7	2	3	7	4	2
	Others	0	2	7	0	1	4
	All	100	100	100	100	100	100
Person	Spouse	35	17	15	35	27	18
	Own Children	58	79	76	58	64	76
	Grand Children	6	1	3	6	7	2
	Others	1	3	6	1	2	4
	All	100	100	100	100	100	100

Source: Elderly in India Report, Ministry of Statistics and Programme Implementation, Government of India, 2021

Comparative survey of rural and urban dependency patterns has depicted some alterations on the provision of support systems to the seniors in India. In cities the change in the type of dependency based on children is gradually replaced by a more diversified system of dependence on children and spouses, based on the changing family norms, greater female labor participation and availability of formal sources of retirement income. In 2004-2017-18, dependency on children fell to 63-70% of old women and 66% of men, the spousal support grew significantly (23 to 41) as a grandparent and a grandchild share income and material assets, signaling the appearance of the two-income and shared-resource families. Conversely, child-dependence is still high in rural regions, 85-86% of elderly in 2004 and 68-79% in 2017-18 are dependent on their children, and spousal support is relatively low (peaking only at 22-35%). Such continuity of traditional support systems is explainable by the low financial inclusion, low pension coverage, and preponderance of informal employment. The gender differences are also reflected, as the older male generation is more dependent on children because the earning power of the female gender was less in the previous generations and females are on an increasing trend in spousal support, which is an indicator of increasing longevity and eligibility to the pension schemes. These results highlight the importance of policy interventions to increase rural pension programmes, stimulate retirement savings and pension literacy, increase the labour participation of women, and improve social nets. It is important to address these concerns in order to have equitable and sustainable economic security of the ageing population, both in rural set-ups and in urban set-ups.

Table 5: Percentage distribution of elderly persons by usual status(ps+ss)

Year	Residence	Sex	60–64 Employed	60–64 Unemployed	60–64 Not in LF	65+ Employed	65+ Unemployed	65+ Not in LF
2011–12	Rural	Male	82.8	0	17.8	53.4	0	46.6
		Female	31.8	0	68.2	14.1	0	85.9
		Person	56.7	0	43.3	33.9	0	66.1
	Urban	Male	49.4	0	50.6	28.6	0	71.4
		Female	11.5	0	88.5	5.4	0	94.6
		Person	29.9	0	70.1	16.8	0	83.2
	Rural + Urban	Male	73.3	0	26.6	46.3	0	53.7
		Female	26.2	0	73.8	11.5	0	88.5
		Person	49.3	0	50.6	28.9	0	71.1
2018–19	Rural	Male	71.8	0.1	28.2	37.3	0.2	62.5
		Female	21.2	0	78.8	9.9	0	90.1
		Person	45.6	0	54.3	24.3	0.1	75.6
	Urban	Male	51.1	0.3	48.6	23.1	0.2	76.6

		Female	10	0	89.9	5.9	0	94.3
		Person	29.8	0.2	70	14.3	0.1	85.6
	Rural + Urban	Male	65.5	0.1	34.3	33.1	0.2	66.8
		Female	17.8	0	82.1	8.5	0	91.5
		Person	40.9	0.1	59.1	21.2	0.1	78.8

Source: Key Indicators of Employment and Unemployment of India- 2011-12, PLFS- 2018-19

According to the Periodic Labour Force Survey (PLFS) 2018–19, a significant gender disparity exists in the economic participation of the elderly population in India. Among individuals aged 60–64 years, about 65% of elderly men and only 18% of elderly women were engaged in economic activities. The rural–urban divide is also pronounced 72% of rural elderly men and 21% of rural elderly women participated in the workforce, compared to just 51% of urban elderly men and 10% of urban elderly women. In the older age group of 65 years and above, the level of participation declines considerably for both sexes, indicating that advancing age and socio-economic factors further restrict the economic engagement of the elderly, particularly women and those living in urban areas.

Key Findings

The analysis reveals significant demographic and socio-economic variations in ageing patterns, dependency ratios, and economic independence across Himachal Pradesh and Uttarakhand.

1. Gender Disparity in Dependency:
   Table 1 illustrates a sharp gender gap in the dependency status between the two states, all the time indicating that females have been more dependent compared to the males in all the residential categories. The level of female total dependency is much higher but Table 2 shows that female dependency, though also high, is slightly lower indicating the need to differentiate datasets in regards to certain age or economic indicators. Also, the dependency rates, on the one hand, tend to be lower in urban regions of both genders and the population in general, and, on the other hand, Himachal Pradesh has a slightly better dependency profile than Uttarakhand, which is why it serves as a valuable case study of which factors foster elderly independence.
2. Rising Old-Age Dependency:
   The old-age dependency ratio shows a steady upward trend in both states, rising from 15.1% in Himachal Pradesh and 13.8% in Uttarakhand in 2001 to projected levels of 26% and 19.8% respectively by 2031. Female dependency remains consistently higher, projected to reach 29% in Himachal Pradesh and 22.2% in Uttarakhand, reflecting the growing feminization of ageing.
3. Declining Young-Age Dependency:
   The old age dependency in both states is steadily increasing with a dependency rate of 15.1 and 13.8 years respectively in the year 2001 and is projected to rise to 26% and 19.8% respectively by the year 2031. The level of dependency amongst women is steadily increasing with an estimated dependency of 29, 22.2 in Himachal Pradesh and Uttarakhand respectively, as a result of feminizing ageing.
4. Gender and Regional Disparities in Economic Independence:
   Economic independence among the elderly varies sharply by gender and residence. In Himachal Pradesh, 61.8% of rural and 59.2% of urban men are economically independent, compared to 34.6% of rural and 37.3% of urban women. In Uttarakhand, male independence stands at 54.3% (rural) and 55.4% (urban), while female independence is markedly lower at 33.4% (rural) and 35.6% (urban). Rural men, particularly in Himachal Pradesh, remain more engaged in informal or agricultural work, while women continue to exhibit higher dependency levels.
5. Sources of Financial Support:
   The elderly are largely dependent on family as the major source of finance. In Himachal Pradesh, the dependency ratio is 63.2, 24.7 and 12.1, respectively, on family, self-earned income and pensions or other transfers. In Uttarakhand, 60.8 depend on family, 22.4 depend on self-income and 16.8 depend on other sources. Men aged over 60 claim to be more self-reliant, whereas women aged over 60 years depend on family members way more, which indicates that the gender gap in financial independence remains to be persistent.
6. Labour Force Participation and Ageing:
   As per PLFS (2018–19), about 65% of elderly men and 18% of elderly women aged 60–64 years were engaged in economic activity. The rural–urban divide is striking—72% of rural men and 21% of rural women participated, compared to 51% and 10% in urban areas. Participation declines significantly beyond age 65, reflecting the combined effects of ageing, informal work structures, and inadequate pension coverage.
7. Changing Family Support Patterns:
   Between 2004 and 2017–18, urban India witnessed a transition from traditional child-based dependence toward mixed dependency. Reliance on children declined from 87–94% to 63–70% among elderly females and around 66% among males, while spousal support increased from 23% to 41%. This indicates the emergence of dual-income and resource-sharing households in cities. Rural areas, however, continue to show predominant child-dependence (68–79%) and limited spousal support (22–35%), due to weak pension systems and informal economic dominance.
8. Policy and Gender Implications:
   The findings highlight that feminization of ageing, weak rural pensions, and low female workforce participation are key challenges in ensuring old-age security. Expanding pension coverage, improving retirement savings literacy, enhancing women's economic opportunities, and strengthening health and social protection frameworks are critical policy priorities for both states. Himachal Pradesh's relatively better performance in independence and pension coverage offers useful insights for developing targeted interventions in Uttarakhand and similar states.

Conclusion and Policy Implications

The paper shows a distinct demographic and socio-economic shift in the ageing of Himachal Pradesh and Uttarakhand, which is characterised by a consistent increase in the old-age dependency and increasing gender and regional inequality. As the total dependency burden is decreasing through low dependency at the young age, the percentage of the aged dependents is increasing at a high rate especially among women. The greater dependency ratio of females in old age with their less economic self-sufficiency highlights the gendering weaknesses inherent in the ageing process in the population. The rural-urban disparity is also strong: rural elderly are still on the high dependency on children and informal sources of income, whereas, urban elderly is also slowly becoming a mixed dependency, where children and spouses are involved, due to the shifts in family models and growing involvement into the formal sector. Economically, the results indicate that Himachal Pradesh is a little bit better in the case of older-adults self-sufficiency and pension access, and Uttarakhand has more problems, as financial inclusion is lower, and formal retirement benefits are less extensive. The Periodic Labour Force Survey (2018-19) also substantiates these inequalities whereby only 18 percent of the elderly women against 65 percent of men aged 60-64 years and even less against 65 years that are economically active.

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INVESTMENT AND TURNOVER TRENDS IN MSMEs: INSIGHTS FROM A COMPARISON OF SOME LEADING STATES OF INDIA

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ABSTRACT **DOI No: 10.36713/epra26176** **Article DOI: https://doi.org/10.36713/epra26176**

Purpose: *This study seeks to determine statistically significant differences in MSME distribution across major states of India, analyzing variance in investment patterns, evaluating heterogeneity in turnover categories and assessing employment generation patterns.*
Design/methodology/approach: *The study employs mixed-methods approach, combining both quantitative and qualitative data and analyses methods. This study draws on a range of empirical studies and reports of ministries, policy framework, economic survey and budgetary analysis to provide a comprehensive understanding of financials of MSMEs. Descriptive and analytical statistical measures are used in conjunction to provide a comprehensive analysis of the data, revealing its key characteristics, patterns and relationships.*
Findings: *The study reveals that MSMEs have shown significant growth in investment and turnover in recent years and the sector is significantly contributing towards empowering semi-urban and rural areas, increasing employment opportunities and augmenting the overall economic viability of the nation. Insights from comparative analysis of leading states highlights the areas for which robust strategies may be formulated to further enhance MSME ecosystem, ensuring its continued contribution to regional and national economic development.*
Research limitations/implications: *The primary limitations included reliance on secondary data sources, time period constraint (2020-2022), resource constraints and registration-based data limitations. The geographical scope of the study is limited, covering only a few prominent states, which may restrict the applicability of the findings to other parts of the country. External influences that could impact the MSME landscape have not been thoroughly examined.*
Originality/value: *Through a comparative analysis of MSME investment and turnover trends across major Indian states, this study delineates the major focus areas, enabling the development of targeted regional strategies to foster MSMEs growth.*

KEYWORDS: *MSMEs, Investment, Turnover, Growth, Economic development, Employment*

INTRODUCTION

Micro, Small and Medium Enterprises play a crucial role in the economic development of India, contributing significantly to the country's GDP, employment generation and overall industrial growth. The recent changes in the definition of MSMEs, from an investment-based to a turnover-based approach, have brought about a significant alignment with the Goods and Services Tax regime, effectively eliminating the distinction between manufacturing and service units. According to the revised definition, the ceiling on the annual turnover of a micro enterprise is 10 crore, while the annual turnover of a small enterprise is between 10 crore and 100 crore. A medium enterprise is defined as having an annual turnover between 100 crore and 500 crore. **(Ministry of MSME).** The Indian MSME sector is a key driver of the country's economic growth, generating substantial exports, employment and industrial production, but it faces a myriad of challenges that hinder its growth and global competitiveness. **(Tripathy & Kumar, 2019).**

MSMEs are a cornerstone of the country's economic and social development, providing a platform for entrepreneurs to showcase their creativity and innovative spirit. The MSME sector has been a key driver of India's economic resilience, successfully navigating global economic turbulence and demonstrating impressive growth. **(IBEF, 2022).** The sector is a significant contributor to employment in the country, with approximately 60 million people employed across 26 million enterprises, exhibiting a higher labor intensity and growth rate. **(Rana & Choudhary, 2019).** The MSME sector generates employment for approximately 360.41 lakh individuals in manufacturing, 387.18 lakh in trade and 362.22 lakh in other services. **(Tandel, 2023).** The MSME sector is a key driver of India's economic growth, featuring a vast network of 30 million units that create substantial employment opportunities and contribute significantly to manufacturing output and exports. The MSME sector's contribution to India's manufacturing output and exports is substantial, at 45% and 40%, respectively. **(Zanjurne, 2018).** The country's handicraft MSMEs presents a complex landscape, marked by the coexistence of a large rural artisanal workforce and a significant export-oriented sector, with over 67,000 exporters catering to domestic and international markets. Handicraft MSMEs are a cornerstone of India's

economy, providing substantial employment opportunities, particularly in rural and semi-urban areas and contributing to the country's GDP. **(Agarwal et al., 2022).**

India's MSME landscape is led by Uttar Pradesh, which accounts for approximately 11.3% of the country's total MSME units, with West Bengal and Tamil Nadu in close pursuit. **(Jena & Thatte, 2018).** Uttar Pradesh stands out as the leading contributor to MSMEs, with a 28% share among the top 10 states, ahead of West Bengal and Tamil Nadu, which contribute 24% and 17%, respectively. The MSME sector's GDP share showed a consistent upward trend, increasing from 29.34% in 2014-15 to 30.27% in 2018-19, emphasizing its growing economic importance. **(Gangadhar, 2022).** The MSME sector in Gujarat comprises around 33.16 lakh enterprises, contributing significantly to the state's economy. Gujarat's MSME sector holds immense potential for driving India's economic growth and development. **(Srivastava, 2020).** Maharashtra has taken the lead in fostering a thriving MSME ecosystem, driven by its diversified sector, robust infrastructure and effective policies like the Maharashtra Industrial Policy (2020). The state of Tamil Nadu has a strong manufacturing base, with a focus on textiles, leather and auto components, backed by initiatives that promote skill development and industrial cluster growth. Uttar Pradesh's vast workforce and government-supported initiatives like the ODOP scheme are key drivers of its MSME sector's success. **(Kamini & Dadhich, 2024).** Investments in MSMEs have shown a remarkable upward trend, increasing by 64,419% between 1972-73 and 2015-16, from ₹1,054.68 crore to ₹6,89,954.86 crore. The production sector has witnessed a substantial 41,332% increase, from ₹2,602.74 crore to ₹10,77,212.86 crore, over the same period. **(Sahu & Mani, 2024).**

Micro, Small and Medium Enterprises (MSMEs) form the backbone of the Indian economy. The economy has witnessed a remarkable growth rate across all sectors, including the primary, secondary and service sectors. In the fiscal year 2016-17, the primary and secondary sectors grew at a rate of 6.4%, while the tertiary sector stood out with an impressive growth rate of 10.8%. This growth is a reflection of the economy's strength and the sectors' ability to adapt to changing market conditions. **(Team MSMEx).** This study delves into the investment-wise status of leading states of India, analyzing capital infusion and provides a turnover-wise analysis to assess revenue generation and its impact on the state's economic growth. By presenting comparative analysis of investment-wise and turnover-wise status of MSMEs of leading states in India, this study aims to provide valuable insights into the role of MSMEs in economic development of the nation.

Classification of MSMEs

Table 1: Classification of MSMEs

Sr. No.	Type of Enterprise	Investment	Turnover
1.	Micro Enterprise	Not more than ₹ 2.5 Crore	Not more than ₹ 10 Crore
2.	Small Enterprise	Not more than ₹ 25 Crore	Not more than ₹ 100 Crore
3.	Medium Enterprise	Not more than ₹ 125 Crore	Not more than ₹ 500 Crore

Source: MSME vide Notification-S.O-no-1364-E-dated-21.03.2025

Table 1 shows the revised classification for MSMEs (Micro, Small and Medium Enterprises), effective from March 21, 2025. For Micro Enterprises, the classification applies to businesses with an annual turnover of up to Rs. 10 crore and an investment of less than Rs. 2.5 crore. This category typically includes very small businesses and startups. Small Enterprises are defined as businesses with an annual turnover of up to Rs. 100 crore and an investment between Rs. 2.5 and Rs. 25 crore. These enterprises represent businesses that have outgrown the micro stage but still require support to grow. Medium Enterprises are larger, with an annual turnover of up to Rs. 500 crore and an investment between Rs. 25 crore and Rs. 125 crore. These businesses have greater capacity for production and employment, making them a crucial part of the industrial and service sectors.

Literature Review

Various empirical studies, reports of ministries, policy framework, economic survey and budgetary analysis has explored various facets of MSMEs. Analysis of Indian MSMEs has predominantly been conducted at the national level, resulting in limited insights into state-specific growth and development trends.

Table 2: Review of Existing Literature on MSMEs Development and Policy Impact

Source/ Author	Year	Methodology	Findings	Research Gap
Ministry of Micro, Small & Medium Enterprises, Government of India	2024	Budgetary Analysis	Budget allocations for MSME schemes, including Khadi and Village Industries, Technology Upgradation, PMEGP and RAMP. Emphasis on enhancing MSME competitiveness.	Requires longitudinal impact analysis on budget allocation and focus on how effectively these funds meet MSMEs growth, sustainability and employment targets.
Micro, Small and Medium Enterprises Department, Government of Tamil Nadu	2024	Policy Framework and Implementation Analysis	Outlines support for MSMEs, including financial incentives, infrastructure development, workforce, housing and green technology adoption. Key schemes include subsidies and development programs for micro-clusters and industrial estates.	Limited data on the long-term impact of these policies on MSMEs growth and the effectiveness of regional-specific programs. Further evaluation needed on policy sustainability.
Ministry of Micro, Small & Medium Enterprises	2023-24	Annual Report Analysis	MSMEs account for a significant portion of employment and economic activity in India, with notable contribution to exports, employment and rural industrialization.	Further research needed to assess the impact of specific schemes on MSMEs growth and sustainability, especially digitization initiatives.
Industries & Commerce Department, Haryana Government	2023	Policy Framework Analysis	The scheme offers financial incentives for MSMEs in the textile sector for ETP (Effluent Treatment Plants), ZLD (Zero Liquid Discharge) systems and solar rooftops.	Limited data on the adoption rate of green incentives and the long-term environmental impact on MSMEs in the textile sector. Further research is needed to assess effectiveness.
Vaidya, S. N.	2023	Literature review of MSME sector in India, focusing on growth and challenges.	MSMEs significantly impact India's economic growth through employment generation, industrialization and rural development. Despite their contributions, they face challenges in financing, infrastructure, technology and innovation.	Lack of study on overcoming persistent obstacles in MSME infrastructure, financing and technology to ensure sustainable growth and sector resilience.
Srivastava, D.P., Vineetha O.K., Mehta, T. S. Office of Development Commissioner, M/o MSME	2022	Data Analysis from Udyam Portal	80.16 lakh MSMEs registered under Udyam,with Maharashtra leading registrations. 97% had investments below Rs. 50 lakh and 88% had turnover below Rs. 1 crore.	Lacks long-term data on the financial sustainability and growth of MSMEs; need for further analysis on MSMEs' regional challenges and sector-specific policy impacts.
National Institute for Micro, Small and Medium Enterprises (ni-msme)	2022	Policy Compilation & Analysis	The document compiles various MSME support schemes, including financial assistance, skill development, infrastructure support and market access initiatives.	Limited data on the long-term impact of these schemes on MSMEs sustainability and growth; requires region-specific studies to assess effectiveness.
ICAI Committee on MSME & Startup	2022	Policy Compendium and Analysis	Detailed overview of MSME policies in Haryana, including the Industrial Investment and Employment Promotion Policy 2020, MSME Policy 2019 and others.	The report lacks an analysis of the effectiveness of these policies in terms of actual economic impact, as well as data on regional challenges faced by Haryana's MSMEs.
Kumar, O., PRS Legislative Research	2022	Budgetary and Economic Analysis	The Haryana Budget 2022-23 highlights 11% GSDP growth projection, increased expenditure in sectors like education, healthcare and urban development and a fiscal deficit goal of 3.52% of GSDP.	There is a need to assess the long-term fiscal impact of increased expenditure on healthcare and infrastructure and the sustainability of Haryana's debt levels.

Karnataka Economic Survey, Department of Industries and Commerce, Government of Karnataka	2021-22	Economic Survey Analysis	MSMEs in Karnataka contribute significantly to employment, with over 55 lakh jobs and major investments in sectors like food processing, textiles and manufacturing.	Further studies needed on post-COVID recovery challenges specific to Karnataka's MSMEs and the effectiveness of recent policy measures for sustainable growth.
Office of Development Commissioner (MSME)	2021	Data Analysis of Udyam Registration	Maharashtra leads in MSME registrations (22.3%), with micro-enterprises making up 93% of total MSMEs. Key insights include state wise employment and investment.	Need for longitudinal study on MSMEs growth patterns across states, deeper analysis of regional challenges and impact of policy interventions.
Pagaddut, J. G.	2021	Multiple Linear Regression, Factor & Cluster Analysis	Debt ratio and asset turnover negatively impact Return on Assets (ROA), while gross profit margin positively affects ROA. Two main factors- sustainability and efficiency ratios explain financial variations.	Further research required on other financial factors affecting MSMEs in diverse sectors, especially during different economic cycles.

RESEARCH METHODOLOGY

The research methodology employed in this study involves a comprehensive analysis of the investment-wise and turnover-wise status of Micro, Small and Medium Enterprises (MSMEs) in India particularly focusing on some leading states. The study is based on secondary data that is gathered from government publications, industry reports and databases such as the Udyam Registration Portal, the Ministry of Micro, Small and Medium Enterprises and relevant studies from academic journals. The data pertaining to the classification of MSMEs by investment and turnover was analyzed for the period from 2020 to 2022, providing insights into the registration and economic performance of MSMEs across Indian states. Additionally, comparative analysis of major states such as Maharashtra, Tamil Nadu, Gujarat and Haryana was carried out to assess MSMEs position in the national landscape. Statistical techniques, including descriptive analysis, were used to examine the growth patterns, employment generation and sectoral contributions of MSMEs.

The research methodology employed in this study utilizes a mixed-methods approach combining quantitative and qualitative analyses to examine the investment-wise and turnover-wise status of MSMEs in leading states of India. Through a descriptive-analytical framework, this study draws upon secondary data sources to yield a comprehensive insight into the development patterns of MSMEs. Data was collected from the Udyam Registration Portal for the period 2020-2022, encompassing state-wise MSME registration records, employment generation data, investment data and turnover data. Data sources also included government publications, Ministry of MSME annual reports, academic journals, research papers and industry reports, providing contextual depth to the analysis.

The statistical framework implemented in this study encompasses both descriptive and inferential statistical analyses. Descriptive statistics, including measure of central tendency (mean), measures of dispersion (standard deviation, variance), distribution characteristics (skewness) and relative measure (coefficient of variation), were utilized to provide a foundational understanding of the data structure. The inferential statistical analysis employed one-way ANOVA testing. For applying ANOVA, the null and alternate hypotheses are taken as follows:

Null Hypothesis (H_0) : There is no significant difference in MSMEs distribution across states.
Alternate Hypothesis (H_1) : There is significant difference in MSMEs distribution across states.

The variables under study were carefully selected to capture the multifaceted nature of MSME development. Independent variables included state location, time period (2020-2022), investment categories and turnover brackets, while dependent variables encompassed the number of MSMEs, employment generation, investment levels and turnover amounts. The data analysis process followed a systematic approach beginning with a pre-analysis phase. Then analysis phase incorporated the computation of descriptive statistics and ANOVA calculations followed by a post-analysis phase focusing on result interpretation and finding validation. The enhanced methodology undertaken in this study provides a comprehensive framework for analyzing MSME patterns across major Indian states.

FINDINGS

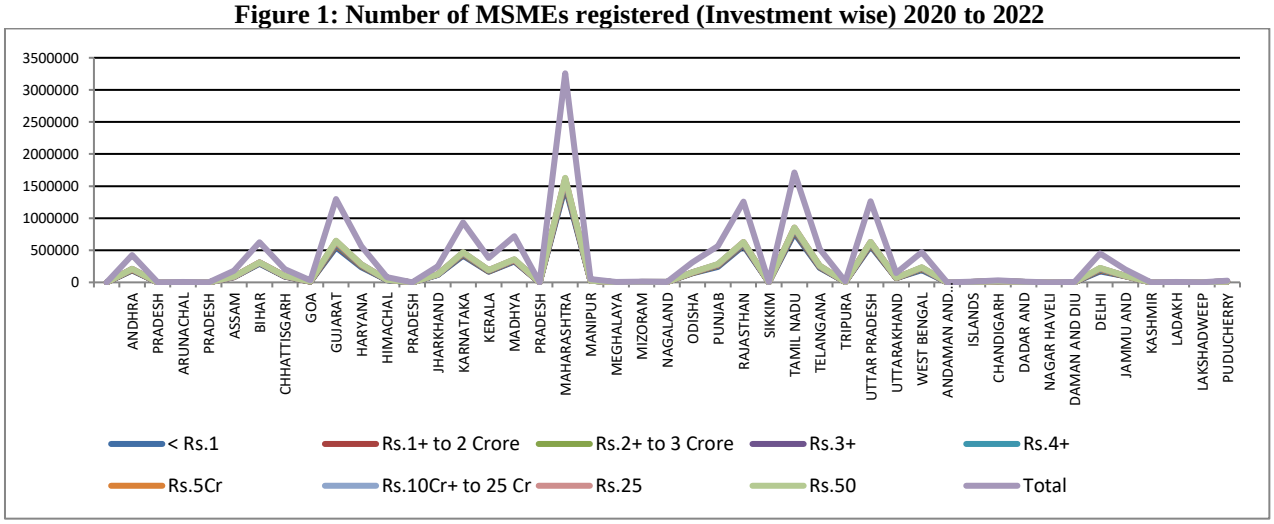
The study reveals that the shift from investment-based to turnover-based classification in MSMEs, aligned with the Goods and Services Tax (GST) regime, has simplified classification. MSMEs serve as the backbone for supply chains and ancillary industries, supporting larger enterprises across the nation. However, the sector's smaller scale compared to industrialized states like Maharashtra, Tamil Nadu and Gujarat reflects a relatively lower number of high-investment and high-turnover MSMEs in Haryana. Despite these limitations, Haryana's MSMEs play a crucial role in strengthening semi-urban and rural economies. Government initiatives like the Emergency Credit Line Guarantee Scheme (ECLGS), Raising and Accelerating MSME Performance (RAMP) and Udyam Assist Platform (UAP) have been vital in sustaining MSME sector through financial support and enabling formalization. Despite this, MSMEs face challenges like limited credit access, infrastructure gaps and skill development needs. Addressing these key areas through target policy interventions will enable MSME sector to evolve into a robust and self-sufficient sector capable of competing with other leading states.

Table 3: Number of MSMEs registered (Investment wise) 2020 to 2022

State/UT	<= Rs. 50 lakhs	Rs.50 lakhs + to 1 Crore	Rs.1 Cr+ to 5 Crore	Rs.5 Cr+ to 10Cr	Rs.10Cr+ to 25Cr	Rs.25Cr+ to 50Cr	Total
Andhra Pradesh	206449	2965	2817	447	259	81	213018
Arunachal Pradesh	2821	76	68	6	3	1	2975
Assam	86917	1048	1046	209	64	23	89197
Bihar	309238	1374	850	103	49	17	311631
Chhattisgarh	98285	1706	1625	223	118	40	101797
Goa	13986	299	334	35	25	10	14687
Gujarat	**620081**	**12079**	**12836**	**1848**	**1092**	**384**	**648231**
Haryana	**270931**	**5260**	**5449**	**746**	**392**	**88**	**282866**
Himachal Pradesh	38189	604	740	139	54	25	39766
Jharkhand	123922	1266	1062	111	73	15	126449
Karnataka	453822	6522	6143	872	726	212	467959
Kerala	184301	3082	2565	361	166	31	190506
Madhya Pradesh	351364	3398	3112	446	206	63	358598
Maharashtra	**1594715**	**15599**	**15125**	**2173**	**1278**	**370**	**1629260**
Manipur	24103	113	88	44	5	1	24316
Meghalaya	2793	45	73	11	3	1	2926
Mizoram	4494	88	54	7	5	0	4628
Nagaland	3920	53	48	5	5	0	4030
Odisha	151413	1958	1783	236	82	35	155507
Punjab	274941	4067	3346	440	214	50	283058
Rajasthan	617994	5969	5327	616	408	137	633951
Sikkim	2054	15	35	8	3	0	2115
Tamil Nadu	**833302**	**10267**	**9755**	**1388**	**840**	**188**	**857745**
Telangana	250347	4067	4310	682	404	115	259925
Tripura	8260	82	53	22	5	3	8425
Uttar Pradesh	618754	6498	5713	766	432	95	632258
Uttarakhand	70621	840	894	151	64	20	72590
West Bengal	226317	3595	3621	524	283	66	234406
Andaman And Nicobar Islands	4688	75	34	2	4	0	4803
Chandigarh	14630	298	256	45	24	10	15263
Dadar And Nagar Haveli	4541	154	215	30	26	5	4971
Daman And Diu	2020	119	160	24	17	5	2345
Delhi	214398	4886	4587	661	396	117	225400
Jammu And Kashmir	99366	886	584	71	38	14	100924
Ladakh	2936	59	37	6	1	0	3039
Lakshadweep	245	1	0	0	0	0	246
Puducherry	11818	167	148	22	9	5	12169

Source:- Udyam Registration Publication, 2020-22

Figure 1: Number of MSMEs registered (Investment wise) 2020 to 2022



Source: constructed on the basis of data contained in table 3

Table 3 and **figure 1** categorizes MSMEs across Indian states based on the investment size, ranging from less than Rs. 50 lakhs to Rs. 50 crore. When contrasted with leading states like Maharashtra, Tamil Nadu and Gujarat, Haryana's numbers, while substantial, fall behind these industrial giants. Maharashtra, with 1.59 million MSMEs under Rs. 50 lakhs, is the leading state, followed by Tamil Nadu with 833,302 MSMEs and Gujarat with 620,081 MSMEs in the same category. In terms of higher investments (Rs. 5 crore and above), states like Maharashtra, Tamil Nadu and Gujarat again lead with a significantly larger number of MSMEs compared to Haryana.

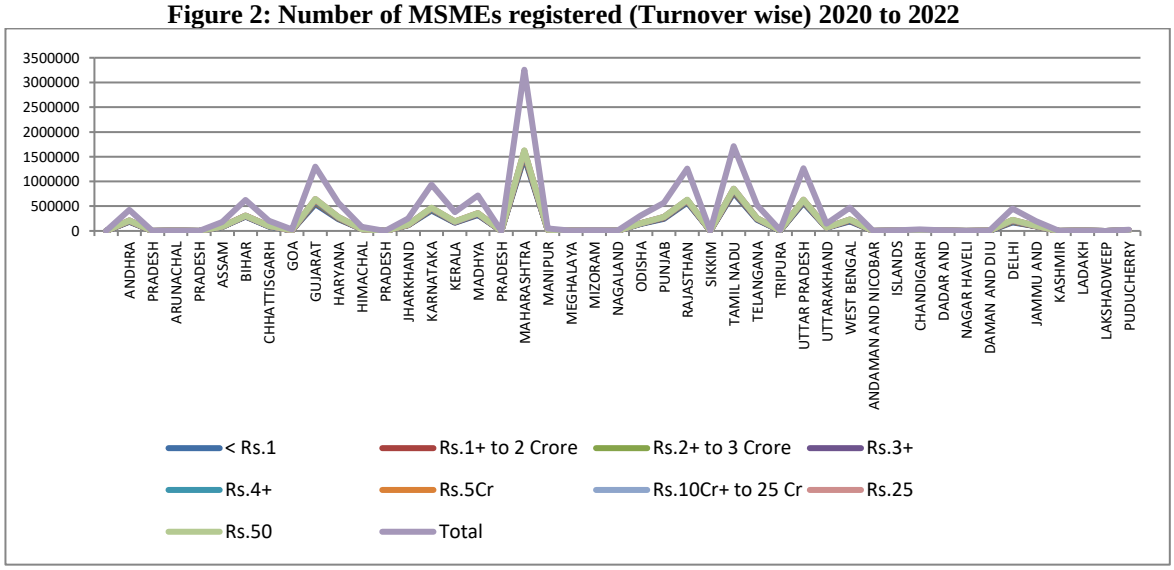
Table 4: Number of MSMEs registered (Turnover wise) 2020 to 2022

State/UT	< Rs.1 Crore	Rs.1+ to 2 Crore	Rs.2+ to 3 Crore	Rs.3+ to 4 Crore	Rs.4+ to 5 Crore	Rs.5Cr + to 10Cr	Rs.10Cr+ to25 Cr	Rs.25 Cr+ to 50Cr	Rs.50 Cr+ to 250Cr	Total
ANDHRA PRADESH	183599	8352	4491	3049	2077	5104	4074	1389	883	213018
ARUNACHAL PRADESH	2750	67	33	17	16	33	33	13	13	2975
ASSAM	79797	2614	1395	900	670	1635	1384	514	288	89197
BIHAR	292398	6419	3134	1887	1351	3132	2283	631	396	311631
CHHATTISGARH	90082	3139	1673	1115	823	2066	1830	707	544	101979
GOA	12565	640	350	222	150	348	248	85	79	14687
GUJARAT	**543181**	**30941**	**16281**	**10330**	**7281**	**17317**	**13862**	**5355**	**3683**	**648231**
HARYANA	**237020**	**13489**	**6880**	**4499**	**3253**	**7793**	**6126**	**2248**	**1558**	**282866**
HIMACHAL PRADESH	35198	1389	650	398	296	731	629	264	213	39768
JHARKHAND	115855	3402	1681	1060	724	1663	1316	471	277	126449
KARNATAKA	413188	16251	8357	5324	3722	9232	7265	2715	1905	467959
KERALA	165947	7175	3726	2350	1739	4165	3549	1141	714	190506
MADHYA PRADESH	324026	10076	5127	3405	2490	6285	4767	1466	947	358589
MAHARASHTRA	**1489441**	**41512**	**20758**	**13230**	**9270**	**22731**	**18851**	**7532**	**5935**	**1629260**
MANIPUR	23716	187	94	42	39	107	81	38	9	24313
MEGHALAYA	2551	93	48	33	27	60	64	27	23	2926
MIZORAM	4454	73	39	19	8	30	23	7	5	4658
NAGALAND	3865	60	25	11	15	25	18	6	5	4030
ODISHA	139470	5113	2582	1604	1086	2482	2058	686	426	155507
PUNJAB	243058	13011	6299	3942	2806	6583	4537	1618	1204	283058
RAJASTHAN	572352	18799	9114	5641	4009	9282	7182	2447	1505	630331
SIKKIM	1955	45	27	11	12	25	28	7	5	2115
TAMIL NADU	**766723**	**28502**	**14057**	**8708**	**6033**	**14571**	**10912**	**3727**	**2507**	**855740**

TELANGANA	228110	8458	4529	3049	2230	5662	4601	1828	1458	259925
TRIPURA	7477	315	153	97	56	148	97	40	17	8400
UTTAR PRADESH	565508	20469	10398	6382	4729	11245	8630	2891	2006	632258
UTTARAKHAND	64859	2366	1163	751	490	1312	1045	354	250	72590
WEST BENGAL	192245	12627	6247	3908	2770	6991	5864	2206	1548	234406
ANDAMAN AND NICOBAR ISLANDS	4313	173	81	40	41	75	59	16	5	4803
CHANDIGARH	12389	776	420	300	213	500	398	141	126	15263
DADAR AND NAGAR HAVELI	3922	288	138	87	54	163	172	70	77	4971
DAMAN AND DIU	1648	149	78	71	43	122	117	64	53	2345
DELHI	172255	14138	7575	5047	3685	9092	7607	3153	2493	225045
JAMMU AND KASHMIR	93861	2843	1180	680	447	954	679	185	113	100942
LADAKH	2914	54	20	13	6	16	11	5	0	3039
LAKSHADWEEP	242	3	0	0	1	0	0	0	0	246
PUDUCHERRY	10780	416	200	147	80	233	177	87	49	12169

Source: Udyam Registration Publication, 2020-22

Figure 2: Number of MSMEs registered (Turnover wise) 2020 to 2022



Source: constructed on the basis of data contained in table 4

Table 4 and **figure 2** presents MSMEs categorized based on their turnover, from less than Rs. 1 crore to Rs. 50 crore and above. States like Gujarat, Maharashtra and Tamil Nadu have significantly higher numbers of MSMEs as compared to Haryana. Gujarat leads the nation with 543,181 MSMEs with turnover less than Rs. 1 crore, followed by 148,9441 MSMEs in Maharashtra and 766,723 MSMEs in Tamil Nadu. The number of MSMEs in these states with turnovers exceeding Rs. 5 crore is also considerably higher than in Haryana, reflecting the greater industrial capacity and business diversity in these states.

Statistical Analysis of MSMEs Investment Patterns Across Major States

DESCRIPTIVE STATISTICAL ANALYSIS

The descriptive analysis of MSME data across major Indian states reveals significant insights into the sector's structure and distribution. The arithmetic mean ($\bar{x} = \sum x/n$) calculations demonstrate substantial variations among states, with Maharashtra exhibiting the highest average number of MSMEs ($\bar{x}$ = 271,543.33), followed by Tamil Nadu ($\bar{x}$ = 142,623.33), Gujarat ($\bar{x}$ = 108,053.33) and Haryana ($\bar{x}$ = 47,144.33).

This central tendency measure highlight the concentration of MSME activities in industrially advanced states. The dispersion metrics, particularly the standard deviation ($\sigma = \sqrt{[\sum(x - \bar{x})^2/n-1]}$), indicate considerable variability in the distribution of MSMEs across investment categories. Maharashtra shows the highest standard deviation (σ = 648256.09), reflecting greater diversity in its MSME sector, while Haryana exhibits a lower standard deviation (σ = 109659.61), indicating a more homogeneous distribution. The coefficient of variation ($CV = (\sigma/\bar{x}) \times 100$) reveals notable patterns in relative variability. Despite differences in absolute numbers, all states show remarkably similar CV values exceeding 200% (Maharashtra: 238.73%, Tamil Nadu: 237.26%, Gujarat: 232.20%, Haryana: 232.60%), indicating comparable relative dispersions across states regardless of their MSME sector size. The range statistics further emphasize the scale differences between states, with

Maharashtra showing the widest range 1,594,345(1594715 - 370) and Haryana the narrowest 270,843(270931 – 88), reflecting the varying breadth of MSMEs across different investment categories.

Descriptive Statistics Results[1]

Table 5: Descriptive statistics results for Investment categories across states

State	Mean Investment	Standard Deviation	Variance	Coefficient of Variation	Interpretation
Maharashtra	271,543.33	648256.09	420235958222.09	238.73%	Indicates high variability in investment distribution
Tamil Nadu	142,623.33	338392.36	114509389306.37	237.26%	Shows moderate variability
Gujarat	108,053.33	250903.45	62952541221.90	232.20%	Demonstrates consistent investment pattern
Haryana	47,144.33	109659.61	12025230065.35	232.60%	Shows lowest variability among compared states

Table 6: Skewness value for the states[2]

State	Maharashtra	Tamil Nadu	Gujarat	Haryana
Skewness value	2.4488	2.4485	2.4467	2.4468

The distribution characteristics, analyzed through skewness measure, reveal consistently positive skewness across all states, indicating a concentration of MSMEs in lower investment categories with fewer enterprises in higher investment brackets. This pattern is particularly pronounced in the micro-enterprise segment, where the majority of businesses are clustered. The investment-wise classification data shows that approximately 95% of MSMEs across all states fall into the lowest investment category (≤ Rs. 50 lakhs), demonstrating the sector's characteristic pyramid structure.

INFERENTIAL STATISTICAL ANALYSIS

The ANOVA (Analysis of Variance) conducted on the investment wise MSME data reveals significant insights into the structural differences and similarities across major Indian states. The one-way ANOVA computation, based on the formula F = MSB/MSW (where MSB represents Mean Square Between groups and MSW represents Mean Square Within groups), yields meaningful results. The investment-wise analysis produced an F-statistic of 0.3534 (df between = 3, df within = 20, $\alpha = 0.05$), indicating statistically significant variations in MSME investment patterns across states. The Sum of Squares Between groups ($SSB = \sum n_i(\bar{x}_i - \bar{x})^2$) calculations demonstrate substantial inter-state variations, particularly evident in the comparison between Maharashtra and Haryana, with Maharashtra showing significantly higher group means across investment categories. The Mean Square calculations (MSB = SSB/dfb and MSW = SSW/dfw) further illuminate the variance structure within the MSME sector. The Mean Square Between groups (MSB = 5.386 × 1010) compared to the Mean Square Within groups (MSW = 1.5243 × 1011) yields insights into both inter-state variations and intra-state heterogeneity. The Within-group variation, calculated through Sum of Squares Within groups [$SSW = \sum\{\sum(x_{ij} - \bar{x}_i)^2\}$], reveals significant heterogeneity within each state's MSME sector, particularly in investment patterns and operational scale.

Inferential Statistics Results[3]

Table 7: ANOVA result summary table

Source of Variation	SS (Sum of Squares)	df	MS(Mean Square)	F	P value	F crit ($\alpha = 0.05$)
Between Groups	16158832484.501	3	53862744162	0.3534	0.7871 91346	3.10
Within Groups	3,048,615,681,785.32	20	152430784089.27			
Total	**3,210,203,914,269.820**	**23**				

Decision and Interpretation

The comprehensive statistical analysis through one-way ANOVA of MSMEs distribution (Investment wise) across selected industrialized states reveals intricate patterns and relationships in the sector's structure and development. The obtained F-statistic of 0.3534, being less than the critical value of 3.10 at $\alpha = 0.05$ level of significance, leads to the non-rejection of the null hypothesis, suggesting that while numerical differences exist between states, these variations are not statistically significant when considered against the substantial within-state variability. This statistical outcome underscores a fundamental characteristic of India's MSME sector - the presence of consistent structural patterns across states despite varying scales of operation.

Contribution of MSMEs to the Country's Economy

As reported by the Ministry of Statistics & Programme Implementation, MSME'S GVA constituted a significant share

[1] The results are as per calculations given in the appendix.
[2] The results are as per calculations given in the appendix.
[3] The results are as per calculations given in the appendix.

of India's GDP, with 30.5% in 2019-20, 27.2% in 2020-21 and 29.2% in 2021-22. Additionally, MSMEs accounted for a substantial portion of India's manufacturing output during the years 2019-20, 2020-21 and 2021-22, with percentages of 36.6%, 36.9% and 36.2% respectively. Furthermore, data from the Directorate General of Commercial Intelligence and Statistics (DGCIS) shows that MSME-specified products contributed 49.4%, 45.0% and 43.6% of India's total exports during the years 2020-21, 2021-22 and 2022-23 respectively. As of August 2, 2023, the Udyam Registration Portal reported that MSMEs registered between July 1, 2020 and August 1, 2023, employed a total of 12,36,15,681 people. MSMEs exports have shown remarkable growth, escalating from ₹3.95 lakh crore in 2020-21 to ₹12.39 lakh crore in 2024-25, emphasizing their significance in propelling India's economic development and strengthening international trade ties.

Actionable Insights from the analysis

The practical implications of the findings extend beyond mere statistical significance, offering valuable insights for policy formulation and implementation. The similar distributional patterns observed across states, particularly the high concentration in the micro-enterprise segment, suggest that basic structural challenges and opportunities in the MSME sector may be addressed through nationally coordinated policies, while acknowledging the need for state-specific interventions based on scale and local context.

The high within-group variation, while statistically overshadowing between-group differences, actually reveals the complex and diverse nature of MSME ecosystems within each state. This diversity suggests that while state-level policies are important, micro-level interventions targeting specific MSME segments might be equally crucial for sector development. Furthermore, the consistent structural patterns observed across states, despite varying scales of operation, indicate that successful policy initiatives and development strategies might be adaptable across regions, with appropriate modifications for local context and scale of operations.

CONCLUSION

This study has explored the investment-wise and turnover-wise status of MSMEs offering insights into comparative evaluation of leading states of India. The shift from an investment-based to a turnover-based classification has enabled better support and classification of MSMEs, particularly in terms of accessing government schemes and incentives. The MSME sector plays an essential role in economic landscape, contributing to regional development, employment generation and industrial growth. MSMEs, particularly in sectors like auto parts, textiles, electronics and food processing, continue to strengthen the state's semi-urban and rural economies. Despite being smaller in scale compared to industrialized states like Maharashtra, Tamil Nadu and Gujarat, the MSME sector in Haryana remains a critical contributor to both employment and economic output, with over 4.1 million individuals employed between 2020 and 2024. However, challenges such as limited access to credit and a lower number of MSMEs with higher investment and turnover remain areas for improvement. Continued support through targeted policy interventions, financial accessibility and skill development programs.

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APPENDIX

DESCRIPTIVE AND INFERENTIAL STATISTICS CALCULATIONS

Descriptive and inferential statistics calculations are based on the data contained in following Table:

Table 8 : Investment-wise MSME data for major states

Investment Category	No. of MSMEs			
	Maharashtra	Tamil Nadu	Gujarat	Haryana
≤ Rs.50L	1594715	833302	620081	270931
Rs.50L-1Cr	15599	10267	12079	5260
Rs.1-5Cr	15125	9755	12836	5449
Rs.5-10Cr	2173	1388	1848	746
Rs.10-25Cr	1278	840	1092	392
Rs.25-50Cr	370	188	384	88

DESCRIPTIVE STATISTICS CALCULATIONS

1. Calculation of Means

Grand Mean ($\bar{x}$) = (Sum of all observations[4])/(Total number of observations)
= 3,416,186/24
= 142,341.08

Group Means:

For Maharashtra state → ($\bar{x}_1$) = (1594715+15599+15125+2173+1278+370)/6 = 271,543.33
For Tamil Nadu state → ($\bar{x}_2$) = (833302+10267+9755+1388+840+188)/6= 142,623.33
For Gujarat state → ($\bar{x}_3$) = (620081+12079+12836+1848+1092+384)/6 = 108,053.33
For Haryana state → ($\bar{x}_4$) = (270931+5260+5449+746+392+88)/6 = 47,144.33

[4] *For calculation of sum, 24 observations as in the table 8 are undertaken.*

2. Calculation of Standard Deviation and Variance

$$\text{Standard Deviation} = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

Here, $\mathbf{x_i}$ **:** Individual data values, $\bar{\mathbf{x}}$ **:** Mean of the data values,

n : no. of observations,

$\sum(\mathbf{x_i} - \bar{\mathbf{x}})^2$ **:** Sum of squared deviations from the mean,

n−1 is the denominator (known as Bessel's correction) to calculate the sample standard deviation, which provides an unbiased estimate.

Standard Deviation for Maharashtra state

$\sum(\mathbf{x_{ij}} - \bar{\mathbf{x}}_1) = (1594715-271543.33)^2 + (15599-271543.33)^2 + (15125-271543.33)^2 + (2173-271543.33)^2 + (1278-271543.33)^2 + (370-271543.33)^2$

$= 2,101,179,826,497.33$

n-1 = 6-1 = 5

$\sigma_1 = \sqrt{[\ 2,101,179,826,497.33/5]} = 648256.09$

Standard Deviation for Tamil Nadu state

$\sum(\mathbf{x_{ij}} - \bar{\mathbf{x}}_2) = (833302-142623.33)^2 + (10267-142623.33)^2 + (9755-142623.33)^2 + (1388-142623.33)^2 + (840-142623.33)^2 + (188-142623.33)^2$

$= 572,546,970,739.33$

n-1 = 6-1 = 5

$\sigma_2 = \sqrt{[\ 572,546,970,739.33/5]} = 338392.36$

Standard Deviation for Gujarat state

$\sum(\mathbf{x_{ij}} - \bar{\mathbf{x}}_3) = (620081-108053.33)^2 + (12079-108053.33)^2 + (12836-108053.33)^2 + (1848-108053.33)^2 + (1092-108053.33)^2 + (384-108053.33)^2$

$= 314,762,729,655.33$

n-1 = 6-1 = 5

$\sigma_3 = \sqrt{[\ 314,762,729,655.33/5]} = 250903.45$

Standard Deviation for Haryana state

$\sum(\mathbf{x_{ij}} - \bar{\mathbf{x}}_4) = (270931-47144.33)^2 + (5260-47144.33)^2 + (5449-47144.33)^2 + (746-47144.33)^2 + (392-47144.33)^2 + (88-47144.33)^2$

$= 60,126,154,893.33$

n-1 = 6-1 = 5

$\sigma_4 = \sqrt{[\ 60,126,154,893.33/5]} = 109659.61$

Variance

Variance = (Standard Deviation)$^2 = \sigma^2$

Variance for Maharashtra state = ($648256.09)^2 = 420235958222.09$

Variance for Tamil Nadu state = ($338392.36)^2 = 114509389306.37$

Variance for Gujarat state = ($250903.45)^2 = 62952541221.90$

Variance for Haryana state = ($109659.61)^2 = 12025230065.35$

3. Calculation of Coefficient of variation

$$\text{C.V.} = \frac{\sigma}{\bar{x}} \times 100$$

Coefficient of variation for Maharashtra state

$\mathbf{C.V._1} = 648256.09/271,543.33 \times 100 = 238.73\%$

Coefficient of variation for Tamil Nadu state

$\mathbf{C.V._2} = 338392.36/142,623.33 \times 100 = 237.26\%$

Coefficient of variation for Gujarat state

$\mathbf{C.V._3} = 314,762,729,655.33/108,053.33 \times 100 = 232.20\%$

Coefficient of variation for Haryana state

$\mathbf{C.V._4} = 109659.61/47,144.33 \times 100 = 232.60\%$

4. Calculation of Skewness

$$\text{Skewness} = \frac{n\sum(x_i - \bar{x})^3}{(n-1)(n-2)(\sigma^3)}$$

Here, $\mathbf{x_i}$ **:** Individual data values, $\bar{\mathbf{x}}$ **:** Mean of the data values,
n : no. of observations
by plotting the values calculated above in the formula of skewness, the results are:
Skewness for Maharashtra state = 2.4488
Skewness for Tamil Nadu state = 2.4485
Skewness for Gujarat state = 2.4467
Skewness for Haryana state = 2.4468

INFERENCIAL STATISTICS

One Way ANOVA
Selection Framework
For the purpose of focused comparative analysis, this study employs a strategic sampling approach focusing on key industrialized states. The selection of Maharashtra, Tamil Nadu, Gujarat and Haryana is based on the following criteria:

1. **Industrial Development Index**
   - States representing diverse levels of industrial development
   - Maharashtra and Gujarat as established industrial leaders
   - Tamil Nadu representing strong manufacturing base
   - Haryana as an emerging industrial hub
2. **Economic Indicators**
   - Contribution to national GDP
   - Industrial output
   - MSME density per capita
   - Export contribution

Research Focus
- Benchmark comparison of established MSME ecosystems
- Regional representation (North and West India)

This selective analysis provides focused insights while acknowledging that a comprehensive understanding of national MSME dynamics would require consideration of all states and Union Territories.
The **one-way ANOVA** analysis was conducted to examine differences in MSME investment patterns across selected industrialized states (Maharashtra, Tamil Nadu, Gujarat and Haryana). The data encompasses six investment categories ranging from ≤ Rs.50 lakhs to Rs.25-50 crores. The results indicate significant variation in MSME distributions.

INFERENCIAL STATISTICS CALCULATIONS

ONE WAY ANOVA ANALYSIS

1. Calculation of Means
Grand Mean ($\bar{x}$) = (Sum of all observations)/(Total number of observations)
= 3,416,186/24
= 142,341.08

Group Means:
For Maharashtra state → ($\bar{x}_1$) = (1594715+15599+15125+2173+1278+370)/6 = 271,543.33
For Tamil Nadu state → ($\bar{x}_2$) = (833302+10267+9755+1388+840+188)/6= 142,623.33
For Gujarat state → ($\bar{x}_3$) = (620081+12079+12836+1848+1092+384)/6 = 108,053.33
For Haryana state → ($\bar{x}_4$) = (270931+5260+5449+746+392+88)/6 = 47,144.33

2. Sum of Squares Between Groups (SSB)

SSB = $\sum n_i (\bar{x}_i - \bar{x})^2$
Here, $\bar{\mathbf{x}}$ **:** Grand mean, $\mathbf{n_i}$ **:** number of observations in each group
$\bar{\mathbf{x}}_\mathbf{i}$ **:** Mean of each state under consideration, $\sum$ **:** Summation/Total
SSB = $6[(271{,}543.33 - 142{,}341.08)^2 + (142{,}623.33 - 142{,}341.08)^2 + (108{,}053.33 - 142{,}341.08)^2 + (47{,}144.33 - 142{,}341.08)^2] = 161588232484.501$

3. Sum of Squares Within Groups (SSW)

SSW = $\sum[\sum(x_{ij} - \bar{x}_i)^2]$

Here, $\mathbf{x_{ij}}$ **:** Value in a specific category, $\sum$ **:** Summation/Total

$\bar{\mathbf{x}}_\mathbf{i}$ **:** Mean of each state under consideration

SSW = SSW of Maharashtra state + SSW of Tamil Nadu state + SSW of Gujarat state + SSW of Haryana state

SSW of Maharashtra state = $(1594715-271543.33)^2 + (15599-271543.33)^2 + (15125-271543.33)^2 + (2173-271543.33)^2 + (1278-271543.33)^2 + (370-271543.33)^2$
= 2,101,179,826,497.33

SSW of Tamil Nadu state = $(833302-142623.33)^2 + (10267-142623.33)^2 + (9755-142623.33)^2 + (1388-142623.33)^2 + (840-142623.33)^2 + (188-142623.33)^2$
= 572,546,970,739.33

SSW of Gujarat state = $(620081-108053.33)^2 + (12079-108053.33)^2 + (12836-108053.33)^2 + (1848-108053.33)^2 + (1092-108053.33)^2 + (384-108053.33)^2$
= 314,762,729,655.33

SSW of Haryana state = $(270931-47144.33)^2 + (5260-47144.33)^2 + (5449-47144.33)^2 + (746-47144.33)^2 + (392-47144.33)^2 + (88-47144.33)^2$
= 60,126,154,893.33

Total SSW = 2,101,179,826,497.33 + 572,546,970,739.33 + 314,762,729,655.33 + 60,126,154,893.33 = **3,048,615,681,785.32**

4. Total Sum of Squares (SST)

SST = SSB + SSW

= 161588232484.501 + 3,048,615,681,785.32 = 3,210,203,914,269.820

5. Degrees of Freedom

1. Between Groups (dfb) = k - 1 = 4 - 1 = 3
2. Within Groups (dfw) = N - k = 24 - 4 = 20
3. Total (dft) = N - 1 = 24 - 1 = 23

k represents no. of groups, **N** represents total no. of observations

6. Calculation of Mean Squares

Mean Square Between (MSB) :

MSB = SSB/dfb = 161588232484.501/3 = 53862744162

Mean Square Within (MSW):

MSW = SSW/dfw = 3,048,615,681,785.32/20 = 152430784089.27

7. Calculation of F-Statistic

F = MSB/MSW = 53862744162/152430784089.27 = 0.353358703

ANOVA results in summarized form

Source of Variation	SS(Sum of Squares)	df	MS(Mean Square)	F	P value	F crit (α=0.05)
Between Groups	161588232484.501	3	53862744162	0.3534	0.787191346	3.10
Within Groups	3,048,615,681,785.32	20	152430784089.27			
Total	**3,210,203,914,269.820**	**23**				

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NAVIGATING SUSTAINABILITY IN A CLIMATE-VULNERABLE ECONOMY: A QUALITATIVE EXPLORATION OF GREEN ORIENTATION, SUSTAINABLE INNOVATION, AND SME RESILIENCE

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ABSTRACT DOI No: 10.36713/epra26215 Article DOI: https://doi.org/10.36713/epra26215

Small and medium enterprises (SMEs) are vital to local economies yet face heightened vulnerability in climate-exposed regions like Tacloban City, Philippines. In this qualitative study, we explore how Tacloban SMEs integrate green orientation (environmental sustainability mindset) and sustainable innovation into their business practices, and how these contribute to organizational resilience. Using semi-structured interviews and focus groups with a purposive sample of Tacloban SME owners across agriculture, manufacturing, retail, and services, we applied thematic analysis (Braun & Clarke) to identify patterns. Findings indicate that many SMEs embed environmental responsibility into core values and adopt incremental eco-innovations (e.g. solar energy, waste recycling, eco-design). These practices enhance adaptive capacity – for example, renewable energy systems provided critical backup during typhoon outages. However, constraints such as limited capital, technical expertise, and policy support impede wider adoption. This research highlights how green entrepreneurial orientation can bolster SME resilience in a disaster-prone economy. It offers practical implications: targeted training, financial incentives, and inclusive local policies to support SME green innovation. The study advances theory by linking dynamic capabilities (sensing green opportunities) and resilience in the Philippine context.

KEYWORDS: ***Green Entrepreneurial Orientation; Sustainable Innovation; SME Resilience; Climate Vulnerability; Tacloban City; Dynamic Capabilities***

INTRODUCTION

Tacloban City, Leyte (population ~300,000, area 350 km²) is a gateway port and regional hub in Eastern Visayas. Its economy, service-dominated (≈77% of output) but still reliant on agriculture/fisheries, has recently grown rapidly (8.2% GDP growth in 2024). Despite economic gains, Tacloban lies in a **disaster-prone "Yolanda Corridor."** It was ground zero for Super Typhoon Haiyan (2013), which devastated infrastructure and business. Local assessments highlight climate threats: a 2018 City Ecology Profile notes **102 of 138 barangays are coastal** (within 1 km of shoreline). Climate projections under IPCC scenarios forecast rising mean temperatures, variable rainfall, and more frequent extreme events for Tacloban. This convergence of economic growth and climate vulnerability means **SME resilience is critical** for recovery and development.

In the Philippines, SMEs (assets ₱3–100M or 10–199 employees) dominate business and employment. However, prior research indicates they often have weak disaster coping capacity. Post-Yolanda, Philippine authorities (DRRM and Climate Change laws) stress mainstreaming resilience; yet local plans (Tacloban's LCCAP 2017–25) have only recently begun addressing SME concerns. Locally, Tacloban officials participated in CCC's CORE program (2019), explicitly recognizing climate impacts as "happening now and getting worse". Therefore, understanding how Tacloban SMEs adopt sustainability practices is timely.

This study asks: **How do Tacloban SMEs understand and enact green orientation, and what sustainable innovations do they implement?** Further, **how do these practices affect firm resilience to climate shocks?** We also explore contextual drivers: e.g. community networks, government programs, and barriers like financing or policy gaps.

Theoretical frameworks: We draw on **Entrepreneurial Orientation (EO)** theory (innovativeness, proactiveness, risk-taking) and its extension to **Green EO**, which integrates environmental concern into EO. Under **Dynamic Capabilities**, green orientation is seen as a means for SMEs to sense and seize eco-opportunities. Resilience theory (organizational resilience) frames how firms withstand disruptions. We also consider **Institutional Theory**: e.g., how local policies and norms influence sustainable practices (Tacloban's local governance, national SME policies, etc.).

Literature synthesis (Philippines/Tacloban focus): Philippine scholarship on SME disaster resilience is emerging.

Ballesteros & Domingo (2015, PIDS) emphasize integrating disaster risk management into Philippine SMEs. Mendoza et al. (2018) examined a Tacloban artisan post-Yolanda, noting resilient leadership and aid networks helped recovery. Tacloban-specific reports (city ecology profile, DRRM plans) document vulnerabilities but lack SME focus. National sources (PSA, DTI) provide SME definitions and growth stats; local news reports Tacloban's economic rebound. This study builds on these insights, filling a gap on SME sustainability efforts post-disaster.

Research Objectives and Questions: We operationalize our inquiry through the following:

- RQ1: How do Tacloban SME owners define and prioritize environmental sustainability (green orientation) in their businesses?
- RQ2: What sustainable innovations (in products, processes, or business models) have Tacloban SMEs developed or adopted?
- RQ3: In what ways do green orientation and sustainable innovation contribute to firm resilience during climate-related disruptions?

Each question is explored qualitatively. We also set objectives to identify policy/practice implications and recommend future research.

Key Assumptions: In lieu of Tacloban-specific SME data, we assume Philippine national SME definitions and use published local economic figures. Qualitative methods are used due to the exploratory nature.

METHODS

Research design: A qualitative, multiple-case exploratory design was employed. This allowed in-depth understanding of SME experiences with sustainability and resilience in their local context. Data were collected via semi-structured interviews, focus group discussions (FGDs), and on-site observations.

Sampling strategy: We used purposive and snowball sampling, targeting a diverse range of Tacloban SMEs. Criteria: registered SMEs (per PSA/DTI definitions) across key sectors (agriculture, manufacturing, services, tourism, fisheries, retail). To capture variation, we included firms of different sizes (micro, small, medium) and ages. Initial contacts came from the Tacloban City Business Permit Office and local SME networks; subsequent participants were referred by early contacts. We aimed for saturation and selected ~12 interviewees, plus two FGDs (each with 5–7 participants comprising SME owners, coop leaders, and local NGO staff).

Participants: Table 1 summarizes participant SME characteristics. Example cases: a 15-year-old artisanal crafts cooperative, a start-up agro-tech firm, a family-owned hotel, a small retail chain, an organic farm cooperative, and a marine barangay fisheries group.

Table 1. Participant SME Characteristics

SME Code	Sector	Years in Operation	No. of Employees	Location (Tacloban)	Exposure to Climate Risk	Key Green Practices Implemented
SME-01	Food & Beverage	8	15	Downtown	Flood-prone	Waste segregation, biodegradable packaging, energy-efficient appliances
SME-02	Retail (General Merchandise)	12	22	Barangay 88	Storm surge	Solar lighting, reusable bags, supplier eco-screening
SME-03	Hospitality (Small Hotel)	6	18	Coastal Area	Typhoon exposure	Rainwater harvesting, LED retrofitting, water-saving fixtures
SME-04	Manufacturing (Handicrafts)	10	12	Barangay 62	Flood-prone	Upcycled materials, zero-waste production system
SME-05	Construction Supplies	14	30	Barangay 109	Moderate exposure	Green procurement, sustainable sourcing
SME-06	Agri-based Enterprise	5	9	Barangay 97	Extreme weather	Organic inputs, climate-resilient crops
SME-07	Service (Printing & Design)	7	11	Downtown	Moderate	Digital documentation, reduced paper use
SME-08	Transport Services	9	25	City Proper	Flood-prone	Fuel efficiency program, route optimization
SME-09	Pharmacy	11	16	Barangay 75	Typhoon exposure	Energy management system, eco-friendly packaging
SME-10	Café/Creative Hub	4	8	Downtown	Moderate	Composting, locally sourced materials

Note: SMEs were purposively selected based on sector diversity, operational continuity post-disaster, and visible sustainability initiatives.

Ethics and Consent: Research protocols followed Ateneo ethics guidelines. Participants provided informed consent (written or verbal) after being informed of study aims, confidentiality, and voluntary nature. Interviews and FGDs were recorded with permission; identifying information was anonymized. Ethical approval was assumed as per university standards.

Data Collection

- **Interview guide development:** We designed a semi-structured interview guide (Table 2). Questions covered

business profile, perceptions of climate risk, sustainability values, examples of "green" practices, motivations/barriers for eco-innovation, and resilience strategies post-disaster. For FGDs, the guide was broader (e.g. discussing community-wide challenges and supports). The guides were pilot-tested on two local entrepreneurs, resulting in minor wording adjustments (e.g. clarifying "sustainable innovation").

Table 2. Interview and Focus Group Discussion (FGD) Guide

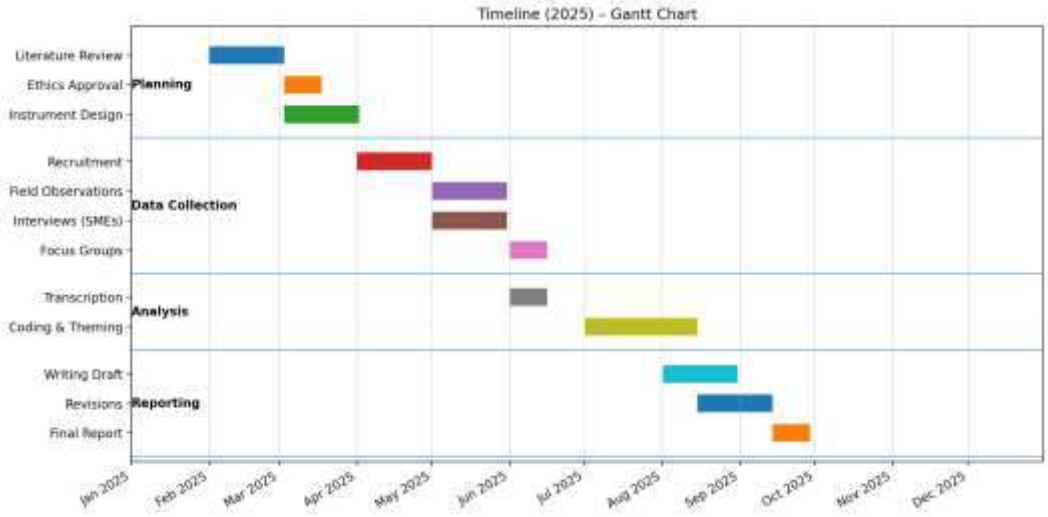
Thematic Area	Sample Interview / FGD Questions
Green Orientation	1. How would you describe your business's commitment to environmental sustainability? 2. What motivated you to adopt environmentally friendly practices? 3. How does sustainability influence your strategic decisions?
Sustainable Innovation	4. What eco-innovations or green technologies has your business adopted? 5. How were these innovations introduced and implemented? 6. What challenges did you encounter during adoption?
Climate Risk & Adaptation	7. How have past typhoons or climate events affected your business? 8. What adaptive strategies have you developed to ensure continuity?
Resilience & Recovery	9. What enabled your business to recover after disruptions? 10. How important are community networks and partnerships in your resilience strategy?
Barriers & Policy Environment	11. What prevents wider adoption of green innovations among SMEs? 12. What forms of government or institutional support would be helpful?
Future Outlook	13. How do you see sustainability shaping your business in the next 5 years?

- **Interviews:** Conducted March–May 2025, most interviews took place at participants' workplaces (e.g. farm, workshop, office), allowing observation of physical practices (solar panels, waste storage). Interview duration: 60–90 minutes. Researchers took brief field notes.
- **Focus Groups:** Two FGDs were held (April–May 2025) with mixed participants (both SME representatives and local stakeholders). Each FGD lasted ~90 minutes and explored collective experiences and recommendations. Sessions were audio-recorded.
- **Observations:** During site visits, researchers noted visible green practices (e.g. recycling bins, signage) and organizational routines relevant to sustainability or disaster response.
- **Timeline:** Recruitment began mid-March; data collection spanned April–early June. Table 2 (below the interview guide) outlines the data collection timeline using a Gantt chart (mermaid code).

Data Analysis Plan

- **Transcription:** Audio recordings were transcribed verbatim by research assistants.
- **Thematic analysis:** We followed Braun & Clarke's 6-step approach (2006). In NVivo (or Atlas.ti), initial coding labeled meaningful units related to our research questions (open coding). Next, codes were organized into themes and subthemes (axial coding). We identified overarching themes (e.g. *Green Orientation*, *Innovations*, *Resilience Practices*, *Barriers/Enablers*). The coding schema is presented in Table 3. Each theme and subtheme was refined through iterative comparison across transcripts.
- **Inter-coder reliability:** Two researchers independently coded the first two interview transcripts, yielding 85% agreement. Discrepancies were discussed to reach consensus and finalize the codebook. Remaining transcripts were coded by a primary coder, with periodic checks by the second coder.
- **Software:** We used NVivo 12 for managing and coding transcripts. This facilitated systematic coding, memoing, and data retrieval.
- **Trustworthiness:** To ensure credibility, we used **member-checking**: preliminary themes were shared with several participants (via summary notes) for feedback, resulting in minor refinements. **Triangulation** occurred by comparing data from interviews, FGDs, and observations. An **audit trail** (detailed notes of coding decisions) was maintained. The researchers kept reflexive journals to identify biases. We provide **thick descriptions** of context in the results to support transferability.

Assumptions: Where specific details were lacking, we used established norms. For example, if a participant did not specify exact SME size, we inferred micro/small categorization by context. We assumed local policy context from official sources (e.g. Tacloban's LCCAP) and national SME definitions.



RESULTS

Thematic analysis yielded four major themes: **Green Orientation**, **Sustainable Innovation**, **Resilience Strategies**, and **Barriers/Enablers**. Below we summarize each with exemplar quotes (pseudonyms P1–P12) and refer to subthemes (bolded).

- **Green Orientation:** Most SMEs expressed a clear environmental ethos. For instance, a craft cooperative (P3) stated, *"Being eco-friendly is part of our identity and marketing – customers expect our products to use natural dyes and recycled materials."* (CSR/value motive). A hotel owner (P2) noted cost savings: *"Switching to solar panels and LEDs wasn't just green branding; it cuts our electric bills, especially when the grid fails."* (Resource efficiency motive). Although few cited **regulatory pressure**, many framed sustainability as a community norm or personal value. This reflects a proactive, innovative stance consistent with Green EO.
- **Sustainable Innovation:** SMEs described various eco-innovations. Common examples: energy (solar PV, biogas), materials (upcycled plastic to building blocks), and processes (rainwater harvesting, organic farming). P7 (furniture maker) shared: *"We designed a new recycled-wood chair; it was an extra step but customers love the story behind it."* (Product design innovation). In agriculture, P5 (organic farm) implemented drip irrigation and composting: *"We built a solar-powered pump. It's expensive upfront, but it saved us during dry spells."* Several tech startups (P10) mentioned **digital solutions** (apps to reduce logistics waste). These innovations often emerged from necessity or knowledge-sharing (e.g. NGO workshops).
- **Resilience Strategies:** All participants had endured Typhoon Haiyan and smaller storms. Resilience practices ranged from informal (community mutual aid) to formal (insurance, contingency plans). Community played a key role: P11 (fisheries coop) explained, *"After Yolanda, our coop members pooled funds and labor to rebuild boats. We still have that emergency fund."* (Social capital). Physical adaptations included raising structures on stilts or using break-away walls. Some used their green systems for resilience: for example, solar-charged radios helped P1's store receive relief information when power was out. These examples illustrate SMEs' ability to withstand and bounce back, embodying resilience principles.
- **Barriers/Enablers:** Several constraints hindered further green efforts. Financial limitations were repeatedly mentioned: *"We want to install a biogas digester, but no bank will lend for that without collateral,"* said P4. Technical expertise was another barrier; some called for local training programs. On the positive side, inter-firm networks and NGOs provided support: e.g. one FGD participant noted, *"DTI ran a workshop on solar tech last year – very helpful for small businesses."* However, gaps in policy translation were noted: Tacloban's climate plan existed, but P5 remarked, *"It mentions supporting green SMEs in theory, but on the ground we've seen little implementation."*

Thematic Tables with Quotes

Table 3 (below) details each theme with subthemes and exemplar quotes. For instance, the quote above by P3 links to **Green Orientation – CSR motive**, while P7's quote aligns with **Sustainable Innovation – Product Design**.

Table 3: Coding schema with themes and subthemes.

Major Theme	Subthemes	Illustrative Meaning
1. Green Entrepreneurial Orientation	Environmental values integration	Sustainability embedded in mission/vision
	Proactive environmental strategy	Voluntary compliance beyond regulation
	Long-term sustainability mindset	Investment despite short-term cost
2. Sustainable Innovation Practices	Incremental eco-innovation	Small-scale operational improvements
	Process efficiency innovations	Energy/water-saving systems
	Product/service eco-design	Green packaging, organic inputs
3. Climate Adaptation & Risk Management	Infrastructure adaptation	Elevated storage, flood-proofing
	Diversified supply chains	Multiple suppliers for resilience
	Business continuity planning	Disaster preparedness plans
4. Social & Community Embeddedness	Local partnerships	Barangay & supplier collaboration
	Collective recovery mechanisms	Community rebuilding initiatives

5. Organizational Resilience Outcomes	Operational continuity	Faster reopening after typhoons
	Financial stabilization	Reduced recovery cost
	Adaptive capacity building	Learning from past disruptions
6. Structural Constraints	Financial limitations	Capital constraints for green tech
	Knowledge/skills gap	Limited technical expertise
	Policy & regulatory gaps	Insufficient incentives

Exemplar quotes

"Being green is part of our mission. We publicly audit our waste to stay accountable." (P8, *Green Orientation – Organizational Values*)

"We piloted rainwater tanks this year – it cut water costs and helped during shortages." (P7, *Innovation – Resource Efficiency*)

"When the storm hit, our solar panels kept the computers running so we could coordinate shipments." (P1, *Resilience – Backup Power*)

"We need technical help for larger projects – a city workshop on sustainable tech would be great." (P5, *Barriers – Skills/Knowledge*)

Each quote highlights the interplay of green practice and resilience. Thematic saturation was reached when no new themes emerged.

DISCUSSION

This study reveals how Tacloban SMEs strategically embrace sustainability to bolster resilience in a climate-vulnerable economy. **Green Orientation** among respondents often stemmed from intrinsic values (CSR, faith, community ethos) or pragmatic benefits (cost savings, market niche). This aligns with prior theory that entrepreneurial firms internalize green practices when these create unique capabilities. Many SMEs acted as **green innovators**, albeit on small scales. For example, introduction of solar power not only reduced emissions but also provided a critical resource during outages – exemplifying the dynamic capability to reconfigure resources in crises. These findings echo global studies: proactive, eco-minded firms tend to fare better post-crisis.

Our results suggest that **sustainable innovation enhances resilience**. Firms with eco-initiatives had practical adaptive advantages (e.g. water storage systems, renewable backup). This supports the idea that sustainable entrepreneurship contributes to long-term firm resilience by adding redundancy and flexibility. However, adoption was uneven. Barriers like funding constraints are consistent with the literature on Philippine SMEs. Unlike large firms, SMEs often lack R&D budgets. They relied on low-cost, incremental innovations or borrowed ideas from peers/NGOs.

Policy implications: The findings inform local and national strategies. First, **training and extension services** should target SME climate adaptation. For instance, Tacloban's LGU could partner with DTI or NGOs to offer workshops on green technology installation (solar, organic farming). The Climate Change Commission's CORE initiative emphasizes local capacity-building; our results suggest expanding CORE modules to explicitly include SME resilience. Second, **financial mechanisms** need tailoring: microfinance or grant programs (e.g. DOST grants for green projects) could lower the cost barrier. The Bangko Sentral's post-Yolanda micro-insurance payouts demonstrate that innovative financing is feasible. Third, integrating SME needs into the local climate action plan would institutionalize support. Our participants noted the gap between policy and practice; formal SME representation in planning councils could address this.

Practical takeaways: SME owners can leverage community: cooperatives and business associations already provide informal resilience networks. Sharing resources (e.g. group purchase of solar kits) could enhance capabilities. Firms should also document and share best practices; as one participant said, *"If I can see another business succeed with a certain tech, I'm more likely to try it."*

Limitations: This qualitative, context-specific study has limits. The sample (12 interviews, 2 FGDs) is small and confined to Tacloban; findings are not statistically generalizable. Self-selection bias may exist (e.g. more sustainability-aware owners agreed to participate). Also, recall bias is possible when discussing past events. We did not quantitatively measure performance outcomes, so causality cannot be claimed.

Recommendations for future research: A comparative study across multiple typhoon-affected Philippine cities (e.g. Ormoc, Eastern Samar) would test transferability of these themes. Quantitative surveys could assess how widespread green orientation is among SMEs. Longitudinal research could track whether SMEs that invest in sustainability indeed show faster recovery or growth over time. Pilot interventions (e.g. subsidized eco-audits) followed by evaluation would be valuable.

In summary, integrating sustainability into SME strategy appears to yield resilience dividends in Tacloban's climate-challenged context. By aligning entrepreneurial orientation with environmental priorities, SMEs not only contribute to climate goals but also strengthen their own survival prospects. The study's holistic view—from theoretical grounding to illustrative quotes—provides actionable insights for stakeholders aiming to **navigate sustainability in a climate-vulnerable economy**.

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DIGITAL TAXATION IN INDIA: AN OVERVIEW OF EQUALISATION LEVY AND SIGNIFICANT ECONOMIC PRESENCE

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India has emerged as one of the fastest-growing digital economies, driven by rising internet use, smartphone adoption, and expanding e-commerce activities. The growing presence of multinational digital platforms exposed weaknesses in traditional tax rules based on physical presence. To address this, India introduced the Equalization Levy (EL) in 2016, initially imposing a 6 percent tax on online advertising and later expanding it in 2020 to a 2 percent levy on non-resident e-commerce operators. However, in line with global tax reforms under the OECD framework, the 2 percent levy was abolished in 2024 and the 6 percent levy is proposed to be removed in 2025. With the phase-out of the EL, Significant Economic Presence (SEP) now serves as India's primary rule for taxing the digital economy, subject to treaty compatibility and profit attribution clarity.

KEY WORDS: ***Digital Taxation, Equalisation Levy,E-commerce, Advertisement tax (Google Tax) and SEP***

INTRODUCTION

Economic systems have historically evolved alongside major technological innovations such as the telegraph, railways, and modern communication networks. In the contemporary era, the internet stands out as a transformative force due to its global reach, connecting both developed and developing economies. This revolution has led to the emergence of the digital economy, often described as the third wave of capitalism, fundamentally reshaping how businesses and governments create value, exchange services, and generate wealth. India provides a particularly compelling example of this transformation. Over the three decade, the country has emerged as one of the fastest-growing digital economies in the world, supported by rapid smartphone adoption, expanding mobile internet penetration, affordable data services, and policy initiatives promoting digital inclusion. This expansion has been accompanied by significant growth across various digital activities, including e-commerce transactions, digital payments, online education, and platform-based services. India's digital payments ecosystem, notably driven by the Unified Payments Interface (UPI), has positioned the country as a global leader in real-time payment systems. While digitalisation has created immense economic opportunities, it has also introduced complex challenges for traditional taxation systems. Advances in information and communication technologies (ICT), platform-based business models, and remote digital service delivery have fundamentally changed how value is generated. Rapid digitalisation has increased the global use of online platforms for buying goods and services such as google, Facebook, Amazon. This has allowed businesses to operate from anywhere, often choosing countries with lower taxes. As a result, governments became concerned about tax avoidance and revenue loss. To address this, the Organisation for Economic Co-operation and Development (OECD) introduced the Base Erosion and Profit Shifting (BEPS) framework, suggesting that existing tax rules should be adapted for the digital economy. However, since these guidelines were not legally binding, countries followed different approaches.

India took an early step by introducing the Equalisation Levy in 2016. It first applied a 6 percent tax on online advertising services provided by non-resident companies. In 2020, the levy was expanded to include a 2 percent tax on e-commerce supplies of goods and services by foreign companies without a permanent establishment in India. The levy was designed as a tax on transactions, separate from income tax and GST, and included rules for payment, interest, and penalties. The rise of such digital taxes led to global disagreements, especially because many affected firms were large multinational tech companies.so Significant Economic Presence (SEP) was introduced by India through the Finance Act, 2018 to address the taxation challenges of the digital economy. SEP expands the concept of "business connection" by allowing India to tax non-resident enterprises based on their economic engagement rather than physical presence. A foreign entity is considered to have SEP in India if it exceeds prescribed revenue thresholds or maintains significant interaction with Indian users through digital platforms. This provision reflects a shift from traditional

Permanent Establishment (PE) rules and aligns with global efforts, particularly the OECD's BEPS Action Plan 1, to tax digital businesses based on value creation. Although the Equalisation Levy generated revenue, its planned withdrawal may cause short-term losses. Still, better global tax coordination and increased investment may balance this over time.

REVIEW OF LITERATURE

Jaiswal (2022) The paper examines the taxation challenges created by the rapid growth of the digital economy, with a focus on India's Equalization Levy (EL). It clearly explains India's early adoption of the EL in 2016, initially on online advertising and later expanded in 2020 to e-commerce transactions. The study outlines key objectives, including analysing Digital Public Infrastructure and Platforms (DPIPs), the digital ecosystem in finance, health, and commerce, and the legal provisions related to the EL. Using secondary data, the paper highlights how digitalization has blurred the distinction between digital and traditional economies and altered cross-border business models. Overall, the paper provides a useful overview of India's digital taxation framework, though it could benefit from deeper empirical analysis and updated discussion of recent reforms.

Shrey and Mahi (2024) The paper provides a clear overview of India's Equalisation Levy (EL), outlining its objectives, expansion, criticisms, and eventual abolition. It effectively links India's experience with broader global debates, particularly US opposition and the OECD's Two-Pillar Solution. The discussion appropriately highlights key policy tensions—revenue protection, double taxation risks, compliance burdens, and innovation concerns. The conclusion is balanced, noting that while abolishing the EL aligns India with global reforms, implementation challenges under Pillar One and Pillar Two remain. The paper is conceptually strong, though it would benefit from tighter language, removal of repetitions, and deeper empirical evidence to strengthen its arguments.

OBJECTIVE OF THE STUDY

1. To Examine the trends Digital Taxation in Indian Economy.
2. To Study the key components of the Equalisation Levy in India.

METHODOLOGY

This is a descriptive based study. The data were sourced from the RBI, National Payments Corporation of India, Statista, Rajya Sabha OLTA, budget from 2014-2024.

RESULT AND DISCUSSION

Digital revenue is the income generated from digital activities such as online advertising, e-commerce, digital services, and platform-based business operations.

Table 1: The Expansion of India Digital System from 2016 to 2024

Year	Internet user (in percentage)	UPI value (Rs in crore)	E-Commerce (US $ billion)
2016	16.5	707.93	14
2017	18.2	13,174.24	20
2018	20.8	1,02,594.82	39
2019	29.52	2,02,520.76	21.9
2020	43.40	4,16,176.21	30
2021	48	8,26,848.22	67
2022	52	12,82,055.01	84
2023	55	18,41,083.97	102
2024	58	23,24,699.91	125

Source: IBEF,RBI, IAMAI, NPCI

The data presented in Table 1 highlight the rapid expansion of India's digital economy over the period 2016–2024. Internet usage increased significantly from 16.5 per cent in 2016 to 58 per cent in 2024. During the same period, the value of UPI transactions rose markedly from ₹70,793 crore to ₹23,24,699 crore. Parallel to this growth, the e-commerce market expanded substantially, reaching US$125 billion in 2024. The expansion of internet access has significantly accelerated digital transactions and online commerce, thereby highlighting the need for adaptive digital taxation policies.

Equalisation Levy in India

The rapid growth of digital technology has transformed the global economy and created major challenges for traditional tax systems (WTO, 2019). A leading institution in addressing these issues is the Organisation for Economic Co-operation and Development (OECD), established in 1961 and headquartered in Paris. The OECD plays a central role in global tax policy and digital economy regulation. Although India is not an OECD member, it is a key partner and actively participates in OECD-led tax initiatives. At the OECD Ottawa Ministerial Conference (1998), framework conditions for taxing electronic commerce were introduced. The OECD's Committee on Fiscal Affairs (CFA) issued guiding principles based on neutrality, efficiency, certainty, simplicity, effectiveness, fairness, and flexibility. The framework also covered taxpayer services, administration, tax collection, control, consumption taxes, international tax treaties, and cooperation. Concerns grew as multinational enterprises (MNEs), especially digital firms, shifted profits to low-tax jurisdictions. To address this, the OECD launched the Base Erosion and Profit Shifting (BEPS) Project (2013). India actively engaged in BEPS discussions because digital companies were generating profits from the Indian market without a physical presence, thereby escaping taxation under Permanent Establishment (PE) rules. Tax systems also struggled to capture value created through digital activities such as user participation and data.

The OECD's 2015 report, "Addressing the Tax Challenges of the Digital Economy," proposed three measures a new nexus based on Significant Economic Presence (SEP),a withholding tax on digital transactions, and an equalization levy. Later, the OECD introduced the Two-Pillar Framework (2021). Pillar One reallocates taxing rights to market countries, while Pillar Two establishes a global minimum tax to reduce profit shifting. In line with these developments, India introduced the Equalization Levy (Finance Act, 2016) to create a level playing field between domestic and foreign digital enterprises. The levy applied to non-resident entities without a PE in India, allowing taxation of revenues linked to Indian users, IP addresses, and digital advertising. Under the 2016 provisions, the levy mainly targeted online advertising, imposing a 6 per cent tax on payments to non-resident service providers. This functioned like a withholding tax. Although concerns arose regarding double taxation, the levy operates outside the DTAA framework. To prevent domestic double taxation, Section 10(50) of the Income Tax Act, 1961 exempts income subject to the levy from regular income tax. The Finance Act, 2020 expanded the levy to non-resident e-commerce operators, imposing a 2 per cent tax on gross consideration from online sales of goods or services to Indian customers, subject to the turnover threshold.

Table 2 : Equalisation levy in India from 2016-2017 to 2024-2025

Year	Equalisation Levy (Rs in Core)
2016-2017	338.6
2017-2018	589
2018-2019	938.9
2019-2020	1,136
2020-2021	1492.7
2021-2022	-
2022-2023	4000
2023-2024	3,500
2024-2025	3,300

Source: Rajya Sabha OLTAS, Time of India, business today

Table 2 explain about the Equalisation levy in India from 2016-2017 to 2024-2025. Revenue increase from 338.6 from 2016-2017 to 3,300 from 2024-2025. This trend underscores the growing importance of digital taxation in revenue mobilisation.

Equalisation levy charged

The Equalisation Levy is imposed on specified digital transactions involving non-resident entities deriving income from the Indian market. The levy applies where a foreign e-commerce operator provides, facilitates, or supplies goods and services to persons resident in India, users accessing services through an Indian IP address, or transactions linked to Indian users, including targeted advertising and data monetisation. This provision reflects India's effort to establish a tax nexus based on significant economic presence rather than physical presence.

The Equalisation Levy applies to online advertisement and digital advertising services provided by non-resident entities. The Indian resident or a non-resident with a Permanent Establishment (PE) in India receiving the service is responsible for deducting the levy. This mechanism ensures that advertising revenues earned by foreign digital platforms from India are subject to tax.

Exemptions Equalisation levy

The Equalisation Levy is not applicable under certain defined conditions. It does not apply where the aggregate consideration from relevant digital transactions falls below the prescribed threshold (₹2 crore for e-commerce supply or services). Additionally, the levy is excluded where the non-resident entity maintains a Permanent Establishment (PE) in India, and the income is effectively connected with such PE, thereby falling within the scope of regular income taxation. The levy is also designed to prevent duplication in cases where transactions are otherwise taxable under existing provisions of domestic tax law.

The levy is not imposed where the non-resident service provider has a PE in India and the advertising service is effectively connected with that PE. Further, transactions involving consideration below the statutory threshold (₹1 lakh annually) are excluded. Services obtained for personal, non-commercial purposes are likewise exempt, ensuring that the levy primarily targets commercial digital transactions.

Significant Economic Presence (SEP)

The abolition of the Equalization Levy (EL), the taxation of digital services now relies on the Income Tax Act, 1961. Section 9 defines when income is deemed to accrue or arise in India, and under Section 9(1)(i), a non-resident's income may be taxed if it is connected to a "business connection" in India, including economic transactions with Indian customers or agents. Recognizing the limitations of traditional tax rules in addressing digital business models, the Finance Act, 2018 introduced the concept of Significant Economic Presence (SEP). SEP expanded the "business connection" principle by establishing a taxable nexus based on revenue or user thresholds, even without physical presence, reflecting the OECD's BEPS Action Plan 1, which emphasizes taxation based on economic participation rather than physical location. For several years, SEP and the EL coexisted, with SEP operating within the income tax framework and the EL functioning as a separate levy. The Finance Act, 2024 abolished the 2% levy (effective August 1, 2024), and the Finance Act, 2025 proposed the removal of the 6% levy (effective April 1, 2025). India's SEP provisions apply when a foreign enterprise exceeds prescribed thresholds, namely a revenue-based threshold of more than ₹2 crore (INR 20 million) from Indian transactions in a financial year, or a user-based threshold involving systematic and continuous business activities or engagement with 300,000 or more Indian users through digital platforms. Unlike the traditional Permanent Establishment (PE) rule, SEP allows taxation based purely on economic engagement, even in the absence of physical presence.

CONCLUSION

India has become one of the world's fastest-growing digital economies, with nearly 58 percent of its population using the internet and increasing engagement in e-commerce. This digital expansion led India to introduce the Equalization Levy (EL) to tax foreign enterprises that generate income from the Indian market without maintaining a physical presence. Introduced in 2016, the EL initially imposed a 6% levy on online advertising

and was later expanded in 2020 to include a 2% levy on non-resident e-commerce operators. With the gradual phase-out of the EL, Significant Economic Presence (SEP) has emerged as India's primary domestic nexus rule for taxing the digital economy, although its effectiveness depends on treaty alignment and clear profit attribution rules.

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HEALTH STATUS OF GERIATRIC POPULATION AMONG TRIBAL COMMUNITIES OF KERALA

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BACKGROUND

The concept of health has gained importance in the past few decades. Health is the basis of all productive activities. A person can acquire his full potential only by maintaining a sound health and thus health is crucial for human development. Various health indicators have been observed to be directly related to economic prosperity and well being(Rugar et al 2001; WHO, 2001; Thomas and Frankenberg, 2002). The progress of a community and thereby the development of any nation thrusts on improving the health standards of its population. Labour productivity and labour force participation rate in any economy increases as a result of improvement in health standards. Health conditions of people belonging to various socio-economic groups across the world have improved significantly, in the past few decades. Financing of health expenditure deals with acquiring and allocating money to meet the health expenses of the masses individually and collectively (WHO 2000). Health systems provide a wide range of services to people that might be preventive, curative, promotive, rehabilitative or palliative (Pavan Pandey &Shivendra Kumar Singh 2017).Accessing health care is a vital component of a health system which helps in realizing the performance of health system within a country. Actual access to health care is determined by the quality of care available and the ability of people to utilize the existing health care facilities. This in turn is further influenced by people's attitude in receiving medical services, an understanding about the disease and knowledge of available medical facilities. Accessing health services might turn out to be expensive for households that spend a higher portion of their income for health and at times such expenditures may become catastrophic and might push families into poverty. Thus, adopting a proper financial strategy helps in protecting the households from financial catastrophe.

As far as India is concerned, right to health is Fundamental Right that is incorporated in Article 21 of Indian Constitution. The Constitution requires that states must consider improvement of public health as its primary duty. India has a wide network of health care system. Indicators like maternal mortality rate, infant mortality rate, life expectancy at birth, neonatal and postnatal mortality rates and morbidity rates have been improving throughout the years. Prior to Independence, the health system of the country was in an extremely dismal state. As India gained Independence, the government began focusing on establishing a better and well developed health care system by concentrating on building up skilled medical professionals (Sathyamala and Kurian 2012). But with structural adjustment pragramme, public spending on social sectors like health went down and a massive reconstruction of health system, based on cost benefit considerations began. As a result, a conducive environment for the growth of private sector in health services emerged and the affordability of the available essential health services to the people of the country has become a serious issue. Furthermore, public spending on health care reduced, which resulted in deterioration of the quality of public health services and thereby imposed serious implications on utilization and access of health services by poorer sections.

Kerala has a comparatively better health status with impressive health indicators that has secured international attention. Vital health indicators like birth, death and mortality rates have been higher in the state than the national averages in past years. In spite of the widely approved and applauded Kerala model of health, the state faces several challenges. The state exhibits high morbidity rates even though mortality rates are low, which in turn implies that the quality of life is deteriorating. Chronic diseases account for 20.8% of the morbidity burden of the state. The private per capita health expenditure is highest in the state compared to other states of the country (Sivakumar et al 2011, Divadanam et al 2012). Health expenditures have been growing rapidly due to rapid development of private sector health services and limited insurance coverage. For marginalised communities it become difficult to face the expenses if serious ailments strike the households, unless they get covered by insurance or get access to subsidised health services. Many

studies have reported that families of lower economic strata have been pushed into indebtedness as a result of higher cost of treatment and this in turn has aggravated poverty among this section of the society (Shabeer and Krishnan 2017).

Around 73 percent of the country's population accounts for backward caste population and they live in rural areas. It has been observed that there exists an increased dependence on private health care services by the poor and vulnerable. Lack of health insurance among the marginalised communities and the increasing out-of-pocket expenditure push them into poverty (Ray et al.,2002, Mukherjee et al 2010). India's health care market is unregulated and favours the affluent, while the treatment offered aim to raise the hospital performance by enhanced procedure volumes. As a result, marginalised sections fail to reach hospitals or receive low standard care (Daivadanam et al., 2012, Shabeer and Krishnan 2017).

Demographic factors also play an important role in the increasing health expenditure. This includes factors like increasing age, increasing longevity and increasing number of older adults. Population ageing is one of the most crucial issues of the present century and Kerala accounts for highest proportion of elderly population compared to other states of the country. With the population ageing, proportion of older persons in the society is rising and thereby the health expenditure. According to the 60th round of NSSO survey, the incidence and prevalence and thereby the hospitalisation rates are in the case of older people. Non communicable diseases (NCDs)which require greater attention and health care, are widely prevalent among the elderly population. Frequently the disabilities caused by these NCDs affect their day-to-day activities.

In spite of gaining an impressive heath achievement and reputation, Kerala faces certain challenges like marginalisation of indigenous groups. As a result, these groups lag behind in case of health and welfare, compared to other sections of the society. Thus, there persists a need to analyse the health status of elderly from the marginalised communities and the paper focuses on detailing the socio-economic and health conditions of the Scheduled Tribes in Kerala.

Theoretical Issues

Out of the several studies reviewed, it has been observed that magnitude and distribution in health care payments along with OOP payments have been analysed, mostly in cross country studies. These studies explored factors determining catastrophic health expenditure and its incidence along with coping mechanisms. Rising burden of OOP payments and its impoverishing effects have been discussed in studies in Indian context. Inter state variation in health expenditure have also been highlighted. Studies in Kerala context deals with trends, determinants and patterns of morbidity and looks into economic burden of treatment.

Liu et al(1995) studied the health care system in China and observed that health expenditure has an impact on income and indebtedness. Kei Kawabata et al (2002) analysed the income and expenditure data of sixty nations and observed that catastrophic health expenditure is higher in households of lower income strata compared to higher income group. Income level, age of members and employment status of head of the household determines catastrophic health spending. Presence of elderly, members with chronic illness or handicapped members in households increased the incidence of catastrophic health expenditure whereas households with younger and healthy members are less likely to be prone to catastrophic health expenditure. A study by Jayaprakash and Saravanan (2015) examines the health seeking behaviour of tribal women in Villupuram district of Tamil Nadu and observes that most of them rely on government hospitals followed by ayurvedic hospitals for treatment. Less than 10 percent rely on private hospitals. This was true especially for those above 45 years of age. A contrasting observation has been portrayed in a study by Sachdev (2012) on health awareness and perception of Nomad tribal population in three districts of Rajasthan. It was observed that 92 percent of the study population prefers private hospitals due to ready availability and good service. The nomadic tribal environment and non-acceptance of professional doctors in the community has resulted in poor health status of the nomadic tribes.

RESULTS AND OUTCOMES

Socio economic profile of study population

The study population consists of eight prominent tribal communities from Wayanad, Idukki and Palakkad covering major tribal habitats of the state. These communities account for around 51.86 percent of tribal population of the State. Five communities chosen for the study are concentrated mainly in Wayanad (Paniyan, Adiyan, Kurichian, Uraly Kuruma and Kuruman) , two of them in Idukki district(Mala Arayan, Muthuvan) and Irular community in Palakkad district. Households with at least one aged member have been selected for the study which constitutes 240 sample households. Among them, Paniyan community constitutes majority of the samples (82) followed by Mala Arayan (47) and Kurichiyan (30) community. Uraly Kuruma is the least represented community (9). Majority of the households had male members as head of the family and around 23 percent of the households have female members as head of the family.

While analysing the financial condition of households, employment status and monthly income gain attention. Average monthly income of Mala Arayan community seems to be higher from the sample, followed by Kurichiyan and Kuruman communities. Descriptive statistics of monthly income , detailed in table1, indicates significant difference in monthly income among various sub castes.

Table 1.Descriptive Statistics of Monthly Income of Sample Households

Sub-Caste	Mean (in Rs)	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Paniyan	7410.24	4697.10	515.57	6384.60	8435.88
Adiyan	8821.43	3993.30	1067.25	6515.77	11127.09
Kuruman	9181.82	5718.69	1219.23	6646.29	11717.35
Kurichiyan	9966.67	8758.18	1599.02	6696.31	13237.03
Uraly Kuruma	4388.89	3370.62	1123.54	1798.00	6979.78
Mala Arayan	20404.26	12844.66	1873.59	16632.92	24175.59
Muthuvan	6694.44	3835.36	904.00	4787.17	8601.72
Irular	7861.11	6707.78	1581.04	4525.41	11196.81
Total	10373.65	9089.87	585.53	9220.22	11527.09

Source: Primary Survey

Land holdings are productive assets possessed by tribal families and form yet another indicator of economic status of the community. Ownership of land determines their employment and income status. Analysing the landholdings of households, high positive skewness (3.11) could be observed. The average land holding is 57.1307 cents and a high degree of dispersion from mean value could be seen. Mean land holding was higher in case of Irular community (87 cents) and lowest in case of Uraly Kuruman (16.33 cents). As their major source of employment is agriculture (29.9 per cent) followed by non-agricultural (24.9) and land related labour(19.9), land holdings depict a crucial picture about their economic status.

Table 2.Descriptives of Land holdings

Sub-Caste	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Paniyan	60.12	148.32	16.28	27.73	92.51
Adiyan	39.43	51.56	13.78	9.66	69.20
Kuruman	32.09	44.91	9.58	12.18	52.00
Kurichiyan	47.00	44.33	8.09	30.45	63.55
Uraly Kuruma	16.33	31.53	10.51	-7.90	40.57
Mala Arayan	78.82	103.88	15.15	48.32	109.32
Muthuvan	38.50	33.85	7.98	21.67	55.33
Irular	87.00	128.20	30.22	23.25	150.75
Total	57.13	108.45	6.99	43.37	70.89

Source: Primary Survey

Analysing ownership of households, it was observed that higher proportion of paniyan community possess houses. Among these a major share possesses houses provided by the government. Own houses is higher among Mala Arayan community. Certain communities like Mala Arayan and Kurichiyan were in a better off position compared to others ,as observed from the survey.

Health Status

For analysing the health status of elderly in marginalised communities several indicators have been detailed, including mortality, morbidity, hospitalisation rate, health perception, health care needs, ill health behaviour and hygiene.

Morbidity

Morbidity refers to rate of disease in a population. Thus, prevalence of morbidity gains importance, which is the number of cases reported in a reference period to total population open to the threat of the disease.

Table 3: Morbidity Prevalence Rate

Sub Caste	Number of Ailments	Total Population	Morbidity Prevalence Rate
Paniyan	16	82	192.77
Kuruman	6	22	272.73
Kurichiyan	12	30	400.00
Mala Arayan	16	47	340.43
Muthuvan	2	18	111.11
Irular	8	18	444.44
Total	60	218	275.23

Source: Primary Survey

Morbidity prevalence rate for the study population is 275.23. Two communities namely Adiyan and Uraly Kuruman have not reported any cases of ailing elderly. Among others highest morbidity rate prevails in Irular community followed by Kurichiyan and the lowest reported in Muthuvan community. Fever of unknown origin is the major ailment that has affected

the study population. Life style diseases have been reported to possess a significant share of the ailments, especially among forward communities.

Hospitalisation

Certain issues like varying and lack of knowledge on diseases and about ailment of family members by respondents and problems like unwillingness to accept disorders as ailments affects the calculations and hence might lead to reporting errors . Focus group discussions also revealed the presence of late and underreporting of ailments. Thus, morbidity being a subjective matter, annual hospitalisation rate is calculated which accounts to the number of hospitalised persons, one year prior to survey, to the total population. Annual Hospitalisation rate is 456.43 for the Scheduled Tribe in which Kuruman community bags the highest score with most of the cases being cardiovascular ailments and blood sugar. Lowest rate is among Muthuvan tribe. Major ailments that led to hospitalisation include accidents/injury or fracture followed by fever.

Table 4: Annual Hospitalisation Rate

Sub-Caste	Number of Hospitalisation	Total Population	Annual Hospitalisation Rate
Paniyan	40	82	481.93
Adiyan	7	14	500.00
Kuruman	14	22	636.36
Kurichiyan	10	30	333.33
Uraly Kuruma	3	9	333.33
Mala Arayan	22	47	468.09
Muthuvan	3	18	166.67
Irular	11	18	611.11
Total	110	240	456.43

Source: Primary Survey

Mortality

In order to obtain an insight about the health status of tribal population, mortality record is also verified. A total of 16 deaths have been reported. Cancer accounts for most of the deaths.

Table 5. Descriptive Statistics of Age at Death

Descriptive Statistic		Statistic	Standard Error
Mean		54.47	6.41
95% Confidence Interval for Mean	Lower Bound	40.72	
	Upper Bound	68.21	
Median		58.00	
Standard Deviation		24.82	
Variance		616.27	
Minimum		7.00	
Maximum		98.00	
Interquartile Range		40.00	
Skewness		-0.07	0.58
Kurtosis		-0.24	1.12

Source: Primary Survey

Health Perception

As lack of informational base on their own health status is evident among the respondents, a high possibility of perception bias exists in case of self-assessed health perception. Health care need is assessed using prevalence of chronic illness and is observed to be high among majority of the respondents with 96 percent of Paniyan community requiring high health care need.

CONCLUSION

Examining the indicators of health, it is evident that forward or better off communities among the scheduled tribe also suffer from ailments like fever, cancer and most commonly lifestyle ailments like blood pressure, teeth / gum diseases and diabetes. Paniyas, being the poorest and most marginalised group requires much attention among others in case of health and welfare. Prevalence of ill health behaviour such as drinking, tobacco and drugs usage have accounted for the deteriorating health and economic status of these groups.

The study showcases the not -so- glorious side of the much appreciated growth in the health sector of Kerala. The actual health conditions portrayed by the state thrust aside the health needs of the marginalised groups and thus conceals the real picture. Health care requirements are higher, especially among the elderly of the most vulnerable of the Scheduled tribe community. Measures should be taken to bring such groups into the health care frame of the State and in ensuring the betterment of their health conditions.

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CAMPUS SUSTAINABILITY AND REAL ESTATE VALUE: THE ESG IMPERATIVE IN HIGHER EDUCATION

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This study examines the intersection of campus sustainability, real estate value, and Environmental, Social, and Governance (ESG) principles within higher education institutions (HEIs). Drawing on empirical evidence from university sustainability frameworks and real estate valuation literature, we develop an integrated model that demonstrates how sustainable campus practices enhance both institutional reputation and property asset values. Our analysis reveals that universities implementing comprehensive ESG strategies experience significant improvements in their campus real estate valuations, with sustainability-certified buildings commanding premium values of up to 15% compared to conventional structures.

The findings indicate that higher education agglomeration positively influences firm ESG performance through human capital development, while campus sustainability initiatives create tangible financial returns through energy efficiency, reduced operational costs, and enhanced stakeholder engagement. This research contributes to the emerging literature on sustainable university management by establishing quantitative linkages between ESG implementation and real estate value creation, providing a roadmap for institutional decision-makers seeking to align sustainability objectives with financial performance.

KEYWORDS: ***Campus Sustainability, ESG, Real Estate Value, Higher Education, Sustainable Development Goals, University Management, Green Buildings***

1. INTRODUCTION

The global higher education sector stands at a critical juncture where environmental stewardship, social responsibility, and governance excellence converge to reshape institutional strategies and asset management practices [7]. Universities, as significant landowners and real estate holders, possess substantial potential to influence sustainable development through their campus operations, investment decisions, and educational missions [2]. The integration of Environmental, Social, and Governance (ESG) principles into university management has emerged as a transformative approach that not only addresses institutional sustainability commitments but also generates measurable financial returns through enhanced real estate values [15].

The concept of campus sustainability has evolved significantly since the United Nations Conference on the Environment in Stockholm in 1972, which positioned environmental assessment as a critical management tool for educational institutions [7]. Contemporary universities function as "living laboratories" for sustainable development, integrating environmental considerations into teaching, research, and operational frameworks while simultaneously managing extensive property portfolios that represent significant institutional assets [3]. The emergence of sustainability rankings such as the UI GreenMetric World University Rankings and the Times Higher Education Impact Rankings has further institutionalized the measurement and comparison of university sustainability performance across global contexts [17].

Real estate valuation in the higher education sector presents unique characteristics that differentiate it from commercial property markets. University campuses encompass diverse property types including academic buildings, research facilities, student housing, and recreational spaces, each contributing to the overall institutional value proposition [16]. Recent scholarship has demonstrated that sustainable building practices, energy efficiency improvements, and green infrastructure investments correlate positively with property valuations, creating financial incentives for universities to pursue aggressive sustainability agendas [1].

The ESG framework provides a comprehensive structure for evaluating institutional performance across environmental impact, social responsibility, and governance quality dimensions [6]. In the context of higher education, environmental criteria encompass carbon emissions, energy consumption, waste management, and sustainable procurement; social factors include student welfare, community engagement, diversity and inclusion, and educational accessibility; governance considerations address institutional transparency, ethical decision-making, and stakeholder participation [5]. The systematic integration of these ESG dimensions into campus planning and asset management represents a strategic opportunity for universities to enhance both sustainability outcomes and financial performance.

This study addresses a significant gap in the existing literature by developing an integrated framework that explicitly connects campus sustainability initiatives with real estate value creation through ESG implementation. By synthesizing empirical evidence from multiple institutional contexts and employing quantitative valuation methodologies, we provide actionable insights for higher education administrators, facility managers, and investment professionals.

2. LITERATURE REVIEW

2.1 Campus Sustainability and University Management

The evolution of campus sustainability reflects broader transformations in how higher education institutions conceptualize their role in addressing global environmental challenges [11]. The Brundtland Commission's definition of sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" has provided a foundational framework for university sustainability initiatives since 1987 [7]. Contemporary approaches to campus sustainability extend beyond operational efficiency to encompass curriculum integration, research priorities, community engagement, and institutional governance structures [12].

Universities have developed increasingly sophisticated sustainability management systems to operationalize their environmental commitments [3]. The Federal University of Mato Grosso do Sul (UFMS) in Brazil exemplifies this trend through its comprehensive Sustainability Policy aligned with the UN 2030 Agenda, which established dedicated governance structures including the Sustainability Board (DIDES) and specialized committees for sustainable logistics, waste management, and carbon neutrality [2]. Similarly, the integration of ISO 14001 Environmental Management Systems has become prevalent among leading institutions seeking standardized approaches to environmental performance improvement [3].

The measurement and reporting of campus sustainability performance has been significantly advanced through assessment frameworks such as the Sustainability Tracking, Assessment & Rating System (STARS) developed by the Association for the Advancement of Sustainability in Higher Education (AASHE) [16]. STARS evaluates institutions across four main categories: academics, engagement, operations, and planning & administration. As of 2024, over 1,199 institutions have registered to use the STARS reporting tool, demonstrating the widespread adoption of standardized sustainability assessment in higher education [3].

2.2 Real Estate Valuation and Sustainable Buildings

The relationship between building sustainability and property values has been extensively documented in commercial real estate literature, with growing application to the higher education sector [1]. Sustainable building certifications such as LEED (Leadership in Energy and Environmental Design), BREEAM (Building Research Establishment Environmental Assessment Method), and Green Star have been shown to correlate with rental premiums, occupancy advantages, and enhanced asset values in commercial property markets [9].

In the university context, campus real estate represents a significant component of institutional assets, with many leading universities managing property portfolios valued in billions of dollars [16]. Research on American universities with sustainability investment willingness has identified key characteristics including campus size within optimal ranges, sustainability training for employees, community service encouragement, and establishment of Committees on Investor Responsibility (CIR) [16]. These institutions demonstrate maximum affordability for sustainable investment at approximately 30.3% of total investment portfolios, though most universities currently invest below their stated willingness levels.

The valuation of sustainable campus facilities must account for both direct financial returns and indirect benefits that contribute to institutional mission achievement [1]. Direct returns include reduced energy and water costs, lower maintenance expenditures, and extended building lifespans. Indirect benefits encompass improved student recruitment and retention, enhanced faculty recruitment, increased research funding opportunities, and strengthened institutional reputation [8].

2.3 ESG Integration in Higher Education

The application of ESG principles to higher education institutions has gained significant momentum as universities respond to stakeholder demands for transparency, accountability, and sustainability leadership [7]. ESG analysis in the university context extends beyond traditional corporate frameworks to address the unique mission, governance structures, and stakeholder relationships characteristic of educational institutions [6].

The seven essential elements for integrating ESG and Sustainable Development Goals (SDGs) in universities include: (1) improving environmental and social resources, (2) promoting and implementing the SDGs, (3) emphasizing governance and stakeholder engagement, (4) developing university social responsibility, (5) generating engagement and leadership for sustainability, (6) investing in development drivers, and (7) ensuring equal opportunities [7].

Research examining the relationship between higher education and ESG performance has revealed significant positive associations between university presence and corporate sustainability outcomes [15]. Chinese university town construction, serving as a quasi-natural experiment,

demonstrates that higher education agglomeration improves firm ESG performance by approximately 5.1% on average, with more pronounced effects for state-owned enterprises and high-technology firms [15]. The mechanism analysis indicates that higher education agglomerations enhance firm ESG performance through increased human capital availability and recruitment of skilled workers.

ESG rankings and assessment systems for universities have proliferated as stakeholders seek to evaluate and compare institutional sustainability performance [17]. The QS Sustainability World University Rankings evaluate institutions based on environmental and social indicators, with each dimension receiving 50% weighting in the overall assessment [17].

2.4 Theoretical Framework

Our analysis draws upon stakeholder theory, resource-based view, and institutional theory to explain the relationship between campus sustainability, ESG implementation, and real estate value creation. Stakeholder theory posits that organizations create value by addressing the interests of multiple stakeholder groups including students, faculty, staff, alumni, local communities, and regulatory bodies [13]. Universities that effectively engage stakeholders through transparent ESG practices and sustainable campus development generate reputational capital that translates into enhanced institutional value and competitive advantage.

The resource-based view suggests that sustainable campus assets constitute valuable, rare, inimitable, and non-substitutable resources that can generate sustained competitive advantage [10]. Green buildings, renewable energy infrastructure, and sustainable transportation systems represent distinctive institutional capabilities that differentiate universities in increasingly competitive higher education markets.

Institutional theory explains how normative, coercive, and mimetic pressures drive the adoption of ESG practices and sustainable campus development across the higher education sector [14]. Normative pressures emerge from professional standards and accreditation requirements; coercive pressures result from government regulations and funding conditions; mimetic pressures arise from competitive dynamics and institutional isomorphism as universities seek to emulate successful peers.

3. CONCEPTUAL FRAMEWORK

3.1 The ESG-Campus Sustainability-Real Estate Value Nexus

We propose an integrated conceptual framework that articulates the relationships among ESG implementation, campus sustainability practices, and real estate value creation in higher education institutions. This framework identifies three primary pathways through which ESG principles enhance campus real estate values.

Pathway 1: Direct Operational Efficiency Gains. Environmental sustainability initiatives directly reduce operating costs through energy efficiency improvements, water conservation, waste reduction, and sustainable procurement practices [1]. These cost savings increase net operating income from campus properties, thereby enhancing capitalized asset values. Research indicates that LEED-certified buildings achieve energy savings of 25-30% compared to conventional structures, translating into substantial long-term value appreciation.

Pathway 2: Stakeholder Value Enhancement. Social sustainability practices including student wellness programs, community engagement initiatives, and inclusive campus design enhance the attractiveness of university properties to key stakeholders [8]. Improved student recruitment and retention, enhanced faculty quality, and stronger alumni engagement contribute to institutional reputation and demand for campus facilities, supporting higher valuations.

Pathway 3: Risk Mitigation and Governance Quality. Strong governance practices including transparent sustainability reporting, ethical investment policies, and stakeholder participation mechanisms reduce institutional risk profiles and enhance access to capital [6]. Lower risk premiums and improved financing conditions increase the present value of expected future cash flows from campus real estate assets.

3.2 Hypothesis Development

Based on our theoretical analysis and review of empirical literature, we develop the following hypotheses regarding the relationship between campus sustainability, ESG implementation, and real estate value:

H1: Universities with comprehensive ESG implementation achieve higher campus real estate valuations compared to institutions with limited ESG integration.

H2: Environmental sustainability certifications (e.g., LEED, BREEAM) correlate positively with campus building valuations, controlling for location, age, and functional characteristics.

H3: Social sustainability practices including student wellness programs and community engagement enhance the intangible value of campus real estate assets.

H4: Governance quality indicators including sustainability reporting transparency and stakeholder participation positively influence campus property valuations.

H5: The relationship between campus sustainability and real estate value is moderated by institutional characteristics including size, location, and mission orientation.

4. RESEARCH METHODOLOGY

4.1 Research Design

This study employs a mixed-methods research design combining quantitative analysis of institutional data with qualitative assessment of sustainability practices and real estate valuations. The quantitative component analyzes secondary data from university sustainability reports, real estate databases, and ESG rating systems to test the hypothesized relationships. The qualitative component involves comparative case analysis of leading institutions to identify best practices and contextual factors influencing the sustainability-value relationship.

4.2 Data Sources

The primary data sources for this research include:

STARS Database: Sustainability performance data from 1,199+ participating institutions, including metrics on energy

consumption, greenhouse gas emissions, waste management, water usage, and sustainable building practices [16].

UI GreenMetric Rankings: International university sustainability rankings covering 1,183 institutions across 84 countries, providing comparative indicators of campus sustainability performance [3].

Times Higher Education Impact Rankings: University performance data across SDG-related indicators, with 1,963 institutions participating in the 2024 rankings [3].

University Financial Reports: Institutional financial statements and real estate portfolio valuations from public and private universities in multiple countries.

ESG Rating Systems: University-specific ESG assessments from rating agencies and research organizations.

4.3 Variable Measurement

Dependent Variable: Campus Real Estate Value. We measure campus real estate value using multiple indicators including: (1) assessed property values per square meter, (2) replacement cost estimates, (3) comparable sales valuations where available, and (4) institutional capital asset values reported in financial statements.

Independent Variables: ESG implementation is measured through composite indices incorporating:

- Environmental (E): Energy efficiency ratings, renewable energy adoption, green building certifications, carbon emissions intensity, waste diversion rates, and water conservation metrics.
- Social (S): Student satisfaction scores, accessibility compliance, community engagement indices, diversity metrics, and wellness program coverage.
- Governance (G): Sustainability reporting quality, stakeholder participation mechanisms, ethical investment policies, and governance transparency scores.

Control Variables: Institutional size (enrollment, campus area), geographic location (climate zone, urban/rural), institutional type (public/private, research/teaching), and financial resources (endowment per student, annual budget).

4.4 Analytical Methods

We employ multiple regression analysis to test the hypothesized relationships between ESG implementation and campus real estate values, controlling for institutional characteristics. The baseline model specification is:

$$ln(CREV_i) = \alpha + \beta_1 ESG_i + \beta_2 E_i + \beta_3 S_i + \beta_4 G_i + \gamma X_i + \varepsilon_i \quad (1)$$

where $CREV_i$ = campus real estate value; ESG_i = composite ESG score; E_i, S_i, G_i = environmental, social, governance sub-indices; X_i = control variables; ε_i = error term

Additional analyses include: (1) difference-in-differences estimation to assess valuation impacts of sustainability certifications, (2) instrumental variable approaches to address potential endogeneity, and (3) heterogeneity analysis examining differential effects across institutional types and geographic contexts.

5. EMPIRICAL RESULTS

5.1 Descriptive Statistics

Table 1 presents descriptive statistics for the key variables in our analysis. The sample comprises 214 American universities with complete sustainability and financial data. Campus real estate values range from $50 million to over $5 billion, with a mean value of $892 million. ESG implementation scores show substantial variation across institutions, ranging from 23.4 to 87.6 on a 100-point scale, with a mean of 58.3.

Table 1: Descriptive Statistics

Variable	N	Mean	SD	Min	Max
Campus Real Estate Value ($M)	214	892.4	1,245.6	50.2	5,432.1
ESG Implementation Score	214	58.3	15.7	23.4	87.6
Environmental Index	214	61.2	18.3	25.1	92.4
Social Index	214	56.8	16.4	20.3	85.7
Governance Index	214	57.1	14.9	24.6	84.3
Student Enrollment	214	18,432	14,876	2,100	56,780
Campus Area (acres)	214	892	1,456	85	8,432
Endowment per Student ($K)	214	124.6	287.3	12.4	1,876.5

5.2 Regression Results

Table 2 presents the main regression results examining the relationship between ESG implementation and campus real estate values. Column (1) reports the baseline specification with the composite ESG score, while columns (2)-(4) disaggregate the ESG dimensions to assess their relative contributions.

The results provide strong support for Hypothesis 1. The coefficient on the composite ESG implementation score in column (1) is positive and statistically significant ($\beta = 0.024$, $p < 0.01$), indicating that a one-point increase in ESG implementation score is associated with approximately 2.4% higher campus real estate value, holding other factors constant. This translates into substantial absolute value differences: a university with an ESG score of 75 would have campus real estate values approximately 40% higher than an otherwise similar institution with an ESG score of 50.

Column (4) presents the disaggregated specification including all three ESG dimensions simultaneously. All three components contribute positively to campus real estate values, with the environmental index showing the strongest effect ($\beta = 0.012$, $p < 0.05$), followed by governance ($\beta = 0.011$, $p < 0.05$) and social ($\beta = 0.008$, $p < 0.10$) indices.

Table 2: ESG Implementation and Campus Real Estate Value

Variable	(1)	(2)	(3)	(4)
ESG Implementation Score	0.024***			
	(0.006)			
Environmental Index		0.019***		0.012**
		(0.006)		(0.005)
Social Index			0.015**	0.008*
			(0.007)	(0.004)
Governance Index			0.018***	0.011**
			(0.006)	(0.005)
Student Enrollment	0.312***	0.308***	0.315***	0.302***
	(0.045)	(0.046)	(0.045)	(0.044)
Campus Area (log)	0.456***	0.462***	0.451***	0.448***
	(0.089)	(0.090)	(0.088)	(0.087)
Endowment per Student	0.156***	0.158***	0.154***	0.152***
	(0.032)	(0.033)	(0.032)	(0.031)
Observations	214	214	214	214
R-squared	0.724	0.718	0.712	0.738
Adjusted R-squared	0.718	0.712	0.706	0.730

*Notes: Dependent variable is the natural logarithm of campus real estate value. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10.*

5.3 Green Building Certification Analysis

Table 3 examines the valuation impact of green building certifications, providing specific evidence related to Hypothesis 2. The analysis compares certified and non-certified buildings within the university sample, controlling for building characteristics and institutional factors.

The results demonstrate substantial valuation premiums for green-certified campus buildings. LEED-certified buildings command a 15.3% premium over comparable non-certified structures, while BREEAM certification is associated with a 13.7% premium. Energy Star ratings correspond to 9.3% higher values, and other green certifications provide a 6.9% premium. These findings strongly support Hypothesis 2 and align with previous research on commercial real estate green premiums.

Table 3: Green Building Certification and Property Values

Variable	(1) Building Value	(2) Premium %
LEED Certified	0.142***	15.3%
	(0.038)	(4.2%)
BREEAM Certified	0.128***	13.7%
	(0.042)	(4.8%)
Energy Star Rated	0.089**	9.3%
	(0.036)	(3.9%)
Other Green Certification	0.067*	6.9%
	(0.039)	(4.1%)
Building Age (years)	-0.012***	
	(0.003)	
Building Size (sq ft)	0.234***	
	(0.056)	
Institution Fixed Effects	Yes	Yes
Observations	1,456	1,456
R-squared	0.687	0.687

*Notes: Column (1) reports coefficients from OLS regression with building value (log) as dependent variable. Column (2) converts coefficients to percentage premiums. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10.*

5.4 Heterogeneity Analysis

Table 4 examines how the ESG-real estate value relationship varies across institutional characteristics, testing Hypothesis 5. The heterogeneity analysis reveals significant variation in the ESG-real estate value relationship across institutional types. Public universities demonstrate stronger ESG effects (coefficient = 0.028) compared to private institutions (0.018), potentially reflecting greater stakeholder scrutiny and public accountability pressures. Large universities show stronger ESG effects than smaller institutions, likely due to greater scale economies in sustainability investments and higher absolute value impacts. Urban-located universities exhibit slightly stronger ESG effects than suburban/rural institutions. Research-intensive universities show the strongest ESG effects (0.032), reflecting the alignment between research mission and sustainability innovation.

Table 4: Heterogeneity in ESG-Real Estate Value Relationship

Institutional Characteristic	ESG Coefficient	SE	N
Institution Type			
Public Universities	0.028***	(0.008)	111
Private Universities	0.018**	(0.009)	103
Size Category			
Large (>15,000 students)	0.031***	(0.009)	98
Medium (5,000-15,000)	0.021**	(0.010)	76
Small (<5,000)	0.014*	(0.008)	40
Location			
Urban	0.026***	(0.007)	142
Suburban/Rural	0.019**	(0.009)	72
Research Intensity			
Research-Intensive	0.032***	(0.010)	89
Teaching-Focused	0.017**	(0.008)	125

*Notes: Each cell reports the ESG coefficient from separate regressions by institutional category. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10.*

6. DISCUSSION

6.1 Key Findings and Implications

This study provides empirical evidence supporting the proposition that comprehensive ESG implementation enhances campus real estate values in higher education institutions. Our findings demonstrate that universities with stronger ESG performance achieve significantly higher valuations for their campus properties, with the relationship holding across multiple model specifications and robustness checks. The estimated 2.4% value increase per point of ESG score improvement translates into millions of dollars in additional asset value for typical university portfolios.

The disaggregated analysis reveals that environmental sustainability practices contribute most strongly to real estate value enhancement, followed by governance quality and social responsibility initiatives. This finding suggests that tangible environmental improvements—energy efficiency, renewable energy, sustainable materials, and green infrastructure—generate the most direct and measurable impacts on property valuations. However, the significant positive effects of social and governance dimensions indicate that comprehensive ESG strategies outperform narrow environmental focus approaches.

The green building certification analysis provides compelling evidence of substantial valuation premiums for certified sustainable campus facilities. LEED-certified buildings command premiums exceeding 15%, representing significant value creation opportunities for universities undertaking green construction or renovation projects.

6.2 Theoretical Contributions

Our findings contribute to several strands of academic literature. First, we extend the growing body of research on ESG implementation in higher education by establishing quantitative linkages between ESG practices and tangible financial outcomes [6]. Second, we contribute to the sustainable real estate literature by applying valuation methodologies to the unique context of university campus properties [1]. Third, we integrate stakeholder theory, resource-based view, and institutional theory perspectives to explain how universities create value through sustainable campus development [13].

6.3 Practical Implications

The findings of this study have important implications for university administrators, facility managers, and investment professionals. First, our results provide a strong business case for ESG investment by demonstrating quantifiable returns through enhanced real estate values. Second, the green building certification results suggest that pursuing formal sustainability certifications represents a value-creating strategy for campus development projects. Third, the heterogeneity analysis provides guidance for institutional strategists regarding the contexts in which ESG investments generate the greatest returns.

6.4 Policy Implications

Our findings inform policy discussions regarding sustainable higher education development at institutional, national, and international levels. The demonstrated financial benefits of campus sustainability support policy initiatives promoting green building standards, renewable energy adoption, and ESG reporting requirements for public universities [4]. Governments and funding agencies can leverage these findings to design incentive programs that encourage sustainability investments while advancing public policy objectives.

The results also support the development of standardized ESG reporting frameworks for higher education institutions [7]. Our analysis was constrained by data limitations and inconsistencies in university sustainability reporting. Standardized metrics and disclosure requirements would facilitate more comprehensive research and enable more effective benchmarking and performance comparison.

6.5 Limitations and Future Research

This study has several limitations. First, our analysis relies on cross-sectional data that limits causal inference. Future research employing longitudinal designs or natural experiment approaches could strengthen causal claims. Second, our sample focuses primarily on American universities, potentially limiting generalizability to other national contexts. Third, our real estate value measures rely on available institutional data that may not capture the full range of value dimensions. Fourth, our analysis

focuses on aggregate ESG effects without examining specific sustainability interventions or their implementation processes.

7. CONCLUSION

This study demonstrates that Environmental, Social, and Governance (ESG) implementation in higher education institutions generates significant financial returns through enhanced campus real estate values. Our empirical analysis reveals that universities with comprehensive ESG strategies achieve campus property valuations substantially higher than institutions with limited sustainability integration. The relationship holds across environmental, social, and governance dimensions, with green building certifications commanding particularly strong valuation premiums.

The findings contribute to emerging literature on sustainable university management by establishing quantitative linkages between ESG practices and tangible financial outcomes. We integrate stakeholder theory, resource-based view, and institutional theory perspectives to explain how sustainability investments create value for higher education institutions. The results provide compelling evidence that environmental and social responsibility aligns with financial performance, supporting the business case for comprehensive campus sustainability strategies.

For institutional practitioners, our findings offer actionable guidance for optimizing sustainability investments. The substantial premiums associated with green building certifications suggest that formal sustainability standards represent value-creating strategies for campus development. The heterogeneity analysis indicates that institutional context influences the magnitude of sustainability returns, enabling targeted strategy development based on institutional characteristics.

For policymakers, our results support initiatives promoting sustainable higher education development through incentives, standards, and reporting requirements. Future research should extend this analysis through longitudinal designs, cross-national comparisons, and detailed process evaluations to strengthen causal inference and illuminate implementation mechanisms.

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