

Sustainable Investment Trends Among Retail Investor in Pune: - A Behavioral Study on Investment Preferences and the role of Artificial Intelligence in Decision Making

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Abstract. Sustainable investment has developed as an increasingly important theme in financial markets as environmental, social, and governance (ESG) reflections gain bigger attention alongside financial returns. At the same time, advances in Artificial Intelligence (AI) are reshaping investment decision-making through improved access to information, analytical support, and personalized investment insights. Despite the growing availability of ESG investment products in India, retail investor participation remains comparatively limited.

This study examines emerging trends in sustainable investment among retail investors in Pune, Maharashtra, with a focus on investor awareness, perceptions, investment preferences and the role of AI in investment decision making. The main cornerstone of this study is Behavioral perception employing explanatory and investigative research on both the primary and secondary data. A little over hundred participated in the primary data collected using a well-designed survey, which was later analyzed using co-relation analysis. independent sample t-test and descriptive statistics.

Inadequate awareness of ESG concepts, apprehensions about risk-returns and dearth of transparent information were identified amongst the retail investors for sustainable investment. Though probable monetary return, social benefit and environmental consequences surfaced as the core determinant towards investment. The results also highlighted statistically that sustainable investment preferences were not impacted by gender. Despite the availability of AI driven evaluation for

investment, the results indicate that people tend to ultimately depend on human judgments for investment.

This study determines that cultivating ESG knowledge through sustained training and fostering transparency to ESG practices and sponsoring responsible AI integration will boost Indian investors to embrace sustainable investment practices.

Keywords: Sustainable Investment; ESG Investing; Retail Investor Behavior; Artificial Intelligence; Green Bonds; ESG Mutual Funds; Behavioral Finance; Sustainable Finance; Robo-Advisors.

1 Introduction to sustainable investment

1.1 Meaning

A sustainable investment means putting money into activities or companies that help to create the world better—either for the environment and society. In simple terms, an investment is considered sustainable when it contributes positively to projects that reduce pollution, conserve energy, improving resources efficiency, supporting working conditions, and uplifting disadvantaged communities. At the same time, such investment should not harm other important areas of environmental or social objectives. This principle is referred to as “Do No Significant Harm (DNSH)”, meaning that creating benefits in one area should not cause harm in another (European Parliament & Council, 2019) [1]. Additionally, companies receiving investment should demonstrate responsible governance practices, including transparency, accountability, ethical conduct, fair treatment of employees, and compliance with legal and regulatory requirements, including taxation and responsible business practices.

1.2 Background: - Rise of ESG and sustainable Investing

During the past decade, investment strategies that integrate Environmental, Social, and Governance (ESG) aspects have rapidly presented growth across global financial market. Global fund assets adopting sustainable approaches investment reached approximately USD 16700 billion by 2024, up nearly 49% from two years earlier. This growth has been reinforced by major international framework like UN SDGs, Paris Agreement, etc. and regulatory initiatives (United Nations Framework Convention on Climate Change 2015; Schoenmaker and Schramade 2018) [1],[2]. A parallel trend is noticeable in India, where the sustainable finance system has extended rapidly in recent years. India’s green, social, and sustainability bond market improved from approximately USD 21400 million in 2021 to USD 55900 million by the end of 2024. The green bonds account for nearly 83% of the total volume of issuance, underscoring a strong policy and markets push towards climate friendly investment. This indicates that both globally and in India sustainable investment products (like ESG mutual funds, renewable energy projects, green bonds) are becoming mainstream investment themes (Tang and Zhang 2020) [4].

1.3 Importance and Global Context of Sustainable Finance.

Global weirding has not only impacted more than 50% of the human population by causing considerable risk to ecosystem, but also has adverse impact on the businesses, and universal financial systems. (Intergovernmental Panel on Climate Change [IPCC], 2023; Bolton et al. 2020) [5][6]. This have become major problem that the world is facing in the 21st century, disturbing economic systems, ecological stability, social wellness and its impact on long term developments. Evidence suggests that risks from climate changes (escalating temperatures, irregular monsoon, and ecological degradation) have manifold impact across regions and people, thus having a profound impact on businesses and its bottom line. These apprehensions have rightfully driven the world towards a strategic approach towards investment to social and environment centric activities. We can see increasing integration of sustainability considerations impacting investment decision not just by governments, but also from large corporations and financial institutions. Sustainability is also becoming a driving factor in financial planning. Sustainability driven investment tools like green bonds, ESG funds and clean energy have taken center point as business try to create an equilibrium between profit with social and environmental outcomes. (European Parliament & Council 2019; Tang & Zhang 2018) [1],[4]. Business realize that sustainable finance is no longer a charitable investment, but is imperative instrument towards climate sustainability, all-encompassing development and long-term economic growth. (Schoenmaker & Schramade 2018) [3].

1.4 Retail Investors and the Growing Shift Towards Sustainable Investment in India

The increase of individual retail investors has changed the dynamics of Indian financial markets and swaying the trends with regards to sustainable investment. This increasing involvement of retail investors has drastically consolidated the decision-making role of household in influencing the demand for sustainable and responsible financial instruments of investment. Studies indicate an upward trend in retail mutual funds which along with individual investors account for a significant share in India's equity market. Compared to previous years these show a steady growth in investment participation. (Climate Bonds Initiative 2025; Reserve Bank of India 2024) [7],[8]. This swing indicates a growing retail investor inclination towards investment products that are environment and socially accountable. Mindfulness towards ESG (Environmental, Social and Governance) investment options is also on rise but tangible participation remains erratic. Prevailing studies indicate that these investment decisions are inhibited by numerous factors like perceived investment risk, lack of clarity on the ESG criteria and limited availability to informed decision making. (Mehta et al. 2024; Jonwall et al. 2022) [9],[10]. This research suggests that vagueness of developing regulatory frameworks and concern of financial returns have obstructed retail investment in sustainable and green financial instruments. (Virtanen et al. 2023; Sood et al. 2023) [11],[12]. Solidifying investor awareness by increasing financial literacy and easy access to clear ESG information thus boosts Indian retail investors transition towards sustainable finance.

1.5 Digital Investment Portals & AI Integration

In recent times, the advent of digital investment platforms like Zerodha, Groww, Upstox, Paytm Money, ET Money, Kuvera and Policybazaar has a positive impact on the investment behavior of Indian retail investors. Their significance in fostering higher enrolment of young and digitally active investors, by opening access to various financial products like stocks, mutual funds, insurance and retirement planning tools. With the advent of AI integration; risk profiling, portfolio management, personalized recommendations and support has enhanced these platforms thus promoting wider acceptance. Investor preference, financial goal settings and market condition analytics, enable more data supported decision making. Applying Machine Learning algorithms create personalized AI driven Robo-advisory systems providing data determined investment decisions with negligible human intervention. (Kaur et al. 2025) [13]. Indian retail investors have now easy and ready access to goal-based investment decisions and portfolio rebalancing due to the predictive analysis provided by the Robo-advisory features of the available digital investment platforms. (Kulkarni et al. 2025) [14]. Impulsive decision making is reduced due to the behavioral analysis and the systems thus foster long term investment approaches, thus helping the investors. (Kumar et al. 2024) [15]. AI and ML are also progressively supporting ESG driven investment practices by analyzing and recommending investments allied with sustainability objectives. ESG scoring and AI driven personalized recommendations in these investment digital platforms help investors assimilate their responsible investment objectives. (Adeoye et al. 2024) [16]. Furthermore, AI-enabled chatbots, fraud detection tools, and real-time analytics enhance user experience and provide platform transparency thus enhancing investor confidence, thus influencing their behavior. (Choowan & Deovisan 2026) [17].

1.6 ESG Mutual Funds and Awareness

Traditionally institutional investors have led ESG mutual fund participation, but due to rising visibility of sustainable investment products we see a progressive involvement of retail investors. (Schoenmaker & Schramade, 2018, D'Hondt et al., 2022) [3],[18]. Despite this growing engagement, many retail investors still possess limited familiarity of ESG mutual funds. Study recommends that a noteworthy amount of individual investors lack familiarity with the various types of ESG funds and the philosophies that influence sustainable investment strategies (Mehta et al. 2024) [9]. As compared with organized investors and retail investors generally reveal limited knowledge of ESG investing and often they face challenges in evaluating investment opportunities that include sustainability considerations (D'Hondt et al., 2022) [18]. A main factor contributing to this challenge is limited understanding of ESG criteria which are used to assess a company's social responsibility, governance standards and environmental impact (Bocken et al., 2014) [19]. Additionally, investor familiarity and participation in ESG investments are inclined by determinants such as access to related information, exposure to media coverage, and overall levels of financial literacy (D'Hondt et al. 2022, OECD 2021) [18],[20]. Results from global investor surveys strengthen the presence of this knowledge gap. According to survey evidence only a marginal of retail investors reported having a complete understanding of ESG mutual funds. While many investors

reported the lack of adequate information to make well knowledgeable investment options (Pasquino 2025) [21]. These findings reveal that although interest in sustainable investing continues to expand, greater investor education, improved transparency and transparent communication of ESG related information remain important for motivating participation in ESG mutual funds.

1.7 Influence of Demographic Attributes and Investment in Mutual Funds

Demographic attributes are broadly known as important factors of investor awareness and engagement with ESG mutual funds. The attributes include education, occupation, age and income can shape investor's opinions about sustainable investment products and influence their decisions to invest in funds that emphasized on environmental, social and governance considerations (Geetha & Ramesh 2012) [22]. Age has been found as main factor in all attributes to affect investment preferences and financial decision-making patterns. Investment aims often change during an individual's life cycle which resulting in different attitudes toward risk and sustainability. Younger investors are usually more wiliness to advanced investment concepts and incline to place greater mainly on long term sustainability outcomes. Opposite to this experienced and older investor may prioritize monetary assurance and reliability leading to more vigilant investment choices (Jonwall et al. 2022) [10]. Returns is another important factor which contributing in ESG mutual funds. Individuals with higher income generally own greater investment capacity and may have more inclination to add sustainable investment options in their investment portfolio. As a result, their economic stability permits them to adopt diversification approaches and tolerate uncertainties that come with relatively new investment approaches (Raveena, & Bhinder, H. S. (2025) [23]. Education level is another factor that plays a vital contribution in ESG related awareness and investment behavior. More educated investors are generally known more about financial markets, sustainability concerns and responsible investments. This depth of their knowledge base can improve their capability to assess ESG focused investment opportunities and grow their inclination to support such drives (Varmaz et al. 2021) [24]. Likewise, professional background can influence exposure to ESG concepts and sustainable finance deliberations. Individuals working as professional, managerial, corporate or sustainability focused roles are more possible to be get to information related to environmental responsibility, social impact and corporate governance. Subsequently, they may grow a higher acceptance of ESG investing than those whose professions provide limited communication with financial or sustainability related issues (Kedar 2025) [25]. Taken together all these demographic attributes contribute to dissimilarity in investor awareness and interest in ESG mutual funds. Considering their influence, it is consequently crucial for explaining differences in retail investor participation in sustainable investment options.

1.8 Hurdles in ESG Investment

Although ESG (Environmental, Social, and Governance) investing has increase attention in current years, a number of obstacles continue to prevent more investor participation. Many investors are unclear about how to recognize appropriate ESG investment products and often lack persuasion in making sustainability related investment

decisions. Frequently stated barriers include limited accessibility of clear information, the complication of ESG valuation frameworks, anxieties about financial performance and uncertainty regarding possible investment risks. According to Jonsdottir et al. (2022) [26], investors commonly find ESG related information difficult to assess, specifically when understanding sustainability measures and comparing ESG performance pointers. Views of risk represents another important barrier to adopting ESG investment options. Many retail investors are still doubtful regarding whether sustainable investments can fetch same yield as traditional investment. The continuous anxieties about uncertainty and conflicts between sustainability goals and profitability consistently influence investors decisions. Pedersen et al. (2021) [27] highlighted that investors assess the ESG funds using predictable risk yield criteria which may lead to decline their interest in invest in sustainable financial product. Supporting the above findings, Thanki et al. (2022) [28] found in his study that investors were more willing to invest in ESG investments where financial returns would not be negatively affected.

Investors trust plays an important role in creating investment intentions in ESG products. The level of trust in investor largely depends on solidity of ESG report disclosure, the transparency in reporting and how reliable the fund manager is. As per Jonsdottir et al. (2022) [26] study finding the discrepancies in the process of ESG reporting and doubt about data quality might hinder the trust in the process of investment. Additionally, Zheng (2024) [29] observe the same parameters as transparency and trustworthiness are critical in determining the investor choice among ESG investment products. According to Weston and Nnadi (2023) [30], confidence in corporate sustainability practices and robust ESG governance systems can motivate sustainable investments. This is possible reducing the risk of greenwashing activities.

1.9 Scope of ESG in India

Global markets have seen a huge increase in ESG investment. This had a significant impact on the Indian investors. As per data published by the Global Sustainable Investment Alliance (2023)[31], the investment in sustainable investment assets doubled to \$40.5 trillion since 2020. Indian investors were well motivated by this surge and have started investing in ESG sustainable financial instruments.

The Indian markets have replicated this global trend. Analyzing the performance shows that Nifty 100, ESG Index, in the long term, delivered much better returns as compared to its benchmarked Nifty100 Index. The average annual returns of ESG index were 1.5% more than the conventional index and generated 10.6% compared to 9.6% of conventional index. This highlights the increasing appeal of ESG sustainability focused investments (NSE Indices 2024)[32].

The Covid pandemic in 2019 greatly impacted the investment attitude towards more responsible and sustainable investments. As noted by Ghosh (2023)[33], the pandemic acted as an enabler for investors to contemplate about environmental and social factors along with economic gains. But earlier to October 2020 there was a dearth of ESG

related investment products in the Indian market. Seeing the increasing demands several asset management companies realized the potential and rushed to introduce dedicated ESG investment schemes. ICIC Prudential, Kotak, Axis, SBI, Aditya Birla and Quantum to name a few have launched mutual fund which are ESG focused, paving way for much more investor participation.

Two main ESG focused equity benchmarks dominate the Indian ESG investments: S&P, BSE 100 ESG Index and Nifty 100 ESG Index. Reports published by Morningstar and quoted by Ghosh (2023)[33] shows an upwards trend in investor involvement in ESG markets, by March 2021 the net investments reached around ₹678 crore, thus reflecting the increasing positive approach in Indian markets towards ESG investments.

Covid was a gamechanger and post pandemic period showed a significantly higher performance of ESG indices as compared with the traditional ones. This reflects the growing confidence of Indian investor in ESG products.

Post-covid era investors are becoming increasingly mindful of the impact on environment, thus reflecting a change in ESG investments in India and its growth. Current scenario reflects this with various ESG focused mutual funds options being available to investors to choose from, with different portfolio compositions and sectorial focus. The total numbers of these investment offerings available in the Indian market, like ICICI Prudential ESG Fund, Axis ESG Equity Fund, Kotak ESG Opportunities Fund, Aditya Birla Sun Life ESG Fund, SBI Magnum Equity ESG Fund, Invesco India ESG Equity Fund, Quantum India ESG Equity Fund, Quant ESG Equity Fund, HSBC Global Equity Climate Change Fund and Mirae Asset ESG Sector Leaders Fund of Fund shows the upward trend and growth in these investments.

Table 1.no. 1- ESG Fund Performance Comparison

Particulars	SBI Green Bond	Adani Green Energy Bond	ICICI Prudential ESG Exclusionary Fund	Aditya Birla ESG Integration Fund
Year of Allotment / Inception	2023	2021	2020	2020
1-Year Return (%)	~7.5% (coupon-based)	~6.8% (yield-based)	6.27%	10.15%
5-Year Return (%)	~7.2%	~6.5%	13.85%	9.87%
Average Return (%)	~7.3%	~6.65%	~10.06%	~10.01%

Growth Percentage	Low (Stable Income)	Moderate	High (Equity Growth)	High (Equity Growth)
AUM (₹ Cr as on 31 March)	Not applicable (Bond issue size ~₹10,000+ Cr)	~\$750M issue size	₹1,491 Cr	₹600 Cr (

1.10 The Growth of Artificial Intelligence in Finance and Retail Investors’ Investment Decision Making Behavior

Artificial intelligence (AI) and machine learning combined with predictive analysis, Robo-advisories and other technological advancements have also changed the way traditional financial services function. Fintech firms and traditional institutions have started incorporating these advancements into their core offerings to boost accuracy, effectiveness and improve customization. (Vuković et al. 2025) [34]. These technological advancements have not only been a boon for customers, but also the investment firms have leveraged it into their operations. Many functions like, but not limited credit assessment, fraud prevention, portfolio optimization and automated advisory have drastically improved with these technological changes. Automation and big data analytics have tremendously improved pattern discovery and generate automated insights that improve the investment decisions.

Automated investment managers (Robo-investors) have found huge acceptance amongst the Indian investors. Their role in providing portfolio management and automated investment recommendations has greatly enhanced the digital platforms and become a main benefit of AI in finance. This has led to providing widespread access to financial investment tools to retail investors as an alternative to the traditional financial advisors. Kashyap (2025) [36]. Kulkarni et al. (2025) [14] conducted further analysis into the use of AI and Robo advisory in these investment platforms and noted the positive impact of AI in alleviating behavioral bias, including excessive positivity and loss aversion. Investor specific recommendations, transparent algorithms and interactive interfaces help investors make investment decisions in a much more logical and educated manner.

All these points to the increasing role of AI in finance. As observed by Chen et al. (2024) [36], investment companies are incorporating ESG criteria into their AI driven platforms. By performing Big Data Analytics, AI can analyze the large and complex databases to substantially improve and incorporate ESG criteria to identify companies that display solid sustainability performance. It was also noticed that Robo-advisors positively influenced investors on sustainable products. Clear regulations and increased awareness play a huge role in the adoption of AI supported ESG investments. Mohapatra et al. (2025) [37]. In 2025, RBI (Reserve Bank of India) started promoting ethical and responsible use of AI in investment tools, to enhance efficiency, innovation and risk management.

Machine learning as the name suggest is a continuous learning process, hence in addition to asset evaluation, fraud detection, and market forecasting and identifying

emerging trends, the machines learn and improves using historical market data and the new data. This adaptive nature helps improve forecasting. (Chen et al. 2021) [36]

2 Research Gap

Regarding India's developing market scenario, there is a lack of research studies to find behaviors of retail investors. Like how a retail investor uses AI driven tools for making knowledgeable decisions. As per current studies investors are increasingly investigating AI tools in finance. The empirical literature on ESG investment strategies remains largely fragmented because no comprehensive framework currently exists that integrates the three major dimensions of this study, namely AI, Behavioral Finance, and Sustainable Investment. Additionally, there are limited studies assessing the influence of AI on investor behavior and decision-making processes, particularly in the context of sustainable investment adoption among retail investors. Awareness and understanding of ESG investment products remain a relatively low between retail investors when compared with traditional investment alternatives. Existing studies have primarily focused on institutional investors, investment performance, or fund outcomes, while comparatively less attention has been given to individual investor awareness, perception, and behavioral preferences towards sustainable investment instruments. Further, limited empirical evidence is available on how demographic factors, perceived risk–return trade-offs, and financial literacy influence retail investors' willingness to adopt ESG-oriented investment products. Finally, local studies focused on measuring investor trust, transparency concerns, and the effect of greenwashing on sustainable investment decisions remain limited, particularly in the Indian scenario and more specifically at the city level.

The aim of research study is to fill gaps by examining retail investors in Pune. To integrating sustainable investment understanding, behavioral factors and the growing role of AI in investment decision making

2.1 Objectives

1. To find the understanding, inclinations and opinions of investors about sustainable investment options.
2. To observe the crucial factors encouraging investors choices in acceptance or ostracism sustainable investment practices
3. To study the role of artificial intelligence in decision making process.

3 Research Methodology

3.1 Research Design

The primary approach is the use of both descriptive and analytical research. Statistical tools like t-test and co-relation analysis were implemented to understand the connections between the variables. Understanding respondents' behavior, awareness and opinions of ESG and investments pertaining to it was done using descriptive research.

3.2 Data Sources

Primary data collection was done using the Questionnaire survey methods using google forms. The survey was focused on understanding the respondents' opinions, their understanding and awareness on ESG related investment. It also looked at how their investment behavior was towards such investment products. This survey was designed not just as descriptive perspective but focused on gathering data with precise responses. Use of Likert scale statements, MCQs, and a few open-ended questions motivated the participant to explore and express their personal thoughts. This survey data became the major source for both descriptive and inferential analysis.

Secondary data was gathered from various reliable sources like publications, NSE (National Stock exchange) data, existing literatures, academic journals. To understand the current trends and progress in ESG investments, business articles, Industry reports and financial publications were used. Secondary data was also enhanced with the reports published by Association of Mutual Funds in India (AMFI), SEBI and RBI pertaining to ESG and green investment funds. Related publications released by Securities and Exchange Board of India (SEBI) and Reserve Bank of India (RBI) regarding sustainable finance and responsible investing were also studied. These secondary sources offered valuable background information, market perspectives, and conceptual foundations that supported the analysis of sustainable investment trends.

3.3 Sampling Method and Sample Size Sources

Primary To maintain diversity of the sampling, participants were chosen from differing backgrounds. People from different educational, social and occupational backgrounds were sample targets. The survey was focused categorical, qualitative, or non-numeric data collection to understand the demographic, awareness of ESG investment options and its challenges. Likert scale was used to understand the respondent's attitude toward ESG investment. This ensured that the sample size entails a good cross section of the investing community thus obtaining a widespread and diverse assessment of their investment practice especially with regards to ESG/sustainable investments. The survey was conducted across various diverse localities in Pune (Swargate, Katraj, Bibewadi and Kothwa). 150 respondents were targeted of which 115 responded. Based on the quality 102 of these were chosen as the sample for final analysis.

3.4 Data Collection Procedure

A well-thought-out Google Form survey was devised based on the research purposes. The form was distributed digitally through social media and emails. Respondents were made aware about the objectives of study and participation remains voluntary. Secrecy and privacy of responses were maintained.

4 Data Analysis and Findings

The gathered data was explored by means of both descriptive and inferential statistical techniques to fathom sustainable investment trends amongst retail investors in Pune. The correlation and t-test were conducted to find a relationship among variables and associate independent groups of investors to examine mindsets' importance.

Table 2.- Descriptive Statistics of Key variables (N = 102)

Variable	Mean	Std. Deviation	Interpretation
Awareness of Sustainable / ESG Investing	3.324	0.987	Moderate awareness
Sustainable investment for long-term returns	3.520	0.931	Moderate agreement
Motivation to support SDGs	3.520	0.898	Moderate agreement
Sustainable investing reduces climate/regulatory risk	3.941	1.013	High agreement
Interest in creating social/environmental impact	4.137	1.034	Strong agreement
Environmental factors in investment decisions	3.961	0.922	High importance
Social factors in investment decisions	3.745	0.792	Moderate importance
Governance factors in investment decisions	4.029	0.826	High importance
ESG firms provide better long-term returns	3.990	0.949	Positive perception
Willingness to increase ESG investment	3.392	1.036	Moderate future intention
Future likelihood of investing in ESG products	4.020	0.844	High future acceptance

Objective (1): Awareness, Perception and Preferences

The descriptive analysis shows that retail investors in Pune have a moderate degree of awareness vis-à-vis ESG-related investments with a typical score of 3.324. The outcomes show that respondents give importance on the positive social and environmental outcomes related with sustainable investing, suggested in a mean score of 4.137.

In the same way, investors have realized the ability of ESG investments in mitigating risks through an average score of 3.941. Also, corporate governance elements were seen as very important since the average score for this was 4.029. This means that investors are slowly accepting the idea that ethical management can make their investments more appealing.

Despite of moderate levels awareness about ESG the respondents show inclinations towards sustainable. The analysis represents high mean score of 4.020 for future investment intention this indicates a positive attitude for the acceptance of ESG based investment opportunities.

Objective (2): Factors Influencing Adoption or Avoidance

The result suggest that retail investors deliberate both financial performance and sustainability factors when making investment assessments. Ahigh mean score of 3.990 indicates trust for companies which has expressive ESG performance which will give turns in long term. Same time respondents reveal enthusiasm for accepting lower financial returns in exchange for sustainability benefits which is reflected by a mean score of 3.108. This finding indicates that although sustainability deliberations are valued, but the financial returns remain the main factor for investment decisions for investors.

Table 3.- Usage of AI in investment

Group	N	Mean
AI Users	73	4.110
Non-AI Users	29	3.793

$t = 1.601, p = 0.116$

The table 3 results show that respondents who use AI based investment platforms show a slightly higher inclined towards investing in sustainable financial options as compared to other non-AI based platform users. The analysis shows that the p-value exceeds 0.05, which means that it is not statistically significant. The analysis indicates that artificial intelligence works as support in the investment decision-making process among retail investors in Pune.

4.1 One-Way ANOVA: Age Group and Sustainable Investment Awareness

Table 4. - One-Way ANOVA

Variable	F-value	Sig. (p-value)	Decision
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Sustainable Investment Awareness across Age Groups	2.14	0.098	Not Significant
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The table 4 indicates that sustainable investment awareness does not differ significantly ($p > 0.05$) across the age groups. The results recommend that awareness is influenced more by investment experience, access to information and financial literacy as compared to age. This indicates prominence of investor education to encourage ESG investment.

Table 5. - Independent Samples T-Test Based on Sustainable Investment Awareness

Awareness Level	N	Mean Sustainable Investment Intention	Std. Deviation	t-value	p-value
Low Awareness (1–3)	52	3.48	0.84	-2.167	0.033
High Awareness (4–5)	50	3.94	0.79		

According to table 5 shows, there is a statistically significant difference between high and low awareness investors ($p=0.033$). High awareness investors had inclined towards ESG investments and other sustainable financial products. This finding is proof of positive influence of awareness on investment preferences.

Table 6.- Independent Samples T-Test Based on Investment Experience

Investment Experience	N	Mean Awareness Score	Std. Deviation	t-value	p-value
Low Experience (No Experience to 3 Years)	72	3.42	0.88	-2.014	0.047
High Experience (Above 3 Years)	30	3.89	0.81		

Table 6 presents t-test which reveals that statistically significant difference between awareness of ESG and sustainable finance products among respondent based on their level of investment experience ($p\text{-value}=0.047$). Investors more than three years of investment experience shows improved awareness of sustainable finance products.

Table 7.- Independent Samples T-Test Based on Age Group

Age Group	N	Mean Awareness Score	Std. Deviation	t-value	p-value
Young Investors (18–25 Years)	77	3.51	0.86	-1.756	0.082

Mature Investors (Above 25 Years)	25	3.87	0.79		
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The independent samples t-test revealed (Table 7) that matured investors demonstrate slightly higher levels of awareness about sustainable investing compared to young investors. Nevertheless, the difference was not statistically significant ($p = 0.082$). Thus, it can be claimed that age is not a significant variable in determining ESG awareness. Opposite to this ESG awareness appears to be related to factors such as investment knowledge and investment experience which are in line with the research objectives of understanding what factors influence retail investor participate in sustainable investments.

4.2 t-Test – Gender Differences in Sustainable Investment Perceptions

Table 8. - t-test Interpretation: - Gender Differences in Sustainable Investment Perceptions

Statements	Group 1 Mean (Male)	Group 2 Mean (Female)	T - Statistic	P-Value	n1 (Male)	n2 (Female)
I consider sustainable investing because it can provide higher financial returns in the long term.	3.533	3.5	0.183	0.85522	60	42
I am motivated to invest sustainably to support the United Nations Sustainable Development Goals (SDGs).	3.45	3.619	-0.923	0.35847	60	42
I believe that sustainable investing helps in reducing risks such as climate risk and regulatory risk.	3.867	4.048	-0.914	0.36279	60	42
I am interested in sustainable investing to create a positive social or environmental impact through my investments.	4.033	4.286	-1.256	0.21224	60	42

Table 8 display results of t-test. The t-test has been used to scrutinize that gender is related with different views on the sustainable investing among retail investors. The p-values larger than 0.05 for each pair indicates there is no statistically significant gender differences demonstrated for all the four dimensions. There are similar opinions from men and women investors regarding the profitability of sustainable investments, the ability to use sustainable investments to manage climate

and regulatory risks, SDG relevance and social/environmental benefits of sustainable investments. Additionally, there remain minor variances between mean scores of men and women, but it failed to be statistically significant.

The data analysis results shows that gender does not influence retail investors about sustainable investments in Pune. Both male and women investors demonstrate the same attitude towards financial benefits, risk management, SDGs relevance and social impacts of sustainable investments. Therefore, preferences for sustainable investment seem to be related to the individual characteristics of investors like awareness level, investment experience and financial literacy.

4.3 Correlation

Table 9. Correlation in ESG fund

<i>Particulars</i>	<i>State Bank of India (SBI) Green Bond</i>	<i>Adani Green Energy Limited Bond</i>	<i>ICICI Prudential ESG Exclusionary Strategy Mutual Fund</i>	<i>Aditya Birla Sun Life ESG Integration Strategy Mutual Fund</i>
State Bank of India (SBI) Green Bond	1			
Adani Green Energy Limited Bond	0.490241923	1		
ICICI Prudential ESG Exclusionary Strategy Mutual Fund	0.242191955	-0.039151551	1	
Aditya Birla Sun Life ESG Integration Strategy Mutual Fund	0.114515821	-0.122304809	0.553483717	1

The above table 9 presents correlation analysis to examines the relationship among four Sustainable and ESG-Focused Financial Instruments in India. ICICI Prudential ESG Exclusionary Strategy Mutual Fund and Aditya Birla Sun Life Energy Strategies Integration Strategy mutual fund shows the highest positive correlation which suggest that

both funds have a similar in terms of developing ESE principles ($r = 0.553$). The relationship between the SBI Green Bond and Adani Green Energy Bond is moderately positive ($r = 0.490$). On the other hand, the correlations between green bonds and ESG mutual funds were usually low ranging from -0.122 to 0.242 . These results demonstrated that sustainable investment products have different patterns of performance. ESG mutual funds display higher degree of alignment with each other whereas green bonds display unlike behavior, suggesting that retail investors seeking sustainable investment portfolios can benefit from diversification.

5 Findings

Sustainability of investment approach, investor motivations, influencing factors and role of Artificial Intelligence (AI) perceived by retail investors in Pune were also examined. The study indicates that the knowledge of ESG funds, green bonds, and sustainable investment products is growing more quickly, but many investors still need to be more knowledgeable and educated before taking an interest in sustainable finance. According to the results, financial returns remain the most important factor when deciding on sustainable investment. Meanwhile, environmental impact and social benefits also became major considerations, indicating that investment is increasingly being directed towards the balance between financial goals and general sustainability targets. They concluded that "investor education and awareness are the strongest drivers of increased participation in sustainable investment products".

A significant impact on sustainable investment behaviour can be attributed to investment experience and awareness, as demonstrated by the t-test. Investors with more market experience and awareness of the ESG were more likely to invest in these products. Despite this, age did not have a significant impact on sustainable investment awareness, suggesting that knowledge and exposure are more valuable than demographic traits. ESG mutual funds exhibit stronger correlations than green bonds, as demonstrated by the correlation analysis indicating variations in performance across sustainable asset classes. Diversification opportunities can be achieved within investment portfolios using sustainable investment products.

According to the results, AI is seen as a beneficial aid for investors in comprehending investment data and improving decision-making capabilities. Even so, investors are still reliant on their own judgment when it comes to making final investment decisions.

6 Discussions

The study shows that retail Indian investor is still warming up to the idea of ESG investments. Dearth of information and lower awareness of green bonds impact broader partaking in sustainable investment.(Ghosh2023, Sakhi et al.2026)[33][38]. Respondents also implied increased awareness, training, transparency and simplifies ESG communication would improve their confidence. This points to the fact that investors are cautious of the risk and returns though they somewhat understand the usefulness of ESC products. Indian retail investors desire the human judgement and view AI-enabled

investment tools with limited trust and clarity, despite their fact that these tools help in faster analysis and decision making.(Ionescu 2025) [39]. A balanced approach, with transparency and clarity into ESG is required, which enables AI assisted human decision making rather than a fully AI driven approach for sustainable investing in Indian context.

7 Conclusion

The research concentrated on sustainable investment awareness, the effect of Artificial Intelligence (AI) and investor inspirations on investment decisions among retail investors in Pune. Findings recommend that interest in sustainable investment products is growing but understanding and awareness of ESG concepts are still in developing stage. Many investors have shown interest in investigating sustainable investment choices but lack of sufficient clarity on the criteria for assessing ESGs and invest wisely.

Still investment decisions are influenced by the financial return with environmental and social factors being focused in the study. Retail investors have to balance their financial goals with the benefits of sustainability when assessing their investments. This is an unvoiced implication. The study data analysis demonstrate that investment experience and awareness were positively correlated with sustainable investment purpose while demographic attributes like gender and age had a restricted influence on investor perceptions.

The study discovered that ESG mutual funds have stronger relations with each other than green bonds, indicating dissimilarity in the activities of sustainable financial instruments and their possibility to diversify investment portfolios. Additionally, the AI based investment tools are getting popular for improving information accessibility and simplifying investment analysis. Nevertheless, the final decision about the investment is still typically determined by personal opinions.

By endorsing ESG literacy, investor education, transparency and enhancing the use of AI driven financial tools in India can strengthen sustainable finance growth.

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9 Disclosure of Interests

The authors have no competing interests to declare that are related to the content of this article.

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