ANTECEDENTS INFLUENCING GREEN ENTREPRENEURIAL INTENTIONS AMONG MANUFACTURING SMES OF PUNJAB

Thesis Submitted for the Award of the Degree of

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in

Commerce

By

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DECLARATION

I, hereby declared that the presented work in the thesis entitled "ANTICEDENTS INFLUENCING GREEN ENTREPRENURIAL INTENTIONS AMONG MANUFACTURING SMES OF PUNJAB" in fulfilment of degree of **Doctor of Philosophy (Ph. D.)** is outcome of research work carried out by me under the supervision Dr. Pawan Kumar, working as Professor, in the Mittal School of Business of Lovely Professional University, Punjab, India. In keeping with the general practice of reporting scientific observations, due acknowledgements have been made whenever work described here has been based on findings of other investigator. This work has not been submitted in part or full to any other University or Institute for the award of any degree.

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CERTIFICATE

This is to certify that the work reported in the Ph.D. thesis entitled "ANTICEDENTS INFLUENCING GREEN ENTREPRENEURIAL INTENTIONS AMONG MANUFACTURING SMES OF PUNJAB" submitted in fulfilment of the requirement for the reward of degree of Doctor of Philosophy (Ph.D.) in the Mittal School of Business, is a research work carried out by Harmanpreet Singh, Registration No. 12224409, is Bonafide record of his original work carried out under my supervision and that no part of thesis has been submitted for any other degree, diploma or equivalent course.

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ABSTRACT

Purpose

Green entrepreneurship has recently garnered significant attention due to the impacts of climate change and the ever-increasing scarcity of natural resources, particularly within the manufacturing sectors of emerging economies. From an industrial perspective, the Punjab region in India is a major industrial hub, comprising numerous small and medium enterprises (SMEs) that fall within environmentally sensitive industry categories. However, among these environment-conscious SMEs—which are expected to lead the transition—the adoption of green business models remains slow, primarily due to policy-driven constraints and regulatory challenges. This research aims to explore the factors that shape the green entrepreneurial intentions of SME owners in Punjab. Specifically, it seeks to assess awareness of green entrepreneurship, analyze perceived barriers and opportunities, and examine the antecedents influencing SME owners' green entrepreneurial intentions. Additionally, the study investigates the moderating impact of entrepreneurship education on the relationship between personality traits and green entrepreneurial intentions. By focusing on the behavior and context of environmentally responsible entrepreneurship in a developing country, this research addresses a critical gap in the literature.

Design/Methodology/Approach

This study employed a convergent parallel mixed-method research design. In the qualitative phase, 38 SME owners were purposively selected from the textile, leather, steel, metal, and rubber industries due to their significant environmental impact. Data were collected through semi-structured interviews and analyzed using thematic analysis in NVivo software to identify key themes related to green awareness, opportunities, and perceived barriers.

In the quantitative phase, 421 valid responses were obtained from SME owners and managers across five major manufacturing districts in Punjab: Ludhiana, Jalandhar, Amritsar, SAS Nagar (Mohali), and Fatehgarh Sahib. The study measured constructs including Green Entrepreneurial Intentions, Personality Traits, Organizational Culture, Entrepreneurial Education, Norms, and Motivation through a structured questionnaire using a seven-point Likert scale. Purposive and quota-proportional sampling techniques ensured adequate representation of the target population. Reliability and validity were confirmed using composite reliability, convergent validity, and discriminant validity.

For statistical analysis, Partial Least Squares Structural Equation Modelling (PLS-SEM) was performed using SMART-PLS version 4.0. This method was selected for its suitability in predictive modeling, particularly for complex models with multiple constructs, indicators, and moderating effects. The analysis began with an assessment of the measurement model, followed by bootstrapping to evaluate the structural model. Moderation effects were examined to identify significant and impactful relationships among constructs. Additionally, PLS

prediction analysis assessed the model's predictive relevance, and Importance-Performance Map Analysis (IPMA) identified the most influential and well-performing constructs in relation to their performance within the framework.

Findings

The findings of this study are particularly noteworthy due to the integration of qualitative and quantitative methods within a single research design in the context of green entrepreneurship. The qualitative phase revealed that stakeholders across almost all sectors demonstrate awareness of green entrepreneurship and its various dimensions. Key themes identified include Green Technology Awareness, Green Education and Skill Awareness, Industry Collaboration for Green Awareness, Green Subsidy Awareness, Green Legislation Awareness, and Environmental Pollution Awareness. These insights were derived from thematic analysis and supported by visual representations, including word clouds and hierarchical charts generated from interview transcripts.

The research further indicated that a considerable proportion of SMEs are actively pursuing areas of green entrepreneurship. Major opportunities identified include adopting Green Manufacturing Technologies, Access to Green Practice Incentives, Leveraging Sustainable Market Demand, Owners' Personality and Visionary Leadership, and Development of a Sustainable Organizational Culture. These themes, along with their subthemes, highlight fundamental factors that can facilitate the transition toward green business practices.

Conversely, the study identified five primary barriers restricting the adoption of environmentally friendly practices: Ambiguous Regulatory Frameworks, Financial Resource Limitations, High Costs of Green Infrastructure, Market-Related Challenges, and Risk Aversion coupled with Traditional Business Mindsets. These barriers encompass regulatory, financial, and sociocultural factors that continue to impede SMEs in Punjab from fully embracing green entrepreneurship.

Quantitatively, the study developed an integrative framework identifying the primary antecedents driving green entrepreneurial intentions (GEIs). This higher-order model, featuring a reflective-formative structure, underwent rigorous assessment for robustness. Following Hair et al. (2019; 2022), reliability and validity were confirmed with outer loadings above 0.65 and composite reliability values ranging from 0.70 to 0.95. The model explains 77.7% of the variance in green entrepreneurial intentions ($R^2 = 0.777$), surpassing the substantial impact benchmark ($R^2 > 0.67$) and reinforcing confidence in the predictive validity of the identified antecedents.

Model fit indices further supported validity. For the saturated and estimated models, Standardized Root Mean Square Residual (SRMR) values were 0.05 and 0.051, respectively, both below the recommended cutoff of $\leq$ 0.08 (Hu & Bentler, 1999), indicating a satisfactory model-data fit.

Finally, the study examined the moderating effect of entrepreneurship education on the relationship between personality traits and green entrepreneurial intentions. Although visual inspection of the slope diagram suggested potential moderation, statistical tests indicated no significant effect. This implies that while entrepreneurial education is valuable, it may not substantially influence how personality traits shape intentions to engage in green entrepreneurial activities within the context of this study's model.

Research Implications / Limitations

This research proposes a multidimensional framework for understanding green entrepreneurial intentions within manufacturing SMEs in emerging economies, offering unique theoretical and practical implications. Unlike previous studies that often treat green entrepreneurship as a static or isolated construct, this study integrates psychological factors (personality traits and motivation), organizational factors (culture and education), and environmental factors (awareness) to provide a more holistic understanding of green entrepreneurial intentions and behavior.

The study strengthens its contributions by combining quantitative validation with rich qualitative insights from SME owners, employing a mixed-methods approach. This methodological rigor offers a model for future research, encouraging scholars to adopt comprehensive approaches when examining sustainable entrepreneurship. Additionally, the study identifies underexplored moderators, such as entrepreneurial education, and highlights the differential influence of culture, infrastructure, and regulatory frameworks on green intentions across regions, opening avenues for comparative and longitudinal research. Furthermore, insights on visionary leadership, market resistance, and enabling and constraining factors provide a roadmap for studying the dynamics of sustainability-driven entrepreneurship amid evolving climate and policy contexts.

More broadly, this research invites reconsideration of green entrepreneurship not merely as an economic pursuit but as a multidimensional, value-driven response to sustainability challenges—both individually intentional and systemically influenced.

However, some limitations must be acknowledged. First, the focus on SMEs in Punjab restricts the generalizability of the findings, as regional socio-economic, regulatory, and cultural factors may shape green entrepreneurial intentions differently than in other states or countries. Future research could enhance generalizability by expanding the sampling frame or conducting cross-country comparisons. Second, reliance on self-reported data introduces potential social desirability and response biases, despite measures taken to ensure anonymity and clarity. Finally, the cross-sectional design limits the ability to capture dynamic changes in green entrepreneurial intentions over time; longitudinal studies would better observe the formation and implementation of sustainable practices.

Despite these limitations, this research provides a strong foundation for future investigations. It calls for longitudinal, multi-regional, and sector-specific studies to validate and refine the framework further. The

constructs and contextual factors identified here can also serve as a basis for developing targeted solutions and policy recommendations to promote green entrepreneurship effectively.

Practical Implications

The study offers practical insights for a diverse range of stakeholders. For policymakers, it emphasizes the importance of understanding the key antecedents influencing green entrepreneurial intentions among SME owners, which can guide the design of enhanced environmental regulations and financial incentives to promote green practices. Educational institutions can incorporate green entrepreneurship courses into their curricula to cultivate environmentally responsible mindsets among future entrepreneurs. Industry leaders can leverage the findings to develop strategic interventions that foster proactive personality traits and strengthen green entrepreneurial intentions. Furthermore, the study highlights major themes related to awareness, opportunities, and barriers, which stakeholders can utilize to increase awareness, mitigate challenges, and enhance perceived opportunities. Financial institutions and government bodies can also create targeted funding models to support SMEs in transitioning to green business models, informed by both qualitative and quantitative analyses. Finally, the findings encourage NGOs and community-based organizations to establish networks and alliances that contribute to building a robust green entrepreneurial ecosystem.

Originality of the Study

This research is among the first empirical studies in Punjab to examine green entrepreneurial intentions in manufacturing SMEs using a mixed-methods convergent parallel design. It introduces a novel and integrative model that identifies the key antecedents driving green entrepreneurial intentions among SME owners. A particularly original contribution is the exploration of entrepreneurship education as a moderator between personality traits and green entrepreneurial intentions—a relationship that remains under-researched in existing literature.

Another distinctive aspect of this study is its qualitative depth. Through semi-structured interviews and thematic analysis, the research captures the experiences and subjective realities of SME owners in Punjab. These qualitative insights reveal an implicit but previously under-articulated understanding of green entrepreneurship within the socio-cultural and regulatory context, highlighting a range of factors that shape entrepreneurial intentions.

By integrating qualitative and quantitative findings, the study not only validates the proposed model but also enriches it with contextual relevance. This dual focus advances a holistic understanding of green entrepreneurship and provides practical guidance for policy and practice. Such insights are particularly valuable for developing countries like India, as they identify context-specific drivers and mechanisms for promoting sustainable practices within the SME sector.

Keywords

Green Entrepreneurship; Manufacturing SMEs; Punjab; Smart PLS; Entrepreneurial Intentions; Mixed-Method Research; Sustainable Development

PREFACE

First and foremost, I express my deepest gratitude to the Almighty for bestowing upon me the strength, patience, and perseverance to carry forward this research journey. Without divine grace, the completion of this Ph.D. would not have been possible.

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INTRODUCTION

1.1. Introduction

1.1.1 Overview of Green Entrepreneurship

Green entrepreneurship has been viewed as a form of innovation for resolving the sustainability and development paradox (Gibbs, 2006; Hall et al., 2010). It undergoes in-depth micro-analysis to encapsulate aspects of a business that designs eco-friendly methods to ensure environmentally sound profit making (Schaltegger & Wagner, 2011). In the context of climate change, resource depletion and environmental degradation, green entrepreneurship makes a significant contribution towards innovation and sustainable development (York & Venkataraman, 2010b). Green entrepreneurs, through their business practices, help in resource preservation and reduction of ecological destruction by adopting green measures that help lower the carbon footprint and conserve limited resources (Isaak, 2002). The significance of green entrepreneurship is accentuated with the United Nations framework for advocating sustainable development goals (SDGs), more precisely, the goal 9 (Industry, Innovation, and Infrastructure) and goal 12 (Responsible Consumption and Production) (Nations, 2015). These goals underline the need to develop industrial processes devoid of practices harmful to the ecosystem and put forward innovative approaches to issue-related environmental disturbances.

Table1.1: A Review of Key Definitions from Scholarly Sources

Source	**Definition of Green Entrepreneurship**
(Berle, 1993)	The term green entrepreneurship can be defined as creating economically viable businesses while incorporating environmentally friendly and conservational practices.
(Elkington & Burke, 1989)	An emerging strategy where business entrepreneurs combine strategic planning with ecological considerations in solving environmental problems and fostering development.
(Anderson, 2000)	The particular approach of analysing and taking advantage of opportunities for creating value using “green” products, services, or processes aimed at protecting the environment.
(B. Cohen & Winn, 2007)	Entrepreneurship involves addressing market failures that stem from environmental issues while simultaneously turning challenges into opportunities via innovation at both ecological and economic dimensions.

(UNEP, 2011)	Green entrepreneurship entails the development of businesses whose activities fundamentally incorporate environmental considerations to promote ecological, economic, and social advancement.
(Hall et al., 2010)	An entrepreneurship paradigm of the present that aims at resolving critical ecological problems of concern through creative, impactful, and scalable business models.
(Kirkwood & Walton, 2010)	Green entrepreneurship entails the particular branch of entrepreneurship that seeks to create and put into action solutions for issues affected by climate change and fosters social change in a way that there is no damage to nature.

Source: By Author

1.1.2 Green Entrepreneurship Intentions

Green entrepreneurial intentions refer to a person's effort and willingness to create or modify companies that operate in a socially responsible manner to protect the environment while making a profit (Schaltegger & Wagner, 2011; Kautonen et al., 2015). These intentions are grounded in the Theory of Planned Behavior (Ajzen, 1991) which asserts that intentions are determined by attitudes, subjective norms, and perceived behavioral control.

Environmental awareness, entrepreneurial education, and socio-cultural values further impact this determinant (Hockerts & Wüstenhagen, 2010). Intentions toward green entrepreneurship are informed by the perceived advantages of sustainable practices like reducing carbon footprints, conserving resources, and enhancing society (Kirkwood & Walton, 2010). Subjective norms capture the influence of social and cultural dimensions, including family and community support for green practices (Hannibal et al., 2016). Confidence in undertaking green initiatives is determined by perceived behavioral control, shaped by the availability of resources, knowledge, and external support systems (Fayolle & Gailly, 2015). Understanding green entrepreneurial intentions is important because they serve as the fundamental driver to actual entrepreneurial action (Krueger Jr et al., 2000). There is evidence that promoting green intentions among owners of SMEs can drive the adoption of green technologies and practices, thus aligning business objectives and environmentally sustainable goals (Hoang & Bui Thanh, 2021). In addition, government support, availability of green financing, and entrepreneurial education also significantly influence these intentions (Roxas & Chadee, 2013).

1.1.3 Green Entrepreneurship Intentions in Punjab

Punjab is renowned for its agriculture-rich industries yet faces mounting socio-ecological issues as a byproduct of its manufacturing sector. The state’s small- and medium-sized enterprises, especially within the textile, leather, and furnace industries, are being held to greater scrutiny to address their ‘pollution’ concerns. In this

regard, it is imperative to note that green entrepreneur intentions are emerging as a means of alleviating the problem while pursuing socio economic development. Local entrepreneurs are slowly beginning to appreciate the need to adopt environmentally-friendly business practices such as combating pollution, protecting dwindling resources, and complying with evolving regulations. The change, however, is often slowed due to insufficient awareness, lack of finances, and entrenched profit-centered short-term strategies. Regardless, renewable energy and waste management advocacy alongside sustainable production initiatives are gradually shifting entrepreneur mentalities towards improved business sustainability in Punjab. These changes illustrate the importance of actively fostering green intentions among SME owners to help balance the region's economy and environment.

1.1.4 Definition of Manufacturing Industry

Different types of activities undertaken in an industry for the production, modification, and processing of goods for consumption, sale, or distribution in the market are termed as the manufacturing industry. The term *"manufacturing process"* in Section 2(k) of the Factories Act, 1948, is defined as operations such as making, modifying, repairing, ornamenting, finishing, packing, cleaning, demolishing, and other activities that prepare an article or substance for use. It also encompasses activities such as pumping oil and water, power generation and distribution, printing, bookbinding, ship construction and repair, and the preservation of goods, including cold storage. The term *"machinery"* is further defined in Section 2(j) of the Act to include appliances such as main movers, devices for transmitting power, and other tools used for constructing, changing, and applying energy in manufacturing activities. A *"factory"* is defined in Section 2(m) as a place where *"manufacturing processes"* are carried out, with or without the assistance of power-driven machinery. This definition applies where there are 10 or more workers with power, or 20 or more workers without power, employed on any day of the previous year, except in the case of mines, mobile units of the armed forces, railway running sheds, and establishments such as hotels and restaurants.

1.1.5 Small and medium-size Enterprises

SMEs serve as the backbone of a nation's wealth due to their significant impact on employment and economic growth. As noted by Yacob et al. (2019), SMEs account for approximately 70% of businesses in most developing countries. Promoting green entrepreneurship among small and medium enterprises (SMEs) in developing nations is therefore crucial for achieving sustainable development. In India, SMEs play a pivotal role in the economy. According to *Forbes*, they contribute nearly 30% of India's GDP and employ around 40% of the population. Most SMEs in India focus on manufacturing, trade, and services, while also contributing to the emerging economy through innovative ideas and entrepreneurial ventures. However, despite these positive attributes, SMEs face challenges in meeting the country's climate change obligations and transitioning toward a carbon-free economy, largely due to their fragmented and vulnerable nature. Considering the country's

resource extraction scenario and existing inequalities, it has become urgent to implement policies aimed at achieving environmental sustainability.

Transforming or establishing businesses as eco-friendly ventures is now one of the most flourishing trends, offering vast opportunities through innovative models and strategies. Making SMEs eco-conscious will not only conserve the environment but also help businesses attract consumer interest, given the growing shift toward eco-friendly and organic products. These industries can be further nurtured to advance the goal of environmental sustainability by bringing more businesses under their scope. To support this, the Ministry of MSME provides guidance through the *Champion Portal*, which assists entrepreneurs in business formation and upgrading. Recent policies have encouraged small businesses to adopt environmentally friendly techniques to expand their operations. Initiatives such as the ZED Certification Scheme and Quality Certification foster collaboration among MSMEs, organizations, and trade associations to promote sustainable practices (MSME, n.d.).

Table 1.2: SME classification (According to Union Budget 2025)

CLASSIFICATION (Manufacturing Enterprises and Enterprises rendering services)	SMALL	MEDIUM
Investment in Plant and Machinery or equipment:	Not more than Rs. 25 crores	Not more than Rs. 125 crores
Turnover	Not more than Rs. 100 crores	Not more than Rs. 500 crores

Source: By Author

Table 1.3: SMEs classification (As per official gazette 2020)

CLASSIFICATION (Manufacturing Enterprises and Enterprises rendering services)	SMALL	MEDIUM
Investment in Plant and Machinery or equipment:	Not more than Rs. 10 crore	Not more than Rs. 50 crore
Turnover	Not more than Rs. 50 crore	Not more than Rs. 250 crore

Source: By Author

1.1.6 Context of the Manufacturing Industry in Punjab

Punjab, India, is exceptionally important for industrial development because of its diverse and strong industries, which in turn contribute significantly to the state's overall economic growth. The manufacturing sector in Punjab includes textiles, automotive parts, sporting goods, light engineering, and leather, all of which contribute to India's GDP. Ludhiana and Jalandhar serve as major clusters for light engineering and hand tools production, while Punjab is also the leading exporter of automotive components. In addition, Ludhiana—often referred to as the *Manchester of India*—is renowned for its textile industry, which exports large volumes of knitwear, thereby strengthening Punjab's economy and positioning the state as a vital region in India's supply chain. According to the Punjab Data Portal, the state has 11,762 industrial SMEs, which constitute about 49.8% of the total SMEs in Punjab (MSME, n.d.-a). These small-scale businesses play a crucial role in shaping the industrial landscape of the state but also pose serious challenges to environmental sustainability. Industrialization has contributed to worsening air and water pollution, particularly in Ludhiana, Jalandhar, and Amritsar, where untreated industrial wastewater is discharged into rivers and other water bodies.

Table 1.4: Number of Manufacturing SMEs in Punjab

Serial No.	Selected States	No of Units
1.	**LUDHIANA**	**5529**
2.	**JALANDHAR**	**1046**
3.	**AMRITSAR**	**873**
4.	**SAS NAGAR**	**821**
5.	**FATEHGARH SAHIB**	**597**
6.	**PATIALA**	**516**
7.	**SANGRUR**	**457**
8.	**BATHINDA**	**324**
9.	**HOSHIARPUR**	**173**
10.	**GURDASPUR**	**168**
11.	**KAPURTHALA**	**162**
12.	**SRI MUKTSAR SAHIB**	**161**

13.	**FAZILKA**	**149**
14.	**MOGA**	**125**
15.	**MANSA**	**109**
16.	**FIROZEPUR**	**106**
17	**BARNALA**	**102**
18	**FARIDKOT**	**102**
19	**RUPNAGAR**	**75**
20	**PATHANKOT**	**73**
21	**SHAHID BHAGAT SINGH NAGAR**	**38**
22	**TARN TARAN**	**36**
23	**MALERKOTLA**	**20**

(Source: MSMEs Dashboard 2023)

1.2 Background of the Study

1.2.1 Evolution of the Green Entrepreneurship

Green entrepreneurship is an umbrella term that has evolved over the years in response to heightened concern over environmental issues, regulatory policies, and society's growing demand for sustainable practices. The concept arose from ecological awareness in the late 20th century. Global movements such as the Stockholm Conference on the Human Environment (1972) and the Brundtland Report (1987) emphasized the importance of sustaining resources for economic development while safeguarding the environment, thereby coining the term *sustainable development* (UNEP, 2011). These movements triggered a shift in entrepreneurial approaches. By the 1990s, the introduction of environmental policies and eco-labeling encouraged more businesses to adopt eco-friendly practices. It was during this period that the notion of "ecopreneurs" emerged—individuals who integrated environmental concerns with entrepreneurial ventures. Around the same time, the Triple Bottom Line (TBL) framework was introduced, which emphasized balancing economic profitability with environmental and social responsibilities (Elkington, 1998). From a theoretical standpoint, this framework underpinned the foundations of green entrepreneurship by providing a deeper understanding of its scope and functions.

In this context, several theories provide a rationale for shaping green entrepreneurship. Institutional theory explains how organizations adopt green practices in response to regulatory, normative, and cognitive pressures. Psychologically, the Theory of Planned Behavior (TPB) addresses intentions to engage in sustainable business practices by integrating beliefs, subjective norms, and perceived behavioral control (Ajzen, 1991). The Resource-Based View (RBV) highlights how firms utilize tangible and intangible resources—such as knowledge and innovation—to develop green technologies (Barney, 1991). Collectively, these theories contribute to understanding the driving factors of green entrepreneurship.

Over the last two decades, green entrepreneurial activity has expanded, driven by climate change, resource scarcity, and environmental degradation. International agreements such as the Kyoto Protocol (1998) have played a significant role in encouraging countries to adopt green governance policies. At the same time, technological advancements in renewable energy, waste management, and the circular economy have further enabled entrepreneurs to pursue sustainable solutions. For example, the wind and solar power industries are emerging as fast-growing markets aligned with sustainability goals.

In India, the rise of environmental challenges, combined with government support, has fostered the development of green entrepreneurship. Initiatives such as the National Action Plan on Climate Change (NAPCC) and the Startup India Mission have encouraged the establishment of eco-friendly enterprises in sectors like renewable energy, sustainable agriculture, and green manufacturing (MoEFCC, 2023). In Punjab, the relevance of green entrepreneurship has increased due to the environmental impact of the region's manufacturing industries. Locally initiated projects promoting solar energy, waste management, and resource efficiency present promising prospects for sustainable entrepreneurial development. However, the pace of adoption remains slow due to limited awareness, inadequate funding, and weak institutional support.

Despite the progress made, significant challenges persist. These include restricted access to green financial products, gaps in technological knowledge, and inconsistent enforcement of environmental laws. Moreover, there is an urgent need to integrate green entrepreneurship education into curricula to nurture a culture of sustainability among future entrepreneurs. In regions such as Punjab—where industrial progress often comes at a severe environmental cost—it is imperative to build a stronger ecosystem for green entrepreneurship. Strengthening public–private collaboration, expanding green subsidies, and reinforcing policy frameworks are critical steps toward advancing sustainable entrepreneurial practices.

Table 1.5: Evolution of the Green Entrepreneurship through policies

Year	Event/Policy	Impact on Green Entrepreneurship
1972	Stockholm Conference on the Human Environment	First major global discussion on environmental sustainability. Raised awareness about integrating environmental concerns into economic policies.
1987	Brundtland Report (Our Common Future)	Introduced the concept of sustainable development economic growth without compromising environmental resources.
1990s	Rise of Ecopreneurs & Environmental Regulations	Businesses started adopting eco-friendly innovations due to stricter environmental policies and eco-labelling practices.
1997	Kyoto Protocol	Legally binding international agreement to reduce greenhouse gas emissions, prompting industries to seek greener alternatives.
1998	Triple Bottom Line (TBL) Framework (Elkington)	Introduced a sustainability model balancing economic, social, and environmental goals in entrepreneurship.
2001	Institutional Theory (Scott)	Explained how regulatory, normative, and cognitive structures influence businesses to adopt sustainable practices.
2015	Paris Agreement	Strengthened commitments to reduce carbon emissions, leading to more incentives and policies supporting green businesses.

2008	National Action Plan on Climate Change (NAPCC)	Launched eight missions focusing on renewable energy, sustainable agriculture, and climate adaptation.
2016	Startup India Initiative	Encouraged innovation and entrepreneurship, including support for green startups and sustainable businesses.
2023	Strengthening Green Entrepreneurship Policies	Indian government introduced updated green policies under NAPCC and Startup India, including enhanced subsidies, incentives, and funding for sustainable businesses.

Source: By Author

1.2.2 Global Conventions Addressing Environmental Challenges

Considering the negative impact of industrial activities on the environment, several global conventions have been established to regulate emissions, hazardous waste, and pollutants. The United Nations Framework Convention on Climate Change (UNFCCC) introduced the Paris Agreement in 2015, which, as of 2023, has 195 signatories and 193 ratifications. Its goal is to limit the rise in global temperature to well below 2°C, with efforts to restrict it to 1.5°C through nationally determined contributions (NDCs). The European Union has pledged to reduce emissions by 55% by 2030, while China has committed to peaking its emissions before 2030.

The Basel Convention of 1989, which came into force in 1992, has 189 parties and regulates the illegal transboundary movement of hazardous waste and materials. Exports of such waste have declined significantly, falling by nearly 60% between 2001 and 2019—from 10 million metric tons to 4 million metric tons. Similarly, the Stockholm Convention, adopted in 2001 and ratified by 186 countries, addresses the management and reduction of persistent organic pollutants (POPs), with 31 countries actively phasing them out. The Kyoto Protocol, adopted in 1997 prior to the Paris Agreement, focused on binding commitments for developed countries to reduce greenhouse gas emissions. During the first commitment period (2008–2012), participating countries exceeded their targets, achieving an average reduction of 22% in greenhouse gas emissions compared to 1990 levels.

Collectively, these conventions have strongly influenced international policies on sustainability and reinforced industrial self-regulation in environmental responsibility. They have promoted a shift toward sustainable economic frameworks by setting regulatory boundaries for emission reductions and have simultaneously stimulated the growth of green entrepreneurship worldwide.

1.2.3 SMEs in the Manufacturing Sector of Punjab

Small and Medium Enterprises (SMEs) form the backbone of Punjab's manufacturing sector, driving innovation, generating employment, and contributing significantly to the state's economy. Punjab hosts 23,586 SMEs, comprising 11,762 in manufacturing and 11,824 in services (MSME, n.d.-a). Among the districts, Ludhiana stands out as the most industrialised, with 5,529 manufacturing SMEs, followed by Jalandhar (1,046) and Amritsar (873). These enterprises operate across diverse sectors, including metal forging, bicycle manufacturing, hosiery, sports goods, and food processing. However, alongside their economic contributions, SMEs also present meso-level environmental concerns due to inefficient resource management and pollution. For instance, textile and dyeing units in Ludhiana are among the primary contributors to water contamination in the Sutlej River (Action Plan for Clean River Sutlej, Government of Punjab, 2019). Similarly, brick kilns and foundries concentrated in Jalandhar and Amritsar release substantial particulate matter, worsening the region's air quality. These environmental challenges underscore the pressing need for sustainable manufacturing practices and highlight the growing relevance of green entrepreneurship in Punjab's SME landscape.

1.3 Conceptualizing Green Entrepreneurship

1.3.1 Defining Green Entrepreneurship in the Context of SMEs

The concept of green entrepreneurship, particularly as it applies to small and medium-sized enterprises (SMEs), marks a significant shift in business practices towards more sustainable models that align with environmental concerns. Schaper (2016) emphasizes the role SMEs play in the global economy and highlights their ability to respond to local markets, which enables them to better facilitate the transition towards greener economies. Unlike traditional models that primarily focus on revenue maximization, this form of entrepreneurship integrates social, economic, and environmental sustainability (Kirkwood & Walton, 2010). In SMEs, green entrepreneurship centers on finding innovative solutions to environmental problems such as reducing waste, conserving resources, and adopting renewable resources. These approaches are particularly relevant for SMEs, as they often face more acute challenges, including limited financial and technological resources, compared to larger businesses (Bocken et al., 2014). Nevertheless, adopting such practices can enhance SMEs' competitive positioning, improve brand reputation, and contribute to broader sustainability targets, thereby creating value for both society and businesses (Elkington, 1998).

1.3.2 The Role of Sustainability in Entrepreneurial Intentions

In the context of growing concern for the environment and increasing regulations, sustainability has become a driving factor for entrepreneurial intentions. As a commitment to opening a new business, entrepreneurial intentions are motivated by the need to solve a challenging problem like climate change (Ajzen, 1991). With regards to sustainability, Small and Medium sized Enterprises (SMEs) are usually motivated by a patchwork

of internal elements like personal ideals and environmental ethics, alongside external factors such as consumer policies, market trends, and legislative incentives (Fayolle & Liñán, 2014).

Entrepreneurs focused on sustainability, by definition, are willing to incur ecological impacts and societal costs, and innovation happens to be a popular means of achieving this (York & Venkataraman, 2010). Integration of sustainability into entrepreneurship strategies includes the adoption of renewable energy sources, waste management systems, and environmentally conscious production processes. These efforts transcend mere compliance with societal norms, allowing SMEs to take active roles in global initiatives for sustainable development like the United Nations Sustainable Development Goals.

1.3.3 Green Business Models in the Manufacturing Sector

The transformation of the manufacturing sector has strived to shed the image of environmental degradation through the adoption of green business models that focus on reducing resource consumption and pollution to create value (Geissdoerfer et al., 2017). These principles advocate circular models of production that optimize resource utility throughout the product lifecycle. The shift to green business models for SMEs in the manufacturing sector poses unmet strategic requirements while also fostering opportunities for innovation. The development of energy-efficient production frameworks, innovative design processes for sustainable materials, and recyclables has become a necessity. Closed-loop production systems enable waste minimization and cost reduction, thereby augmenting profit margins (MacArthur, 2013). The adoption of green models by SMEs in Punjab presents an opportunity to align with national environmental policies, positioning them as leaders in sustainability and long-term competitiveness. As the region continues to grapple with industrial water pollution and unsustainable emissions, eco-conscious business practices are expected to gain increasing competitive value.

1.4 Environment challenges posed by Manufacturing activities

The manufacturing industry has long been a driver of Punjab's economic growth. However, it has simultaneously emerged as a major contributor to environmental degradation and public health risks. Industrial hubs such as Ludhiana, Jalandhar, and Amritsar have become pollution hotspots, particularly due to the textile, chemical, leather, and electroplating sectors. The Punjab Pollution Control Board (PPCB, n.d.) reports that operations such as oil furnace use and textile dyeing have led to alarming air pollution levels, with sulphur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (PM2.5 and PM10) regularly exceeding permissible limits.

Water resources are similarly imperiled. The Central Pollution Control Board (CPCB, 2025) highlights that key rivers like the Sutlej and Beas are heavily contaminated with industrial effluents containing toxic heavy metals including chromium, lead, and cadmium. The Sutlej's tributary, Buddha Nallah, has become a critical industrial pollution hotspot, representing a severe threat to aquatic ecosystems and downstream communities.

Soil quality has also deteriorated due to hazardous waste generated by the leather tanning and chemical industries, reducing agricultural productivity and threatening rural livelihoods.

The National Green Tribunal (NGT) has noted a 34% rise in hazardous waste generation in Punjab over the past decade, intensifying soil erosion and ecological decline. Furthermore, Punjab's industrial sector remains heavily dependent on non-renewable energy sources such as coal and furnace oil, significantly driving greenhouse gas emissions. According to the Ministry of Environment, Forest and Climate Change (MoEFCC, 2023), industries contribute nearly 40% of the state's total emissions.

These challenges underscore the urgent need for sustainable interventions. Key priorities include the construction of effluent treatment plants, the integration of renewable energy systems, and the adoption of cleaner production technologies. Although initiatives such as the Ministry of MSME's Zero Effect Zero Defect (ZED) Certification Scheme provide a framework for sustainability, effective outcomes require stricter policy enforcement, higher levels of awareness, and collaborative action between industries, regulators, and local communities.

1.5 Rationale of the Study

Punjab stands as a prominent centre for small- and medium-sized enterprises (SMEs) in India and plays a significant role in the country's industrial production. However, this economic activity is accompanied by environmental impacts, particularly in pollution-intensive industries such as textiles, leather, and chemicals. These industries, classified first under the National Industrial Classification and then by the Punjab Pollution Control Board (PPCB), fall into the "Red" and "Orange" categories due to the environmental harm they cause, including water pollution, hazardous waste generation, and greenhouse gas emissions. While awareness of the need to incorporate sustainable practices is growing, the manufacturing sector—and especially SMEs in pollution-intensive industries—has received little attention in green entrepreneurship research. Most studies focus on broader, service-based frameworks, creating an important gap in understanding the green entrepreneurial intentions of SME owners in these sectors (Y. Li et al., 2023). Moreover, very little research examines the industrial dynamics of Punjab, which is characterized by unique socio-economic and environmental contexts that shape business operations.

This study addresses these gaps by analysing the development of green entrepreneurial intentions among SME owners in Punjab's manufacturing industry. It draws upon consolidated theories such as the Theory of Planned Behaviour, Social Cognitive Theory, and Institutional Theory to explore awareness, barriers, and opportunities for ecosystem entrepreneurship (Ajzen, 1991; DiMaggio & Powell, 1983). The research seeks to highlight actionable factors regarding environmental awareness, concern, and the underlying challenges within industries such as textiles, leather, and chemicals. Furthermore, the study examines the impact of entrepreneurship education on the intent to pursue green entrepreneurial ventures, which remains a gap in green entrepreneurship scholarship. Prior studies suggest that awareness and training have a profound effect

on the sustainability of business operations, yet few have investigated the moderating effect of these factors on green entrepreneurship in SMEs (Qazi et al., 2020; Mamun, 2022). This research aims to inform policies and educational frameworks that address the particular needs of Punjab's industrial ecology.

1.6 Significance of the study

This study explores the antecedents of green entrepreneurship in SMEs with regard to green practices, as well as the associated intentions, barriers, and opportunities. Using a mixed-methods approach, the research integrates qualitative strategies, including semi-structured interviews with SME owners, and quantitative surveys to examine the key antecedents of green entrepreneurship. This methodological integration helps in understanding the extensive opportunities and barriers SMEs encounter along sustainable transition pathways. In particular, the research identifies barriers to action, explaining why and how factors such as personality traits, social norms, and environmental awareness influence SME owners' intentions toward green entrepreneurship. Furthermore, it assesses awareness levels to evaluate the extent of knowledge and understanding of green entrepreneurship among SME stakeholders. Additionally, the study provides actionable insights by offering evidence-based recommendations for policymakers to design effective strategies, such as financial incentives, capacity-building initiatives, and regulatory support. Finally, it addresses gaps in the existing literature by examining the less-explored dimensions of green entrepreneurship in SMEs, particularly in emerging economies such as India.

1.7 Relevance of the Study

From an academic standpoint, this study advances the theoretical understanding of green entrepreneurship by examining it within SMEs in an emerging economy. It highlights the specific challenges and opportunities faced by SMEs in Punjab's manufacturing industries and provides context-specific knowledge that can enrich broader scholarly discourse on sustainable entrepreneurship in similar paradigms. For policymakers, the study offers critical insights to inform the design and implementation of targeted strategies that encourage sustainable practices. For instance, policies such as the Perform, Achieve, and Trade (PAT) Scheme under the National Mission for Enhanced Energy Efficiency demonstrate the positive impact that well-tailored policies can have on industrial sustainability in India. Building on such frameworks, the study proposes tailored financial incentives, technological adoption, and capacity-building grants to address the unique challenges of SMEs. These measures aim to foster sustainability while enhancing the competitiveness of Indian industries in line with global environmental standards. Ultimately, the study emphasizes that the transformative potential of green entrepreneurship lies in its ability to address the environmental challenges posed by SMEs. By advancing sustainable practices, the research contributes to the development of a cleaner, more resilient industrial ecosystem and reinforces India's commitment to sustainable development and global environmental leadership.

1.8 Scope of the study

The scope of this study is primarily centered on green entrepreneurship within manufacturing SMEs in Punjab. Geographically, the research is restricted to the five districts with the highest concentration of SMEs, as these regions are economically dynamic and play a significant role in shaping entrepreneurial and sustainability practices. From an industrial perspective, the focus is on high-pollution manufacturing sectors, including textiles, chemicals, and leather, as identified by the Punjab Pollution Control Board (PPCB). These industries were selected due to their significant environmental impacts, such as water pollution, hazardous waste generation, and greenhouse gas emissions. To maintain analytical focus, the service sector is excluded, given its relatively lower direct contribution to environmental degradation compared to manufacturing. The theoretical foundation of the study draws on multiple perspectives, including the Theory of Planned Behavior, Theory of Reasoned Action, Social Cognitive Theory, Resource-Based View, Institutional Theory, Stakeholder Theory, Knowledge Spillover Theory, and Dynamic Capabilities Theory. These frameworks collectively guide the investigation of antecedents influencing green entrepreneurial intentions, such as personality traits, social norms, and environmental awareness. Methodologically, the study employs a mixed-methods approach. It begins with qualitative interviews with SME owners to capture in-depth perspectives, followed by quantitative surveys to statistically examine the antecedents of green entrepreneurial intentions. Multi-case studies are not included due to time constraints, limiting the scope to the current knowledge base and empirical evidence gathered through primary data collection. This study contributes to the literature on green entrepreneurship by addressing gaps in awareness while identifying the distinct challenges and opportunities faced by manufacturing SMEs in Punjab. The findings are expected to inform policy design, entrepreneurial education, and industry practices aimed at advancing a more environmentally sustainable industrial ecosystem.

1.9 Chapter plan of the study

Chapter 1: Introduction

This first chapter provides a background of green entrepreneurship and its relevance in the context of the manufacturing sector, particularly among Punjab's SMEs. It outlines the development of green entrepreneurship, the environmental harm caused by manufacturing SMEs, and the role of entrepreneurial intentions in advancing sustainability. The chapter also reflects on the theoretical and practical aspects of the study, highlighting its significance for policymakers and industry experts. Furthermore, it seeks to conceptualize green entrepreneurship within SMEs by emphasizing green business models and sustainable development. Finally, the chapter establishes the need and rationale for the study and offers an extensive overview to guide the subsequent chapters.

Chapter 2: Literature Review

The primary focus of this chapter is the development of green entrepreneurship, particularly in the context of SMEs. It examines the extent of research conducted on green entrepreneurial intentions, sustainability practices, and the challenges SMEs face in adopting green initiatives. The chapter also identifies and addresses gaps within the existing literature by formulating relevant research questions and defining the objectives of this study. A conceptual model, supported by propositions and hypotheses, is presented. This review further analyzes prior research on the topic, outlines their conclusions, and justifies the emphasis of this study on green entrepreneurship and SMEs, while also highlighting methodological considerations and analyses discussed in the subsequent chapters.

Chapter 3: Research Methodology

This chapter explains the research methods employed to achieve the objectives of this study. It outlines the research strategy, underlying philosophical assumptions, and conceptual frameworks, followed by a discussion of the mixed-method approach. The qualitative phase addressed the first and second objectives through thematic analysis of interview data collected from SME owners. The quantitative phase focused on the third and fourth objectives using structured surveys and subsequent statistical analysis. The chapter further details the sampling techniques, data collection methods, and analysis tools employed—NVivo for qualitative analysis and PLS-SEM for quantitative analysis. Finally, it demonstrates how validity, reliability, and ethical considerations were ensured, thereby establishing the rigor of the research process.

Chapter 4: Qualitative Findings

This chapter presents the qualitative findings related to green entrepreneurship awareness, as well as the opportunities and barriers faced by SMEs, in line with the first two objectives of the study. The findings are organized into thematic and sub-thematic frameworks derived from a systematic thematic analysis of semi-structured interviews with SME owners in Punjab. The chapter explores participants' perceptions, with a focus on their awareness, motivations, and challenges in adopting green entrepreneurship, and how these factors shape green entrepreneurial intentions. These insights deepen the understanding of the contextual factors influencing intentions to engage in green entrepreneurship and provide a foundation for the quantitative analysis presented in the next chapter.

Chapter 5: Quantitative Findings

This chapter presents the quantitative findings, which are analyzed based on the responses collected through structured surveys. It begins with the demographic profile of SME owners and then examines the antecedents influencing green entrepreneurial intentions. The chapter further investigates the relationships among key variables, including the moderating role of entrepreneurial education in the relationship between personality traits and green entrepreneurial intentions. Statistical tools, particularly PLS-SEM, are employed to validate the hypotheses and interpret the results. The findings provide empirical evidence in support of the study's

objectives and contribute to a deeper understanding of the factors driving green entrepreneurship among SMEs.

Chapter 6: Summary and Implications

This final chapter encompasses the entire study, synthesizing the key findings from both qualitative and quantitative analyses into a cohesive narrative. It highlights the theoretical and managerial implications, along with policy areas that require attention to foster green entrepreneurship among SMEs. The chapter further outlines the study's limitations and provides directions for future research by addressing gaps that warrant further exploration. Overall, this concluding discussion integrates all objectives, findings, and implications of the research, while offering robust evidence to support the claims made. It delivers valuable insights for academia, industry, and policymakers in promoting the adoption of green entrepreneurial practices.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The literature review is one of the most important parts of research because it serves as the foundation of a research project, whether it is a particular article, thesis, or dissertation, as it integrates existing data while providing a summary of what has already been done in the field. It is not only a summary of prior studies but also an in-depth analysis of various works in a specific field to identify trends, discrepancies, and gaps. According to Winchester and Salji (2016), a well-conducted literature review demonstrates a comprehensive grasp of the subject while situating the work within the wider academic discourse, which can be vital for emerging scholarship. Literature reviews also play an important role in formulating the context and background of the research problem and guiding the development of research questions. For instance, in theses and dissertations, they often help identify gaps in pre-existing literature as well as the focal point for the current study (Snyder, 2019). The same applies to journal articles, where the literature review integrates new evidence with previously published work and explains why and how the new contribution is important and original (Boote & Beile, 2005).

A literature review holds a prominent position in the academic landscape because it offers a critical assessment of data and information available within a field of study, making it integral to any research endeavor. It enables a researcher to integrate findings from multiple studies, thereby enhancing their overall understanding of the relevant research. A literature review also assists in identifying patterns or trends, revealing gaps, and synthesizing additional work that builds on these patterns or trends (Snyder, 2019). It presents validated claims from previous studies as evidence-based outcomes, which help determine whether findings should be accepted as reliable or debated against contrasting results. Furthermore, the review contributes to the precise formulation of research questions by highlighting unclear portions that emerged from earlier studies and portraying inconsistencies in results. For example, researchers can analyze how different methods and frameworks used by others have led to varied conclusions, and then adjust their own approach accordingly. By identifying gaps left by previous works, the literature review ensures that new research is not only relevant but also meaningful, ultimately contributing something original to the field (Jesson, 2011).

2.2 Theoretical development

2.2.1 Theory of Planned behavior

The Theory of Planned Behavior (TPB) is one of the foundational frameworks developed to explain how an individual's intentions are linked to their actions (Ajzen, 1991). TPB identifies three central factors that shape behavioral intentions: attitudes, subjective norms, and perceived behavioral control. Attitude refers to an individual's positive or negative evaluation of a particular behavior. Subjective norms denote the perceived social pressures an individual experiences regarding whether to engage in a behavior, while perceived

behavioral control reflects the individual's perception of the ease or difficulty of performing the behavior. The TPB model has been widely applied to understand entrepreneurial intentions across multiple disciplines. It suggests that intentions are not solely influenced by economic structures or culture but also by personal attitudes toward entrepreneurship, social norms, and self-assessed ability. Within entrepreneurship, TPB can be extended to include additional factors, such as personality traits and institutional support, including access to funding, which can encourage green entrepreneurship.

In this study, TPB is applied to examine the green entrepreneurial intentions of SME owners (Qazi et al., 2020). The model helps verify intentions related to environmental sustainability and accounts for the influence of perceived societal norms regarding green practices in business operations. Furthermore, this study enhances TPB by incorporating both internal factors, such as proactive behavior by entrepreneurs, and external factors, such as societal demand for sustainable development and entrepreneurship education. By integrating these elements, the study offers a more nuanced understanding of the antecedents that influence green entrepreneurship in SMEs. Thus, TPB serves as a valuable framework for explaining the interplay of diverse motivators driving green entrepreneurial intentions among SME owners in Punjab.

2.2.2 Theory of Reasoned Action

It serves as an early foundation for the Theory of Planned Behavior (TPB) and focuses on the ways subjective norms and attitudes influence the causation of intentions. Originally developed by Fishbein, the Theory of Reasoned Action (TRA) emphasizes that intention is a behavioural antecedent, primarily dictated by an individual's attitude toward the behaviour as well as the normative perceptions of the surrounding society. According to TRA, a person is likely to form an intention to act if they evaluate the behaviour positively and believe that significant others expect them to engage in it. This model highlights that an intention to perform a behaviour is the primary predictor of its actual occurrence (Fishbein & Ajzen, 1977).

TRA has been applied to examine intention formation in business venture development, with particular attention to the influence of societal expectations on entrepreneurial actions. In the context of green entrepreneurship, the theory is relevant for understanding how SME owners' perceptions of environmental sustainability, coupled with social expectations, shape their decisions to adopt green practices. Subjective norms—defined as the social expectations or pressures faced by entrepreneurs—play a significant role in their decision-making processes.

This study employs TRA to investigate how the personality traits of SME owners interact with societal norms regarding sustainability to influence their green entrepreneurial intentions (Qazi et al., 2020). It further evaluates the extent to which these owners are committed to eco-friendly business investments by assessing the strength of their intentions. Importantly, the theory suggests that the decision to pursue green entrepreneurship is shaped not only by personal values but also by external social expectations. Thus, TRA provides valuable insights into the societal and cultural factors that motivate or discourage SME owners from

adopting green practices, particularly at a time when sustainability is gaining increasing importance. Ultimately, the theory underscores that the integration of sustainable practices into SMEs' operations depends largely on both the social environment and the personal attitudes of their owners.

2.2.3 Social Cognitive Theory

Bandura (1991) proposed the Social Cognitive Theory (SCT), which explains the integration of personal, environmental, and behavioral factors as components of human action. As a major determinant of behavioral change, SCT emphasizes **self-efficacy**, or the belief in one's ability to achieve specific goals. Bandura argued that individuals are not passive recipients of external influences; rather, they are active participants in their environments, capable of self-regulation and reflection. The theory also posits that learning is inherently social, encompassing not only direct experiences but also the observation of others' actions.

SCT is particularly relevant in understanding how entrepreneurs develop the belief and capability to establish and manage businesses. When individuals believe they can successfully engage in entrepreneurial activities, their level of self-efficacy becomes a critical determinant. Entrepreneurs with high self-efficacy are more likely to confront and overcome challenges, navigate obstacles, and achieve success in their ventures. Moreover, SCT acknowledges **social learning**—the acquisition of knowledge and skills through observing others—which is vital in entrepreneurial ecosystems where successful entrepreneurs serve as role models.

This research applies SCT to examine the effects of self-efficacy and social learning on the intentions of green entrepreneurs among SME owners. The focus is specifically on the self-efficacy of SME owners and its influence on their willingness to engage in green entrepreneurship. Li et al. (2020) also highlight social factors such as interactions with peers and other green entrepreneurs—as significant contributors to the development of green entrepreneurial behavior. Within the SME context, SCT underscores the role of both personal and contextual factors, illustrating how entrepreneurs adopt green practices through social interactions and community networks.

2.2.4 Resource-Based view Theory

The Resource-Based View (RBV), initially proposed by Wernerfelt (1984) and further advanced by Barney (1991), argues that a firm's competitive advantage arises from its unique resources and capabilities. To achieve a sustainable competitive advantage, resources must possess the VRIN attributes—being valuable, rare, inimitable, and non-substitutable. Unlike market-based perspectives, RBV emphasizes internal resources such as human capital, organizational culture, and firm-specific knowledge as the primary drivers of long-term success.

In the context of sustainability, RBV provides a useful framework to explain how SMEs can leverage their internal resources to achieve environmental goals and strengthen their competitive position in green entrepreneurship. For instance, firms with eco-friendly technologies or a reputation for sustainability can

differentiate themselves, defend market share, and maintain a long-term advantage (Hart, 1995). By innovatively developing green products and processes, SMEs can establish market dominance and ensure prolonged competitiveness.

This research applies RBV to investigate how SMEs utilize their distinctive internal resource—organizational culture to embed and sustain green practices.

2.2.5 Institutional Theory

Institutional Theory provides a comprehensive framework for understanding how organizations align their behavior with societal norms and values. It was developed to explain the gap between organizational theory and practice, suggesting that organizations are influenced by three key institutional pressures—normative, mimetic, and coercive—that govern organizational behavior. These pressures compel firms to conform to institutional norms regardless of cost or benefit. Industry norms create mimetic pressures, legal and regulatory frameworks impose coercive pressures, while professional standards and societal expectations generate normative pressures. Institutional Theory has often been applied to examine how organizations respond to environmental laws, sustainability expectations, and corporate social responsibility.

However, green entrepreneurs frequently encounter significant institutional barriers when adopting sustainable practices, due to external requirements such as regulatory frameworks, government policies, and corporate responsibility demands. Factors such as government regulations, industry standards, and advocacy from environmental groups can act as restrictions and obstacles to SMEs' decisions regarding green entrepreneurship. This research focuses on how SMEs respond to these challenges, particularly in adopting environmentally friendly operations and complying with regulatory requirements. Institutional Theory is especially useful in understanding how small and medium-sized businesses balance compliance with environmental standards alongside economic performance. Nevertheless, the theory overlooks personal motivations and individual traits that may influence green entrepreneurship, which are better addressed through the Theory of Planned Behavior (TPB) and the Theory of Reasoned Action (TRA).

2.2.6 Stakeholder Theory

Stakeholder Theory, as presented by Freeman (1984), emphasizes the importance of addressing the needs of all stakeholders within a business's operational framework, moving beyond the traditional shareholder-focused approach. Stakeholders encompass suppliers, government bodies, society, local communities, employees, consumers, and environmental groups. For businesses to achieve sustainable success, the theory argues that they must balance the interests and demands of these diverse constituents. By including stakeholders in the decision-making process, businesses can foster long-term performance, collaboration, and trust.

This theory is particularly relevant in the context of sustainable business practices, which inherently involve multiple stakeholders and require their active participation and support. For small and medium-sized

enterprises (SMEs), the adoption of environmentally friendly practices often necessitates collaboration with regulatory bodies, employees, local communities, and customers to ensure that business operations align with environmental objectives (Clarkson, 1995). Active stakeholder engagement is therefore vital for maintaining social legitimacy and achieving sustainable outcomes.

This research draws on Stakeholder Theory to examine how SMEs engage with diverse stakeholders—such as clients, suppliers, and government agencies to promote green entrepreneurship. The theory not only underscores the significance of stakeholder engagement in implementing sustainable practices but also provides insights into how SMEs navigate the competing interests of different groups in pursuit of environmental goals. While incorporating green practices into SME business models can be challenging, Stakeholder Theory highlights that it also presents valuable opportunities, particularly when stakeholder expectations are misaligned.

2.2.7 Knowledge Spillover Theory

Acs et al. (2013) argue that knowledge which organizations fail to utilize fully can create entrepreneurial opportunities if commercialized. This implies that both firms and individuals outside the organization that originally generated the knowledge can harness it for venture creation. Enterprises clustered around universities and research institutions often benefit from the informal spillover of information due to their close geographic proximity. Knowledge spillovers are fundamental to the introduction of new innovations in sustainable technologies and practices. SME owners often leverage knowledge from universities, research institutions, and other businesses to design and implement green technologies and processes (Audretsch, 2015). By overcoming resource constraints and tapping into external knowledge, SMEs are able to develop green innovations that would otherwise be unattainable within their own organizations.

The ways in which SMEs access and utilize knowledge, as well as the external environmental factors influencing them, shape their ability to practice green entrepreneurship. This study explores the impact of scholarly communication channels such as those provided by universities, government, and large corporations—on the adoption of green innovations in SMEs. Particularly in the context of limited internal resources, this theory is valuable for understanding how external knowledge resources stimulate the development of green entrepreneurial intentions and activities in SMEs.

2.2.8 Dynamic Capabilities Theory

The Dynamic Capabilities Theory emphasizes a firm's ability to adapt, integrate, and reconfigure both internal and external resources in response to shifting environments (Becker et al., 1998), thereby determining how a company can respond to changes within the industry. Unlike the Resource-Based View, which considers a firm's resources as static, this theory highlights the importance of flexibility, adaptability, and innovation capabilities that allow firms to transform in line with market conditions and environmental challenges. The

development of dynamic capabilities enhances a firm's capacity to exploit new opportunities while reducing risks associated with environmental volatility. In the context of green entrepreneurship, SMEs must acquire dynamic capabilities to operate more sustainably. Entrepreneurs working in this domain are required to continuously renew and innovate their business models to align with evolving regulatory frameworks and market demands (Teece, 2007). By applying dynamic capabilities, SMEs can effectively respond to environmental challenges, build resilience, and foster agility—ultimately advancing long-term sustainability. This research applies the Dynamic Capabilities Theory to analyze how green entrepreneurial engagement is cultivated among SMEs in Punjab. The theory provides a useful lens for understanding how small and medium-sized enterprise (SME) owners can enhance their ability to innovate within the green market and adapt to evolving environmental challenges. In doing so, it sheds light on how dynamic capabilities enable green entrepreneurial intentions and support SMEs in integrating sustainability into their business models, thereby strengthening their competitiveness in the growing market for green goods and services.

2.3 Empirical Studies on Green Entrepreneurship in SMEs

The rapidly growing focus on environmental issues, coupled with the recognition by most businesses of their responsibility in addressing ecological challenges, has positioned green entrepreneurship as a critical field of study and practice. Some entrepreneurs deliberately engage in ecological entrepreneurship, defined as socially responsible and value-driven, to achieve success across monetary, social, and ecological dimensions (Zhang et al., 2023). Interest in green entrepreneurship has increased primarily because it advances the objectives of sustainable development by reducing negative environmental impacts, stimulating innovation, and promoting responsible business practices.

Particular attention has been given to small and medium-sized enterprises (SMEs), which are considered key drivers of economic growth in many countries. Many industries now recognize the growing demand for environmentally sustainable products and services, viewing it as a source of competitive advantage. Consequently, green entrepreneurs are increasingly motivated to seek new opportunities (Polas et al., 2023). However, the adoption of green entrepreneurship is shaped by several factors, including entrepreneurs' awareness of sustainability issues, antecedents of green entrepreneurial behavior, and entrepreneurial intentions. In particular, green entrepreneurial intentions (GEI) are crucial because they strongly predict actual entrepreneurial behavior and reflect the dual purpose of green entrepreneurship: profit generation and environmental preservation.

Personal traits—such as attitudes toward sustainability, awareness of environmental issues, and personality factors like proactivity and self-efficacy—have been shown to influence GEI (W. Hu & Tresirichod, 2024; Qazi et al., 2020). External influences, such as regulatory incentives and market demand, also shape these intentions (Mamun, 2022b). Previous studies highlight the role of sustainability orientation as a mediator between entrepreneurial orientation and GEI (Li et al., 2023; Zhang et al., 2023). Moreover, gender-specific

frameworks and policies are needed to foster greater participation of women in green entrepreneurship (Soori, 2023).

Awareness of green entrepreneurship itself is another crucial factor. Sher et al. (2019) found that environmentally conscious entrepreneurs are more proactive in identifying green opportunities and adopting sustainable practices. Education and training can play a key role in raising this awareness. Educational institutions, in particular, are instrumental in equipping learners and aspiring entrepreneurs with the knowledge and skills needed to address sustainability challenges (Shabeeb Ali et al., 2023). Higher education financing has also been found to reinforce students' green entrepreneurial behavior (Vasilescu et al., 2023a).

While green entrepreneurship offers opportunities for innovation, competitive advantage, and brand goodwill, particularly in markets where consumers and regulators value sustainability (Makhloufi et al., 2022), it also faces significant barriers. These include limited financial resources, insufficient access to green technologies, and restrictive regulatory frameworks (Mamun, 2022b). For SMEs in developing contexts, such as rural Bangladesh, external knowledge spillovers, environmental awareness, and perceived ease of adoption have been identified as critical to green innovation (Polas et al., 2023).

SMEs are often more flexible and responsive than larger firms, making them well-positioned to adopt green practices. However, their efforts are constrained by limited resources, lack of expertise, and insufficient institutional support (Vasilescu et al., 2023). Evidence suggests that tailored policies and incentives can enhance SME contributions to the green economy (Jun et al., 2021). Manufacturing SMEs, in particular, play a pivotal role given their innovative potential and significant environmental footprint (Potluri & Phani, 2020). Transitioning manufacturing SMEs toward green entrepreneurship requires investment in sustainable supply chains, resource efficiency, and clean technologies (Jiang et al., 2020). Yet, adoption remains slow due to the perceived high costs and complexity of green technologies (Mamun, 2022b).

Ultimately, green entrepreneurship in SMEs represents a promising yet challenging pathway for achieving sustainable development. Entrepreneurial personality traits, awareness, and institutional support emerge as key determinants of GEI. Further research is needed to examine how these factors interact, especially within manufacturing, which is a high-impact sector (Potluri & Phani, 2020; Makhloufi et al., 2022). By overcoming obstacles and leveraging opportunities, green entrepreneurs can drive innovation, enhance competitiveness, and contribute to building a sustainable future.

2.4 Research gap

Based on the comprehensive evaluation of existing literature, it is evident that many issues remain unexplored and require further investigation. Much of the prior work on green entrepreneurship appears understudied and underexplained, leaving critical gaps that need to be addressed. The following under-researched areas highlight these gaps. Notably, the current state of the literature suggests that a qualitative research design, particularly

one that relies on expert interviews, would be highly effective in deepening the understanding of green entrepreneurship. Such research is particularly relevant for SMEs, where the impact of green entrepreneurship factors is essential not only for sectoral policies and strategies but also for industrial clusters and towns.

There is also a need to examine the role of sustainable ecological SMEs and the techniques they employ to overcome financial and marketing barriers, using both quantitative and qualitative network perspectives (Lemaire et al., 2022). Reports further note that general awareness of public assistance programs among enterprises remains low, and awareness of energy efficiency, environmental, and social issues is even lower. Moreover, many firms still approach sustainability primarily as a matter of compliance, rather than as an opportunity for innovation and business growth. Understanding the level of green entrepreneurial awareness is therefore critical.

Another significant gap relates to the influence of culture and nationality on green entrepreneurship. People from different cultural and national backgrounds may hold distinct views on sustainable business practices, which could affect entrepreneurial behavior. From a future-oriented perspective, there is also a need to determine which among social value, economic value, or environmental value most strongly drives intention and behavior toward adopting sustainable practices (Yasir et al., 2023). Similarly, the potential of frameworks such as the EFEA model to be applied beyond low-income households requires further exploration (Mamun, 2022b). In addition, research on the role of life experience, income or social background, risk tolerance, and social support in shaping green entrepreneurial objectives would provide valuable insights.

Scholars have also emphasized the importance of entrepreneurship education as a moderating factor in the formation of green entrepreneurial intentions. For instance, W. Wang et al. (2021) argue that prior experience and entrepreneurship education can play a critical role in shaping green entrepreneurial competencies and behaviors. However, there is still limited rigorous research on how green entrepreneurship education specifically influences SME owners (Qazi et al., 2020). Further investigation into competencies, behaviors, and intentions concerning the green economy remains an important area of study.

Finally, existing research on green entrepreneurship has not sufficiently addressed sector-specific issues, particularly in the manufacturing sector. This gap is especially relevant to manufacturing SMEs in Punjab, a region with distinctive industrial dynamics and environmental challenges. Addressing this gap, the present study will investigate the awareness, opportunities, and barriers of green entrepreneurship in relation to manufacturing SMEs. Furthermore, it will examine the factors influencing green entrepreneurial intentions among SME owners, with the aim of better understanding both the driving forces and obstacles to green initiatives within this context. In doing so, the study seeks to advance knowledge in the field and improve understanding of green entrepreneurship in the manufacturing sector.

2.5 Research Questions

This research examines green entrepreneurship within the manufacturing SMEs of Punjab, with particular focus on the antecedents of green entrepreneurial intentions. Specifically, it seeks to investigate SME owners' awareness of green entrepreneurship, the opportunities and challenges they encounter, and the key antecedents influencing their intentions to pursue green entrepreneurship. Additionally, the study analyses the moderating role of entrepreneurship education in the relationship between personality traits and green entrepreneurial intentions. By addressing these issues, the research contributes to the discourse on sustainable business practices in SMEs, aiming to uncover the factors that either inhibit or motivate the adoption of green entrepreneurship within the manufacturing sector.

To achieve these research aims, the following key research questions have been formulated

1. What is the awareness of green entrepreneurship among manufacturing SMEs owners
2. What opportunities and barriers do SME owners face when engaging in green entrepreneurship in the manufacturing industry?
3. What are the key antecedents influencing green entrepreneurial intentions among manufacturing SME owners?
4. How does entrepreneurship education moderate the relationship between personality traits and green entrepreneurial intentions among SME owners?

2.6 Research objectives

Based on the research questions and identified research gaps, the objectives of this study have been framed as follows

1.To examine the awareness of green entrepreneurship among SMEs owners.

2. To explore the opportunities and barriers of green entrepreneurship among SMEs owners.

3. To analyse the key antecedents affecting green entrepreneurial intentions among SMEs owners.

4. To determine the moderating influencing role of entrepreneurship education on relationship between personality traits and green entrepreneurial intentions

2.7 Research Model

This research model draws upon established theories to address gaps identified in the literature review. The most prominent frameworks include the Theory of Planned Behaviour (TPB), the Theory of Reasoned Action (TRA), Social Cognitive Theory (SCT), Stakeholder Theory, and the Resource-Based View (RBV). Together, these theories provide a comprehensive understanding of the factors that shape intentionality and willingness to engage in green entrepreneurship. In addition, constructs such as Environmental Awareness, Organizational

Culture, Subjective Norms, and Entrepreneurial Motivation are considered significant drivers of green entrepreneurial intentions. Entrepreneurial Education holds particular importance, as it is expected to moderate the relationships between personality traits and green entrepreneurial intentions. In essence, entrepreneurial education is anticipated to enhance or alter the influence of these traits, thereby fostering the adoption of green entrepreneurship. Guided by these theoretical foundations, the model aims to examine the interplay among various factors while cantering on the green entrepreneurial intentions of manufacturing SME owners.

2.8 Hypothesis Development

2.8.1 Personality Traits

Personality traits influence how individuals interpret situations and interact with their environment. These traits play a vital role in shaping actions, particularly in business contexts (McCrae, 1992; Zhao & Seibert, 2006). Entrepreneurs are often characterized by a distinct set of traits that affect their ability to innovate, take risks, and recognize opportunities. Personality traits have been recognized as pivotal predictors of entrepreneurial activity (Zhao et al., 2005). According to the Theory of Planned Behaviour (TPB), an individual's intentions are shaped by their attitudes toward the action, perceived behavioural control, and subjective norms, all of which can be influenced by personality traits (Ajzen, 1991). In the context of green entrepreneurship, traits such as proactiveness, entrepreneurial self-efficacy, need for achievement, and risk aversion form the foundation of intentions, as they shape how individuals perceive and respond to potential opportunities and challenges in eco-friendly business practices.

H1 Personality traits have significant impact green entrepreneurial intentions.

2.8.1.1 Proactiveness

Proactiveness is a personality trait characterized by the pursuit of change and opportunities in future contexts. Individuals who exhibit this trait are quick to adapt and capitalize on emerging trends, often staying ahead of competitors. Such behavior is a hallmark of entrepreneurial orientation. In the context of green entrepreneurship, proactiveness is particularly crucial for recognizing opportunities in dynamic environments (Bateman & Crant, 1993). Gupta and Batra (2016) argue that proactive individuals are more inclined to adopt sustainable practices in anticipation of environmental changes, such as the transition toward greener business activities. These individuals demonstrate heightened entrepreneurial alertness, which fuels innovation aimed at addressing environmental challenges. Kickul and Gundry (2002) emphasize that proactiveness acts as an innovation driver in unpredictable and turbulent markets—conditions that typify green entrepreneurship. Given the frequent regulatory changes and the expanding demand for sustainable products, a proactive mindset becomes essential for entrepreneurial success. This aligns with Urban and Kujinga (2017), who contend that proactive entrepreneurs are more likely to adopt green technologies and spearhead sustainable development

initiatives. By doing so, they contribute significantly to the proliferation of green entrepreneurship across diverse industries.

Empirical evidence further highlights that proactive individuals possess a deeper understanding of environmental challenges and the business opportunities they create. Such individuals are therefore more likely to engage in green entrepreneurship (Hu et al., 2018). Environmental concerns not only influence their entrepreneurial ambitions but also shape their innovation orientation. Chen et al. (2023) observe that proactive individuals are well-positioned to identify and respond to the growing demand for sustainable products and services. Their forward-looking behavior not only drives the creation of green enterprises but also accelerates the integration of sustainability practices across industries. Moreover, Y. S. Chen et al. (2023) demonstrate that proactiveness is strongly linked to entrepreneurial intentions, particularly in industries where innovation and sustainability are central. Proactive individuals are better equipped to foresee and adapt to shifts such as regulatory reforms or consumer preferences for eco-friendly products. Supporting this, Hu et al. (2018) found a significant association between proactiveness and entrepreneurial intentions, underscoring that proactive individuals often focus on solving environmental issues through business innovations. Similarly, Adel (2021) and Qazi et al. (2020) highlight the ability of proactive entrepreneurs to cope with the complexities of green entrepreneurship, actively promoting practices such as green technology adoption and environmentally friendly production processes. These practices are indispensable for ensuring long-term business viability.

Although prior studies establish a robust link between proactiveness and entrepreneurial intentions, there remains limited research specifically examining the relationship between proactiveness and green entrepreneurial intentions. Building on this gap, the following hypothesis is proposed:

H1a: Proactiveness has significant impact on green entrepreneurial intentions.

2.8.1.2 Entrepreneurial self-efficacy

Entrepreneurial self-efficacy (ESE) refers to an individual's belief in their ability to initiate, manage, and succeed in entrepreneurial activities. This construct is widely recognized in entrepreneurship literature as it influences both the intention to start a venture and the willingness to overcome obstacles (Chen et al., 1998). ESE aligns with Social Cognitive Theory (SCT), which emphasizes the role of self-efficacy in motivating behavior and shaping outcomes (Bandura, 1997). In the context of green entrepreneurship, ESE becomes particularly important because entrepreneurs face unique challenges related to sustainability, governance, and volatile market conditions (Shepherd & Patzelt, 2011). Research consistently highlights the positive relationship between ESE and entrepreneurial intention. For instance, Kickul et al. (2009) found that higher levels of self-efficacy are significantly associated with stronger entrepreneurial intentions, while Zhao et al. (2005) confirmed that ESE is a critical determinant in the decision to engage in entrepreneurial activities.

Applied to green entrepreneurship, ESE extends to environmental and social domains. Entrepreneurs must believe in their ability to implement sustainable practices, comply with environmental regulations, and design eco-friendly business strategies. Gustafsson and Khan (2017) note that green entrepreneurs with high ESE are more likely to develop and apply innovative solutions to environmental challenges. Similarly, Kirkwood and Walton (2010) highlight that individuals with greater environmental self-efficacy engage more actively in eco-friendly entrepreneurial ventures. Urban and Kujinga (2017) further confirm that entrepreneurs with strong self-efficacy pursue green ventures because they believe they can overcome the operational challenges of sustainability-oriented businesses. Self-efficacy also plays a mediating role between personality traits (such as proactiveness, risk-taking, and need for achievement) and entrepreneurial intentions. Individuals with higher ESE are more inclined to act upon these traits, translating them into entrepreneurial behavior (Schlaegel & Koenig, 2014). In green entrepreneurship, this means that self-efficacious individuals not only identify sustainable opportunities but also believe in their capacity to implement them successfully. Hsu et al. (2017) support this view, showing that entrepreneurs with higher ESE navigate the uncertainties of starting and scaling a business more effectively. Moreover, self-efficacy fosters innovation. Mueller and Conway (2013) argue that self-efficacious entrepreneurs are more likely to adopt novel ideas, apply research, and experiment with new methods—all of which are essential for building environmentally friendly enterprises. Since green entrepreneurship requires the development of eco-innovative products, processes, and services, ESE is a critical enabler of risk-taking and perseverance in pursuing sustainability. Overall, the literature strongly suggests that ESE shapes green entrepreneurial objectives. Entrepreneurs with high self-efficacy are more likely to recognize and pursue eco-friendly opportunities, believe in their capacity to implement these opportunities, and remain persistent when confronted with challenges.

Based on this, the following hypothesis is proposed:

H1b: Entrepreneurial self-efficacy has a significant impact on green entrepreneurial intentions.

This proposition draws on extensive research documenting the relationship between self-efficacy and entrepreneurial engagement (Bandura, 1997; Zhao et al., 2005; Hsu et al., 2017). In the context of green entrepreneurship, self-efficacy is particularly important, as entrepreneurs are required to address complex challenges at the intersection of sustainability, innovation, and market demands. Entrepreneurial self-efficacy (ESE) enhances entrepreneurs' confidence in overcoming these challenges, thereby motivating them to pursue green entrepreneurial initiatives and contribute to mitigating environmental degradation.

2.8.1.3 Need for achievement

An individual's internal drive to excel in tasks and achieve milestones is referred to as the need for achievement (nAch). This motivational factor is particularly influential in shaping entrepreneurial intentions and behaviours. McClelland (1961) was the first to define this psychological characteristic, associating it with intense self-fulfilment, high aspiration levels, goal orientation, and the acceptance of responsibility for

outcomes. In the field of entrepreneurship, nAch is regarded as one of the most significant motivational factors for pursuing entrepreneurial activities (Rauch & Frese, 2007). Individuals with a high nAch are typically driven by a strong desire to succeed and are willing to take calculated risks to attain their goals. Research has shown that nAch is closely associated with entrepreneurial success, as entrepreneurs with this trait tend to set ambitious yet realistic targets and actively seek performance feedback (Kallio et al., 2016; Johnson, 1990). This conviction fosters persistence, determination, and dedication—qualities essential for establishing and managing a business.

nAch is critical for the identification and exploitation of opportunities in business, particularly in relation to proactive behaviour, innovation, and risk-taking (Shane et al., 2003). When individuals are motivated by strong goal-directed aspirations, entrepreneurial activity becomes more appealing, as business ownership aligns with their personal objectives. Such individuals are also more likely to take initiative and pursue new business ideas, exhibiting traits characteristic of proactive entrepreneurs (Gartner et al., 1994). A wealth of empirical evidence supports this link. For example, a meta-analysis by Collins et al. (2004) confirmed a significant relationship between entrepreneurial intentions and nAch, demonstrating that individuals with a strong desire for achievement are more likely to engage in entrepreneurship. Cross-cultural studies have also corroborated this finding, suggesting that nAch is a universal characteristic of entrepreneurial behaviour (Stewart & Roth, 2007).

The role of nAch becomes particularly pronounced in ecological or green entrepreneurship. Sustainable business practices present challenges and opportunities that appeal to achievement-oriented entrepreneurs, as they allow the pursuit of both personal goals and socially valued objectives (Shepherd & Patzelt, 2011). Green entrepreneurs often succeed not only by striving for personal accomplishment but also by delivering environmentally sustainable solutions (Gerlach, 2003). Achievement motivation is therefore aligned with eco-friendly practices, as entrepreneurs channel their drive into creating products, services, and processes that generate sustainable value. However, it has also been noted that motivational traits, when not coupled with ecological awareness, may fail to foster environmental conservation (Mueller & Thomas, 2001). Nevertheless, in contexts where sustainability is integrated into entrepreneurial objectives, achievement motivation supports efficiency, innovation, and environmentally responsible practices.

The connection between nAch and entrepreneurial intentions is further supported by Baum et al. (2001), who found that achievement-oriented entrepreneurs are more likely to recognize and exploit opportunities. This link is particularly relevant in green entrepreneurship, where the ability to identify and act on ecological and sustainable opportunities is essential for success. Eco-entrepreneurs with high nAch often regard sustainable ventures as both a personal achievement and a societal contribution. Thus, the literature provides strong theoretical and empirical support for the development of a hypothesis concerning the impact of nAch on entrepreneurial intentions, particularly in the context of green entrepreneurship.

H1c: Need for achievement has a significant impact on Green entrepreneurial intentions.

The relationship between the need for achievement (nAch) and entrepreneurial behaviour was first emphasized by McClelland (1961), whose pioneering work highlighted achievement motivation as a key entrepreneurial driver. Building on this foundation, more recent studies by Baum et al. (2001) and Collins et al. (2004) further underscore the predictive role of nAch in shaping entrepreneurial intentions. Within the domain of green entrepreneurship, nAch not only motivates individuals toward eco-entrepreneurial initiatives but also fosters personal accomplishments that align with broader environmental benefits (Shepherd & Patzelt, 2011).

2.8.1.4 Risk Aversion

An individual's tendency to avoid hazards in decision-making and prefer predictable, safer outcomes is termed risk aversion. This trait is especially critical in entrepreneurship, where decisions are made under conditions of uncertainty and ambiguity. As argued by Knight (1921), entrepreneurship is inherently uncertain due to risks related to economic fluctuations, competition, financing, and the potential for failure. Because of these uncertainties, entrepreneurs with high levels of risk aversion are less likely to demonstrate entrepreneurial behaviour or intentions (Cramer et al., 2002).

Entrepreneurial intention is generally found to be negatively correlated with risk aversion: the more risk-averse an individual is, the less likely they are to pursue uncertain business ventures. Segal et al. (2005) confirm that highly risk-averse individuals often avoid entrepreneurship because potential rewards do not sufficiently compensate for the possibility of failure and financial loss. Conversely, individuals with lower levels of risk aversion are more willing to embrace uncertainty, which increases their likelihood of starting and sustaining new businesses. Risk-averse individuals often prefer safer career paths, including salaried employment (Forlani & Mullins, 2000). Similarly, Levesque and Minniti (2006) found that risk aversion is a critical determinant of entrepreneurial involvement, showing that those with higher tolerance for risk are more likely to engage in new venture creation. Likewise, Caliendo et al. (2009) provided empirical evidence that high risk aversion is detrimental to entrepreneurial intention, discouraging individuals from pursuing self-employment.

In the context of green entrepreneurship, risk aversion becomes even more relevant. Sustainable business ventures are often associated with higher levels of uncertainty due to challenges such as the higher costs of green technologies, fluctuating consumer demand for sustainable products, and unpredictable environmental policies (Kirkwood & Walton, 2010). Risk-averse entrepreneurs may perceive these barriers as deterrents, delaying or preventing the adoption of green innovations (Lueg et al., 2015). However, some green entrepreneurs may display a lower degree of risk aversion because their motivations extend beyond profit, encompassing environmental and social missions (Muñoz & Dimov, 2015). This intrinsic motivation can counterbalance the deterrent effects of risk aversion. Additionally, government subsidies, tax incentives, and policy support reduce the perceived risks associated with green entrepreneurship (Hall et al., 2010).

Empirical studies further highlight that risk tolerance is a crucial entrepreneurial characteristic. Hmieleski and Corbett (2008) reported that entrepreneurs with lower risk aversion are more likely to pursue innovative

opportunities. Within green entrepreneurship, this willingness to embrace uncertainty is particularly important, as entrepreneurs must navigate unknown markets and devise novel solutions to environmental challenges. Frese and Gielnik (2023) emphasize that the ability to assess and manage risks is central to entrepreneurial success, positioning risk tolerance as a vital trait for green entrepreneurs.

In summary, entrepreneurial intentions are significantly shaped by risk aversion. Highly risk-averse individuals are less inclined to engage in entrepreneurial activities due to the uncertainty and potential losses involved. In the case of green entrepreneurship, this tendency may act as an additional barrier since sustainable initiatives are often perceived as riskier. However, intrinsic motivation and supportive institutional frameworks, such as government incentives, can help mitigate these risks and encourage participation in green entrepreneurship.

H1d: Risk aversion has a significant impact on green entrepreneurial intentions.

There remains a gap in fully addressing the relationship between risk aversion and entrepreneurial intention, a notion previously highlighted in the literature (Caliendo et al., 2009). Within the context of green entrepreneurship, the elevated risks associated with sustainability initiatives may amplify risk aversion, thereby discouraging individuals from pursuing eco-entrepreneurial ventures (Kirkwood & Walton, 2010). However, the negative influence of risk aversion on green entrepreneurial intentions may be mitigated by intrinsic motivation and supportive external frameworks (Muñoz & Dimov, 2015).

2.8.2 Environmental awareness

Environmental awareness refers to the recognition of environmental issues, an understanding of the consequences of human activities, and the acceptance of the need to adopt sustainable practices. In the context of green entrepreneurship where sustainability serves as a key motivator—environmental awareness significantly influences entrepreneurs' decision-making frameworks (Leonidou et al., 2013). Entrepreneurs with strong environmental consciousness are more likely to pursue pro-environmental actions, prioritizing sustainability over short-term profits by integrating green strategies into their business models. Werff et al. (2013) emphasized that individuals with higher environmental awareness are predisposed to adopting sustainable business practices due to both recognition of environmental harm and a sense of moral responsibility to mitigate it. Entrepreneurs act on this responsibility by implementing green policies such as renewable energy adoption, resource conservation, and waste reduction.

Moral and ethical considerations are not the only outcomes of environmental awareness. As Bonn and Fisher (2011) argue, it also enhances entrepreneurs' opportunity recognition, enabling them to identify emerging sustainability trends such as green products, waste management innovations, and renewable energy solutions. Such entrepreneurs often gain a competitive advantage by meeting the demands of environmentally conscious consumers. The relationship between entrepreneurial intentions and environmental awareness is well

established in the literature. Ozaralli and Rivenburgh (2016) found that individuals with greater environmental awareness exhibit stronger intentions to engage in green entrepreneurial activities, such as developing businesses that address carbon emissions and pollution reduction. Similarly, Jolink and Niesten (2015) argued that the adoption of sustainable innovations is largely shaped by levels of environmental awareness.

Entrepreneurs with high environmental awareness are also more likely to invest in and promote green technologies, contributing to broader societal goals such as combating climate change and reducing environmental degradation. Environmental awareness is thus recognized as a critical driver of sustainable business practices and innovation (Pacheco, Dean, et al., 2010). Eco-conscious entrepreneurs tend to design business models that balance profitability with environmental stewardship, often reaping greater long-term benefits compared to purely profit-driven ventures. Schaper (2016) further argued that ecologically minded entrepreneurs draw on sustainable expertise to build competitive advantages in markets where consumers increasingly favor eco-friendly purchasing decisions.

This creates a self-reinforcing cycle in which environmental concern stimulates entrepreneurial creativity, which in turn strengthens entrepreneurs' market positions. Considering the extensive empirical evidence linking environmental awareness with green entrepreneurship and pro-environmental behavior, the following hypothesis is proposed:

H2: Environment awareness has a significant impact on green entrepreneurial intentions.

This hypothesis is well-supported, as existing literature indicates that individuals with higher levels of environmental awareness are more inclined to engage in green entrepreneurial activities (Ozaralli & Rivenburgh, 2016; Leonidou et al., 2013). Environmental consciousness not only instills a sense of civic responsibility to protect the environment but also enables entrepreneurs to identify new business opportunities within the realm of sustainability (Van der Werff et al., 2013; Jolink & Niesten, 2015). Consequently, the more ecologically conscious entrepreneurs are, the stronger their intention to pursue green entrepreneurial initiatives, as they seek to align corporate objectives with environmental sustainability goals.

2.8.3 Organizational Culture

As noted by Schein (2010), organizational culture is defined as the shared beliefs, values, norms, and practices that shape an organization's decision-making processes and behaviors. It plays a vital role in shaping entrepreneurial activities, particularly in relation to sustainable business practices and green initiatives, by setting the boundaries within which employees' function and collaborate. In entrepreneurial firms, organizational culture is often regarded as a key determinant in fostering flexibility, risk-taking, and innovation. An innovative organizational culture is especially important for green entrepreneurship, as it supports creativity and the willingness to experiment with new approaches (Quinn, 2011). Such a culture enables leaders and employees to develop and implement unconventional strategies to solve business problems

while simultaneously pursuing ecologically sound alternatives. Moreover, Quinn (2011) emphasizes that organizational culture not only influences internal operations but also shapes the company's external reputation and image. A strong sustainability-oriented culture enhances the credibility and legitimacy of green entrepreneurial ventures, grounding environmental responsibility in the ethos of the organization rather than treating it as a mere marketing tool.

In fostering green entrepreneurship, aligning internal culture with eco-friendly values is crucial. As Bansal (2003) argues, organizational culture often prioritizes eco-sustainable goals over short-term economic gains, reflecting a long-term vision for green enterprises. This suggests that sustainability can drive decision-making, even in the face of higher initial investment costs or extended payback periods. Empirical studies further support this view: Yuan et al. (2022) found that sustainability-oriented, innovation-driven firms are more likely to adopt green technologies and processes. Such firms adapt more effectively to changing regulatory and market demands while also taking a proactive stance toward environmental challenges. Conversely, a rigid and hierarchical culture can hinder the transition to sustainability, as it discourages risk-taking and innovation—both essential for green entrepreneurship (Linnenluecke & Griffiths, 2010). In contrast, a culture that embraces responsiveness, flexibility, and collaboration fosters green entrepreneurial initiatives.

Cultural dimensions such as ethical decision-making and corporate social responsibility (CSR) are particularly significant in advancing green entrepreneurship. Firms that embed CSR into their culture are more likely to adopt responsible and sustainable practices, thereby aligning business success with broader social and environmental responsibilities (McWilliams & Siegel, 2001). This broader perspective on prosperity integrates financial performance with social and environmental outcomes. Importantly, the development of a green organizational culture rests heavily on leadership. Yukl (2006) suggests that leaders committed to sustainability foster cultures supportive of green entrepreneurship by embedding sustainable priorities into company strategies and inspiring employees to adopt similar values. Such leadership champions sustainability not only at a policy level but also in shaping day-to-day practices.

In sum, the literature highlights the crucial role of organizational culture in shaping entrepreneurial behaviour, making it especially relevant to green entrepreneurship (Bansal, 2003). It is expected that a strong sustainability-oriented culture will create an environment conducive to green entrepreneurial initiatives by aligning leadership and employees around environmentally focused goals (Yuan et al., 2022). Cultivating such a culture enables market innovations and supports sustainable competitive advantage by embedding environmental responsibility into the core values and processes of the organization.

H3: Organisation Culture has a significant impact on green entrepreneurial intentions.

2.8.4 Entrepreneurial Motivation

Entrepreneurial motivation refers to the internal drive that encourages individuals to engage in entrepreneurial activities such as creating new businesses, innovating, and generating value within the economy. It encompasses a combination of internal and external factors that influence not only the decision to start a business but also the persistence required to sustain entrepreneurial efforts despite risks and uncertainties. Entrepreneurial motivations are often classified into categories such as economic, psychological, and social factors. To understand why individuals, choose entrepreneurship and how they sustain their ventures in the face of challenges, it is essential to examine entrepreneurial motivation. Prior research has identified key drivers such as financial goals, independence, and personal achievement as significant factors influencing entrepreneurial motivation. The Push-Pull Theory of Entrepreneurship provides important insights into these motivations. According to this theory, individuals may be *pushed* into entrepreneurship due to dissatisfaction with their current employment or lack of available job opportunities, or they may be *pulled* towards entrepreneurship by the potential for financial rewards, personal development, or enhanced social status (Amit & Muller, 1995). Another pertinent framework is Maslow's Hierarchy of Needs, which emphasizes that at the stage of self-actualization, individuals are motivated by the desire to realize their full potential. Within this context, entrepreneurs often seek personal fulfillment through innovation and creativity. As Shane et al. (2003) note, many entrepreneurs are driven by a strong motivation to build ventures that not only generate economic value but also create a lasting legacy with long-term societal impact.

1. **Economic Motives:** From an entrepreneurial perspective, financial gain is often regarded as the most influential motivator. Research by Douglas and Shepherd (2000) highlights that the potential to earn substantial profit and achieve financial autonomy frequently drives individuals to pursue business ventures and take risks. In the context of green enterprises, these economic motives may translate into cost savings through eco-friendly innovations or the exploitation of emerging opportunities in the sustainability-driven market.

2. **Psychological Driving Forces:** Beyond financial considerations, psychological factors such as the desire for control, autonomy, and personal accomplishment play a vital role in entrepreneurial motivation. McClelland’s (1961) Need for Achievement (nAch) Theory emphasizes that individuals with a high need for achievement set challenging goals and derive satisfaction from attaining difficult milestones, thereby fostering entrepreneurial behavior.

3. **Social Motivations:** In addition to economic and psychological factors, social motivations are also influential, particularly for green and social entrepreneurs. Many seek to address issues such as climate change and social inequality through their ventures. Bansal and Roth (2000) argue that socially and environmentally motivated entrepreneurs are more inclined to embed sustainability into their businesses, aligning profit with purpose.

4. **Autonomy and Self-Achievement:** The pursuit of independence and self-determination is another core motivator. Stewart et al. (1999) suggest that individuals drawn to entrepreneurship value the freedom to make independent decisions and shape their own ventures. Within green entrepreneurship, this motivation extends beyond financial autonomy to include a commitment to advancing environmental sustainability.

In practice, entrepreneurs are often motivated by a **blend of intrinsic and extrinsic factors**, where personal values coexist with opportunities for sustainable innovations (Schaltegger & Wagner, 2011). Muñoz and Cohen (2018) further observe that many green entrepreneurs are intrinsically driven by pro-environmental values and the desire to contribute to societal well-being through sustainable business practices. At the same time, external factors such as rising societal expectations and regulatory pressures, spurred by heightened awareness of environmental degradation and climate change, also encourage the adoption of green initiatives (Pacheco et al., 2010). In this regard, Cohen and Winn (2007) assert that green entrepreneurs are uniquely motivated by the dual pursuit of profit generation and environmental problem-solving.

H4: Entrepreneurial motivation has a significant impact on green entrepreneurial intentions.

This hypothesis is grounded in studies that examine the relationship between entrepreneurial motivation and both the later stages of business creation and the success of business operations. Muñoz and Cohen (2018) argue that environmentally motivated entrepreneurs are more inclined toward green entrepreneurship, while Douglas and Shepherd (2000) contend that highly motivated individuals tend to engage more strongly in entrepreneurial activities. Similarly, Shane et al. (2003) and McClelland (1961) emphasized the importance of autonomy, achievement, and self-direction, highlighting entrepreneurial success as a key outcome of motivation, particularly the need for independence and achievement. Within the context of green entrepreneurship, motivated individuals are likely to anticipate the demand for sustainable innovations and actively strive to integrate eco-friendly objectives into their business strategies. According to the Push-Pull Theory (Amit & Muller, 1995), both internal desires and external opportunities influence entrepreneurial behavior. Therefore, this hypothesis posits that stronger entrepreneurial motivation will lead to a greater intention to pursue green entrepreneurship.

2.8.5 Subjective Norms

Subjective norms are a crucial component of the Theory of Planned Behaviour (TPB), which posits that social perceptions influence an individual's behaviour alongside attitudes (Ajzen, 1991). The concept of subjective norms reflects the belief that individuals are expected to act in certain ways by their significant others, including family, friends, colleagues, and society. Within entrepreneurship, subjective norms often shape entrepreneurial intentions, particularly when the behaviour involves social or environmental concerns such as green entrepreneurship. Green entrepreneurship, in this context, is driven by the growing expectation that businesses should reduce their environmental impact. This normative (and often societal) pressure for

sustainability propels eco-sustainable entrepreneurship, which is defined as business practices that are environmentally conscious and favourable to nature (Dean et al., 2010). Entrepreneurs' perceptions of significant social pressures strongly influence the extent to which they integrate eco-friendly practices into their ventures. For example, an individual may adopt sustainable business strategies due to the belief that their social network values and prioritizes environmental sustainability.

2.8.5.1 Normative Beliefs

Fishbein and Ajzen (1977) define *normative beliefs* as the perceptions individuals hold regarding the expectations of significant members of their social milieu concerning a particular behaviour. To a considerable extent, an individual's actions are influenced by the people important to them and by what is perceived as appropriate behaviour within that social context. Thus, normative beliefs related to entrepreneurship shape whether individuals feel socially supported or socially pressured to start a business. In the case of green entrepreneurs, these beliefs may manifest as a perceived social obligation to engage in sustainable business practices, often influenced by the environmental consciousness of peers and professional networks. Scholars have highlighted that normative beliefs can either motivate or discourage entrepreneurial activity. Importantly, such beliefs often operate in alignment with broader societal expectations: in contexts where eco-friendly approaches are prioritized, individuals with strong normative beliefs are more likely to view green entrepreneurship as a legitimate and respected career path (Liñán & Chen, 2009). Similarly, Meek et al. (2010) argue that entrepreneurial decisions are significantly shaped by socio-cultural norms that favour environmental sustainability, thereby making the pursuit of sustainability-oriented ventures more attractive.

2.8.5.2 Moral Obligation

Moral obligation refers to an individual's internalized psychological duty or self-regulation to act in a certain way, guided by ethics and values rather than external pressure (Schwartz, 1977). Unlike normative beliefs, which reflect social expectations, moral obligation motivates individuals to act based on their personal sense of right and wrong.

In the context of green entrepreneurship, moral obligation is reflected in the willingness to take responsibility for mitigating environmental harm and adopting sustainability practices. Individuals with a strong moral compass are more likely to consistently engage in pro-social and pro-environmental behavior, regardless of social approval (Bamberg & Möser, 2007). This is particularly significant when dealing with quasi-public goods such as the environment and natural resources, where individuals may feel morally bound to act for the sake of long-term preservation.

Entrepreneurs with a strong ethical orientation often perceive sustainability as an inherent duty. For instance, Markman and Baron (2003) found that entrepreneurs with high ethical awareness are more inclined to pursue

socially responsible and environmentally sustainable ventures, driven by their moral obligation to community welfare.

The Development of Hypotheses for Subjective Norms Then, given the relevance of subjective norms for the construction of entrepreneurial activity, the following hypotheses are proposed:

H5: Subjective norms have a significant impact on green entrepreneurial intentions.

H5a: Normative beliefs have a significant impact on green entrepreneurial intentions.

H5b: Moral obligation has a significant impact on green entrepreneurial intentions.

These hypotheses are grounded in the Theory of Planned Behaviour (Ajzen, 1991), which posits that individuals are more likely to engage in specific activities when they perceive social pressure from significant others (subjective norms). In the context of green entrepreneurship, entrepreneurs are more inclined to pursue environmentally friendly ventures if they believe that their social circle values sustainability (normative beliefs) or if they feel a moral responsibility to protect the environment. Subjective norms play a crucial role in shaping entrepreneurial intentions, particularly when the intended action is socially accepted, as demonstrated by Liñán and Chen (2009). Supporting this, York et al. (2010) found that entrepreneurs are more willing to incorporate green features into their businesses in regions where environmental sustainability is highly valued.

Further, Bamberg and Möser (2007) and Schwartz et al. (2019) explain that personal ethics instill a sense of moral responsibility, confirming that individuals possess intrinsic motivations to act in environmentally responsible ways. These perspectives highlight how subjective norms, normative beliefs, and moral obligation converge to shape entrepreneurial intentions. Thus, ethical and social constructs of society play a pivotal role in fostering green entrepreneurship and strengthening green entrepreneurial intentions.

2.8.6 Entrepreneurship Education as a Moderator Between Personality Trats and Green Entrepreneurial Intentions

The importance of entrepreneurial education is critical, as it fosters and shapes individuals' attitudes, skills, and intentions, particularly in green entrepreneurship. Specific traits such as proactiveness, entrepreneurial self-efficacy, need for achievement, and risk aversion significantly influence an individual's engagement in sustainable business activities. Moreover, these attributes and the relationships among them can be profoundly enhanced through entrepreneurial education. Equipped with appropriate knowledge and structured training on sustainability, proactive individuals are far more likely to identify and seize new environmental opportunities (Bateman & Crant, 1993; Lans et al., 2014). High levels of entrepreneurial self-efficacy can be further strengthened through targeted education, thereby enabling individuals to navigate the challenges of managing green businesses effectively (Zhao et al., 2005). Achievement-driven individuals may also benefit from

educational programs that integrate sustainability and innovation, motivating them to pursue sustainable ventures (McClelland, 1961). Conversely, risk aversion, traditionally considered a barrier to entrepreneurial engagement, can be mitigated through exposure to risk-reduction strategies taught in entrepreneurship education (Stewart Jr & Roth, 2001; Nabi et al., 2017).

For the purposes of this study, we treat entrepreneurial education as a distinguishing categorical moderator by dividing it into two distinct types:

- **Formal Entrepreneurial Education**: This includes a more traditional form of learning, such as university lectures, workshops, and other forms of certification courses. These formal settings play an important role in shaping entrepreneurial intentions because they provide the theoretical frameworks, systematic learning, and exposure to best practices through which students are expected to acquire the skills.

- **Informal Entrepreneurial Education**: This includes learning through experience, mentoring, self-study and the exposure they SMEs gain from their practice. Informal education balances entrepreneurs' individual needs with the constantly shifting demands of green entrepreneurship.

The aim of the study is to examine whether, by differentiating between formal and informal entrepreneurial education, these distinct types of education act as more potent moderating factors in the relationship between personality traits and green entrepreneurial intentions. This refined focus highlights not only the overarching moderating effect of education but also provides a basis for policy and educational reform by demonstrating how different educational structures can influence entrepreneurial behaviour within a sustainable framework.

H6: Entrepreneurship education moderates the relationship between personality traits and green entrepreneurial intentions among SME owners

It is expected that both formal and informal educational frameworks will strengthen the influence of personality traits on the inclination toward green entrepreneurship. By distinguishing formal education from informal education, this model seeks to explain the development of entrepreneurship in the context of sustainable business, highlighting the role of education and broadening the understanding of factors that shape entrepreneurial intentions. The findings could assist policymakers and educators in designing robust programs aimed at fostering entrepreneurial skills and environmental responsibility within the SME sector.

Accordingly, the study proposes a conceptual framework based on a thematic review of past studies, followed by an in-depth theoretical analysis and the development of relevant hypotheses. The conceptual framework is presented in Figure 2.1.

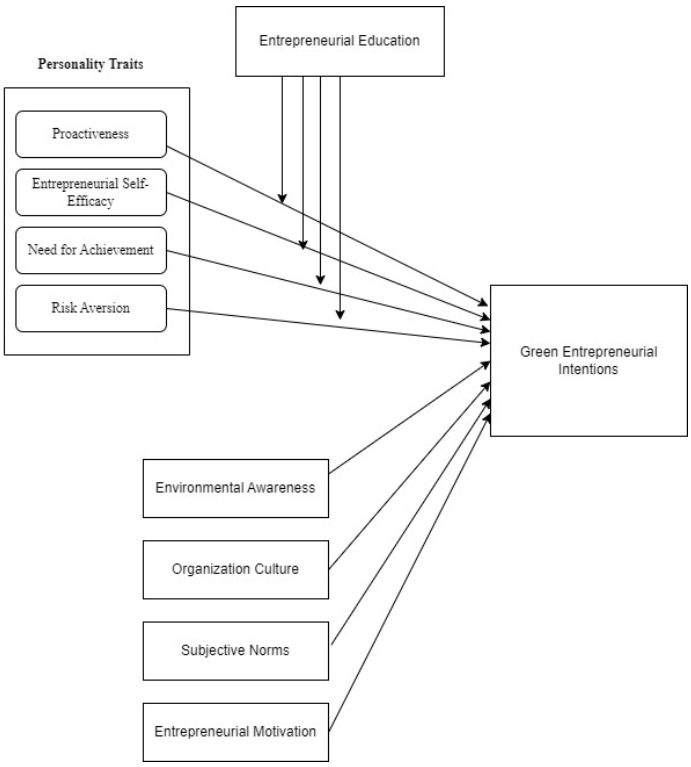

Figure 2.1 Conceptual Framework on Green Entrepreneurship

Source: By Author

2.9 Summary

The study began with a careful analysis of the key theories forming the foundation of the research, aiming to strengthen understanding of individuals' intentions to engage in green entrepreneurship. Theories examined include the Theory of Planned Behaviour (TPB), Theory of Reasoned Action (TRA), Social Cognitive Theory (SCT), Resource-Based View (RBV), Institutional Theory, Stakeholder Theory, Knowledge Spillover Theory of Entrepreneurship (KSTE), and Dynamic Capabilities Theory (DCT). Each theory was analyzed for its contribution to understanding entrepreneurial practices and its application in previous research. Following the theoretical review, the author examined empirical studies in detail. The literature was synthesized to demonstrate how these educational and entrepreneurial theories have been applied across different phenomena and to identify key variables such as personality traits, environmental awareness, organizational culture, subjective norms, entrepreneurial motivation, and entrepreneurship education. The relationships between these variables and green entrepreneurial intentions were then explored to construct the conceptual framework for this study. By following this systematic process, the researchers developed hypotheses grounded in a comprehensive review of the literature. Finally, all concepts and their related hypotheses were organized into a cohesive model, providing a clear structure for the study and highlighting the complex interplay of antecedents influencing green entrepreneurial intentions.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology developed to study the antecedents of green entrepreneurial intentions among SME owners in Punjab's manufacturing sector. It provides a detailed account of the methods used to investigate factors such as awareness, opportunities, barriers, and the role of entrepreneurship education in shaping green entrepreneurial intentions. Given the multifaceted nature of the study, a mixed-methods approach was adopted, combining qualitative and quantitative techniques. Qualitative data provide rich insights into experiences and perceptions, while quantitative data allow for hypothesis testing and statistical validation, thereby enhancing the depth and robustness of the analysis.

The chapter is organized into two main sections aligned with the study's objectives. The first section covers qualitative methods, addressing objectives 1 and 2, which explore SME owners' awareness of green entrepreneurship and examine the opportunities and challenges they face. The second section focuses on quantitative methods, fulfilling objectives 3 and 4, which analyze the antecedents of green entrepreneurial intentions and examine the moderating effect of entrepreneurship education on the relationship between personality traits and green entrepreneurial intentions.

The sections below elaborate on the methodology step-by-step:

• 3.2 Research Approach. Outlines the application of the mixed-method approach detailing its alignment with the objectives of the study.

• 3.3 Philosophical Assumption. Outlines the philosophical foundations that relate to both qualitative and quantitative components of the study.

• 3.4 Research Design. Discusses in detail the convergent parallel design and the processes involved in collecting and analysing qualitative and quantitative data simultaneously.

3.5 Research Methods: Subdivided into two sections:

Part One: Qualitative Phase – It describes the target population, sampling units and sample size. Discusses data collection methods including interview, focus groups, and document analysis as well as data analysis techniques and validation.

Part Two: Quantitative Phase – It describes population, sampling frame, sample size, survey design, instruments, data collection time frame, and statistical tools used for data analysis such as PLS SEM.

This approach enables accomplishing all objectives for qualitative as well as quantitative methods of research.

3.2 Research Approach

A research approach is a fundamental component of research methodology, encompassing the overall strategy for collecting, analyzing, and interpreting data in relation to the study's objectives or research questions. According to Creswell and Creswell (2017), there are three primary research approaches: qualitative, quantitative, and mixed-methods.

a. **Qualitative research** is exploratory and seeks to understand underlying reasons, perspectives, and motivations. It relies on non-numerical data collected through interviews, focus groups, and observations to gain in-depth insights (Creswell & Poth, 2016).

b. **Quantitative research** is structured and seeks to quantify phenomena, transforming data into numerical form for statistical analysis. It commonly employs surveys and experiments to test hypotheses or examine relationships among variables (Bryman, 2016).

c. **Mixed-methods research** integrates qualitative and quantitative approaches, combining the strengths of both to achieve a comprehensive understanding of the research problem (Tashakkori, 1998).

For this study, which explores the antecedents affecting green entrepreneurial intentions among SME owners in Punjab's manufacturing sector, a mixed-methods design was adopted. This approach aligns with the study's objectives by providing both rich contextual insights and empirical data. The qualitative phase addresses objectives 1 and 2, capturing SME owners' awareness of green entrepreneurship, motivations, opportunities, and barriers—factors that are not easily measurable and require detailed exploration through interviews (Saunders, 2009). The quantitative phase addresses objectives 3 and 4, analyzing measurable variables such as personality traits and testing the moderating influence of entrepreneurial education on green entrepreneurial intentions (Creswell & Creswell, 2017).

The combination of qualitative and quantitative data enables the study to identify not only the "what" of the key antecedents but also the "why" and "how" of their significance and impact. This dual approach enhances the rigor and depth of the research, providing a holistic understanding of the factors shaping green entrepreneurial intentions among SME owners (Tashakkori, 1998).

3.3 Philosophical Approach

The philosophical assumptions underlying a study shape its research methodology and reflect the researcher's perspective on the nature of reality, knowledge, and the interaction between the researcher and the subject of study. These assumptions guide the research process, influencing the choice of methodology, data collection methods, and analysis strategies. The core theoretical assumptions that form the foundation of research philosophy include ontology, epistemology, and methodology (Guba & Lincoln, 1994). A clear understanding of these assumptions enables researchers to justify their methodological decisions and situate their findings

within broader academic discourse. In scholarly literature, four key research paradigms are often highlighted—interpretivism, positivism, pragmatism, and realism—each of which informs study design and shapes the approach to knowledge generation.

3.3.1 Interpretivism

In the interpretivism paradigm, reality is considered socially constructed, meaning that subjective interpretations shape a person's perception of the world (Schwandt, 1994). To capture these personal and social realities, qualitative research methods such as interviews and observations are commonly employed (Saunders, 2014). Knowledge is generated through interactions with participants, highlighting the inherently subjective nature of reality (Willis, 2007). Advocates of this paradigm acknowledge that contextual and personal factors influence each individual's reality. Interpretivism is particularly useful in qualitative studies, as it provides a holistic understanding of motives, values, and actions. This paradigm is most appropriate when the focus is on understanding meaning rather than solely on objective facts.

3.3.2 Positivism

Cohen et al. (2002) associate the positivist philosophical approach with an objective reality that exists independently of human perception. This reality can be measured and tested using scientific methods. The paradigm emphasizes careful observation, precise measurement, and the collection of reliable evidence to formulate generalizations or establish rules. Positivist researchers typically employ systematic scientific methods such as experiments and surveys to gather quantifiable data and test hypotheses (Bryman, 2016). The primary goal is to determine causal relationships and develop predictive models that explain phenomena. Positivism is particularly applicable to the natural sciences and to branches of the social sciences that focus on measuring variables and establishing facts. It is most useful for academic inquiries aiming to provide empirical evidence and generalizable conclusions.

3.3.3 Realism

Realism is a philosophical stance that acknowledges the existence of an objective reality but asserts that our understanding of it is always mediated through human and social interpretation (Sayer, 1999). According to realists, while an independent, non-constructed reality exists, its perception is influenced by social, cultural, and historical contexts. As noted by Bhaskar (2013), realism aims to strike a balance between the extremes of positivism and interpretivism by integrating both rational frameworks and subjective experiences to understand phenomena. Realist research often examines the interactions between structures and agents, exploring how underlying processes shape observable outcomes. This approach is particularly suitable for studies that consider both objective facts and the subjective interpretations surrounding those facts.

3.3.3 Pragmatism

Pragmatism as a philosophical approach to research is grounded in practical outcomes and problem-solving. It does not adhere to a single method but instead employs an eclectic approach, using both qualitative and quantitative techniques to address specific research questions (Creswell & Creswell, 2017). According to Morgan (2007), pragmatism evaluates theories or beliefs based on how effectively they address real-world problems. Researchers adopting this paradigm focus on achieving the objectives of the study with practical relevance and impact. This philosophy is particularly suited to mixed-methods research, where qualitative and quantitative data are integrated to provide a comprehensive understanding. The flexibility of pragmatism allows researchers to adapt methods according to the needs of the study, ensuring relevance and feasibility. In this research, a mixed-methods design is applied, making pragmatism an appropriate philosophical foundation. Quantitative data measures the impact of various antecedents on green entrepreneurship, while qualitative data captures the personal motivations, barriers, and opportunities experienced by SME owners. This approach exemplifies the pragmatic principle of using multiple methods within a single study to tackle complex research problems (Morgan, 2007).

3.4 Research Design

The research design defines the framework within which the study's objectives are achieved. This study adopts a mixed-methods approach, incorporating both qualitative and quantitative data collection and analysis techniques to comprehensively understand the factors fostering green entrepreneurial intentions among small and medium-sized enterprises (SMEs) in Punjab. The use of mixed methods is justified by the need to examine complex relationships, such as those between specific personality traits, entrepreneurial education, and green entrepreneurial intentions. Additionally, it facilitates a holistic understanding of the opportunities and barriers faced by SME owners.

Various mixed-methods designs exist, including explanatory sequential, exploratory sequential, transformational, and multi-level designs, among others. For this study, a convergent parallel design was employed, in which qualitative and quantitative data were collected simultaneously, analyzed separately, and then merged (Creswell & Clark, 2017). This design effectively combines the generalizability of quantitative data with the contextual richness of qualitative data, providing a nuanced and comprehensive understanding of the phenomena. Moreover, integrating multiple data sources enhances the validity and reliability of the findings, ensuring robust conclusions that can inform strategies to improve green entrepreneurship.

3.5 Research Methods

Research methods are indispensable tools that facilitate the collection and analysis of data to address specific research inquiries (Bryman, 2016). The choice of methods is typically guided by the study's objectives, the type of research questions posed, and the underlying theoretical framework (Saunders, 2016). Research

methods can be qualitative, emphasizing interpretation and understanding, or quantitative, focusing on measurement and statistical analysis. For complex research questions, mixed-methods research integrates both approaches to provide a more comprehensive understanding of the phenomenon under investigation (Creswell & Plano Clark, 2023).

This study is divided into two sections. Part One employs qualitative methods, including interviews and thematic analysis, to capture rich insights from SME owners regarding their experiences with green entrepreneurship. Part Two utilizes quantitative approaches, incorporating surveys and statistical analysis, to examine patterns, relationships, and moderating effects, such as the role of entrepreneurship education. By integrating qualitative and quantitative methods, the study achieves a holistic understanding of the antecedents influencing green entrepreneurial intentions among SMEs.

Part 1 Qualitative Phase

The following subsection focuses on the specific research methods employed to achieve the qualitative objectives of this study. Several critical considerations must be addressed when adopting a mixed-methods research design, including the sampling strategy and the timing of data collection for both qualitative and quantitative phases. For instance, in a convergent parallel design, it is important to determine whether the qualitative sample will overlap with the quantitative sample and whether the sample sizes and characteristics will be homogeneous or heterogeneous across the two methods (Creswell & Clark, 2017). Careful planning of the data collection period is also essential to ensure that the integration of all phases provides a comprehensive understanding of the research problem (Tashakkori, 2010).

In this study, these considerations are addressed by providing detailed descriptions of the research questions, sample, and data collection procedures for the qualitative phase. This phase is crucial for exploring SME owners' awareness, perceived opportunities, and barriers related to green entrepreneurship, given that the study aims to examine green entrepreneurial intentions in the manufacturing sector. Insights from this qualitative phase will also help corroborate the quantitative findings, thereby enabling a more holistic and thorough investigation of the research problem.

3.5.1 Population of the Study

The qualitative component of this study samples SMEs from the Punjab region's Ludhiana, Jalandhar, Amritsar, SAS Nagar (Mohali), and Fatehgarh Sahib districts, which are the five largest manufacturing hubs in the state. These districts were selected due to their high concentration of manufacturing activities and their strategic importance to Punjab's industrial landscape. With the growing emphasis on sustainability and green initiatives, these areas are particularly suitable for examining intentions toward green entrepreneurial activities.

The study follows a specific sampling strategy based on the National Industrial Classification (NIC) system, which categorizes industries according to their economic activities and environmental impact. SMEs were further subclassified using the guidelines of the Punjab Pollution Control Board (PPCB), focusing on red and orange category industries. These industries are closely monitored due to their higher potential for environmental harm and greater sustainability pressures. By integrating the NIC approach with PPCB environmental classifications, the study ensures that the sampled SMEs belong to manufacturing sectors most relevant to green entrepreneurship.

This sampling strategy ensures methodological rigor while maintaining industrial relevance, enabling a detailed exploration of the awareness, opportunities, and barriers to sustainable business practices among SME owners. Furthermore, within the convergent parallel design, the qualitative phase enhances the quantitative analysis by providing rich contextual insights into the green entrepreneurial intentions of SMEs in Punjab.

3.5.2 Sampling Unit

A key consideration for both the qualitative and quantitative phases of this research was whether to use the same sample population. Although the sample sizes differed between the two phases, all participants were drawn from the same pool to ensure consistency of research outcomes and comparability across methods. This aligns with the convergent parallel design, which allows for the independent collection of qualitative and quantitative data from the same population, facilitating a more holistic evaluation of the phenomenon (Creswell, 2011).

Within this framework, the sampling units consist of manufacturing SMEs located in Punjab's five largest industrial districts: Ludhiana, Jalandhar, Amritsar, SAS Nagar (Mohali), and Fatehgarh Sahib. These districts were selected due to their high concentration of industrial output, representing a significant share of the state's manufacturing activity. To structure the sampling process, the study utilizes the National Industrial Classification (NIC) system, which organizes industries according to economic activity. The focus is on SMEs within industries categorized by the Punjab Pollution Control Board (PPCB) as Red or Orange, reflecting their higher pollution potential and stricter environmental regulations (PPCB, 2020). By integrating NIC classifications with PPCB environmental categorizations, the study ensures that the selected SMEs not only represent major manufacturing sectors but also provide meaningful insights into sustainability practices and green entrepreneurial intentions.

3.5.3 Sample size and Sample selection

The discussion in this part of the paper focuses on the strategies of sample selection and the underlying the rationale behind participant selection. Considering the scope of the research on SMEs and green entrepreneurship in high environmental impact sectors, it was necessary to implement purposive sampling strategy to capture relevant SMEs.

3.5.3.1 Determining the Sample Size

In this qualitative study, 55 SMEs were initially contacted, of which 38 participants completed the interviews. Notably, data saturation was achieved at 32 respondents, indicating that no new significant themes were emerging beyond this point. Nonetheless, the researchers collected data from all 38 participants to enhance the robustness and reliability of the findings. Research by Guest et al. (2006) empirically demonstrates that theoretical saturation generally occurs around 30 participants, supporting the adequacy of this sample size for in-depth exploration of green entrepreneurial intentions. Similarly, Creswell and Poth (2016) note that 30 to 50 interviews are typically sufficient to achieve saturation in qualitative research, further validating the sample's suitability for capturing meaningful insights.

3.5.4 Sampling Techniques

This section outlines the sampling techniques employed in the study and provides a justification for participant selection. Given the focus on green entrepreneurship within environmentally sensitive sectors, purposive sampling was adopted to select SMEs that possess firsthand experience and knowledge of sustainability-related issues, ensuring the relevance and depth of the data collected.

3.5.4.1 Purposive Sampling

The purposive sampling technique specifically targeted participants who were most likely to provide rich, meaningful insights aligned with the research objectives. SMEs listed under the Punjab Pollution Control Board (PPCB) Red and Orange categories were selected due to their high environmental risks and stringent regulatory oversight, ensuring the study focused on industries actively transitioning toward green entrepreneurship and eco-sustainability (Patton, 2014).

Participants were drawn from the manufacturing segment, specifically those directly involved in operations. These respondents are best positioned to provide insights into the barriers, opportunities, and drivers of green entrepreneurial activity (Palinkas et al., 2015). This approach enables the study to offer detailed explanations of the adoption of sustainability practices in Punjab's most prominent industrial sectors, creating a solid foundation for analyzing green entrepreneurial initiatives.

3.5.4.2 Justification for Technique Chosen

Given the qualitative component of this study, a purposive sampling technique was considered appropriate, allowing the researcher to select participants who are knowledgeable and capable of providing rich, relevant insights aligned with the study's objectives (Patton, 2014). Participants were drawn from SMEs in the manufacturing sector across focus regions in Punjab, specifically those classified under the Red and Orange categories by the Punjab Pollution Control Board (PPCB) due to their significant environmental impact. This selection ensures relevance to the green entrepreneurship discourse. The study aims to explore the

opportunities, barriers, and antecedents influencing green entrepreneurial intentions within environmentally sensitive industries. Targeting these high-impact businesses allows the research to gather insights from individuals directly engaged with sustainability challenges, providing a robust basis to examine the complex relationship between green entrepreneurship and industrial pollution in Punjab (Palinkas et al., 2015).

3.5.4.3 Alternative technique Considered

Alternative sampling approaches, such as random sampling and stratified sampling, were not employed in this study, as they are more commonly used in quantitative research. Random sampling lacks the ability to target specific participants, which could have resulted in excluding green entrepreneurs and reduced the relevance of the data collected. Stratified sampling, while focused on gathering data across different sectors, was not ideal because the study aimed to delve deeply into industries most relevant to green entrepreneurship. In contrast, purposive sampling aligns directly with the research objectives by selecting participants capable of providing rich insights into the motivations and barriers associated with implementing green practices (Robinson, 2014). This approach ensures that respondents are drawn from the precise population needed to address the study's questions while also satisfying the qualitative nature of the research.

3.5.5 Data collection

In phenomenological research, the collection of qualitative data emphasizes understanding the lived experiences of participants. This approach enables researchers to capture the essence of participants' experiences, including the subtle nuances of interpretation, perception, and meaning that individuals construct around their experiences (Smith, 2004). For this study, a qualitative questionnaire was employed to collect detailed and rich information directly from the participants, allowing for in-depth insights into their experiences with green entrepreneurship.

3.5.5.1 Qualitative questionnaire development

With reference to the experiences of small and medium-sized enterprise (SME) owners who are, or aspire to be, green entrepreneurs, the qualitative questionnaire was designed to explore their perceptions and lived experiences regarding green entrepreneurship. The questions were developed through a rigorous multi-stage process to ensure alignment with the overarching goals of the study. They incorporated diverse dimensions, including environmental knowledge, eco-conscious practices, factors that hinder green initiatives, and practices that facilitate or promote sustainable efforts.

3.5.5.2 Validation of Questionnaire

To ensure the reliability and validity of the qualitative questionnaire, expert validation was conducted. The questions were presented to a panel of educators and practitioners who were knowledgeable about the subject matter and its relevance to the study (Creswell & Poth, 2016). Their feedback was carefully considered, and

incorporating their recommendations led to the development of the final version of the expanded questionnaire, ensuring it effectively captured the intended information.

3.5.5.3 Data collection procedure

Data were collected through face-to-face interviews using a semi-structured qualitative questionnaire. For each participant, efforts were made to explore their awareness, perceptions, and lived experiences related to green entrepreneurship. The interviews lasted 45 minutes to 1 hour, providing sufficient time to discuss key issues surrounding green entrepreneurial intentions and practices. Participant confidentiality was strictly maintained throughout the process, and detailed notes were taken during the interviews to support accurate data analysis (Creswell & Poth, 2016).

3.5.5.4 Transcription procedure

After the interviews, each participant's responses were documented in a Word file to facilitate further analysis. Given that the phenomenological approach emphasizes an in-depth understanding of lived experiences, it was essential to transform these interactions into textual format. Although audio recordings were not made—as SME owners were uncomfortable sharing sensitive information—efforts were taken to preserve the richness of participants' perspectives through immediate post-interview documentation (Rutakumwa et al., 2020). This process ensured that the depth and nuance of participants' experiences were maintained, enabling detailed coding and thematic identification (Braun & Clarke, 2008). The transcripts underwent careful scrutiny to verify accuracy, completeness, and reliability before qualitative analysis.

3.5.6 Sample Characteristics

This study's sample comprises SMEs located in the Ludhiana, Jalandhar, Amritsar, SAS Nagar (Mohali), and Fatehgarh Sahib districts of Punjab. These districts were chosen due to their high concentration of manufacturing SMEs and their significance to Punjab's industrial economy. To align with the research focus on green entrepreneurial intentions, SMEs were selected based on their environmental impact, specifically those classified under the Punjab Pollution Control Board (PPCB) Red and Orange categories, and according to their industry type as per the National Industrial Classification (NIC) system. This purposive selection ensured the inclusion of industries with high environmental impact, such as textiles and yarn, chemicals, hand tools, rubber and plastics, metal, pharmaceuticals, medical electrical equipment, machinery, auto parts, paper and printing, sports goods, sanitation, and leather—particularly those with the potential to adopt green entrepreneurial practices. Business owners and senior managers were chosen as primary respondents, given their decisive role in implementing sustainability and green entrepreneurship initiatives. This sampling strategy was designed to capture a diverse range of perspectives on the barriers and enablers of green entrepreneurship.

3.5.7 Techniques of Analysis and Software Used

In the qualitative phase, thematic analysis was employed to identify key themes, patterns, and insights from the data collected. In qualitative research, thematic analysis is widely used to define concepts and construct narratives aligned with the study's objectives (Braun & Clarke, 2008). To enhance the rigor and reliability of the analysis, NVivo software was utilized. NVivo facilitates systematic coding, categorization, and visualization of qualitative data, enabling a detailed understanding of the factors influencing green entrepreneurial intentions among SME owners. Additionally, the software supports data triangulation, ensuring that the perspectives expressed in the interviews are coherent and consistent with the overall research findings.

Part Two: Quantitative Phase

3.5.8 Population of the study

The quantitative component of this research targets SMEs located in Punjab's major manufacturing districts: Ludhiana, Jalandhar, Amritsar, SAS Nagar (Mohali), and Fatehgarh Sahib. These districts were deliberately selected due to their high concentration of manufacturing SMEs, making them ideal for studying green entrepreneurial intentions. To refine the study population, a multi-stage sampling procedure was employed. First, industries were organized according to the National Industrial Classification (NIC) framework to ensure comprehensive coverage of relevant manufacturing subsectors. Priority was then given to industries classified under the Punjab Pollution Control Board (PPCB) Red and Orange categories because of their higher pollution potential and regulatory significance.

Within the NIC and PPCB boundaries, additional attention was given to sectors with strong SME representation, high environmental impact, and potential for green transformation. Factors such as industry accessibility, sustainability relevance, and sectoral importance were also considered to ensure a practical and meaningful sample.

This systematic approach ensures that the final sample encompasses industries that are both accessible for evaluation and environmentally significant. By integrating NIC classifications and PPCB environmental risk categories, the study maintains methodological rigor and complements the qualitative findings, offering a balanced and comprehensive view of green entrepreneurial intentions among SMEs in Punjab.

3.5.9 Sample Unit

In research, a sample is defined as a smaller subset of a larger population, selected for more intensive study and analysis. Careful consideration is required in selecting the sample to ensure that the insights obtained are representative of the broader population. For this study, the sample unit consists of manufacturing SMEs from five major districts of Punjab, chosen for their high density of SMEs. These districts were selected to maintain balance between the qualitative and quantitative phases of the study, in line with the convergent parallel design

framework (Saunders, 2016). Using these sample units enables comprehensive and insightful analyses while ensuring representativeness of the wider SME population in the region. Calculating an appropriate sample size is crucial for the effectiveness of the study, particularly because the mixed-methods approach relies on cross-validating qualitative and quantitative findings.

3.5.10 Sampling Frame & Sampling Techniques

For conducting the survey, the sampling frame was developed by integrating official datasets to accurately capture the distribution of manufacturing SMEs in Punjab. Data regarding the distribution of manufacturing units across different districts was obtained from the MSME Dashboard (2021), which facilitated the selection process. The five largest manufacturing districts—Ludhiana, Jalandhar, Amritsar, SAS Nagar (Mohali), and Fatehgarh Sahib—were chosen, as together they account for nearly 75% of Punjab's total manufacturing output.

To streamline the sample and focus on industries with pronounced environmental challenges, the Punjab Pollution Control Board (PPCB) Red and Orange category lists were employed. These categories classify industries according to their pollution potential, with red and orange industries posing the greatest environmental risks. Given that this study emphasizes green entrepreneurship and sustainability, these sectors were considered most relevant because they face both pressures and opportunities for environmental transformation. By combining district-level economic data from the MSME Dashboard with environmental risk assessments from PPCB (2020), the study ensures a methodologically robust and targeted sampling strategy, enhancing the credibility of the research outcomes by concentrating on industries that are both economically significant and environmentally impactful.

A mixed sampling approach was employed, combining purposive sampling and quota proportional sampling to ensure representativeness. Initially, purposive sampling was used to identify the five largest manufacturing districts from the 23 districts in Punjab, targeting areas with the highest concentration of SMEs and relevance to the research topic. Subsequently, quota proportional sampling was implemented within these districts to ensure that the SME population from each district was proportionately represented according to the number of operating units. This approach enhanced the adequacy and representativeness of the sample (Etikan et al., 2016).

3.5.11 Sample size determination

To ensure representative sampling, several approaches were employed in this study. For a population ranging between 7,500 and 10,000 SMEs, the Research Advisory sample size table recommended a sample size of 370. To further refine this estimate, the Raosoft sample size calculator was used, which determines sample size based on the margin of error, confidence level, population size, and response distribution. In this case, the calculator suggested a minimum of 369 respondents (Raosoft Inc.). Additionally, Cochran's formula for finite

population adjustment was applied, which confirmed that 369 was an appropriate minimum sample size for the study.

To strengthen the reliability and robustness of the findings, the study ultimately collected data from a higher sample of 421 respondents. The final sample comprised owners and managers of SMEs located in the five largest manufacturing districts of Punjab, selected for their relevance to the study of green entrepreneurial intentions.

3.5.12 Development of Instruments

In designing the framework for the antecedents of green entrepreneurial intentions, the constructs were synthesized from an extensive review of the literature and adapted to the specific context of this research. All items were measured using a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) to maintain consistency in the evaluation of all constructs.

The primary constructs and their measurements included several variables. Green Entrepreneurial Intentions was measured using 6 items based on previously validated instruments. Personality Traits were subdivided into four sub-constructs: Proactiveness (6 items), Entrepreneurial Self-Efficacy (6 items), Need for Achievement (6 items), and Risk Aversion (6 items), capturing personal motivators for entrepreneurial behavior. Additionally, Environmental Awareness, Organizational Culture, and Entrepreneurial Motivation (each with 6 items) assessed environmental, organizational, and motivational factors influencing green entrepreneurial intentions.

Subjective Norms, which impact entrepreneurial actions, were measured using two sub-constructs: Normative Beliefs (4 items) and Moral Obligation (4 items). Finally, Entrepreneurial Education was included as a categorical moderator, distinguishing respondents based on formal or informal education in entrepreneurship, thereby allowing an examination of its moderating effect on entrepreneurial intentions.

Table 3.1: Instrument Sources

Constructs	**Sub Constructs**	**Sources**	**No. of Items**
Green Entrepreneurial Intentions		Adapted from the (Qazi et al., 2020), (Yi, 2021),(Noor et al., 2022),(Weng et al., 2022)	6
Personality Traits	Proactiveness	Adaptive from (Qazi et al., 2020), (Y. S.	6

		Chen et al., 2023), (Sam Liu & Huang, 2020)	
	Entrepreneurial self-efficacy	Adaptive from (Qazi et al., 2020), (Y. S. Chen et al., 2023), (Sam Liu & Huang, 2020)]	6
	Need for achievement	Adaptive from [(Roy, 2023), (Qazi et al., 2020)]	6
	Risk aversion	Adaptive from (Zhang & Cain, 2017), (Rosique-Blasco et al., 2016), (Qazi et al., 2020)	6
Environmental awareness		Adapted from (Zhang & Cain, 2017), (Rosique-Blasco et al., 2016), (Qazi et al., 2020)	6
Organisation Culture		Adapted from (Lillo & Ferguson, 2022), (Y. S. Chen, 2011), (Y. S. Chen et al., 2023), (C. H. Wang, 2019)	6
Subjective Norms	Norms belief	Adapted from [(Mamun, 2022a), (Prabowo et al., 2022)]	4

	Moral obligation	Adapted from [(Mamun, 2022a), (Wu & Wu, 2014)]	4
Entrepreneurial Motivation		Adapted from [(Wu & Wu, 2014)]	6

Source: By Author

3.5.13.1 Content Validity

In the second stage of this research, the survey instrument underwent a rigorous pre-testing process to ensure its content validity. An expert panel evaluated each item for its relevance and specificity in relation to the study's objectives. The Content Validity Ratio (CVR), a statistical method used to determine whether individual items should be retained or removed based on expert assessment, was applied (Gilbert & Prion, 2016). Items that fell below the CVR threshold were either modified or eliminated. Incorporating the experts' recommendations helped make the instrument more clear, precise, and comprehensive, thereby enhancing its ability to accurately capture the data required to address the study's objectives.

3.5.13.2 Profile of the Panel Member

The expert panel consisted of 10 members, including six academicians, one bank manager specializing in financing SMEs, and three SME owners or industrialists. The combination of academic and practical expertise enhanced the content validity of the survey instrument by ensuring that it was both theoretically sound and relevant to the SME context. Using the Content Validity Ratio (CVR) method, the panel evaluated the relevance of each item, and items were subsequently modified or refined based on their recommendations.

Content Validity Analysis Using the Content Validity Ratio (CVR)

The survey instrument was evaluated for content validity by a full panel of experts. Each panellist rated six items using a three-point scale, ranging from:

• 1 = Essential (Item is important to measure the construct)

• 2 = Useful (Item relates to the construct but not fundamentally)

• 3 = Not Necessary (Item does not relate to the construct)

(Lawshe, 1975) was applied to determine CVR for each item.

$$CVR = (n_e - (N / 2)) / (N / 2)$$

Where:

- n_e = Count of experts marking item as “Essential”
- N = Total experts on the panel.

As per Lawshe's classification, the critical CVR value for a panel of 10 experts has been established to be 0.8. It was determined that items with a CVR value of 0.8 or greater were deemed essential for the construct.

CVR Results and Item Retention

When applying CVR analysis to all 67 items, they received the following assessments:

• 46 items had a CVR value of 1 (rated as Essential by all) and were preserved in the final form.

• 21 items achieved a CVR value of 0.8 or greater and were classified as reliable due to feedback from experts. These items were accepted with slight modifications.

• 7 items did not meet the 0.8 threshold, suggesting not enough agreement around their essential nature and were removed from the instrument.

Hence, the final instrument was adjusted to 60 normal items and 2 Global indicators and 1 Marker indicator: 46 items were kept as is termed unmodified, 21 were kept as modified, and 7 were exclusion based on the expert analyses.

Table 3.2: Description of Scale Indicators

Sr. No	Construct	Sub-construct and number of indicators	Coding	Statement of variables
1.	Green Entrepreneurial Intentions (6)		GEI1	There is scope to implement green initiatives in my enterprise.
			GEI2	I have given thoughtful consideration to various aspects of green entrepreneurship.
			GEI3	I have given thoughtful consideration to various aspects of green entrepreneurship.
			GEI4	I have a preliminary concept for a green enterprise to implement in the near future.
			GEI5	I aspire to initiate a green enterprise aimed at addressing environmental issues.
			GEI6	I aspire to transit into new ways of doing green business to save the environment.

2.	Personality Traits	Proactiveness (6)	PRO1	I keep myself informed about major trends in the industry.
			PRO2	I am a fairly active member of an industry association at the local/regional/national level.
			PRO3	I am continuously looking for innovative ways to enhance the sustainability.
			PRO4	I am quick to identify environmentally friendly opportunities
			PRO5	I identify the significance of being prepared for the future.
			PRO6	I identify the significance of being prepared for the future.
		Entrepreneurial Self-Efficacy (6)	ESE1	I can adapt to unexpected changes in the business environment.
			ESE2	I am determined to initiate environmentally friendly projects that will provide a competitive edge for my business.
			ESE3	I am confident in my ability to transform eco-conscious ideas into successful ventures.
			ESE4	I am confident that launching a green business would be highly profitable.
			ESE5	I have the practical knowledge and expertise needed to establish an environmentally responsible business.
			ESE6	I am determined to find innovative ways to contribute in solving environmental problems.
		Need for Achievement (6)	NA1	I am driven by a strong desire to achieve success.
			NA2	I am committed to taking on added responsibilities that enhance the growth of my business.
			NA2	I will try hard to enhance my performance to ensure the success of my business.

			NA4	I will try hard to enhance my performance to ensure the success of my business.
			NA5	I take responsibility for the success or failure of my business, attributing outcomes to my actions rather than external factors
			NA6	I consider receiving recognition and feedback for my business crucial for assessing and improving my performance.
		Risk Aversion (6)	RA1	I exercise caution when making decisions and prefer situations with predictable outcomes.
			RA2	I generally avoid situations with uncertain outcomes.
			RA3	I prefer to make informed decisions and avoid taking unnecessary risks.
			RA4	I actively seek knowledge, recognizing the importance of understanding the emerging challenges of technology & competition.
			RA5	I balance risks and benefits, mixing innovation with proven strategies in my decision-making.
			RA6	I prioritize familiar challenges in my current business model over uncertain new ventures, even if they may offer greater rewards.
			RA7	Please assess to what extent your traits affect your overall personality.
3.	Environmental Awareness (6)		EA1	I have a clear understanding of how environmental legislation is relevant to my business.
			EA2	I am well-informed about what represents "best environmental practice" in my industry.
			EA3	I pay close attention to business activities that can impact the environment.
			EA4	I am well-informed about the causes and consequences of environmental pollution

			EA5	I have a clear understanding of the concept of green development
			EA6	I am aware that our unsustainable practices can harm to the environment and quality of life on the planet.
4.	Organizational Culture (6)		OC1	The organization consistently drives growth by exploring innovative ideas related to green practices.
			OC2	The organization focuses on understanding environmental management and preservation.
			OC3	The organization is attentive to environmental standards and regulations.
			OC4	The organization designs goods and processes to have a minimal impact on the environment.
			OC5	The organization integrates environmental goals with other business objectives.
			OC6	The organization encourages and motivates its employees to embrace environmentally sustainable practices.
5.	Subjective Norms	Norms belief (4)	NB1	My family members believe that i should embark on green entrepreneurship.
			NB2	My friends would advocate for me to pursue green entrepreneurship.
			NB3	My professional network aspires to engage in green entrepreneurship.
			NB4	I value the opinions and sentiments of society regarding green entrepreneurship.
		Moral Obligation (5)	MO1	I believe that developing green products and processes is a way to fulfil my duty towards the environment.
			MO2	I believe in creating green products for the eco-conscious market.
			MO3	I believe that organizations should proactively promote the notion of environmental protection.

			MO4	I believe that organizations should motivate employees to support environmental protection through their personal actions.
			MO5	Please assess to what extend your beliefs and obligation impact your entrepreneurial intentions
6.	Entrepreneurial Motivation (6)		EM1	I aspire to become an environmentally conscious business owner/manager.
			EM2	I envision a prosperous business future through the establishment of a venture dedicated to environmental sustainability.
			EM3	I seek to establish a green enterprise to gain societal recognition.
			EM4	I am fully prepared and eager to be a green entrepreneur.
			EM5	I am driven to start a green enterprise to contribute to national sustainability agenda.
			EM6	I am committed to establishing a green enterprise to actively participate in the development and preservation of ecological environment.

Source: By Author

3.5.13.2 Construct Validity

Construct validation serves as a cornerstone in evaluating the measurement model, ensuring that the indicators accurately represent the constructs they are intended to measure. In this study, construct validity was assessed through three main components: composite reliability, convergent validity, and discriminant validity, with particular emphasis on the reflective measurement models.

3.5.13.2.1 Composite Reliability

Composite Reliability (CR) assesses the internal consistency of a construct by measuring the degree of variance shared among its indicators. Unlike Cronbach's Alpha, which assumes equal reliability across all indicators, CR accounts for the outer loadings and measurement errors, providing a more accurate estimate of reliability in structural equation modelling (SEM). In this study, three primary metrics were applied to compute composite reliability.

Cronbach's Alpha (α):

Cronbach's Alpha computes this average correlation and is often used as a traditional measure. However, it underestimates the contributions of all indicators and the estimation of PLS-SEM may be biased. The formula for evaluating the Cronbach's alpha is:

$$\alpha = (K^* \sum cov_{ij}) / [(\sum var_i) + (K-1) * \sum cov_{ij}]$$

Where:

α represents Cronbach's alpha coefficient

K is the number of items

$\sum$**cov_ij** is the sum of covariances between all pairs of items

$\sum$**var_i** is the sum of the variances of each item

As a result, the final instrument was refined to include 60 normal items and 2 global indictor and 1 Market indicator: 46 items retained without modification, 21 items retained with minor revisions, and 7 items excluded based on the expert panel's assessments.

Rho-A (ρA): In the realm of PLS-SEM, Rho-A serves as an enhanced proxy of reliability, especially with the rosy assumption of perfect model construct specification. The evaluation Rho-A follows is:

$$\rho\_a = (\sum \lambda\_i^2) / [(\sum \lambda\_i^2) + \sum \Theta\_ii]$$

Where:

ρ_a is the composite reliability coefficient

λ_i is the standardized loading of item I on the construct

Θ_ii is the error variance of item I $(1- \lambda\_i^2)$

Rho-A offers a more precise indication of reliability, especially in models characterized by high specification accuracy.

Rho-C measures internal consistency across all the same indicators within a single construct for Structural Equation Modeling (SEM) and is commonly applied in Partial Least Squares (PLS) SEM. It considers the actual outer loadings and measurement errors of the indicators; hence it is more reliable in reflective models.

The formula for calculating rho_c is:

$$\rho\_c = (\sum AVE\_i) / [(\sum AVE\_i) + \sum \rho\_ij^2]$$

Where:

AVE_i is the average variance extracted for item i

ρ_ij^2 is the squared correlation between item i and item j

The rho coefficient (ρc) is used to assess the internal consistency of a construct. A value greater than 0.7 is generally considered satisfactory, indicating adequate reliability. Values above 0.8 signify high reliability. However, if ρc exceeds 0.95, it suggests redundancy among the items, meaning the indicators are too similar and fail to provide distinct information about the construct.

Table 3.3: Results of Composite Reliability

Constructs	**Cronbach's alpha**	**Composite reliability (rho_a)**	**Composite reliability (rho_c)**
EA	0.885	0.909	0.911
EM	0.907	0.907	0.928
ESE	0.91	0.911	0.93
GEI	0.923	0.925	0.94
MO	0.874	0.876	0.914
NA	0.936	0.937	0.949
NB	0.825	0.829	0.884
OC	0.848	0.85	0.888
PRO	0.881	0.883	0.91
RA	0.886	0.89	0.913

Source: By Author

3.5.13.2.2 Convergent Validity

Convergent validity assesses the extent to which the indicators of a construct align to measure the underlying concept, ensuring their relevance and coherence with the construct. Average Variance Extracted (AVE) measures the proportion of variance captured by the construct's indicators relative to the total variance, providing an assessment of validity. A high AVE value indicates a strong correlation between the indicators and the construct, confirming their collective significance and theoretical consistency.

The Average Value Estimate (AVE) is computed utilizing the subsequent formula:

$$\mathbf{AVE} = \sum \lambda_i^2 / n$$

Where:

λi: Standardized outer loadings of the indicators

n: Number of indicators.

Table 3.4: Results of Convergent Validity (AVE) (Pilot Testing)

Constructs	Average variance extracted (AVE)
EA	0.633
EM	0.685
ESE	0.69
GEI	0.723
MO	0.726
NA	0.758
NB	0.658
OC	0.57
PRO	0.628
RA	0.637

Source: By Author

An AVE value of 0.5 or greater is generally considered acceptable, indicating that the construct explains at least 50% of the variance in its indicators. This threshold ensures that the indicators collectively provide a strong representation of the construct, as suggested by Fornell and Larcker (1981). Conversely, AVE values below 0.5 imply that the construct may inadequately represent the shared variance of its indicators, signaling the need for further refinement of the measurement model. Convergent validity is therefore a crucial aspect of construct validity, reinforcing both the theoretical soundness and empirical reliability of the measurement model.

3.5.13.2.3 Discriminant Validity

Discriminant validity determines the extent to which the measures of a construct are distinct from those of other constructs, ensuring coherence and conceptual clarity within the model. It represents a fundamental aspect of construct validity, confirming that the indicators of a construct correlate more strongly with their own construct than with any other construct. In this study, discriminant validity was assessed using the Fornell-Larcker criterion, a widely recognized and rigorous method in structural equation modeling. According to this criterion, the square root of the Average Variance Extracted (AVE) for each construct should exceed its

correlation coefficients with all other constructs in the model. This ensures that a construct shares greater variance with its own indicators than with other constructs, thereby demonstrating its distinctiveness and theoretical soundness.

The calculation of the Fornell-Larcker Criterion is as follows:

$$\sqrt{AVE} > \text{Correlation (Construct A, Construct B)}$$

Where:

$\sqrt{AVE}$: The square root of the average variance Derived for the Construct,

Correlation (Construct A, Construct B): The relationship between the construct and any other construct.

Table 3.4: Results of Discriminant Validity

Constructs	EA	EM	ESE	GEI	MO	NA	NB	OC	PRO	RA
EA										
EM	0.692									
ESE	0.748	0.807								
GEI	0.596	0.676	0.858							
MO	0.728	0.815	0.664	0.64						
NA	0.704	0.621	0.788	0.768	0.672					
NB	0.671	0.856	0.7	0.661	0.874	0.606				
OC	0.742	0.705	0.795	0.869	0.671	0.69	0.757			
PRO	0.743	0.756	0.889	0.913	0.657	0.87	0.713	0.854		
RA	0.751	0.723	0.791	0.804	0.697	0.749	0.707	0.799	0.804	

By Author

3.5.14 Application of PLS-SEM in the Study

Structural Equation Modeling (SEM) allows researchers to examine relationships between observed and latent variables. For predictive and exploratory research, Partial Least Squares SEM (PLS-SEM) is particularly effective, especially for emerging phenomena such as green entrepreneurial intentions. Unlike covariance-based SEM, PLS-SEM focuses on maximizing the explained variance of dependent constructs, making it suitable for complex models involving multiple independent, dependent, mediating, and moderating variables (Hair et al., 2019).

In this study, PLS-SEM is employed to:

1. Analyze the antecedents influencing green entrepreneurial intentions among SME owners.

2. Assess the moderating effect of entrepreneurial education on the relationship between personality traits and green entrepreneurial intentions.

The choice of PLS-SEM is justified for several reasons. First, it accommodates both reflective and formative constructs. Second, it effectively handles complex models with multiple mediators and moderators, such as the inclusion of education as a moderator. Third, it performs well with small to medium sample sizes and non-normal data, which is common in social research contexts. Its bootstrapping procedure further allows precise estimation of indirect and moderating effects, critical for understanding the nuanced influences on green entrepreneurial intentions.

The constructs in this study—personality traits, environmental awareness, organizational culture, subjective norms, and entrepreneurial motivation—interact in a multifaceted way. PLS-SEM enables the evaluation of these interactions and their combined effect on green entrepreneurial intentions while simultaneously assessing the moderating influence of entrepreneurial education. This methodology ensures that the study captures both the theoretical complexity and the practical implications, providing actionable insights for SME owners and policymakers.

By focusing on explained variance and prediction, PLS-SEM aligns with the exploratory and practical nature of this research. It systematically examines the interplay among antecedents, green entrepreneurial intentions, and moderating factors, reinforcing the study's methodological rigor and real-world relevance.

3.5.14.1 Moderation Analysis: A Powerful Tool for Investigating Relationships

Moderation analysis is a type of analysis used to examine relationships using statistics that are more sophisticated than others, as it explains how the association between two variables shifts under the influence of a third variable, called the moderator. This technique provides extreme depth to analyze the relationships between two variables in a more complex interaction. By using a moderator, researchers can identify how and why specific impacts occur, improving the understanding of multifaceted phenomena.

In this regard, moderation analysis is well known in the fields of social and business research, as well as in behavioral studies, due to the intricacy of associations among different types of variables. Moderation analysis is best used when associations require patterning because of the inherent controllable factors that exist. This allows researchers to determine whether the strength, and even the direction, in which an independent variable influences a dependent variable, occurs differently at different levels or groups of the moderator. This capacity to reveal conditional effects makes moderation analysis a critical tool for advancing theoretical understanding and practical application in various fields.

Moderators can be grouped into two broad types: categorical moderators and continuous moderators.

- **Categorical Moderators**

A categorical moderator splits the sample into distinct groups or categories, allowing the researcher to determine whether the relationship between the independent and dependent variables of interest changes across these groups. For instance, gender, education, or types of organizations can act as categorical moderators. This is very helpful in identifying group-specific behaviours and designing strategies for intervention.

- **Continuous Moderators**

A continuous moderator does not have distinct groupings and exists along a continuum. Some examples include age, income, or environmental awareness. With continuous moderation analysis, you study how changes in the value of the moderator impact the strength and direction of the relationship between the independent and dependent variables.

3.5.14.2 Relevance of Categorical Moderators to the Current Study

In this case, entrepreneurial education is the categorical moderator introduced to examine its impact on the relationship of personality traits and green entrepreneurial intentions in SME owners. The study defines entrepreneurial education into two broad types:

- **Formal Entrepreneurial Education**

This encompasses all taught out courses like university lectures, workshops, and certifications that aim to equip learners with entrepreneurial skills and knowledge. Formal education offers the best practices which together with theoretical frameworks can shape the intention to form a business.

- **Informal Entrepreneurial Education**

Informal education includes learning by doing, mentorship training, self-taught knowledge, and practical experiences encountered in life. SME owners tend to rely heavily on informal education to help them address problems and seize potential opportunities along their entrepreneurial journeys. The aim of this research is to determine whether the two types of education, formal and informal, act differently on the relationship between the educator's personality traits and the intention to pursue green entrepreneurship at different levels. This consideration broadens the perspective on the impact of education on the entrepreneurial behavior of SMEs for policy makers and curriculum designers.

3.5.14.3 Moderation analysis is particularly valuable in this study for several reasons

The addition of entrepreneurial education as a moderator makes it possible to assess whether the impact of personality traits on green entrepreneurial intentions differs with regard to the type of education an SME owner has received. This knowledge is important for planning specific policies aimed at stimulating green entrepreneurship. By examining the moderating influence of entrepreneurial education, the study enriches the theoretical explanation of how external factors and personal traits affect entrepreneurial intention. The results from moderation analysis can inform tailored educational frameworks that address the specific needs of small

and medium-sized enterprise (SME) owners, enhancing their green entrepreneurial intentions. The distinction between formal and informal entrepreneurial education adds value to the analysis by illustrating how green entrepreneurial intentions among SME owners are influenced by education. Such a framework will not only contribute to the body of knowledge but also provide actionable recommendations for the greening of SMEs.

3.6 Summary

This chapter provides a detailed explanation of the research methodology, outlining the mixed-methods approach adopted for the study. It discusses the research approach, philosophy, and methods used, segmenting the methodology into two phases: qualitative and quantitative. In the qualitative part, issues such as population, sample unit, sample size, sampling method, and sample characteristics are discussed. The quantitative part includes instrument design, content validity, and construct validity, all of which require methodological rigor. This developed approach provides a solid foundation for the ensuing chapters on data analysis and findings.

CHAPTER 4

QUALITATIVE ANALYSIS AWARENESS, OPPORTUNITIES AND BARRIER ANALYSIS

4.1 Introduction

Understanding the antecedents of green entrepreneurial intentions of small and medium-sized enterprise (SME) owners would be of limited value without engaging in deep discussions with the business owners and entrepreneurs. A primary concern, which will help address the first two objectives, is to analyse the level of awareness SMEs have about green entrepreneurship, since this awareness often forms the foundation of their sustainability initiatives. Understanding these factors helps identify both the opportunities available to them and the key barriers they face during the intention and implementation phases of adopting green entrepreneurial practices. To address these questions, qualitative semi-structured interviews were conducted, capturing the nuanced perceptions and lived experiences of SME owners regarding these opportunities and barriers. The comprehensive methodology and justification for this approach are explained in Chapter 3.

4.1.2 Procedure for thematic analysis

Thematic analysis, as described by, was selected for this study in order to identify and make sense of the patterns within the data given by SMEs owners in Punjab. Because of the uniqueness of the data, especially since a number of the respondents spoke Punjabi and used colloquial terms, manual thematic analysis is required for transcript editing. Following this, NVivo software was used to conduct a detailed analysis of the transcripts, which ensured that there was deep engagement with the data and that the important subtleties in the participants responses were captured.

1. Acquaintance with the Data

The first step within the analytical framework involved multiple readings of the respondent's transcripts (Braun & Clarke, 2008)This helped in achieving comprehension of the material and forming some preliminary ideas. All relevant materials had to be captured, which meant that transcripts had to be interpreted numerous times, especially since many comments utilized local and casual language that required informal interpretation. In this stage, the author documented his thoughts on preliminary ideas and remarks in the form of handwritten notes which corresponds with (Nowell et al., 2017) advocating achieving immersion in data.

2. Formulation of Initial Codes

In this case, the next step was developing codes which were inductively gathered from the data themselves (Charmaz, 2006). Based on the responses provided by participants, their informal language in addition to other described experiences needed an adaptable approach when it comes to coding. With the help of NVivo, relevant segments of data that aligned with the aims of the study were assigned codes, focusing on important topics like barriers to adoption and awareness of sustainable practices.

3. Finding Themes

After coding tasks were completed, similar codes were grouped to form higher-level themes and sub-themes. As described (Braun & Clarke, 2008), in this step, it is about combining codes into prospective themes and sub-themes based on visible patterns in the data. Redundant or overlapping themes were carefully analysed and consolidated in order to eliminate overlaps. In the case of renewable energy adoption, it was possible to create sub-themes termed as solar energy awareness and obstacles to adoption.

4. Refining and Evaluating Themes

Each theme was analysed and adjusted to ensure that it accurately represented the truth (Braun & Clarke, 2008). In this step, weak or irrelevant elements were removed, while redundant sub-themes were either aligned or refined for precision. I would argue that data saturation occurred with 32 participants, but 38 full responses were analysed out of 55 originally reached out to. This aligns (Fusch Ph D & Ness, 2015) who describes saturation as the point when no new data can be generated from the information at hand.

5. Defining and assigning Themes

Upon finalization of the themes, They were given brief and accurate names. Such as, “Green Technology Awareness” and “Renewable Energy Adoption” were formed based on the response patterns that emerged. Each topic was supported by several sub-themes including hurdles to solar energy and cost-related problems, which contributed greater clarification towards the main themes (Gioia et al., 2013).

6. Combining Quotations with Analysis

Finaly, verbatim quotations from respondents were used to exemplify the key themes and sub themes. The choice of quotes was focused on those that provided fresh perspectives, as opposed to repeating previously accepted notions (Jw, 1998). This approach ensured representational diversity within the study, which enhanced understanding of the various difficulties faced by SME owners concerning green business practices. For example, quotes about financial barriers to solar energy adoption highlighted the cost issues associated with renewable energy.

7. Validity and Reliability

In the course of the theme analysis, steps were taken to ensure the validity and reliability of the results (Lincoln, 1980). The overlapping themes were amalgamated, and the excerpts used for the final analysis were chosen for their significance to new understanding within each theme. In addition, working alongside colleagues and remaining reflexive throughout the manual coding process ensured that the analysis could be corroborated, rendering it devoid of partiality.

4.2 To examine the awareness of green entrepreneurship among SMEs owners.

This research investigates the awareness of green entrepreneurship among small and medium-sized enterprise (SME) owners. For this purpose, interviews were conducted, followed by thematic analysis to deeply understand their perceptions and awareness of green entrepreneurship. The study identifies six main themes pertaining to green awareness, each of which includes several sub-themes. These themes form an organized structure to analyse the multi-faceted awareness of green entrepreneurship among SMEs. The subsequent sections discuss these themes and sub-themes, illuminating the multifaceted aspects of green entrepreneurial awareness.

4.2.1 Hierarchy Chart on the Awareness of Green Entrepreneurship

The hierarchy chart produced from NVivo shows a systematic map exhibiting the major themes and sub-themes concerning the awareness of green entrepreneurship among SME owners. This analysis categorizes green awareness into six core themes: Green Laws Awareness, Green Education & Skill Awareness, Environmental Pollution Awareness, Green Subsidies Awareness, Industry Collaboration Driving Green Awareness, and Green Technology Awareness, as presented in Figure 4.1.

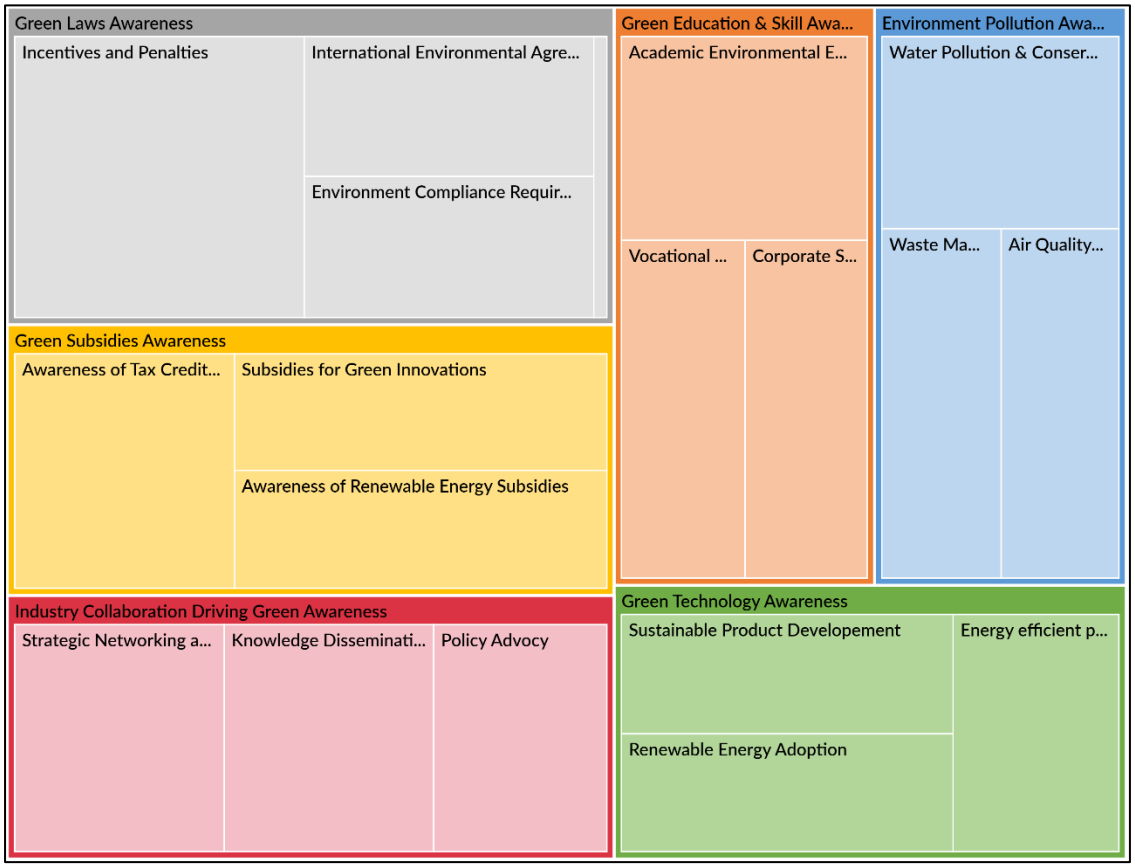

Figure 4.1 Hierarchy Chart on Awareness of Green Entrepreneurship

Source: Author analysis through NVivo

4.2.2 Green Technology Awareness

Each of the themes has been categorized into sub-themes, which include regulatory compliance, education initiatives, pollution concerns, subsidization, industry collaboration, and technology. Throughout this hierarchy, various issues with green entrepreneurship awareness among SMEs are highlighted, enhancing the understanding of comprehensive engagement concerning the adoption of sustainable practices. The need to implement sustainable practices has created increasing awareness among SMEs, as the advantages of green technology become apparent. Despite initial apprehension about the cost, there is growing recognition of solar power and other renewable options and how they can reduce operational costs as well as environmental impact. Small and medium-sized enterprises have started to learn about the implementation of energy-saving techniques, leading to improved sustainability and reduced business expenditure. In addition, a notable shift towards environmentally conscious design has heightened the focus on eco-friendly materials and technologies. This motivation is essential for SMEs to adopt green technology in their operations.

The word cloud of green technology awareness in SMEs of Punjab is depicted in Figure 4.2. Some essential attributes such as energy usage, efficiency, solar, and awareness indicate an affirmative response towards the adoption of green technology. SME owners fixated on words such as “design,” “consumption,” and “growing,” while prioritizing sustainability, which brings to light a concerning perception towards green practices. The word apparent represents a growing awareness of green technology among SMEs.

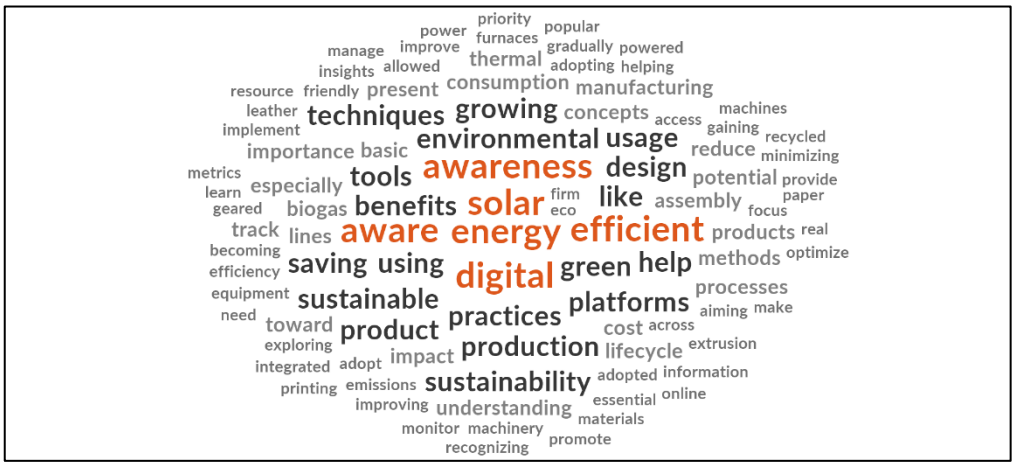

Figure 4.2 Word Cloud of Green Technology awareness

Source: Author analysis through NVivo

4.2.2.1 Renewable Energy Adoption

Solar energy, in particular, has become one of the primary focal areas of green technology awareness and its adoption in the industry. Business owners explicitly discussed the recognition of solar energy and emphasized its capacity to lower operational costs and environmental impacts.

"There is an increasing recognition of the significance of solar energy; however, concerns regarding initial investments persist."

The appropriations perception alongside the impression f substantial upfront expenses, remain as significant obstacles.

"There are inadequacies in understanding the economic benefits, especially in chemical processes, for their usage in solar energy."

Adoption productivity and reliability issues impact adoption.

"Solar energy has its benefits, but its productivity issues and questions regarding use reliability makes the turn to it difficult."

Complexity and expected hurdles, alongside dependability issues, persist, stalling expansive deployment.

4.2.2.2 Energy Efficient Practices Awareness

Business awareness of energy-efficient strategies has gradually increased with the recognition of cost reduction and corporate social responsibility factors. Adopting such approaches is making processes more sustainable and efficient.

"With advanced machinery, energy and water consumption has decreased significantly during dyeing processes."

In the same way, government spending is being cut across multiple industries with some adoption.

"Leather industry's energy efficient tanning techniques are reducing emissions along with energy expenditure."

Firms are exploring other domains actively now.

"Improvement of metal melting process with heat recovery systems ensures better performance of these processes due to energy waste mitigation."

Energy efficiency is increasingly prioritized across several industries, offering both financial and environmental advantages.

4.2.2.3 Sustainable Product Development

Through innovative approaches, industries are working to alleviate the effects of production activities on the environment, which has resulted in raising awareness of sustainable product development. This includes the use of biodegradable materials coupled with green designs.

"The use of eco-friendly fabrics and dyes is contributing to the increasing recognition of sustainable product design, which in turn reduces environmental damage."

Likewise, there are ecological changes within many branches.

"The utilization of biodegradable chemicals and vegetable tanning has resulted in a more environmentally friendly leather production process."

There are also initiatives focusing on reducing emission outputs.

"Efforts are being undertaken to reduce harmful emissions during vulcanization in rubber production."

These statements clearly indicate that the overriding objectives of modern industries revolve around sustainable product development, along with waste-minimizing techniques and the use of greener materials.

4.2.3 Green Education and Skills Awareness

To promote sustainability and entrepreneurship in small and medium-sized enterprises (SMEs), green education and skills awareness must be addressed first. Business schools play a key role in training executives, as they can equip them with the environmental education necessary to practice sustainable business management. Entrepreneurs in the chemicals, textiles, and leather industries become aware of sustainable practices by attending specialized workshops and seminars. Moreover, sustainability training helps corporate entrepreneurs understand corporate social responsibility (CSR), thereby empowering them to adopt sustainable business models and operations. These workshops are crucial for fostering sustainable entrepreneurship and environmental innovation.

Figure 4.3 The word cloud on green entrepreneurial education and skills awareness illustrates important terms identified by SME owners, focusing on "sustainable," "institutions," "entrepreneurs," "educational," "training," and "awareness" as the focal points. These terms reflect an increasing and positive shift towards entrepreneurial green education and skills.

Figure 4.3 Word Cloud of Green education and skills awareness

Source: Author analysis through NVivo

Additionally, words like “CSR,” “vocational,” “specialized workshops,” and “sustainability” convey a strong demand from practitioners and business owners who possess a deeper understanding of sustainability. This data suggests an increased intention to integrate green education, sustainability training, and eco-friendly approaches within entrepreneurial practices.

The following sub-themes contribute to the identification of the main theme: Green Entrepreneurial Education and Skills Awareness.

4.2.3.1 Academic Environmental Education

Academic education in environmental matters is increasingly recognized as an effective strategy for promoting ecological consciousness and entrepreneurial skills.

"Green chemistry workshops furnish entrepreneurs with appropriate methods for adopting green practices by teaching them sustainable production techniques."

The informal sessions equip learners with relevant knowledge needed to effectively implement sustainability concepts within various practical contexts.

"People with an eco-friendly disposition are likely to gain from practical lessons on green processes."

These workshops aim to bridge the gap between hands-on skills for environmental sustainability care and the theoretical aspects of sustainable development.

"These trained individuals would then be able to actively advocate for innovative sustainability strategies by designing energy-efficient machines and other sustainable devices."

The body of knowledge supporting these programs is vital for developing the creativity needed to combine sustainability with effectiveness. These targeted programs focus on equipping learners with sustainable business model frameworks and strategies, thereby actively engaging academic institutions in nurturing entrepreneurial skills.

4.2.3.2 Vocational Training

The research indicates that entrepreneurs' capacity to implement sustainable solutions is improved by vocational training in green technologies, resulting in more environmentally responsible business practices. (Cohen & Winn, 2007; Schaltegger & Wagner, 2011).

"Entrepreneurs are reducing environmental harm through vocational programs that emphasize sustainable processes."

These sessions are vital because they provide information that can be applied in real life.

"Through the vocational training programs, entrepreneurs are able to adopt more advanced, eco-friendly techniques due to having undergone training focused on sustainable production processes."

Vocational training enables educated business people to make better-informed sustainable decisions as a result of these targeted classes. Vocational training not only raises awareness but also motivates entrepreneurs to design solutions, thereby greatly extending the green innovation impact across sectors. Educational initiatives play a fundamental role in sustainable entrepreneurship and green innovation by offering specialized training.

4.2.3.3 Corporate Sustainability Training

As noted by (Bansal & Roth, 2000), incorporating CSR into corporate strategy provides businesses with a way to curb their ecological impact while simultaneously attending to social obligations, thereby creating sustainable, long-term growth. This has made corporate social responsibility harder to ignore for entrepreneurs seeking to align their business practices with broader socio-environmental issues.

"Training programs that teach eco-friendly processes and CSR are key to helping entrepreneurs reduce their environmental impact."

Such programs enable them to embrace practices consistent with sustainable development while achieving corporate objectives.

"CSR training provides direction for sustainable manufacturing compliance with industry benchmarks."

Entrepreneurs learn how sustainability can be embraced alongside operational efficiency for enhanced profitability, socially responsible brand image, and shared value creation.

"Corporate sustainability training for energy efficiency and waste minimization provides tools for the development of environmentally conscious enterprises."

These awareness training workshops provide strategies and methods to incorporate green technologies into business processes, transforming daily operations into eco-conscious undertakings.

4.2.4 Industry Collaboration Driving Green Awareness

Inter-firm cooperation has become one of the primary drivers of environmental awareness among small and medium-sized enterprises (SMEs). Businesses acquire essential knowledge, establish strategic partnerships, and promote sustainable practices through attending events or through collaborations. These collaborative efforts not only increase environmental awareness but also assist in the adoption of green technologies and sustainable operations within companies. (Wagner, 2013; Hockerts & Wüstenhagen, 2010). The next sub-themes demonstrate how further industry collaboration is accelerating the movement toward green entrepreneurship. Figure 4.4 depicts a word cloud of the most frequently used terms "green," "industry," "shift," "cultural," and "sustainability" by SME owners. It also highlights words such as "knowledge,"

"partnerships," "campaign," "conferences," and "policy," which indicate increasing awareness resulting from industry collaboration and conferences.

Figure 4.4 Word Cloud of Industry collaboration driving green awareness

Source: Author analysis through NVivo

The following sub-themes assist to articulate the overarching concept Industry collaboration fostering green awareness.

4.2.4.1 Knowledge Dissemination

The sustainable development of small and medium-sized enterprises (SMEs) can be achieved through the dissemination of knowledge at industry gatherings and seminars, as well as through partnerships with other organizations. These forums facilitate the exchange of modern technologies, professional opinions, and real-life case studies, ensuring that entrepreneurs do not miss out on new developments in the world of green business.

"Industry events offer essential insights into sustainable technologies, enabling the implementation of best practices in practical contexts."

Such events equip entrepreneurs with the knowledge of invent new environmentally friendly products and services for their companies.

"Conferences function as venues for disseminating success narratives and innovations in green manufacturing, motivating broader implementation of sustainable practices."

These assemblies motivate their members to use the knowledge they gained from the meetings by providing them with effective ways of doing so.

"Partnerships with environmental organizations improve the implementation of green technologies, facilitating the effective adoption of sustainable solutions by SMEs."

These collaborations equip enterprises with the tangible and intangible tools required for a holistic adoption of sustainability in their operations. These platforms not only promote the importance of sustainability but also

encourage the formation of constructive partnerships that enable firms to continuously transform and improve industry standards toward greener practices. By participating in regular knowledge-exchange meetings, SME owners can create better corporate sustainability models and advance their environmental goals.

4.2.4.2 Strategic Networking and Alliances

In industries undergoing a green shift, strategic networking and alliances are crucial for raising awareness of sustainable business practices. Such partnerships are formed during networking activities, meetings, and industry collaborations, which help entrepreneurs engage with environmental groups, technology providers, and other sustainability-oriented businesses.

"Networking events facilitate the establishment of partnerships aimed at promoting the adoption of green technologies and enhancing awareness of environmentally sustainable practices."

These activities not only encourage the sharing of resources but also expose entrepreneurs to innovative ways of reducing their environmental impact.

"Conferences and industry initiatives function as venues for intersectoral collaboration, advancing the shared goals of sustainability."

From these events, entrepreneurs acquire sustainable production knowledge, which they can apply in their businesses through strategic alliances.

"Environmentally focused organizations and green technology companies provide sustainable practice solutions that aid businesses in the easier implementation of energy efficiency technology."

These partnerships raise sustainability awareness while providing solutions to sustainability challenges, thereby advancing environmental goals. Partnerships and networking enhance awareness and understanding of green practices by linking entrepreneurs to key stakeholders. Such collaborations between businesses and environmental organizations work toward common sustainability goals and drive innovation, sustainable and environmentally responsible business practices, and long-term ecological stewardship across multiple industries.

4.2.4.3 Policy Advocacy

Policy and regulatory coherence advocacy are crucial for both within-ecosystem and cross-ecosystem SME collaboration aimed at improving sustainability awareness. Businesses have opportunities to directly engage with policymakers at industry meetings, conferences, and campaigns, where sustainable policies are advocated. These opportunities help SMEs participate in environmental policy formulation and increase their awareness of dynamic regulatory frameworks, thereby minimizing compliance burdens and encouraging proactive sustainability efforts.

"Industry events serve as a venue for businesses to participate in policy advocacy, aligning their operations with new environmental regulations."

These advocacy campaigns enable businesses to foster eco-acts for stronger sectoral sustainability.

"Conferences provide essential platforms for promoting green policies which assist SMEs to align sustainability efforts with legislation and regulations, as well as with industry benchmarks."

Participation to these events enables organizations with the required skills to streamline processes while attaining environmental goals and regulatory compliance.

"Promoting policy at industry conventions allows enterprises to champion changes to regulations that help in adopting sustainable practices and energy-efficient technologies."

This type of advocacy ensures that companies can achieve sustainability for both the enterprise and the environment in the long run. By attending such events, SMEs promote understanding of the importance of regulatory alignment and help formulate policies that support sustainability. Businesses are also able to meet with legislators at these events and advocate for better policies that benefit the environment, thereby promoting a more sustainable and eco-friendly economy.

4.2.5 Green Subsidies Awareness

A firm's adoption of green technologies and sustainable practices is more likely to be encouraged with an increased understanding of government subsidies, tax credits, and deductions. These financial incentives make the adoption of renewable energy and eco-friendly technologies comparatively cheaper, thereby making green entrepreneurship more feasible.

Figure 4.5 Word Cloud of Green Subsides Awareness

Source: Author analysis through NVivo

Stakeholders in companies, particularly those in the metal production and dyeing industries, are gradually recognizing the economic as well as environmental advantages of these subsidies, which will likely lead to wider adoption of sustainable practices. However, some businesses continue to ignore these opportunities, which in turn limits the full scope of sustainable entrepreneurship.

The word cloud in Figure 4.5 shows the most frequently used words by SME owners, such as “awareness,” “green,” “tax,” and “subsidies.” It also highlights that the owners noted “deductions,” “incentives,” “renewable,” and “financing.” These words reflect the growing attention that government subsidies and financial incentives are receiving and illustrate the shift toward more sustainable practices from the perspective of SMEs.

The following sub-themes contribute to the formulation of the overarching theme: Green Subsidies Awareness.

4.2.5.1 Awareness of Renewable Energy Subsidies

The consideration of government subsidies for renewable energy is increasingly motivating firms to implement sustainable practices. Government incentives mitigate the strain associated with adopting new technologies, thereby making sustainable green entrepreneurship more appealing and economically feasible. The shift toward sustainable practices will accelerate as more organizations are incentivized to adopt renewable resources and technologies.

“Subsidies are being recognized by various stakeholders, thereby increasing the number of companies entering green entrepreneurship.”

“The incentive-based awareness regarding solar energy has motivated numerous enterprises to practice sustainability.”

This awareness, especially in the metal production and dyeing industries, is encouraging the shift towards sustainable renewable energy adoption for long-term financial savings and sustainability.

“Recognition of renewable energy subsidies are motivating industries to cut down operational costs while improving sustainability performance.”

The growing awareness of these financial incentives drives the adoption of more comprehensive sustainable practices. However, the scope for entrepreneurship and the extensive adoption of renewable energy technologies remains limited, as some companies do not recognize these incentives, thereby reducing the overall potential for sustainable entrepreneurship.

4.2.5.2 Subsidies for Green Innovations

The growing appreciation of government subsidies for green innovations helps firms invest in environmentally friendly products and encourages sustainable practices. These subsidies are designed to offset the financial burdens of adopting green technologies, enabling the adoption of cleaner and more efficient manufacturing methods.

“Stakeholders are becoming aware of governmental subsidies for green innovations, which promote the adoption of environmentally sustainable production methods and lower overall expenses.”

"Subsidies aimed at promoting eco-friendly sustainable practices are acknowledged and have stimulated investment by manufacturers to develop innovative environmentally friendly technologies that enhance operational efficiency."

Increased awareness promotes innovation by removing unsupported financial burdens which enables firms to embrace sustainable practices. Subsidies provide corporations the capability to research and develop new advanced sustainable technologies.

"Green subsidies assist stakeholders in making decisions regarding the adoption of new technologies which promote sustainable practices."

"Subsidies for green innovations supports investment in energy-efficient processes and technologies, and thus brings about positive change in the industry."

The growing awareness of government subsidies for green innovation is helping companies overcome financial barriers, thereby increasing investment in sustainable technologies that provide both long-lasting economic and environmental benefits.

4.2.5.3 Awareness of Tax Credit and Deduction

Tax credits and deductions associated with sustainability are becoming increasingly recognized among stakeholders. These monetary incentives are vital for enterprises to adopt eco-friendly technologies and green innovations, which help reduce expenditures while optimizing long-term sustainability.

"Stakeholders increasingly understand the tax credits available for green investments and are motivated to adopt more sustainable production practices."

"Awareness regarding tax credits applicable to environmentally preferable business practices propels investment in greener technologies and processes."

This tax incentives help offset the costs associated with adopting environmentally sustainable practices. Companies not only become more socially responsible, but with the tax savings, strengthen their financial position, promoting competitiveness in the marketplace.

"The adoption of new environmentally friendly technologies can be made easier through the use of tax incentives for sustainability initiatives."

"Corporate awareness of tax allowances for green innovation tends to encourage businesses to adopt relevant sustainable practices that yields profits as well."

The implementation of green entrepreneurial practices in many industries will be greatly supported by the increasing awareness of tax claims. The availability of these funds allows companies to purchase renewable

energy sources, energy-saving technologies, and other eco-friendly materials, thereby facilitating the adoption of green practices.

4.2.6 Green Laws Awareness

The increasing awareness of incentives and penalties is significantly influencing green entrepreneurship, especially within SMEs. Regarding emission levels, waste management, and resource conservation, businesses are increasingly realizing the need to adhere to both local and international benchmarks. This understanding is primarily driven by government incentives and the threat of penalties for non-compliance.

As illustrated in Figure 4.6, the word cloud indicates that terms such as "Sustainable," "Agreements," "Legislation," "International," and "Emissions" capture the attention of SME owners. Additional words gaining prominence include "Laws," "Disposal," "Compliance," "Penalties," "Usage," and "Impact." These observations highlight the shift SME owners are beginning to make toward paying greater attention to laws and regulations concerning sustainability. There is also growing recognition of international agreements and the need to comply with environmental laws.

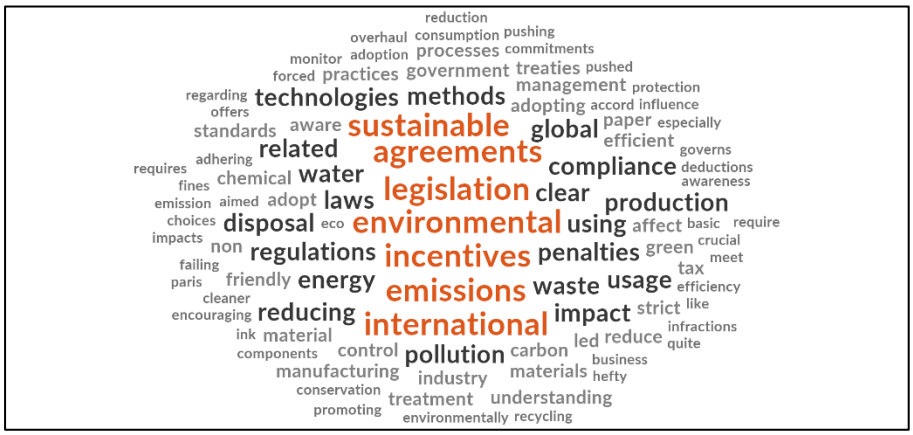

Figure 4.6 Word Cloud of Green Laws Awareness

Source: Author analysis through NVivo

The following sub-themes contribute to the identification of the main theme Green Laws Awareness.

4.2.6.1 Environmental Compliance Requirements

Environmental compliance regulations are important for enhancing SMEs' knowledge regarding sustainability. By compelling companies to rethink their processes and integrate sustainable practices, these regulations force them to re-evaluate not only to avoid penalties but also in response to increasing environmental responsibility.

"The law requires the controlled emission of harmful gases and improved waste management practices."

"Due to legal and ecological reasons, we have had to use Environmentally Eco-Friendly Technologies which are legally and ethically important even though they are costly."

These assist firms in understanding the importance of emission reduction and technology sustainability, thus, enhancing corporate environmental responsibility.

"Protecting the environment while abiding by both stringed regulations on the use of water and disposal of harmful chemicals has forced us to completely alter our workflows. While challenging, this ensures that we operate sustainably and avoid hefty fines."

Businesses are forced to critically rethink their use of water and management of chemicals; thus, the application of strict guiding principles fosters holistic understanding of sustainable resource management.

"Compliance with the pollution control legislation has had a profound effect on our company. We have adopted more stringent waste and emission reduction policies."

Compliance ensures that the companies grasp the benefits of adhering to pollution control thus encouraging them to adopt new practices for waste and emissions reduction.

"Pollution control legislation has exerted a substantial influence. We have implemented more rigorous waste management and emissions reduction practices."

Adhering to environmental compliance not only ensures legal conformity but also significantly enhances awareness of sustainability. Such policies encourage innovation and the adoption of sustainable practices among businesses.

4.2.6.2 International Environmental Agreements

Awareness of global environmental treaties is increasingly influencing SMEs; however, the complexities and costs of compliance pose significant challenges for small enterprises. Many small business owners are beginning to understand the profound impact of international treaties and agreements, but achieving full compliance remains an arduous task.

"Understanding international treaties like the Paris Agreement poses no challenge. However, grasping how they affect the chemical production processes of our SME remains difficult."

The Paris Agreement along with other treaties is encouraging SMEs in the chemical sector to advance their operational activities.

"International accords are impacting our application of sustainable materials and though small textile enterprises use these guidelines, complete alignment remains a challenge."

Small and medium-sized enterprises around the globe are realizing their environmental obligations under international treaties while striving to fully comply. These international treaties are pushing.

"Global agreements for water conservation and pollution control are inciting changes in the dyeing industry, but these international benchmarks are particularly difficult for SMEs like us."

Dyeing and leather industries are slowly starting to realize the importance of complying with international regulations.

The awareness of the international agreements like Paris Accord and Kyoto Protocol are motivating SMEs to adopt ecologically sound practices. Nevertheless, the path toward full compliance is often blocked by limited resources, funding, and the technology needed to meet cross-border regulatory requirements.

4.2.6.3 Incentives and Penalties

The increasing awareness of incentives and penalties is strongly influencing green entrepreneurship, especially within SMEs. Government incentives make raw materials easier to obtain and market, while penalties for non-compliance with environmental regulations create a necessity for sustainability beyond standard business practices. Together, these mechanisms balance the education on the need for green business with the responsibility of implementing sustainable corporate practices.

"We understand that the government gives tax breaks for environmentally friendly chemicals; however, compliance costs associated with environmental acts remain a critical challenge to small businesses."

This illustrates the shifting perception of how taxes incentives foster the adoption of sustainable materials, while companies are cautious because of the hefty penalties associated with breaches of compliance.

"Though the incentives on paper waste are alluring, the compliance costs associated with waste disposal regulations are incredibly burdensome for SMEs."

Business owners understand that while the implementation of sustainable practices can be financially rewarding, the legal risks attached to noncompliance can be incredibly costly, forcing them to provide real solutions.

"Tax breaks are provided for sustainable manufacturing processes; however, a careful approach to changing regulations on emissions makes staying compliant with the law very risky."

Firms are beginning to understand the need to balance tax savings from implementing sustainable practices with the potential loss of revenue resulting from noncompliance with environmental regulations. The growing awareness of balancing incentives and penalties is driving the green entrepreneurship movement, revealing potential profits and highlighting the need to avoid steep penalties. This heightened awareness encourages SMEs to adopt sustainability as a core element of their long-term strategy.

4.2.7 Environmental Pollution Awareness

The growing awareness of SMEs regarding environmental pollution reflects their understanding of their industry's pollution footprint in terms of air, water, and waste management. Concerns regarding greenhouse gases, waste, and water consumption are now driving businesses toward cleaner technologies, sustainable practices, and improved waste management systems that help reduce their ecological footprint. These factors motivate enterprises to adopt more sustainable operational practices while simultaneously complying with regulatory requirements and promoting general eco-friendliness.

As illustrated in Figure 4.7, "Air," "Water," "Pollution," and "Waste" are among the prevalent keywords, demonstrating heightened focus and concern during the interviews. This shows that SME owners are not only aware of the different forms of pollution resulting from their industries but also conscious of the need to address these challenges. Furthermore, words such as "Conscious," "Quality," "Management," and "Concern" suggest that these executives care about advanced environmental practices, indicating the emergence of more sustainable practices. The consistent repetition of these concepts highlights a prioritization of pollution reduction, directly or indirectly, by many SMEs and reflects heightened environmental responsibility.

Figure 4.7 Word Cloud of Environmental Pollution Awareness

Source: Author analysis through NVivo

The following sub-themes contribute to the identification of the main theme Environmental Pollution Awareness

4.2.7.1 Air Quality Awareness

The growing awareness of SMEs regarding environmental pollution reflects their understanding of their industry's pollution footprint in terms of air, water, and waste management. Concerns regarding greenhouse gases, waste, and water consumption are now driving businesses toward cleaner technologies, sustainable practices, and improved waste management systems that help reduce their ecological footprint. These factors motivate enterprises to adopt more sustainable operational practices while simultaneously complying with regulatory requirements and promoting general eco-friendliness.

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4.2.7.2 Water Pollution and Conservation

The SME sector is one of the most significant contributors to water pollution and the overexploitation of water resources. Increased focus on this sector is encouraging organizations to adopt more rigorous eco-friendly initiatives aimed at improving wastewater treatment and implementing better methods for water conservation.

“The release of chemical wastes contributes to water pollution. We are working on improving our waste treatment systems to reduce the impact our organization has on the environment.”

The lack of a balanced environment, particularly regarding water, is being recognized by many organizations, especially in the chemical industry, as a major issue. To mitigate their environmental impact, they are actively adopting improved waste treatment systems. Awareness of environmental pollution, particularly from wastewater generated by dyeing activities, is becoming an increasing concern.

“We are acutely aware of water pollution issues, particularly regarding the release of chemical waste. We are striving to enhance waste treatment methods to mitigate our environmental impact.”

Numerous enterprises, especially those involved in the chemical sector, are recognizing their contribution to water pollution and are proactively pursuing improved waste treatment methods to reduce their environmental impact.

“Our consciousness of water contamination is increasing, especially with the substantial volumes of water utilized in dyeing operations. We are evaluating water recycling techniques to mitigate this issue.”

Textile and garments industries that rely on water are more aware regarding its consumption along with the pollution created from it. This awareness is driving the research towards water recycling and conservation techniques to reduce their impact.

“Our tanning process substantially contributes to water pollution, and although we recognize conservation initiatives, managing wastewater poses a challenge for smaller enterprises such as ours.”

Despite operational constraints, small enterprises are more focused on compliance with environmental norms, especially in refuse treatment in order to reduce pollution and improve sustainability.

"In recent years, we have become more aware of paper manufacturing processes and the unnecessary use of water, thus, have begun practicing water-saving methods to combat this issue."

Utilization of water promoting practices in industry along with better management of waste is driven by companies to take more responsibility towards their water-related environmental impacts.

Motivation to enhance water usage and refuse management systems among small and medium-sized enterprises is positively influencing their operations towards exceeding environmentally sustainable standards.

4.2.7.3 Waste Management Awareness

The increasing attention and awareness of waste management are motivating companies across industries to adopt sustainable practices and reduce their environmental footprint. Businesses are focusing on the improved containment, recycling, and reuse of waste materials, particularly complex hazardous materials, as part of their corporate social responsibility (CSR) initiatives.

"We understand very well the need for effective waste management, particularly in terms of waste hazardous chemicals."

"We have focused on reducing trash with improved containment and recycling strategies."

Organizations are motivated to improve their processes because they have hazardous wastes to ensure that waste generation is reduced and more effectively controlled.

"The disposal of waste, particularly scraps of textiles and effluents of dyestuffs, is a problem of growing concern. We have begun to take steps to mitigate textile waste and the chemical residue waste responsibly."

Businesses in these textile industries are becoming more and more accountable for their waste fabric and chemical wastes. Thus, businesses are integrating recycling processes and actively seeking ways to eliminate chemical wastes in an environmentally safe manner.

"Leather tanning produces a significant amount of waste, and there is an increasing understanding of the need for proper handling. Our goal is to cut down on environmental harm by repurposing waste by-products."

Within the leather industry, awareness of waste generation is motivating companies to find ways of reusing by-products to reduce operating costs while simultaneously improving environmental impact and increasing efficiency in their waste management practices. This trend does have a silver lining, as it is encouraging the adoption of recycling programs, reduction of material waste, and responsible production across various industries. The focus on waste management signifies a broader shift toward embracing environmental responsibility and operational efficiency.

4.3 To explore the opportunities and barriers of green entrepreneurship among SMEs owners.

This study addresses the issue of sustainable entrepreneurship among owners of small and medium-sized enterprises (SMEs) by examining the opportunities and barriers associated with it. The interview method was employed, followed by thematic analysis to identify key patterns within the data. Through this analysis, the author identified five central themes related to opportunities and another five themes related to barriers. All major themes are supported by a multitude of sub-themes, as revealed in the interview transcripts. This framework captures the complex interplay of both enabling and constraining factors in relation to green entrepreneurship in SMEs. The sub-themes, analyzed alongside the central themes, are further explored in the discussion section.

4.3.1 Hierarchy chart on Opportunities and barriers of green entrepreneurship

This research uses thematic analysis to identify specific opportunities and obstacles that influence green entrepreneurship among small and medium-sized enterprise (SME) owners. The hierarchy tree obtained from NVivo displays five key themes constituting opportunities: the owner's personality and visionary leadership, sustainable organizational culture, incentivized green practices, green manufacturing technology, and demand sustainability, as shown in Figure 4.8. These themes emphasize the supportive motivators that drive SMEs toward adopting environmentally friendly business practices.

Conversely, five key barrier themes were also identified: market challenges, monetary resource constraints, ambiguous regulations, costly green infrastructure, and risk aversion associated with a traditional mind-set. These barriers illustrate the socio-structural and psychological factors that constrain SMEs in adopting green entrepreneurship. Within each of these themes, multiple sub-themes were formed from the interview transcripts, shedding further light on the particular issues motivating or demotivating SMEs' green transition. This systematic approach helps explain both the drivers and barriers to green entrepreneurship.

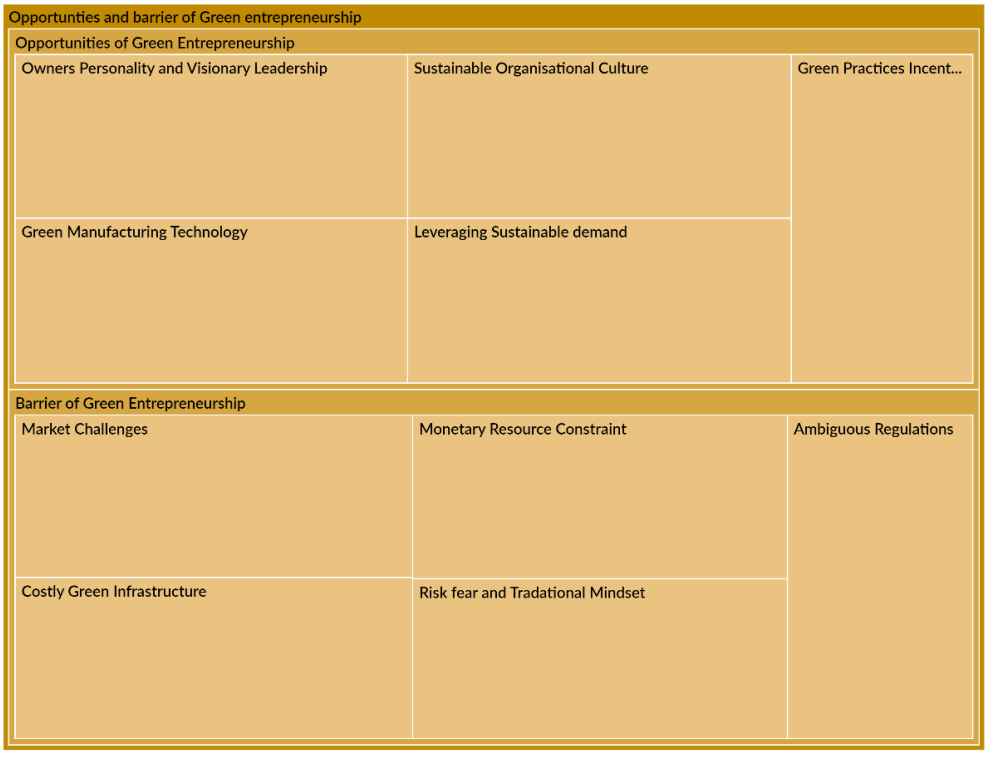

Figure 4.8 Hierarchy Chart on Opportunities and barriers of green entrepreneurship

Source: Author analysis through NVivo

4.3.2 Opportunities of Green Entrepreneurship

Green entrepreneurship offers a variety of opportunities for ventures as well as for environmental sustainability. It highlights key opportunities through the adoption of green manufacturing technologies, leveraging incentives for eco-friendly practices, and tapping into growing sustainable demand. A sustainable organizational culture, paired with visionary leadership, fosters business innovation and success in a competitive market. These elements not only address environmental challenges but also accelerate business growth.

4.3.2.1 Green Manufacturing Technology

The adoption of energy-intensive and resource-optimizing practices opens up opportunities for sustainable entrepreneurship under the theme of Green Manufacturing Technology. The implementation of smart manufacturing tools, such as IoT and AI, streamlines operations, reduces waste, increases efficiency, and lowers carbon emissions. Moreover, the use of energy-efficient equipment and advanced recycling technologies enhances environmental stewardship while curtailing costs. As companies strive to thrive within a more eco-friendly context, the focus on long-term profitability is more essential than ever.

As seen in the word cloud in Figure 4.9 for Green Manufacturing Technology, terms such as “Waste,” “Energy,” “Technology,” “Solar,” and “Production” are prominently featured. These illustrate SMEs’ perception of green manufacturing as a critical opportunity. Furthermore, terms such as “Digital,” “Advancements,” “Monitor,” “Smart,” and “Optimized” reinforce the attention given to technology in these enterprises and suggest a favourable attitude toward the adoption of new ideas in sustainable manufacturing.

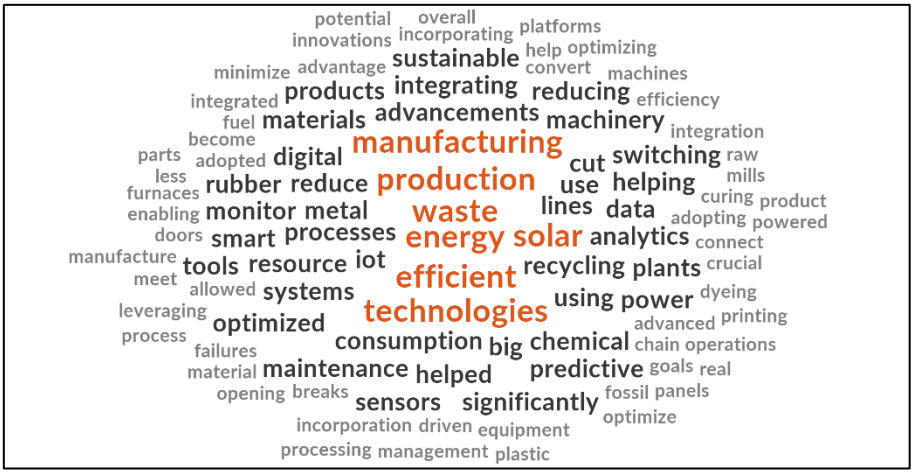

Figure 4.9 Word Cloud of Green Manufacturing Technology

Source: Author analysis through NVivo

4.3.2.1.1 Energy Efficient and Resource Optimization

The growing focus on energy-efficient technologies opens distinctive avenues within the scope of green entrepreneurship, allowing for better optimization of resources during cost reduction. Companies are realizing the synergetic advantages of saving costs and adopting greener practices simultaneously through the use of energy-efficient equipment.

"Having installed new energy-efficient equipment, we now monitor our energy expenditures and consumption, and during the monitoring period, we're using less energy than ever. Streamlined cost management and enhanced sustainability are the direct outcomes of the new equipment."

Numerous firms have realized that upgrading their machinery to energy efficient alternatives not only boosts their operational efficacy but also improves their sustainability metrics. Achievement of energy and resource efficiency improves performance and motivates long term eco-efficient practices.

"Currently, we are using energy-efficient dyeing machines that saves on water and electricity. Our sustained commitment to cost-effective, environmentally-friendly business paradigms, makes optimal resource usage central to our operations."

Advanced dyeing machines exemplify energy efficient technologies that significantly reduce electricity and water usage while contributing to resource optimization.

"With the use of new energy-efficient technologies, our tanning processes have cut energy expenditures significantly, which in turn reduced our spending on cryogenic operational cost, greenhouse gas emissions, and overall carbon footprint while improving our competitive edge."

In this regard, energy efficient technology is cost-effective and cuts emissions while significantly reducing energy consumption, thus giving businesses an upper hand in the market.

The aforementioned examples support how certain technologies that are energy efficient and resource conserving can be taken advantage of energetically by businesses to obtain financial benefit as well as achieve environmental objectives. Focused efforts directed toward sustainable corporate strategies make energy efficiency an important factor influencing profitability and environmental stewardship.

4.3.2.1.2 Smart Manufacturing

The adoption of new technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and big data can help companies refine production processes related to waste and energy, thereby benefiting these firms on multiple fronts.

"With IoT sensors and AI, we are able to optimize waste and make Chemical Production more efficient as equipment failures can be predicted, thus making our business model sustainable."

IoT sensor and AI systems have the capability to predict possible equipment failures, thus preventing resource and time waste associated with recurring downtimes.

"Textile manufacturing is more environmentally friendly and cost effective after resource waste reduction due to implementation of AI-based systems and big data analytics."

Ultimately, an investment in energy-efficient technologies and practices strengthens operational and financial performance alongside environmental sustainability, enabling these firms to achieve multiple operational objectives and cost savings.

"The Internet of Things, an example of smart manufacturing tools, now enables us to track energy consumption during processes in real time, thereby streamlining production while considerably decreasing the company's carbon emission footprint."

This is financially favourable for manufacturing firms as it reduces carbon emissions and further advances eco-friendly objectives.

"Operational costs and resources are lessened due to the utilization of AI for predictive maintenance in manufacturing plants, thus enhancing environmental conservation and sustainability."

This ensures enhanced green production methods along with a substantial reduction in costs. Such improvements fundamentally ease the financial burden of transitioning to eco-friendly business models. The dual benefit of technology enabling the integration of sustainability with the intelligence of smart manufacturing assists green entrepreneurs. These advancements present an opportunity to mitigate negative environmental impacts of smart manufacturing on the environment while enhancing the overall productivity and profits of a firm.

4.3.2.1.3 Waste Reduction Solutions

Waste reduction solutions offer a prime area for green entrepreneurship, particularly for small and medium-sized enterprises (SMEs). These solutions not only mitigate the company's carbon footprint but also create new revenue opportunities by leveraging innovative recycling methods and sustainable business practices.

"Focus on sustainability through the creation of novel business models anchored on the recapture of value through the advanced chemical recycling system which transforms waste by-products into reusable assets."

Such a process will not only help reduce waste but also help diverge to new, eco-friendly models by recycling waste into reusable materials.

"We see potential in recycling textile waste into new yarns through innovative machinery, which not only reduces waste but also offers a profitable new market for eco-friendly fabrics."

The advanced machinery not only improves the performance by energy savings through decreased waste but produces eco-friendly fabrics, which serves the ever-growing demand for sustainable fashion.

"The use of additive manufacturing and metal recycling technologies is helping reduce raw material waste, offering opportunities to repurpose scrap metal into high-value products."

Focusing on green entrepreneurship creates a simultaneous impact towards business model innovation and sustainable development.

"Steel recycling opens new doors that focus on waste reduction and material reuse aligned with new strategies towards sustainable green business."

Adopting efficient technologies in steel recycling enables small and medium-sized enterprises (SMEs) in the metal sector to reduce waste economically, fostering new green business ventures. These SMEs benefit both economically and environmentally by embracing such technologies.

For SMEs, waste reduction strategies represent a unique opportunity to innovate within their sectors. Eco-entrepreneurs can implement recycling processes alongside waste management systems, mitigating their ecological footprint while simultaneously developing new market prospects.

The convergence of waste reduction processes with entrepreneurial creativity facilitates the development of novel sustainable business models, underscoring that eco-conscious practices can be successfully integrated with business value.

4.3.2.2 Green Practices Incentives

Incentives for practicing greener entrepreneurship are powerful motivators that can make business operations eco-friendlier and more sustainable. Financial aids such as tax allowances, carbon credits, emission trading, and renewable energy grants subsidize the transition to green practices. Carbon credit schemes, which monetize emission reductions, generate profits for SMEs while providing tax breaks on emission-reducing equipment. Additionally, renewable energy subsidies make green conversion economically viable, promoting potential profits alongside global sustainability. Together, these incentives greatly reduce the risks associated with business innovations under the green economy.

As shown in Figure 4.10, the word cloud highlights important terms such as "Credits," "Grants," "Tax," "Renewable," and "Government," indicating that the majority of SME owners are knowledgeable about and make use of green practice incentives to improve their businesses. Moreover, words such as "Green," "Credit," "Support," "Funding," "Friendly," and "Systems" are frequently used, reflecting the structured approach SMEs take in leveraging multiple forms of support to practice green operations.

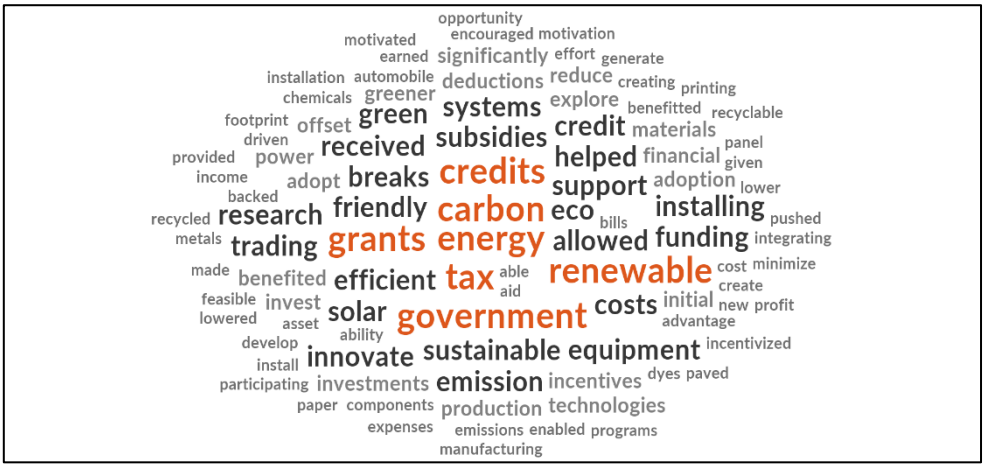

Figure 4.10 Word Cloud of Green Practices Incentives

Source: Author analysis through NVivo

4.3.2.2.1 Tax Breaks on Sustainable Investments

Tax incentives and government subsidies that promote sustainable investments are becoming increasingly important for SMEs seeking to engage in green entrepreneurship. Such funding makes adopting new eco-friendly technologies and sustainable practices more cost-effective, both financially and in terms of facilitating easier implementation for companies.

"The tax incentives for investing in energy-efficient machinery have been crucial for us. These breaks significantly lower the cost of upgrading to greener technologies, making it easier to comply with sustainability goals."

For SMEs, the return on energy-efficient equipment can be a challenge. Tax incentives and financial breaks enables greater adoption of these technologies. In doing so, businesses are able to align with operational sustainability goals paving the way for green entrepreneurship.

"We've benefited from tax deductions on sustainable materials and equipment. These incentives have been key in helping us transition to more eco-friendly processes without excessive upfront costs."

Striving for eco-friendly targets and attaining them often comes with the need to invest heavily in associated materials and machinery. Such tax breaks, and deductions, eliminate the monetary burden aiding SMEs in achieving greener objectives which would otherwise be expensive.

"The installation of energy-efficient equipment comes with a government tax incentive which has helped us reduce energy costs, as well as curtail emissions."

Tax incentives facilitate the improvement of environmental performance as well as reduction of energy bills for SMEs, which previously were a cost burden.

The financial viability of sustainable investments motivates green entrepreneurship, which is supported by these incentives. With limited resources, SMEs can harness these tax breaks as a foundation for pursuing environmentally sustainable innovations.

4.3.2.2.2 Carbon Credit and Emission Trading

Emission trading schemes (ETS) and carbon credits create a significant opportunity for green entrepreneurship, particularly for SMEs aiming to reduce their carbon emissions while simultaneously generating financial gains. These mechanisms serve both as incentives and as additional financial resources, motivating investments in sustainable technologies and practices.

Companies are allowed to sell their surplus emission reductions, effectively creating a market for sustainability

"Emission trading scheme has incentivized us to invest in eco-friendly production methods because carbon credits can serve as valuable assets for future investments."

This is particularly helpful when trying to make the move to sustainability easier for those with limited resources.

"Emission reductions enabled us to gain profit making it easier to justify and implement greener technologies."

The carbon credit framework offers enterprises an opportunity to gain a distinct advantage for being environmentally responsible while competing in the market. Through reduced emissions and carbon credit trading, businesses are able to enhance their environmental outlook and earn additional sustainable funds. These mechanisms are appealing for SMEs to dive into green entrepreneurship, driving long-term environmental and economic sustainability.

4.3.2.2.3 Grant and Subsidies for Renewable Energy

For SMEs, the adoption of grants and subsidies for renewable energy offers a viable pathway toward green entrepreneurship. These funds eliminate hurdles linked with the steep capital expenditure required for the installation of renewable energy systems like solar and wind, making green adoption both viable and more profitable.

"Government subsidies for solar panel installation have significantly reduced our upfront costs, making it easier to transition to renewables in our chemical production."

This opens new opportunities for SMEs to engage in sustainable operations at minimal upfront costs.

"The grants we received for wind power adoption have lowered our energy expenses and made sustainable manufacturing more affordable."

The grant funding enables firms to recover the initial investment on renewable energy systems resulting in minimal energy costs in future.

"The financial aid we received for wind energy adoption helped us overcome the high initial investment, enabling a sustainable shift in our metal production process."

With the availability of such subsidies, companies find it easier to embrace greener policies which helps strengthen their market positioning over time.

Through the use of grants and subsidies, SMEs are able to become less dependent on fossil fuels, sustain lower operational costs, and cultivate sustainable practices. Such aids tend to not only motivate eco-friendly operations, but also the innovation of using renewables, making SMEs frontrunners in the green economy.

4.3.2.3 Leveraging Sustainable demand

In green entrepreneurship, the Leveraging Sustainable Demand (LSD) model enables businesses to incorporate eco-friendly materials, sustainable supply chains, and responsible production practices. Ethically sourced products, recycled materials, and green certifications are increasingly becoming competitive advantages for businesses that embrace sustainable practices. LSD allows businesses that actively practice sustainable marketing, organic sourcing, and environmentally responsible logistics to differentiate themselves. Governmental support and common practices facilitating these transitions are also in place, making such practices more feasible. Adopting green consumer policies allows businesses to enhance brand value, market positioning, and profit margins through sustainability within the eco-entrepreneurial paradigm.

In Figure 4.11, the word cloud emphasizes relevant terms such as "Supply," "Chain," "Eco," and "Friendly." These words underscore the increasing attention being given to sustainable sourcing. While customers show a growing willingness to pay more for green goods and services, terms like "Premium," "Pay," "Demand," "Marketing," and "Certified" reflect brand strategies. This indicates that while eco-friendly production approaches are on the rise, businesses must balance price, customer expectations, and complex supply chains to maximize sustainability.

Figure 4.11 Word Cloud of Leveraging Sustainable demand

Source: Author analysis through NVivo

4.3.2.3.1 Green Product Development

The increasing interest in sustainable and eco-friendly products is enabling small and medium-sized enterprises (SMEs) to capitalize on opportunities in green entrepreneurship. The shift in consumer preferences, which is significantly influencing green product development, is likely to offer lucrative opportunities for businesses to capture emerging markets.

"We're seeing a growing demand for biodegradable chemicals, which presents a major opportunity for us to innovate. Consumer preferences are driving us toward creating more eco-friendly formulas."

The focus on biodegradable and environmentally friendly chemicals is steadily increasing. SMEs now position themselves positively in the market by innovating with green alternatives to traditional chemicals, thereby establishing themselves as eco-friendly market leaders.

"Sustainable fabrics such as organic cotton and recycled materials are increasingly in demand. This change is motivating us to develop sustainable clothing lines which aligns with consumer demand."

Revival of the textile industry is made possible due to the overwhelming availability of organic and recycled materials driven by consumer demand.

"The need for social responsibility is driving consumers to look for alternatives to leather products that are both cruelty-free and eco-friendly. This is forcing us to develop product lines cantered on green leather substitutes which provides new opportunities."

Old market regulations concerning the leather industry are renewed by cruelty-free and eco-friendly services, permitting product innovation. Small and medium-sized enterprises have the capability to respond to this market need and gain a competitive advantage with the growing trend of socially responsible consumerism.

"Innovative concepts for the production of metal products using recycled materials is what more and more customers are looking out for. This has led to the creation of sustainable metal products as we are able to use green materials and methods."

Small and medium-sized enterprises have the opportunity to capitalize on the expanding market for recycled metal products while adopting eco-friendly manufacturing processes. Prioritizing green product innovation enables businesses to position themselves as leaders in sustainable manufacturing.

The development of environmentally friendly products is gaining prominence as a vital aspect of green entrepreneurship for SMEs, providing an opportunity to address evolving consumer preferences.

4.3.2.3.2 Premium Pricing for Sustainability

The opportunity exists for small and medium enterprises engaging with green entrepreneurship to leverage premium pricing due to sustainability initiatives. As market trends indicate, a section of consumers is ready to pay a premium for goods and services that align with their environmental values.

"Customers are willing to pay a premium for less environmentally harmful goods, which means we can sustain and balance our effective enduring sustainability strategies and our profits."

These insights reveal how entrepreneurs can benefit from the green consumerism trend provided by highly targeted sustainable marketing wherever consumers want to invest in products through their purchasing decisions labelled as eco-friendly, thereby obtaining premium pricing for these products. The approach promotes proper green strategy that balances eco-friendly efforts along with effective approaches to ensure financial independence.

"Consumers prioritize the eco-friendly labels, green pricing or premium pricing strategy makes it very easy to fund our cost-effective green efforts."

The support of these programs advances the position of SMEs in testing and deploying alternative renewable resources in environmental innovations and achieve eco-friendly marketing concepts.

"Certain customers are more than happy to spend on sustainable products, permitting us to maintain demand, even with elevated pricing."

The willingness of customers to invest in sustainability allows businesses to maintain demand even when implementing green practices that involve higher costs.

Eco-friendly products create a niche market where SMEs can set prices above production costs to achieve financial targets. Green initiatives support environmental objectives while generating financial gains, all within the framework of corporate social responsibility.

4.3.2.4 Owners Personality and Visionary Leadership

The theme "Owner's Personality and Visionary Leadership" focuses on green entrepreneurship, where high self-efficacy and adaptability combine with a strong commitment to sustainability. Change-oriented and eco-friendly adopters drive their businesses toward market leadership as sustainability frontrunners. Their confident navigation of practices fosters innovation and initiative. Ambitious sustainability goal setting inspires teams and establishes industry benchmarks, further advancing environmental and economic success.

The word cloud presented in Figure 4.13 highlights terms such as "Confidence," "Materials," "Sustainable," "Leadership," "Practices," "New," and "Solutions," suggesting that SMEs emphasize innovative approaches in green entrepreneurship. Additionally, words like "Strong," "Proactive," "Owner," "Early," and "Positioned"

underscore the critical role of the owner's personality, particularly proactive leadership, as a significant value-add for SMEs transitioning to sustainable practices and green entrepreneurship.

Figure 4.13 Word Cloud of Owners Personality and Visionary Leadership

Source: Author analysis through NVivo

4.3.2.4.1 Adaptability and Openness to Change

Change and adaptability are among the most important opportunities for the development of green entrepreneurship in SMEs. These traits enable enterprises to meet market needs while also positioning them as forerunners in sustainable transformations. Companies can respond to and act on changing market demands earlier than their peers, giving them a competitive advantage in the green market.

"There was a need to shift our processes to eco-friendly ones, which is why green chemistry became imperative early on. Because of green chemistry, we were able to make changes in our processes before the market demand skyrocketed."

Shifting to green chemistry practices earlier than the market expectations enabled businesses to remain ahead of the competition. Such shifts resulted not only in less damaging environmental impacts, but also created opportunities to dominate the market as early movers in sustainable solutions.

"We acted early and began using organic materials way before the sustainable fabrics craze swept around, which turned us into frontrunners of the green textile market."

Businesses were able to capitalize on the emerging demand for eco-friendly clothing and textiles long before it became a global phenomenon, allowing them to strengthen their position within the green textile movement while increasing their reputation and market share.

"Our leadership noted the increased emphasis placed on recycling and integrated sustainable sourcing in our supply chain which gave us a head start in green manufacturing."

For industries, changing sourcing methods to incorporate more recycled and sustainably sourced materials has proactively helped businesses reduce their carbon emissions and become leaders in sustainable manufacturing.

The capacity to adopt new practices and the willingness to embrace change empower small and medium-sized enterprises (SMEs) to turn challenges into opportunities. This initiative allows businesses to gain a competitive advantage in the transitioning green economy

4.3.2.4.2 Green Entrepreneurial Self Efficacy

It plays a significant role in driving sustainable initiatives within a SMEs, when business owners and managers assures in their capacity to implement eco-friendly processes. This confidence pushes them to take proactive steps toward green entrepreneurship, making sustainability a main element of business strategy.

"My confidence in implementing eco-friendly processes allows me to lead projects that prioritize sustainability, even amidst regulatory challenges."

When entrepreneurs have a confidence in their ability to manage sustainable practices, they are more likely to lead projects that balance both regulatory demands and environmental goals.

"Believing in my ability to innovate with sustainable materials has empowered our team to shift toward greener production methods."

Entrepreneurs who trust their capacity to innovate with sustainable resources can effectively lead their teams upward adopting greener methods.

"I am convinced that adopting sustainable practices will benefit our business long-term, which motivates me to pursue green initiatives actively."

Confidence in the long-term benefits of sustainability promotes entrepreneurial drive, allowing business leaders to fully focus on green practices as a strategic investment rather than just a compliance measure.

"My confidence in navigating eco-friendly regulations helps me advocate for sustainable practices within our company, leading to positive changes."

Their ability to confidently handle complex environmental laws allows them to champion green initiatives within their organizations, resulting in the positive environmental and financial outcomes.

This self-belief leads to proactive decision-making, green innovation, and long-term business success, making it as key driver of green entrepreneurship.

4.3.2.4.3 Aspiration for Sustainability

The aspiration for green entrepreneurship motivates entrepreneurs to pursue ambitious goals and achieve innovations in the processes and practices of their organizations. This strong drive cultivates a culture of excellence, with teams working diligently to meet environmental standards.

"Sustainability challenges make me work harder and set more aggressive goals. It is in our company's sustainability vision to be the frontliners in environmental solutions."

With an increased focus on ever greater environmental and ecological impact measure metrics, more successful outcomes become all the more sustainable, significantly boosting achievable results in entrepreneurship efforts.

"My objective is to create the best in class ecologically responsible industrial systems, which justifies my commitment to be a green entrepreneur."

Greater concentration on developing the strategies and methods for achieving these goals shifts the teams' focus to the dual benefit on the company and environment.

"As I stated earlier, hitting sustainability targets I see can help the industry reset targets and find new limits."

The environment can be further improved when entrepreneurs using a green approach aim to strengthen their brand, creating a more positive influence on the industry than has been achieved previously.

The aspiration for sustainability remains one of the main driving forces for these entrepreneurs, as it effectively integrates business objectives with environmental responsibility. It encourages setting ambitious yet achievable targets and implementing practices that align the company with green energy policies and sustainable development.

4.3.2.5 Sustainable Organisation Culture

Sustainable organizational culture is a core driver of green entrepreneurship and is closely linked with continuous learning, employee involvement, and a lasting commitment to sustainability. Companies that integrate sustainable development into their framework significantly increase their chances of achieving long-term environmental and economic success.

The word cloud in Figure 4.14 indicates that SME owners frequently mention terms such as "Continuous," "Learning," "Culture," "Sustainability," "Collaboration," "Team," and "Employees," highlighting a strong focus on embedding a culture of business sustainability within the organization. Other terms like "Organizational," "Practices," "Commitment," "Values," and "Ideas" provide further evidence supporting the need to cultivate a collaborative culture that nurtures sustainability. These findings suggest that developing a sustainable organizational culture may be one of the foremost emerging opportunities for SMEs to pursue innovation, collaboration, and a sustained commitment to green practices.

Figure 4.14 Word Cloud of Sustainable Organisational Culture

Source: Author analysis through NVivo

4.3.2.5.1 Commitment to Continuous Learning

For small and medium businesses intending to lead in sustainable initiatives, persistent education offers an entrepreneurial opening.

"Our company allocates resources towards training our personnel to adopt the latest environmentally friendly technologies, ensuring processes are put in place which allow for innovation within the eco-friendly domain."

Such company policies enable actively engaging employees to adopt practices which make businesses more sustainable while ensuring the company maintains leadership in green innovation.

"We focus on teaching our team concerning the production of eco-friendly goods and sustainable processes. This ethos helps us to greenify attitude fabric manufacturing which drives us forward."

Businesses of small and medium sizes make constant efforts by embracing change and adapting which enables them to thrive in such eco-friendly focused competitive environments.

"Through the provision of educational seminars held on eco-friendly substitutes, their relentless commitment to learning aids in ensuring the company can continue to innovate in the eco-friendly domain."

Participating in workshops on eco-leather not only enables the business to enhance environmental objectives, but also helps capture the expanding market for ethical and eco-friendly goods. Adequate and early training enables employees to proactively position themselves towards maintaining competition.

"By conducting training sessions on sustainable dyeing practices, we have been able to minimize our carbon footprints. The sustainable processes we implement are a result of our learning-focused culture that motivates us to continually improve and adopt more environmentally friendly procedures."

An organizational culture focused on learning enhances an enterprise's ability to innovate and ensures sustainable growth in the green economy.

In the context of small and medium-sized enterprises (SMEs), prioritizing learning significantly strengthens the prospects for achieving sustained success in green entrepreneurship. This approach represents a strategic investment in green knowledge, optimizing cost-effectiveness and contributing to increased competitiveness within the expanding green economy.

4.3.2.5.2 Employee Empowerment and Engagement

Encouraging employee involvement is important when trying to implement sustainability measures within the company. Creating ownership through involving employees supports a shift towards sustainability across the company's activities.

"We support a culture where employees are given the opportunities to put forward eco-friendly innovations. This culture leads to processes that are more sustainable since everyone feels ownership."

This attitude gives staff the opportunity to actively tackle issues such as waste reduction and efficiency improvement, thus nurturing an environment which is favorable for sustainable practices.

The team is encouraged to come up with ways to cut back waste in the processes, which has led to new ideas that contribute to the sustainability objectives of the organization.

"When employees are given the opportunity to speak, we find out new sustainable practices that improve the performance of the organization."

This approach helps to boost morale as well as creativity and innovativeness. Staff are encouraged to come up with green ideas which leads to numerous successful initiatives.

"Sustainability discussions with employees have provided some very useful innovative techniques that fundamentally change how we do things."

This allows the organization to close the gap between the ideal and the real by keeping sustainability at the center of the conversation while continuously testing new propositions.

"Participation in sustainability training enables employees to embrace their creativity in developing green solutions,"

This dedication enhances corporate reputation by ensuring that every employee possesses the necessary knowledge and skills to actively participate in the organization's sustainability initiatives. The company's culture values the ideas and innovations that employees contribute, enabling the creation of new processes that reduce carbon emissions and advance the company's green agenda.

4.3.2.5.3 Sustainability as a Core Organisational Value

Integrating sustainability as a core value is crucial for green entrepreneurship. Emphasizing sustainable practices fosters innovation and positions a business as a leader in eco-friendly markets. When deeply embedded in a company's philosophy, sustainability becomes more than a marketing strategy; it shapes every company-wide decision, from product development to supply chain management, in a holistic manner. For numerous corporations, sustainability serves as an impetus to strive for further innovation.

"It guides our decisions on product formulations and processes, ensuring minimal impact on the environment."

This structure allows businesses to operate efficiently and simultaneously strive towards the desired sustainability goals, redefining the boundaries of innovation in materials and processes.

"Positioning sustainability as a core value creates focus on waste minimization and ethical sourcing."

It shows a direct impact on the greening of manufacturing which turns the companies towards greener processes. Prioritizing Eco-friendly materials and ethical sourcing enables businesses to meet the rising consumer demand while sustainably positioning themselves competitively in emerging green markets.

Incorporating sustainability results in investments in cleaner technologies.

"Sustainability is a core value of the company and is woven throughout the entire value chain, from extraction to production"

It demonstrates how this guiding principle enhances operational efficiency and reduces carbon footprints. Such practices not only minimize environmental impact but also significantly lower costs and increase revenues through sustainable innovations.

This commitment to sustainability presents a tremendous opportunity for green entrepreneurs. It strengthens brand image and fosters consumer loyalty. Treating "sustainability as a core value" enables organizations to meet consumer expectations by delivering high-performing, appealing green products while achieving climate objectives.

These advances increase the likelihood of overcoming the challenges posed by climate change, provided businesses prioritize effective strategies guided by sustainability values.

4.3.3 Barrier of Green Entrepreneurship

The themes 'Ambiguous Regulations,' 'Monetary Resource Constraints,' 'Market Challenges,' 'Critically Costly Infrastructure,' and 'Risk Aversion and Traditional Mindset' provide significant insight into the barriers to green entrepreneurship and capture the complex challenges SMEs face in practicing sustainability. Unclear regulations create confusion that directly limits access to funding, which constrains investment in green

technologies. Additionally, non-eco-friendly competition and the high cost of sustainable infrastructure exacerbate these challenges. Green entrepreneurship is further hindered by a focus on maintaining short-term stability and a traditional risk-averse mindset, limiting SMEs' willingness to adopt innovative, environmentally friendly practices.

4.3.3.1 Ambiguous Regulations

The convergence of shifting environmental policies, overlapping jurisdictions, and weak enforcement frameworks creates the problem of Ambiguous Regulation, which acts as a significant barrier to ecological entrepreneurship for SMEs. The absence of clear regulatory frameworks imposes an opportunity cost on businesses attempting to implement environmentally friendly policies, as they may not be able to recover associated expenses. Furthermore, overlapping governance structures complicate compliance, requiring SMEs to adhere to multiple regulations simultaneously. This not only hinders operational efficiency but also stalls the pursuit of uniform sustainability solutions. Entrepreneurs often expend a disproportionate amount of resources navigating competing mandates, which limits their capacity to operate sustainably.

As highlighted in the previous section, SMEs identified terms most relevant to their experience, including 'Lack,' 'Enforcement,' 'Environmental,' and 'Insufficient,' which are illustrated in the Word Cloud of Figure 4.15. Additional terms such as "Conflicting," "Overlapping," "Inconsistency," "Frequent," and "Complicate" further reveal how SME owners perceive these policies. While the intent of these regulations is to promote environmental sustainability, in practice they frequently generate confusion and impede effective implementation.

Figure 4.15 Word Cloud of Ambiguous Regulations

Source: Author analysis through NVivo

4.3.3.1.1 Changing Environmental Laws

The lack of clear and consistent guidelines for environmental policies presents a significant challenge for SMEs seeking to adopt eco-friendly entrepreneurship. Ambiguous policies hinder enforcement, making it difficult for businesses to implement environmentally sustainable procedures while remaining compliant.

“The rules on how to classify and process chemical waste are incomplete, hence compliance remains a persistent challenge. We tend to overcommit on investments in waste handling.”

As illustrated in this case, SMEs often assume the worst-case scenario, leading to excessive investments in waste management procedures.

"There’s a lack of clear directives on sustainable dye disposal methods. We struggle to align our processes with the regulations because the specifics are often missing."

The absence of clear regulations for spent dye accounting has significantly affected the textile dyeing industry’s efforts to adopt sustainable practices. This broad uncertainty causes delays in sustainability initiatives and results in inefficient allocation of resources for compliance with poorly defined requirements.

“Guidelines on environmental protection in relation to leather tanning do not provide specific benchmarks. If at least there are no benchmarks provided, there is no way one could claim compliance with the stipulated eco requirements.”

Without concrete benchmarks, SMEs face highly restrictive decision-making environments, making the adoption of green practices extremely difficult.

In summary, SMEs seeking to implement green entrepreneurship practices encounter challenges stemming from vague or constantly shifting environmental regulations. Addressing this issue requires the development of more precise legal instruments with clear, actionable steps that support businesses, foster innovation in sustainability, and maintain competitive advantage.

4.3.3.1.2 Overlap of Jurisdictions

The overlapping jurisdictions and domains of authorities act as an impediment to the implementation of green practices, particularly for firms striving to adhere to multiple, and at times contradictory, legal frameworks due to the numerous environmental regulations. A combination of these factors often results in governance that causes confusion and delays, which together foster inefficiency, working against the intended green goals.

“Overlapping laws regarding water and chemical discharge tend to create confusion and therefore make compliance difficult and cumbersome.”

This sentiment illustrates how firms can become trapped in a web of different regulatory layers, such as local, state, or federal authorities, each having different standards on what constitutes reasonable waste discharge. Overlaps, blending, or accumulation of regulations hinder the adoption of explicit sustainable policies and strategies aimed at achieving uniform sustainability targets.

"The struggle with contradictory rules set by federal and local bodies makes maintaining consistent compliance with environmentally friendly policies nearly impossible."

The absence of jurisdiction-prescribed frameworks or clear guidelines creates doubt, making it difficult to prioritize which rules to follow without compromising green efforts.

"Conflicting lower- and upper-level regulations create ambiguity regarding what practices we must adhere to in order to be environmentally compliant."

Paradoxes in governance, although intended to advance business objectives, can inadvertently undermine purposeful initiatives focused on adopting technologically green strategies and accelerating firm transitions.

Corporate advocacy for regulatory clarity, on the other hand, must balance compliance with legal frameworks while addressing these paradoxes. Collaborating with public authorities or forming coalitions for advocacy marks a crucial first step for green business owners in pressing for regulations that foster growth across multi-sectoral industries.

4.3.3.1.3 Lack of Enforcement and Accountability

The sub-theme Lack of Enforcement and Accountability highlights the challenges faced by green entrepreneurs when environmental regulations are not consistently enforced, generating frustration and reducing incentives for investment in sustainability initiatives.

"It's frustrating to compete for customers when, without strong enforcement of environmental regulations, competitors who cut costs by ignoring sustainability practices face no repercussions."

This quote illustrates the inequity created when non-compliant companies operate freely, benefiting from reduced costs while adhering firms bear the expenses associated with eco-friendly practices.

"There's no motivation to stick to ecologically sound policies when all the competitors who aren't held accountable for their actions face no enforcement."

Green entrepreneurs often experience disillusionment when competitors ignore regulations, slowing industry-wide progress toward sustainability.

"It is difficult enough trying to be an upfront green company when strong enforcement is absent."

Weak enforcement allows reckless competitors to avoid compliance, undermining the efforts of genuinely sustainable businesses and even encouraging superficial greenwashing. The inconsistent application of environmental laws enables non-compliant companies to thrive, creating an uneven competitive landscape and discouraging socially responsible initiatives. Lax enforcement diminishes the perceived value of sustainability investments, whereas consistent enforcement would level the playing field, enhancing the returns and importance of adopting eco-friendly practices.

4.3.3.2 Monetary Resource Constraint

Monetary Resource Constraint emerges as a significant barrier to green entrepreneurship among SMEs due to high investment costs, ongoing maintenance expenses, and ambiguous returns on investment (ROI). Sustainable changes are often capital-intensive, posing challenges for underfunded businesses. Although eco-friendly technologies can yield long-term cost savings, the immediate financial burden of sustainable materials, upgraded machinery, and new processes often deters SMEs from adopting them.

The Word Cloud in Figure 4.16 highlights terms such as *"Investment," "Green," "Financial," "Costs,"* and *"Returns,"* reflecting the monetary constraints that impede SMEs from implementing green practices. Even with government incentives, words like *"Options," "Initial," "Limited," "Costly," "ROI,"* and *"Upfront"* portray a scenario of high initial costs combined with restricted financial resources. This suggests that, despite available incentives, the substantial upfront investment and uncertain returns limit SMEs' capacity to invest confidently in eco-friendly initiatives.

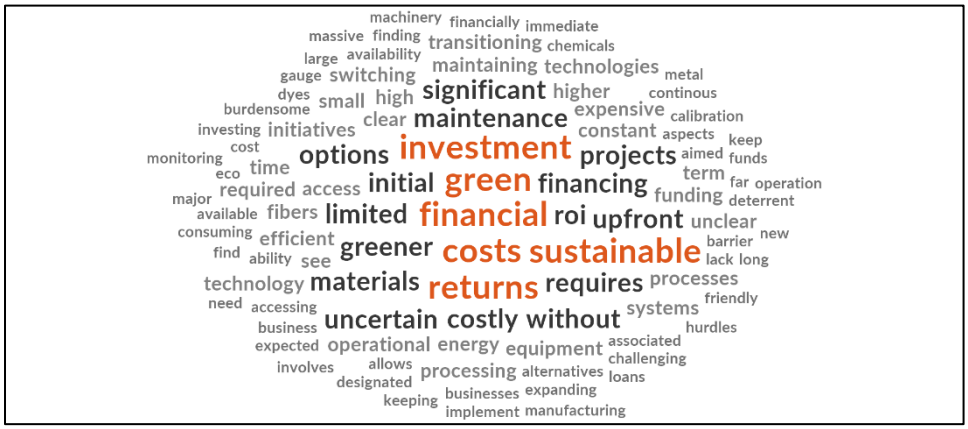

Figure 4.16 Word cloud of Monetary Resource Constraint

Source: Author analysis through NVivo

4.3.3.2.1 High Initial Investment Costs

The lack of monetary resources represents a significant barrier for many small and medium enterprises (SMEs) seeking to engage in green entrepreneurship, largely due to the high upfront investment required to adopt sustainable practices. While some firms receive support from government policies, the overall financial burden often discourages the implementation of eco-friendly business processes.

> *"The upfront shift to sustainable chemicals and equipment comes at too steep a cost. The return on investment in implementing greener processes is slower than what we currently benefit from."*

The capital-intensive nature of adopting green technology presents a fundamental challenge for SMEs, particularly in sectors dominated by chemical processes. These industries often require new machinery, raw materials, and even complete production line restructuring, which can be especially taxing for firms with limited liquidity.

"Energy-efficient machines are crucial to our processes, yet the upfront costs far outweigh the return for an SME like us."

Manufacturers of all sizes face similar difficulties in affording energy-efficient upgrades. Although such improvements promise long-term cost savings, the immediate financial outlay presents a risk for SMEs operating on thin margins.

"We've researched eco-friendly tanning methods, but the investment into the equipment and materials necessary for the processes is too much for our business to take on right now."

In these cases, SMEs' limited financial resources fall short of supporting proposed environmentally friendly and economically beneficial changes.

"The shift toward sustainable component manufacturing entails the adoption of new materials and technology, which are costly and therefore a major obstacle for us."

Industrial manufacturing faces the dual responsibility of adopting sustainable materials while simultaneously redesigning processes. SMEs operating in fiercely competitive, low-margin sectors are particularly constrained by these initial costs. Despite the presence of encouraging policies, the limited and restrictive green SME policy framework continues to stifle attempts to promote green entrepreneurship among these enterprises.

4.3.3.2.2 Ongoing Maintenance and Operational Costs

This poses a critical concern for companies transitioning to sustainable, eco-friendly procedures, as such technologies often involve high maintenance and operational costs.

"Shifting to greener chemicals comes with a lot of additional costs, especially when factoring in the maintenance and servicing of new equipment required to handle the greener, safer chemicals."

This illustrates that while adopting greener materials is beneficial, the monetary burden of maintaining new systems can offset the immediate advantages.

"Green smelting technologies are a necessary step forward for us to reduce our environmental footprint, but these technologies come at a hefty and labor-intensive price."

In this context, the move toward sustainability is constrained by the intricate demands of costly, time-intensive systems that require constant upkeep, adding both operational and financial challenges.

"We've switched to using recycled paper and eco-friendly inks, but the new printing technology that supports this requires constant monitoring and maintenance."

The costs associated with purchasing and operating eco-friendly equipment significantly increase overall operational expenses. Additionally, hiring skilled personnel to manage these systems further compounds the

financial burden. Consequently, even well-intentioned eco-friendly initiatives may pose substantial constraints on company finances.

"Business processes shift to maintenance, and the protective measures for safeguarding these systems are acquisition. Requiring protection raises operational costs."

While the transition to eco-friendly systems demonstrates a commitment to sustainability, the long-term expenses and need for specialized expertise highlight why many companies are hesitant to fully adopt these practices. The initial shift represents only the beginning, with ongoing maintenance and operational demands creating additional financial pressures that may discourage further engagement in green initiatives.

4.3.3.2.3 Unclear Return on Investment

This highlights the financial risk that companies face when considering the adoption of greener, sustainable practices, particularly in capital-intensive sectors where costs are immediate and easily quantified, but long-term benefits are difficult to measure.

"We're not certain whether transitioning to greener processes will lead to proportional savings, and this uncertainty during these times of financial crunch makes investing very difficult."

This statement emphasizes that savings are a critical factor in investment decisions, yet the ambiguity surrounding long-term returns complicates disbursement strategies.

"Switching to eco-friendly processing incurs a very pronounced initial investment alongside long-term returns that are clouded by uncertainty."

As noted, this uncertainty can result in stagnation, as businesses seek more concrete evidence or projections regarding the recovery of their investments in green technologies.

"The so-called benefits of adopting green practices, while claiming to reduce costs, come at a price that is overly high in the short term, tipping the scales of value subsequently, with the supposed ROI too foggy to calculate."

The financial impacts of sustainability initiatives are often opaque and may take extended periods to materialize, causing frustration for firms that need to manage short-term costs within broader financial planning frameworks.

ROI ambiguity thus presents a substantial barrier to adopting eco-friendly technologies within green entrepreneurship. Businesses must weigh prospective long-term savings and benefits against significant upfront costs, particularly when returns are uncertain or delayed. This hesitancy can impede progress toward sustainable business models, even in industries that are otherwise eager to embrace green innovation.

4.3.3.3 Costly Green Infrastructure

Expensive green infrastructure remains a significant barrier for SMEs seeking to adopt sustainable practices. Many companies encounter challenges related to limited access to renewable energy sources and sustainable technology infrastructures, which are both costly and difficult to obtain. The stagnation of green innovation in SMEs is often driven by outdated equipment and systems that hinder the adoption of modern green technologies. Furthermore, a lack of technical expertise and limited training opportunities creates a shortage of skilled personnel capable of maintaining new technologies, further impeding progress toward sustainable operations.

The word cloud in Figure 4.17 highlights terms such as 'Infrastructure,' 'Technology,' 'Challenge,' 'Lack,' and 'Systems,' emphasizing the technological and infrastructural constraints that obstruct SMEs from implementing green practices. While efforts are underway to develop effective sustainable solutions, terms like 'Without,' 'Outdated,' 'Difficult,' 'Costly,' and 'Expertise' illustrate the persistent gaps faced by SMEs grappling with aging systems, insufficiently skilled personnel, and the high cost of upgrading infrastructure. These findings indicate that while green infrastructure is essential, SME investments in sustainable technologies are often stalled due to dysfunctional equipment, limited strategic guidance, inadequate policy support, and the financial burden associated with comprehensive system overhauls.

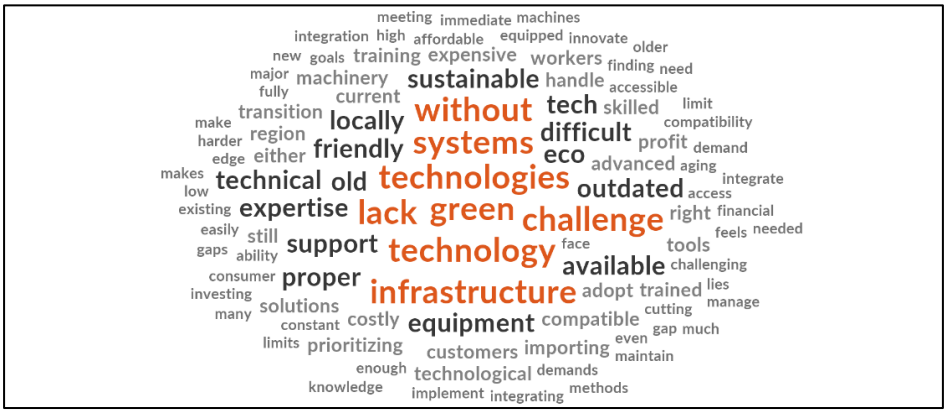

Figure 4.17 Word cloud of Costly Green Infrastructure

Source: Author analysis through NVivo

4.3.3.3.1 Inadequate Infrastructure for Renewable Energy

Although SMEs are increasingly aware of and adopting green technologies, they continue to face significant challenges, particularly the lack of infrastructure for renewable energy and sustainable business practices. Accessing and affording advanced eco-friendly technologies remains a major hurdle.

"In comparison to greener chemical engineering processes, the unaffordable cutting-edge technology hinders sustainable production."

SME owners often encounter knowledge and resource gaps where greener chemical engineering processes exist, but their high costs or limited accessibility render them effectively unavailable.

“Reducing water consumption and waste is achievable for our firm, but unfortunately, the equipment that facilitates these processes is either too expensive or non-existent in our local market.”

Streamlined green practices that support reductions in water usage, waste, and energy consumption remain poorly accessible and costly, making their adoption difficult for SMEs. Consequently, many enterprises are forced to postpone the transition to greener practices.

“Implementation of these green practices becomes impossible because the eco-friendly tanning technology we require is extremely limited and unobtainable, particularly at a price that aligns with our financial capacity.”

In specific sectors, such as leather tanning, sustainable substitute products are rarely available or economically viable, making compliance with environmental regulations while maintaining profitability extremely challenging.

“Although we’d prefer cleaner techniques for metal processing, the area lacks sufficient green technology where we operate, and the little that does exist is extraordinarily costly.”

This undersupply of eco-friendly processing technologies in fields such as metal fabrication further compounds the barriers SMEs face.

“Purchasing this type of printing technology is within our reach. However, onshore availability is non-existent, and offshore procurement is prohibitively expensive.”

Similar issues affect other industries, such as printing, where limited access to sustainable technologies undermines the adoption of eco-friendly alternatives. While the shift toward ecological technologies is occurring among SMEs, the weak infrastructural framework remains a predominant obstacle. To enable broader adoption of sustainable approaches and support the development of an environmentally sustainable economy, enhancing the accessibility and affordability of green technologies must be prioritized.

4.3.3.3.2 Lack of Technical Expertise and Training

Most SMEs continue to be hindered by a lack of green training and technical expertise, limiting their ability to implement substantial sustainable changes. Many firms struggle to find personnel with the skills required to operate, maintain, and innovate modern eco-friendly technologies.

"We don’t have enough skilled workers who understand how to operate or maintain the green technologies we want to adopt."

This highlights how the technical skills gap impedes transitions to greener practices. Even when businesses are motivated to adopt sustainable policies, the absence of trained personnel remains a critical barrier, as emphasized by the respondent:

"Lack of technical expertise in sustainable technologies holds us back from making significant green transitions, becoming an insurmountable barrier."

Moreover, the shortage of skills constrains innovation in sustainability. As one respondent noted:

"Training gaps in green tech limit how much we can innovate and adopt sustainable solutions in our production."

These gaps not only reduce operational productivity but also hinder the proper maintenance of eco-friendly equipment, compounding the challenges of scaling sustainable initiatives. Collectively, the quotes illustrate the persistent lack of well-structured and easily accessible training resources, which are essential for SMEs to make informed managerial decisions and successfully integrate green technologies into their strategic operations.

4.3.3.3.3 Incompatible Systems

The sub-theme "Incompatible Systems" highlights how outdated equipment constitutes a major barrier to the adoption of green technologies among SMEs. Many firms face a difficult dilemma:

"Our existing systems are obsolete, and there is a complicated cost involved in upgrading them to enable the use of green technologies."

This challenge is further exacerbated by the fact that:

"The majority of our equipment is far too old to be compatible with new sustainable technologies, which makes transition very challenging."

Upgrading production equipment is both costly and operationally risky, especially when attempting to maintain normal business operations. One respondent captured this concern succinctly:

"The challenge lies in adopting green technologies on our old systems without halting production."

For many companies, dealing with outdated machinery is a significant burden:

"Many of our machines are retrofit-incapable of leveraging green tech solutions, and their replacement poses a substantial financial burden."

Even when firms are motivated to implement sustainable changes, the existing systems paradoxically resist adaptation, creating persistent roadblocks:

"Our older systems cannot be modernized to support new sustainable technologies, and there is a support gap somewhere above a minimal budget."

These outdated tools hinder the integration of necessary innovations that would otherwise facilitate the transition to eco-friendly practices.

In summary, the Incompatible Systems sub-theme illustrates how obsolete frameworks impede SMEs from adopting green technologies, posing both economic and operational challenges to their sustainability initiatives.

4.3.3.4 Market Challenges

The term "Market Challenges" refers to the various obstacles that SMEs face when attempting to implement sustainable practices in a competitive market. The significantly higher cost of adopting new green technologies and materials represents the primary hurdle, as firms compete against cheaper, conventional alternatives. Additionally, traditional investment stakeholders, who prioritize secure and predictable returns, often overlook or underfund green initiatives, further complicating SMEs' efforts to transition toward environmentally sustainable practices.

The Word Cloud in Figure 4.18 highlights 'Sustainability', 'Competitors', 'Costs', 'Price', and 'Consumers' as key terms and demonstrates some of the market related challenges facing SMEs in adopting green practices. Even with demand for the sustainability, overall business sentiment is weighed down by few 'non', 'short', 'lower', 'pressure', and 'quick' which suggest that corporations compete on price, are burdened by short-term cost pressures, and consumer expectations to keep pricing down. This indicates that while sustainable practices are aligned with long-term gains, SMEs are reluctant to fully embrace green initiatives due to the immediate price competitiveness, financial stringency, and market affordability.

Figure 4.18 Word Cloud on Market Challenges

Source: Author analysis through NVivo

4.3.3.4.1 Cost Competitiveness vs Green Investments

Companies that adopt green technologies and materials face significant hurdles in demonstrating their value, particularly when competitors offer cheaper, non-sustainable alternatives.

"Transitioning to green chemicals is expensive, and when suppliers offer cheaper, non-sustainable options, we struggle to justify the extra costs to price-sensitive customers."

Green methodologies often carry additional financial burdens, particularly in the eyes of investors and stakeholders, making adoption inherently challenging. One respondent highlighted this concern:

"Switching to energy-efficient steel production methods requires heavy investment, but the risk-averse mindset of investors slows down the transition."

Investors tend to shy away from initiatives that disrupt established practices because such changes can heavily impact profit figures. Major shifts can create considerable uncertainty regarding returns, especially if the processes are significantly more expensive, as illustrated by the following statement:

"Stakeholders prefer to stay with established dyeing processes rather than invest in sustainable alternatives, citing fears of unpredictability in returns."

This captures why process overhauls are often delayed. Established practices remain rigid due to concerns about return on investment and associated costs. While stakeholders recognize the long-term importance of sustainable changes, short-term financial impacts act as a deterrent. As noted:

"Purchasing eco-friendly machines is avoided because of doubts regarding return value; hence, the adoption of sustainable practices proceeds slowly."

Addressing these challenges requires implementing systems that clearly communicate potential long-term savings and strategically reshape the market to encourage sustainable adoption. Efforts to influence customer preferences toward eco-friendly products and highlight opportunities for customer retention can help firms justify green investments despite short-term cost concerns. Ultimately, maintaining a balance between sustainability and cost competitiveness is essential for businesses aiming to thrive in an increasingly environmentally conscious market.

4.3.3.4.2 Pressure from Non-Sustainable Competitors

Non-sustainable companies often leverage their lower operational costs as a competitive advantage, which creates significant hurdles for firms adopting sustainable practices.

"Non-sustainable competitors frequently operate at lower costs, making it harder for us to justify the additional expenses involved in adopting green practices."

This highlights how sustainability-focused businesses are challenged when pricing their eco-friendly products higher than cheaper alternatives.

"Our competitors who don't invest in sustainability can offer lower prices, making it tough for us to compete with eco-friendly products."

The consistent undercutting by non-sustainable competitors forces green enterprises to choose between losing market share or compromising their eco-friendly initiatives.

"The cost advantage that non-sustainable competitors have makes it hard for us to justify the extra expense of implementing green practices."

Traditional competitors' pricing advantages create a difficult marketing environment for businesses striving to adopt more sustainable approaches.

"We struggle to keep up with competitors who don't invest in green initiatives because they can offer products at cheaper prices."

As the sub-theme *Pressure from Non-Sustainable Competitors* suggests, companies pursuing eco-sustainability face considerable challenges when competing against firms that prioritize cost over environmental protection. This pressure affects pricing, market positioning, and the overall feasibility of adopting green practices, underscoring the systemic challenges faced by SMEs striving to transition to sustainable business models.

4.3.3.4.3 Short Term Profit Pressures

The sub-theme *Short-term Profit Pressure* highlights the tension between sustainable investments and the immediate cash flow demands that many SMEs face. For businesses striving to implement green practices, the pressure to generate quick profits often conflicts with the long-term nature of sustainability initiatives.

"Inflexibility to show immediate gains makes it impossible to achieve any form of investment in sustainability, which inherently is a long-term undertaking,"

captures why opportunities for going green are often elusive for firms. Similarly,

"Our expectations are to realize value in a matter of weeks, and this stands at odds with the slow, long-drawn-out ROI associated with the endeavour referred to as going green,"

underscores the conflict between aggressive short-term profit expectations and the long-term goals of sustainable development. This is further emphasized in the statement,

"Cost control measures to enhance a firm's sustainability are oftentimes disabled by the need to show rapid profits."

Under such pressing financial deadlines, organizations may struggle to view green initiatives as worthwhile, even if they recognize their long-term merit.

Collectively, these insights reveal that the financial structures within which many SMEs operate do not incentivize long-term sustainable investments, making it challenging for businesses to fully embrace green technologies and practices.

4.3.3.5 Risk Fear and Traditional Mindset

The sub-theme *Risk, Fear, and Traditional Mindset* encapsulates the primary barriers that green innovations face due to conservative stakeholder behavior. Despite widespread recognition of the importance of eco-friendly approaches, many investors and financiers remain risk-averse, favoring stable, familiar strategies over change. This entrenched investment mindset slows the adoption of greener technologies, as stakeholders often perceive such shifts as risky.

The Word Cloud in Figure 4.19 highlights prominent terms such as 'Reluctant,' 'Hesitant,' 'Scepticism,' 'Fear,' and 'Regulations,' alongside 'Invest,' 'Technologies,' and 'Green.' These terms illustrate not only hesitation in embracing sustainable practices but also a deeper resistance toward taking decisive actions. While green investment may open strategic opportunities, strong resistance persists due to financial risks, regulatory uncertainty, and a preference for operational stability. This indicates that, although sustainability is acknowledged in principle, concerns regarding profitability, potential operational disruptions during transitions, and adherence to rigid business frameworks constitute significant obstacles to the adoption of green practices.

Figure 4.19 Word cloud of Risk Fear and Traditional Mindset

Source: Author analysis through NVivo

4.3.3.5.1 Conservative Investment strategies

The owners of small and medium-sized enterprises understand the advantages that come with green innovations, and they are ready to adopt eco-friendly practices; however, other stakeholders like investors and financial supporters tend to resist these changes because of perceived financial risks.

"Due to the perceived financial risks associated with eco-friendly practices, our sponsors prefer to rely on outmoded chemical processes."

This sponsorship framework slows the shift towards the adoption of greener chemical processes even with available data showing a surge in demand for eco-friendly products.

"There are far more stable and safer options available for investment other than green leather tanning technologies."

This conservative mindset makes it hard for companies to adopt sustainable practices despite rising demand from consumers.

"Stockholders refuse to support eco-friendly investments irrespective of the availability of sustainable materials due to their apprehensions regarding unpredictable financial returns."

Small and medium-sized enterprises looking to adopt sustainable materials in their manufacturing processes often face resistance from stakeholders focused on the unpredictability of financial returns.

"Adopting energy-saving methods in steel production entails a great deal of capital investment, but the return-on-investment mentality of investors slows down adaptation."

Capital-intensive companies in the steel sector face an uphill battle under the restraining influence of risk-averse and overly cautious investment frameworks. This imbalance is readily achievable by overcoming the barriers posed to green business.

These barriers can be rationalized as investment strategies which only vacate room for sustainable innovation if the issues tied to this risk-averse basis are dealt with more exhaustively.

4.3.3.5.2 Resistance to Regulatory Changes

Resistance to Regulatory Change emphasizes the opposing forces posed by stakeholders and entrenched business practices, which make navigating new environmental regulations particularly challenging. Stakeholders often perceive these regulations as burdensome and resist the necessary adjustments, viewing changes as obstructions rather than potential value-adding opportunities. This sentiment is captured by one respondent:

"Regulatory changes are hurdles which attempt to obstruct progress toward sustainability."

The frequent updates and evolving guidelines often exacerbate confusion, as stakeholders regard these changes as threats rather than enablers of progress. This paradox is reflected in the statement:

"The stakeholders who resist changing are set in their ways and hence the evolving regulations create confusion."

As a result, many stakeholders tend to disregard continually evolving regulations, seeing them as attempts to disrupt cost structures or output systems, which leads to complete reluctance to comply. This form of anchored resistance arises from a desire to avoid any disruption to established business models.

At the organizational level, achieving environmental compliance is further challenged by a lack of innovation and sustainably adaptive practices. Overcoming this resistance requires encouraging more flexible mindsets and engaging stakeholders effectively, highlighting the long-term value of regulatory shifts beyond their superficial perception as obstacles.

4.3.3.5.3 Focus on Immediate Operational Stability

Focus on Immediate Operational Stability exemplifies the "pause-and-reflect" tendency among stakeholders who hesitate to embrace green transitions due to concerns about disrupting 'business as usual.' Systemic inertia often leads stakeholders to view eco-initiatives as inherently risky and disruptive. As one respondent noted:

"There's a strong focus on immediate stability; stakeholders view green transitions as risky and prefer to stick with proven practices."

This fixation on stability, reliability, and safety perpetually inhibits experimentation with sustainable approaches. Green initiatives are often seen as disruptive innovations and may face strong opposition from traditionalist stakeholders. Another statement highlights this perception:

"Stakeholders often perceive green initiatives as a threat to our operational stability."

Such emphasis on stability frequently curtails experimentation and exploration of new avenues, as most stakeholders prioritize maintaining the 'known safe' rather than venturing into novel, untested practices. This hesitation is further captured in the comment:

"The focus on immediate stability among stakeholders leads to hesitation in exploring eco-friendly innovations."

In essence, the challenge lies in balancing operational stability with the pursuit of innovation and sustainability. To mitigate this resistance, businesses must cultivate an environment that addresses stakeholder concerns while emphasizing the long-term benefits of transitioning to greener practices.

4.4 Conclusion

This chapter aimed to achieve two primary research objectives: (1) examining the awareness of green entrepreneurship among SME owners, and (2) exploring the opportunities and barriers associated with the adoption of green entrepreneurship. Through thematic analysis, six key themes with several subthemes were identified to assess SME owners' awareness of green entrepreneurship. These themes, derived from a word cloud and hierarchical chart generated from the interview transcripts, included: Green Technology Awareness, Green Education and Skills Awareness, Industry Collaboration Driving Green Awareness, Green Subsidies Awareness, Green Laws Awareness, and Pollution Awareness. Each theme and its subthemes reveal different dimensions of how SMEs perceive and engage with green entrepreneurship, reflecting their understanding of sustainability, financing, regulation, and corporate environmental accountability.

To address the second objective, the study identified five key themes related to opportunities in green entrepreneurship: Green Manufacturing Technology, Green Practices Incentives, Leveraging Sustainable Demand, Owners' Personality and Visionary Leadership, and Sustainable Organizational Culture. These themes and their subthemes highlight the various avenues that could enable SMEs to transition toward greener business models. Conversely, five primary barriers were identified that hinder the adoption of green practices: Ambiguous Regulations, Monetary Resource Constraints, Costly Green Infrastructure, Market Challenges, and Risk Aversion Coupled with a Traditional Mindset. These barriers underscore the financial, regulatory, and cultural challenges that remain significant for SMEs in Punjab.

The overarching conclusion suggests that while awareness of green entrepreneurship exists among SMEs, it is not effectively translated into practice. This gap is influenced by collaborative educational and technological frameworks, policy design, environmental concerns, and financial incentives within Punjab. Despite these critical factors, the prevalence of multiple challenges indicates a lack of strategic policy frameworks, inadequate financial support systems, and limited attitudinal shifts toward actively pursuing green entrepreneurship among SMEs.

This chapter provides crucial insights into the scope of green entrepreneurship in the SME context. The knowledge gained here sets the stage for further analyses of the primary factors determining green entrepreneurial intent and the moderating role of entrepreneurship education in the subsequent chapters. These findings will inform the next chapter, which focuses on the key drivers and facilitators of green entrepreneurship practices among SMEs.

CHAPTER 5

QUANTITATIVE DATA ANALYSIS AND INTERPRETATION

5.1 Introduction

In Chapter 3, we outlined the research methodology employed in this study. This chapter delves into the analysis of the collected survey data, utilizing appropriate statistical tools to present a comprehensive and in-depth interpretation of the findings. The first section of this chapter focuses on the demographic profile of SME owners and managers. By analyzing and discussing their demographic characteristics, this section aims to provide insights into their intentions and personality traits concerning green entrepreneurship. A detailed examination of the quantitative aspects and research objectives is also included in this phase. The second section addresses the analysis of the key antecedents influencing green entrepreneurial intentions among SME owners, aligning with the study's objectives. This is followed by a moderation analysis, which investigates the moderating role of entrepreneurial education—both formal and informal—on the relationship between personality traits and green entrepreneurial intentions. This analysis fulfills the fourth objective of the study. Finally, the chapter evaluates the predictive relevance of the conceptual model, providing a robust understanding of the variables and their interconnections within the context of green entrepreneurship.

5.1.1 Demographic Description

The demographic profile of respondents plays a crucial role in the analysis of any research study, as it provides foundational insights into the characteristics of the sample population. In this study, a total of 421 respondents were included for analysis, offering a diverse and representative dataset. A majority of participants in the study who reported their gender were men, making up 94.01% of the respondent group (396), while only 5.9% (25) were female. The findings suggest that most of the sample's companies are owned and managed by men. Among the sample, those in the 31 to 40 years age group were mostly involved in managing and owning SMEs. The breakdown continues with 18.99% (80) in the 41 to 50 years group and 8.55% (36) over 50 years. Approximately 4% (19) of entrepreneurs fall below the age of 30, indicating that few young people start businesses in the sector. The majority of firms in the sample (299) have been operating for 11 to 20 years, while others are in the early stages (51), have operated for 21 to 30 years (42), and have been open for longer than 30 years (26). This distribution emphasizes the past and present success of SMEs in operations. 86.22% of the firms in the sample (n=363) have between 5 and 75 employees. Firms with 76 to 200 workers make up 9.26% (39) of the total, and those with more than 200 workers account for only 2.14% (9). These findings highlight the focus of the study on small and medium enterprises (SMEs). Regarding education, 42.28% (178) of respondents are graduates, while 30.64% (129) have completed higher secondary education. In addition, 18.76% (79) have completed a postgraduate degree, and 6.41% (27) have earned a diploma. Only one respondent has a doctorate/Ph.D. (0.24%) and another has completed matric education (0.24%). This shows that a significant portion of the sample has received a graduation degree or equivalent. Most respondents are

company owners (68.17%, n=287), and a smaller group are managers (31.59%, n=133). Therefore, the findings from the study largely represent the opinions of key SME decision-makers.The educational background of respondents plays a pivotal role in shaping their entrepreneurial intentions and capabilities, particularly in the context of green entrepreneurship. In this study, the education levels of SME owners and managers were categorized as Matric (10th Class), High Secondary (12th Class), Diploma, Graduation, Post-Graduation, Doctorate/Ph.D., and Others. Formal education, such as university degrees, equips individuals with theoretical knowledge, technical skills, and structured training essential for entrepreneurship (Fayolle et al., 2006). Conversely, informal education, which includes learning through experience, apprenticeships, or self-taught methods, plays a critical role in fostering entrepreneurial learning and adaptability (Cope, 2005; Politis, 2005).

To address the dual nature of entrepreneurial education, this study classified it into two categories: formal entrepreneurial education and informal entrepreneurial education. Respondents with formal qualifications, such as diplomas, degrees, or advanced certifications in business or related fields, were considered to have formal entrepreneurial education. Conversely, those whose learning stems from practical experience, mentorship, or hands-on business exposure without formal credentials were categorized under informal entrepreneurial education. This distinction is particularly relevant as entrepreneurial education, whether formal or informal, has been shown to significantly influence entrepreneurial behavior, skills, and intentions (Fayolle et al., 2006). While some respondents may possess both formal and informal entrepreneurial education, the primary categorization in this study is based on the dominant source of their entrepreneurial knowledge. This approach ensures clarity and consistency in analyzing the moderating effect of entrepreneurial education on green entrepreneurial intentions. By examining both formal and informal educational backgrounds, this study captures the diverse learning trajectories of SME owners and managers, providing deeper insights into their readiness and motivation for adopting sustainable practices.

The size of the workforce within the firms was also considered, with the number of employees divided into three groups: 5–75 employees, 76–200 employees, and above 200 employees. This segmentation highlights the scale of operations and its potential impact on the adoption of green entrepreneurship practices.

Overall, the demographic profile of respondents is a critical aspect of this study, as it enables a nuanced understanding of how factors such as age, gender, education, firm age, turnover, designation, and workforce size influence green entrepreneurial intentions. This detailed demographic analysis provides the foundation for exploring the antecedents and moderating factors affecting green entrepreneurship among SMEs, offering valuable insights into the dynamics of sustainability within this sector.

Table 5.1: Demographic Description of Entrepreneurs of SMEs

Demographics	**Category**	**Frequency**	**Percentage**
Gender	Female	25	5.9%

	Male	396	94.01%
	Total	421	100%
Age	Less than 30 Years	19	4.51%
	31 to 40 Years	286	67.93%
	41 to 50 Years	80	18.99%
	Above 50 Years	36	8.55%
	Total	421	100%
Firm Age	1-10	51	12.11%
	11-20	299	71.02%
	21-30	42	9.98%
	Above 30	26	6.18%
	Total	421	100%
Number of Employees	5-75	363	86.22%
	76-200	39	9.26%
	Above 200	9	2.14%
	Total	421	100%
Education	Matric	1	0.24%
	High Secondary	129	30.64%
	Diploma	27	6.41%
	Graduation	178	42.28%
	Post- Graduation	79	18.76%
	Doctorate/PhD	1	0.24%
	Others	5	1.19%
	Total	421	100%
Designation	Owner	287	68.17%
	Manger	133	31.59%
	Total	421	100%
Firm Size	Small	392	93.11%
	Medium	29	6.88%

5.2 To analyse the key antecedents affecting green entrepreneurial intentions among SMEs owners

The objectives of this study are achieved through the Structural Equation Modeling (SEM) technique, implemented using Partial Least Squares (PLS-SEM). Through an extensive literature review, the researcher identified six key antecedents that shape green entrepreneurial intentions for SMEs in Punjab: Personality Traits, Environmental Awareness, Organizational Culture, Subjective Norms, Entrepreneurial Motivation, and Entrepreneurial Education. From this foundation, a theoretical model was created to analyse the interactions among these variables. PLS-SEM is ideally suited for testing complex models laden with latent variables and is thus highly effective in examining the interplay of the various antecedents and green entrepreneurial intentions. PLS-SEM is applied in two stages. The initial step entails evaluating the measurement model to confirm the constructs' reliability and validity. This evaluation ensures that the survey items effectively capture the theoretical constructs they are intended to measure. For reflective constructs, internal consistency reliability is assessed using Cronbach's alpha and Composite Reliability (CR), with CR deemed adequate if it exceeds 0.70. The Average Variance Extracted (AVE) assesses convergent validity, wherein the construct must explain over 50% of the variance of its indicators; a minimum value of 0.50 is considered acceptable.

The Fornell-Larcker Criterion and the Heterotrait-Monotrait Ratio (HTMT) are used to establish discriminant validity, as they measure the extent to which each construct represents a distinct concept. Indicator multicollinearity is examined using the Variance Inflation Factor (VIF), where a value lower than 5 indicates weak inter-indicator multicollinearity. Significant indicator weights are tested against hypotheses, while insignificant ones are evaluated based on theoretical relevance. Additionally, redundancy analysis is carried out to test the validity of formative constructs against reflective measures. This comprehensive process ensures proper representation of both reflective and formative constructs in adherence to measurement theory, allowing further analysis to be conducted with confidence.

The first part of confirming the measurement model involves applying Confirmatory Factor Analysis (CFA) to validate relationships among latent variables and their respective indicators. This step safeguards accuracy concerning empirical research constructs, ensuring alignment with the theoretical framework and intended multidimensionality. At this stage, the measurement model is confirmed to be reliable and valid, establishing a foundation for examining hypothesized relationships within the model. In the second stage, the focus shifts to structural model evaluation aimed at testing relationships among latent variables. This begins with assessing the coefficient of determination (R^2), which indicates the proportion of variance in the dependent variable explained by the independent variables. Higher R^2 values indicate greater predictive capability of the model. Path coefficients (beta values) are examined to determine the strength and direction of relationships between constructs, while p-values assess statistical significance, with a cut-off set at below 0.05. Predictive relevance (Q^2) is also evaluated using the blindfolding procedure to gauge the outcomes of dependent variable models.

This approach ensures that the relationships among antecedents—such as personality traits, environmental awareness, subjective norms, organizational culture, and entrepreneurial motivation—are accurately captured. Utilizing a reflective-formative higher-order model enables comprehensive analysis of the constructs, providing broad and insightful understanding of green entrepreneurial intentions among SMEs.

5.2.1 Measurement Model Assessment (Reflective-Formative)

The first step in carrying out PLS-SEM analysis is testing the measurement model, which involves determining the connections or relationships between indicator variables and their latent constructs. As noted by Hair et al. (2019), the primary objective at this stage is to establish the reliability and validity of the constructs. The evaluation criteria and processes differ depending on whether constructs are reflective or formative. In this study, all constructs are reflective, with the exception of two.

For the measurement model assessment of reflective constructs, outer loadings, composite reliability, and convergent validity are calculated. Loadings are checked to determine whether individual indicators adequately represent the construct. Typically, values above 0.70 are considered acceptable. Composite Reliability (CR) is computed to evaluate internal consistency across the construct. Relying on a threshold of 0.70, CR is considered acceptable if a value of 0.70 or higher is attained. Convergent validity, estimated using Average Variance Extracted (AVE), is considered adequate if the value is 0.50 or above, meaning the construct accounts for more than half of the variance of its indicators. Each of these validity tests ensures that the reflective constructs are accurate and precise enough to be relied upon for further analysis.

Different evaluation criteria are used for formative constructs. A redundancy analysis is performed to validate the construct against a reflective measure of the same concept. Multicollinearity among indicators is evaluated using the Variance Inflation Factor (VIF), with values below 5 considered acceptable. Furthermore, the significance and relevance of indicator weights and loadings are assessed to determine their meaningful contribution to the construct. These procedures ensure the accurate representation of formative constructs in alignment with the theoretical framework.

The table that follows details the procedure for analysing the reflective and formative constructs measurement model. The table systematically presents the steps to enhance reliability and validity for the study's constructs.

Table 5.2: Steps to Evaluate the Measurement Model for Reflective and Formative Constructs

Aspect	**Reflective Constructs**	**Formative Constructs**
Indicator Evaluation	Outer loadings (> 0.70) to ensure indicators	Indicator weights to assess their contribution to the construct.

	adequately represent the construct.	Significance tested using bootstrapping.
Reliability Assessment	Composite Reliability (CR ≥ 0.70) to evaluate internal consistency.	Not applicable, as reliability is not a focus for formative constructs.
Convergent Validity	Average Variance Extracted (AVE ≥ 0.50) to ensure sufficient variance explained by the construct.	Redundancy analysis to validate the construct against a reflective measure of the same concept.
Discriminant Validity	Fornell-Larcker criterion and HTMT (Heterotrait-Monotrait ratio ≤ 0.85).	Not applicable to formative constructs.
Multicollinearity	Not directly applicable, but cross-loadings are checked for indicator uniqueness.	Variance Inflation Factor (VIF < 5) to ensure no high multicollinearity among indicators.
Significance Testing	Bootstrapping to test the significance of outer loadings.	Bootstrapping to test the significance of indicator weights.

Source: By author

5.2.1.1 Assessment for the Reflective construct

- **Indicator Outer Loadings**

The Outer loadings values of all indicators surpass the threshold value of 0.65 (Hair et al., 2019) as shown in the Figure 5.1. The items within latent variable (sub-construct) have been systematically coded, such as Proactiveness being represented as PRO1, PRO2 and Entrepreneurial self-efficacy as ESE1, ESE2 and so forth

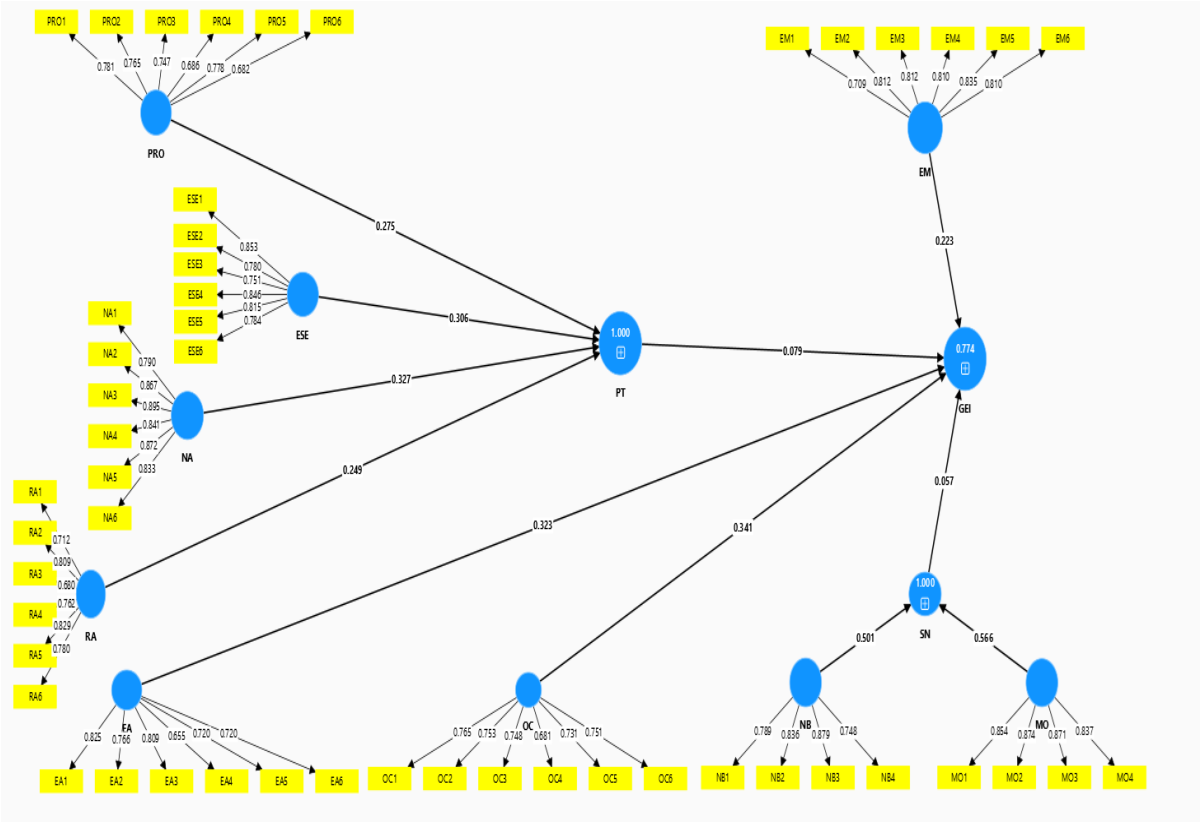

Figure 5.1 Measurement Model Assessment

Source: Author Calculated through SmartPLS

Table 5.3: Results of Indicators Reliability

Construct	**Sub-Construct**	**Construct coding**	**Outer Loadings**
Personality Traits	Proactiveness	PRO1	0.781
		PRO2	0.765
		PRO3	0.747
		PRO4	0.686
		PRO5	0.778
		PRO6	0.682
	Entrepreneurial Self-Efficacy	ESE1	0.853
		ESE2	0.780
		ESE3	0.751
		ESE4	0.846
		ESE5	0.815
		ESE6	0.784
	Need For Achievement	NA1	0.790
		NA2	0.867

		NA3	0.895
		NA4	0.841
		NA5	0.872
		NA6	0.833
	Risk Aversion	RA1	0.712
		RA2	0.809
		RA3	0.680
		RA4	0.762
		RA5	0.829
		RA6	0.780
Environmental Awareness		EA1	0.825
		EA2	0.766
		EA3	0.809
		EA4	0.655
		EA5	0.720
		EA6	0.720
Organisational Culture		OC1	0.765
		OC2	0.753
		OC3	0.748
		OC4	0.681
		OC5	0.731
		OC6	0.751
Subjective Norms	Normative Belief	NB1	0.789
		NB2	0.836
		NB3	0.879
		NB4	0.748
	Moral Obligation	MO1	0.854
		MO2	0.874
		MO3	0.871
		MO4	0.837
Entrepreneurial Motivation		EM1	0.709
		EM2	0.812
		EM3	0.812
		EM4	0.810

		EM5	0.835
		EM6	0.810

Source: By Author

The SmartPLS analysis required coding of the data as it facilitated organization and eased management inspection. In verifying the reliability of the indicators during the data coding process, it was ensured that the threshold values set for outer loadings of the indicators were met. The coding of the indicators and their outer loading values is contained in Table 5.3.

- **Construct reliability and validity**

The measurement model requires special attention to check internal consistency during the factor evaluation process. Internal consistency is assessed and confirmed by indicators such as Cronbach's alpha and Composite Reliability (CR), which ensure that the indicators consistently represent the underlying construct. In exploratory research, a reliability value of 0.60 is considered the lowest acceptable threshold, while a value of 0.70 is the minimum for established research. An additional reliability indicator, rho_A (ρ_A), has been utilized in this study, as proposed by Dijkstra and Henseler (2015), to provide an alternative measure. The analysis in this study showed that all constructs met both external and internal consistency, with Cronbach's alpha and CR values exceeding 0.79; no constructs fell below the stipulated thresholds presented in Table 5.4.

Convergent validity was assessed to determine whether the indicators accurately capture the construct. This was analyzed using the Average Variance Extracted (AVE), which evaluates the proportion of variance in the indicators explained by the construct. An AVE value exceeding the 0.50 benchmark indicates that the construct accounts for a significant portion of the variance among its indicators. The results confirmed that all constructs surpassed the cut-off AVE value, thereby verifying that the indicators adequately represented their respective constructs (Table 5.4). This analysis rigorously validates the Trust/Confidence and Satisfaction measurement model for construct validity, ensuring that the model is reliable, valid, and provides robust evidence for subsequent structural assessment.

Table 5.4: Results of Construct Reliability and Validity

Construct	**Cronbach's alpha (α)**	**Composite reliability (rho_a)**	**Composite reliability (rho_c)**	**Average variance extracted (AVE)**
EA	0.845	0.856	0.886	0.565
EM	0.886	0.887	0.914	0.638
ESE	0.891	0.894	0.917	0.649
GEI	0.919	0.921	0.937	0.714

MO	0.882	0.883	0.919	0.738
NA	0.923	0.924	0.94	0.723
OC	0.83	0.835	0.887	0.664
PRO	0.834	0.836	0.878	0.546
RA	0.857	0.865	0.893	0.583

Source: By Author

- **Discriminant Validity**

Discriminant validity, as part of the measurement model evaluation, verifies that the constructs are distinct and represent different concepts. In this study, discriminant validity was assessed using two widely accepted approaches: the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT) method. The HTMT ratio, a more recent and stringent approach, measures the ratio of between-construct correlations to within-construct correlations (Henseler et al., 2015). In general, HTMT values below 0.90 indicate adequate discriminant validity. To establish validity in this study, the HTMT values were examined within the confidence intervals, considering both lower and upper bounds (Table 5.5).

Table 5.5: Results of Discriminant Validity with HTMT Criterion

Constructs	**Environmental Awareness**	**Entrepreneurial Motivation**	**Entrepreneurial Self-Efficacy**	**Green Entrepreneurial Intentions**	**Moral Obligation**	**Need for achievement**	**Normative Belief**	**Organisational Culture**	**Proactiveness**	**Risk aversion**
Environmental Awareness										
Entrepreneurial Motivation	0.853 [0.802: 0.901]									
Entrepreneurial Self-Efficacy	0.627 [0.536: 0.715]	0.648 [0.564: 0.728]								

Green Entrepreneurial Intentions	0.907 [0.861: 0.95]	0.854 [0.809: 0.895]	0.597 [0.504: 0.682]							
Moral Obligation	0.441 [0.335: 0.540]	0.435 [0.333: 0.534]	0.260 [0.158: 0.363]	0.422 [0.328: 0.513]						
Need for achievement	0.541 [0.440: 0.638]	0.486 [0.393: 0.576]	0.685 [0.602: 0.764]	0.525 [0.431: 0.611]	0.178 [0.084 : 0.285]					
Normative Belief	0.425 [0.317: 0.530]	0.445 [0.338: 0.549]	0.226 [0.132: 0.335]	0.417 [0.317: 0.513]	0.879 [0.836 : 0.919]	0.132 [0.071 :0.236]				
Organisational Culture	0.865 [0.813: 0.914]	0.819 [0.762:0 .870]	0.547 [0.447: 0.640]	0.906 [0.869: 0.940]	0.336 [0.228 : 0.445]	0.483 [0.384 :0.577]	0.366 [0.25 3: 0.476]			
Proactiveness	0.706 [0.630: 0.775]	0.683 [0.606: 0.758]	0.868 [0.825: 0.906]	0.704 [0.628: 0.770]	0.241 [0.145 :0.347]	0.835 [0.779 :0.885]	0198 [0.113 : 0.312]	0.668 [0.579: 0.750]		
Risk aversion	0.547 [0.443: 0.646]	0.572 [0.483: 0.657]	0.725 [0.649:0 .796]	0.524 [0.420:0 .619]	0.175 [0.082 : 0.276]	0.644 [0.569 : 0.715]	0.161 [0.09 6: 0.275]	0.553 [0.455: 0.643]	0.733 [0.652: 0.809]	

Source: By Author

The Fornell-Larcker criterion evaluates the discriminant validity of a model by checking the square root of the average variance extracted (AVE) for each construct alongside its correlations with other constructs (Fornell

& Larcker, 1981). To allow for discriminant validity, the AVE of the construct cannot be the highest correlating construct in the model. This method allocates shared variance between a construct and its indicators. In this research, all constructs met the Fornell-Larcker criterion, confirming that the constructs are distinct from one another as illustrated in Table 5.6.

Table 5.6: Results of Discriminant Validity with Fornell Larcker Criterion

Constructs	**Environmental Awareness**	**Entrepreneurial Motivation**	**Entrepreneurial Self-Efficacy**	**Green Entrepreneurial Intentions**	**Moral obligation**	**Need for achievement**	**Normative Belief**	**Organisational Culture**	**Proactiveness**	**Risk Aversion**
Environmental Awareness	**0.752**									
Entrepreneurial Motivation	0.740	**0.799**								
Entrepreneurial Self-Efficacy	0.545	0575	**0.806**							
Green Entrepreneurial Intentions	0.807	0.722	0.541	**0.845**						
Moral Obligations	0.381	0.386	0.231	0.383	**0.859**					
Need for Achievement	0.483	0.438	0.623	0.484	0.162	**0.8500**				

Normative Belief	0.356	0.383	0.195	0.366	0.756	0.118	**0.815**			
Organisational Culture	0.731	0.704	0.473	0.795	0.288	0.424	0.306	**0.739**		
Proactiveness	0.600	0.587	0.750	0.617	0.204	0.736	0.164	0.561	**0.741**	
Risk Aversion	0.470	0.502	0.638	0.470	0.150	0.584	0.139	0.470	0.625	**0.764**

Source: By Author

The study ensured strong discriminant validity by employing both the Fornell-Larcker criterion and HTMT. These checks reinforce that the constructs within the model are independent enough to capture the intended relationships, enabling interpretation and meaningful analysis of the structural relationships in the next step.

5.2.1.2 Assessment for the formative construct

This study considered both Personality Traits (PT) and Subjective Norms (SN) as higher-order constructs (HOCs) with a reflective–formative operationalization. To assess these constructs, a disjoint two-stage method was employed as proposed by Becker et al. (2012) and Hair et al. (2019). In the first stage, the latent variable scores for the lower-order constructs (LOCs) were calculated using the PLS algorithm. These scores reflect the relationships between indicators and their LOCs at lower levels within the hierarchy, ensuring construct validity and reliability at the lower-order level. In the second stage, the latent variable scores obtained from the PLS analysis were used to evaluate the contribution of the LOCs to the HOCs.

The evaluation began with an assessment of collinearity, where multicollinearity was checked using the Variance Inflation Factor (VIF) test. All VIF values were below the accepted cutoff of 5.0 (Kock, 2015), confirming that the LOCs did not exhibit multicollinearity. To further test the validity of the reflective–formative structure, regression analysis was performed. This assessed the degree of association between the global indicator of the HOC and the LOCs, confirming whether the LOCs accurately represent the construct. The redundancy analysis results indicated strong correlations, confirming the convergent validity of both PT and SN as reflective–formative HOCs. Additionally, using a bootstrapped re-sampling procedure, the significance of 10,000 tests for LOC loadings was evaluated. It was established that all weights were statistically significant except those from NA and RA. Although the weights of these constructs were not significant, their loadings were significantly above 0.50 (Hair et al., 2016). This demonstrates the degree to

which each LOC contributes to defining the dimensions of the HOCs, thereby validating the modeling of PT and SN in this manner.

Hair et al. (2022) suggested that for a formatively captured construct and a reflectively measured item, the correlation should be at least 0.708, meaning "more than half of the alternative measure's variance is explained by the constructs." For PT and SN, this analysis yielded path coefficients of 0.730 and 0.904, respectively, which exceed the 0.708 threshold (Table 5.7; Figures 5.1 and 5.2).

These results confirm the reflective–formative empirical structural relationships for PT and SN. The VIF values confirm the absence of collinearity issues, while the strong alignment of the global indicator with the LOCs in the redundancy analysis demonstrates construct validity. The bootstrapping results further reinforce the proportional contribution of LOCs, supporting the hypothesized relationships and construct validity. The third criterion involves evaluating the outer weights and outer loadings. If the outer weights are not statistically significant ($p > 0.05$), the outer loadings are examined to assess the indicator's contribution to the construct. In this study, all loadings met the recommended threshold values, confirming the robustness of the formative measurement model for PT and SN as HOCs.

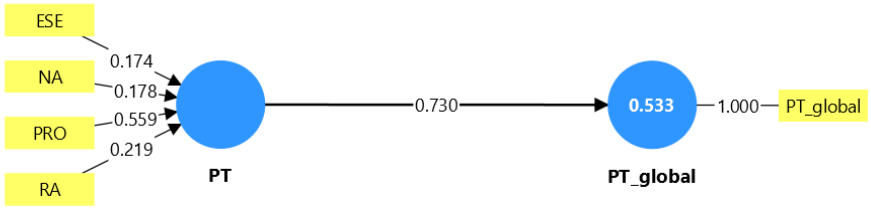

Figure 5.2 Redundancy analysis of Personality Traits

Source: Author Calculated through SmartPLS

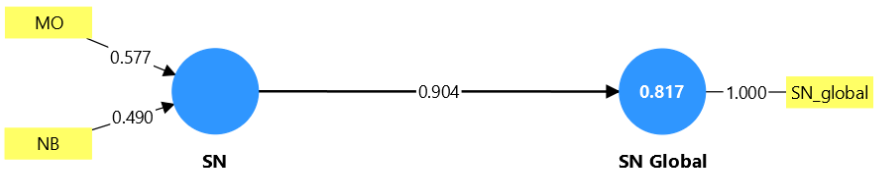

Figure 5.3 Redundancy analysis of Subjective Norms

Source: Author Calculated through SmartPLS

Table 5.7 Results of Redundancy, VIF, T-Statistics, P-Values and Outer Loadings

HOC	LOC	Redundancy Analysis (Path Coefficient)	VIF	Outer Weights	T-Statistics	P-Values	Outer Loadings
PT	Proactiveness		3.211	0.696	5.910	0.000	0.975
	Entrepreneurial Self-efficacy	0.730	2.581	0.220	2.153	0.031	0.855
			2.330	0.026	0.257	0.797	0.765
	Need for achievement		1.913	0.153	1.633	0.103	0.743
	Risk aversion						
SN	Moral obligation	0.904	2.33	0.618	3.797	0.000	0.956
	Normative Belief		2.33	0.448	2.629	0.000	0.915

Source: Author Calculated through SmartPLS

5.2.2 Structural Model

Following the validation of the measurement model, the structural model was analyzed to test the relationships among the constructs. The assessment respected the suggestions of (Hair et al., 2022; Henseler et al., 2015; Sarstedt et al., 2021) which ensured thorough analysis of the model's prediction and explanation abilities. This step included the assessment of the model's predictive and explanatory power including R^2, path coefficients, p-values, and the output of a bootstrapping process.

The coefficient of determination (R^2) measures the ratios of the dependent variable's explained by independent variables, thus serving as a measure of the model's explanatory capacity. (Chin, 1998) grouped R^2 values as significant (0.75), moderate (0.50), and weak (0.25). In this research, R^2 values for dependent constructs showed moderate explanatory power which indicates these independent variables do account for the changes in green entrepreneurial intentions and the related constructs to a significant level. Path coefficients were analyzed to assess the strength and the nature of the relationships between the constructs. Positive coefficients suggested a direct relationship while negative coefficients indicated the opposite. The value of the coefficient measured the effect. P-values were used to test the statistical significance of these path coefficients, and in this case, a simpler value of 0.05 was used. A value under this threshold demonstrates the null hypothesis can be rejected and affirm the proposed relations between constructs. In order to improve estimation of standard errors and confidence intervals for the path coefficients, a bootstrapping procedure was applied. (Hair et al., 2022) recommended 10,000 resamples of the original dataset be drawn for this.

The bootstrapped coefficients confirmed the statistical significance of most hypothesized relationships, as marked by p values less than the 0.05 cutoff. This step, in combination with previous findings, strengthens the credibility of our conclusions and demonstrates that the model is unwavering. Evaluation of the structural model strongly supports the hypothesized relationships, indicating that the constructs including Personality Traits, Environmental Awareness, and Entrepreneurial Motivation significantly influence green entrepreneurial intentions (substantial path coefficients and high R^2 values). These findings underscore the model's predictive accuracy and its relevance to understanding green entrepreneurial intentions among SMEs in Punjab. Following the prescribed procedures, advanced statistical methods were utilized which attribute to the robustness and dependability of the study's outcomes and the understanding of phenomena surrounding green entrepreneurship.

5.2.2.1 Structural Model Assessment

Table 5.8 Steps of Structural Model Assessment

Sr. No	Steps	Descriptions	Threshold Limits	Citation
1.	Check Multicollinearity	Calculate Variance Inflation Factor (VIF) for predictor variables.	VIF < 5 (acceptable), VIF < 3 (preferred)	(Hair et al., 2019)
2.	Coefficient of Determination (R^2)	Assess the explanatory power of the model.	R^2 > 0.19 (weak), R^2 > 0.33 (moderate), R^2 > 0.67 (substantial)	(Hair et al., 2019)
3.	Hypothesis Testing	Test significance of path coefficients using bootstrapping.	p-value < 0.05 or < 0.01 (depending on significance level).	(Hair et al., 2019)
4.	Effect Size (f^2)	Measure the impact of predictor variables on the dependent variable.	f^2 > 0.02 (small), f^2 > 0.15 (medium), f^2 > 0.35 (large)	(Cohen, 1988)

5.	Model Fit Indices	Assess overall model fit (e.g., CFI, TLI, RMSEA, SRMR).	CFI > 0.90, TLI > 0.90, RMSEA < 0.08, SRMR < 0.08	(L. Hu & Bentler, 1999)
6.	PLS-PREDICT	Evaluate predictive power of the model using PLS-PREDICT.	$Q^2 > 0$ (predictive relevance), RMSE and MAE values compared to benchmark models.	(Shmueli et al., 2019)

Source: Author Calculated through SmartPLS

- **Variance Inflation Factor**

Table 5.9 shows the VIF inner values that range from 1.022 to 2.967 for all constructs. Thus, showing there are no multicollinearity issues.

Table 5.9: Results of VIF Inner values

Constructs	**VIF**
EA -> GEI	2.967
EM -> GEI	2.817
Gender -> GEI	1.022
OC -> GEI	2.516
Personality Traits -> GEI	1.855
Subjective Norms -> GEI	1.244

Source: Author Calculated through SmartPLS

VIF values above the threshold indicate multicollinearity, which may distort the reliability of regression coefficients and should be addressed by removing or combining correlated predictors.

- **Coefficient of Determination (R^2)**

The coefficient of determination, or R-squared (R^2), is a statistical metric that captures the explanatory power of the independent variables in a given model relative to its dependent variable. It ranges between 0 and 1, whereby 0 indicates no explanatory power while 1 indicates total variance explanation. For instance, an R^2

value of 0.33 depicts a scenario in which 33% of the changes in the dependent variable are explained by the independent variables in the model. Typically, R^2 values are classified as weak, moderate, and strong at 0.19, 0.33, and 0.67, respectively. The R^2 value for factors influencing green entrepreneurial intention (GEI) is 0.777, as illustrated in Table 5.10. This means that 77.7% of the variance in green entrepreneurial intentions is explained by the independent variables, such as the antecedents of GEI. Following these thresholds (Hair et al., 2019), an R^2 value above 0.67 is regarded as substantial. In this case, it indicates that the independent variables strongly influence green entrepreneurial intentions. The model's efficacy in explaining GEI is further validated by the extremely high R^2 value, which reinforces the strength of the factors incorporated into the model.

Table 5.10: Results of Coefficient of Determination (R^2)

Constructs	**R-square**	**R-square adjusted**
GEI	0.777	0.774

Source: Author Calculated through SmartPLS

Regardless, a high R^2 value isn't necessarily indicative of having a good model, since it does not indicate if important variables are present, or how well the model aligns with the data. Moreover, R^2 alone does not provide a complete picture regarding the performance of the model.

- **Hypothesis Testing**

As an important component of SEM, hypothesis testing serves to assess the level of statistical significance associated with the proposed relationships between the constructs in a research model. It involves checking whether the proposed relationships (such as the impact of independent variables on dependent variables) actually exist within the data. In path analysis, hypothesis tests are usually conducted using structural path coefficients, which reflect the magnitude and direction of relationships, and are tested using p-values derived from bootstrap samples (Hair et al., 2019). When the p-value is below 0.05 or 0.01, the relationship is considered significant, and the assumption within the hypothesis is accepted. Additionally, the t-values obtained from bootstrapping are used to measure the strength of the findings, with values exceeding 1.96 ($p < 0.05$) or 2.58 ($p < 0.01$) regarded as significant. In confirming the structure of the hypothesis, the analysis is further supported by an evaluation of the level of prediction difference between the results dealing only with the parameters of the model. Despite this, researchers must ensure that the measurement model possesses sufficient reliability and validity prior to interpreting the results of the structural model, as poor measurements can lead to erroneous interpretations (Hair et al., 2019). Meeting these hypothesis testing requirements provides sufficient grounds to generalize relationships among constructs and contribute new insights to the

body of knowledge. The outcomes of the structural path assessment are illustrated in Figures 5.1, 5.2, and Table 5.11.

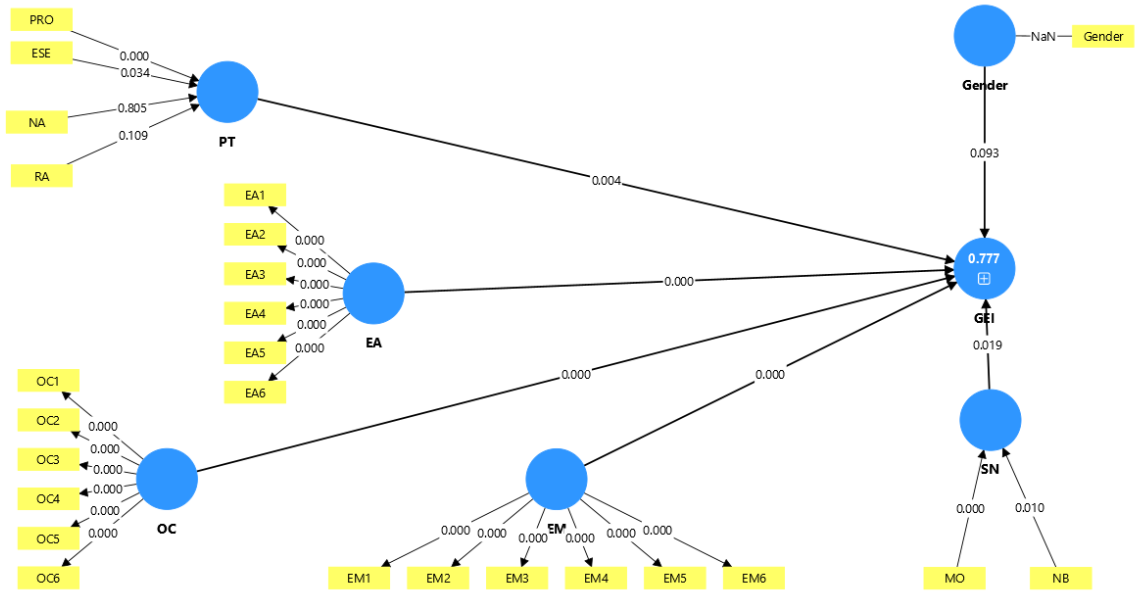

Figure5.4 Structural Model Assessment (Model 1)

Source: Author Calculated through SmartPLS

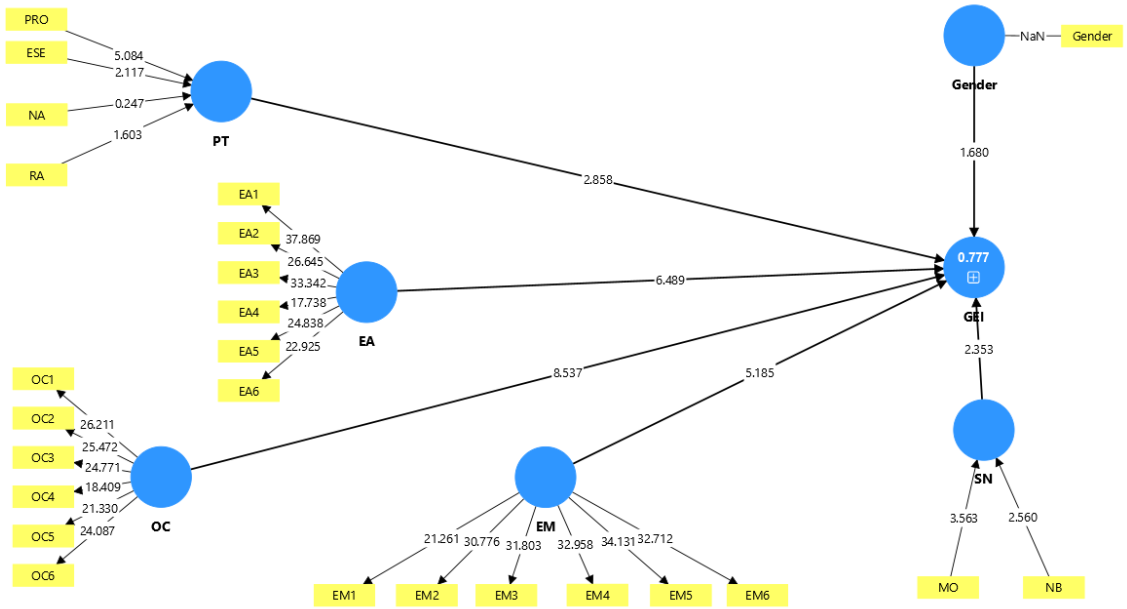

Figure 5.5 Structural Model Assessment (Model 2)

Source: Author Calculated through SmartPLS

As shown in Table 5.11 EA, EM, OC, PT And SN has positive impact on GEI supporting the Hypothesis 1,2,3,4 and 5.

Table 5.11: Results of Structural Model Assessment

Criterion Variable	Predictor Variable	Hypothesis Path	Beta (Original Sample)	T-value	P-value	Significance
GEI	EA	EA -> GEI	0.373	6.489	0.000	Significant
GEI	EM	EM -> GEI	0.243	5.185	0.000	Significant
GEI	CV	Gender -> GEI	0.260	1.680	0.093	Not Significant
GEI	OC	OC -> GEI	0.518	8.537	0.000	Significant
GEI	Personality Traits	Personality Traits -> GEI	0.153	2.858	0.004	Significant
GEI	Subjective Norms	Subjective Norms -> GEI	0.097	2.353	0.019	Significant
Source (s): Researcher's own calculations Note (s): GEI= Green Entrepreneurial Intentions, EA= Environmental Awareness, EM= Entrepreneurial Motivation, OC= Organisational Culture, CV= Control Variable						

Source: Author Calculated through SmartPLS

In structural Model, predictor variable such as Environmental awareness (EA), Entrepreneurial Motivation (EM), Organization culture (OC), Personality Traits (PT), and Subjective Norms (SN) were tested to examine their impact on Green Entrepreneurial Intentions (GEI). The findings revel that **EA** has a significant positive impact on GEI (**β = 0.373, t = 6.489, p < 0.001**), indicating higher levels of environmental awareness among SME owners are associated with stronger intentions to engage in green entrepreneurship, **EM** is also found to significantly influence GEI (**β = 0.243, t = 5.185, p < 0.001**), implying that internal entrepreneurial drive plays an important role in fostering green intentions.

Organizational Culture (OC) illustrates the strongest relationship with GEI (**β = 0.518, t = 8.537, p < 0.001**), emphasizing that a sustainability-oriented culture within SMEs significantly contributes to the development of green entrepreneurial intentions. **Personality Traits (PT)** also have a significant but modest effect on GEI (**β = 0.153, t = 2.858, p = 0.004**). **Subjective Norms (SN)** exhibit a statistically significant relationship with

GEI (**β = 0.097, t = 2.353, p = 0.019**), showing that Moral obligations and Normative belief plays a supporting role in shaping green entrepreneurial intentions.

One control variable namely Gender have been included. Control variable plays a crucial role in research as they impact precision of casual relationships and the outcomes of hypothesis testing. In this study Male has been coded as 1 and female 0. The results show a path coefficient of **β = 0.260, t = 1.680, p = 0.093**, indicating that gender does not have a statistically significant effect on green entrepreneurial intentions. It suggests that gender does not impact the model outcomes in this study. Control variables are important in structural models as they increase the precision of causal relationships and make sure that the estimated effects of key predictor variables are not confounded by external influences.

- **Effect Size**

Effect size measures the magnitude of a particular relationship or difference between two or more variables. Among the different measures, one commonly used in SEM is f^2. The f^2 value is important for evaluating the impact of predictors. According to Abrami and Cohen (1988), f^2 values of 0.02, 0.15, and 0.35 are categorized as small, medium, and large effect sizes, respectively. In this study, the f^2 values align with Cohen's benchmarks, where OC demonstrated a medium effect, while the other variables showed small effects. This indicates that OC is comparatively a more important predictor and is therefore a stronger determinant of the dependent variable.

This study employs a robust methodology to explore the relationships between EA, EM, GEI, Gender, OC, Personality Traits, and Subjective Norms. As presented in Table 5.12, Organizational Culture (OC) recorded the largest effect size (0.209), followed by Environmental Awareness (EA) (0.155) and Entrepreneurial Motivation (EM) (0.075). Smaller effect sizes were observed for Personality Traits (PT) (0.021), Subjective Norms (SN) (0.013), and Gender (0.008). These values illustrate the relative strength of influence exerted by each variable within the model.

Table 5.12: Results of effect size (f^2)

Variables	Original sample (O)
EA -> GEI	0.155
EM -> GEI	0.075
Gender -> GEI	0.008
OC -> GEI	0.209
Personality Traits -> GEI	0.021
Subjective Norms -> GEI	0.013

Source: Author Calculated through SmartPLS

The use of effect sizes and f^2 values underscored the relative importance of the constructs which added to the body of knowledge in the area of study. Goodness of Model fit.

- **Goodness of Model fit**

Evaluating model fit is important in SEM, as it determines how well the hypothesized model corresponds with the actual data. The SRMR (Standardized Root Mean Square Residual) values of 0.05 for the saturated model and 0.050 for the estimated model support Hu and Bentler's (1999) claim of a good fit, with a threshold of ≤ 0.08. For d_ULS (Unweighted Least Squares Discrepancy) and d_G (Geodesic Discrepancy), the values (1.237 and 1.314 for d_ULS; 0.653 and 0.653 for d_G) suggest an acceptable fit, although specific benchmarks for these metrics are context-dependent (Henseler et al., 2015).

Table 5.13 shows the Chi-square value for the saturated model as 1463.457, while the estimated model records 1483.473. Although the values are high, they are expected in large-sample studies. While the significance of the Chi-square test does indicate a poor fit, reliance should be placed on relative fit indices. Bentler and Bonett (1980) set the accepted threshold for the NFI (Normed Fit Index), where values of 0.834 and 0.832 indicate a reasonable fit, although for complex models a stricter boundary of 0.90 is recommended.

Table 5.13: Results of Model Fitness

	Saturated model	**Estimated model**
SRMR	0.050	0.050
d_ULS	7.609	7.609
d_G	0.653	0.653
Chi-square	1463.457	1463.457
NFI	0.834	0.834

Source: Author Calculated through SmartPLS

The model demonstrates a reasonable fit where SRMR indicates good fit and other indices sustain a reasonable approximation to the data.

- **PLS Predict**

In this study, we assessed the structural model's predictive performance using both in-sample and out-of-sample prediction metrics in line with modern PLS-SEM protocols. To measure in-sample predictive precision, the coefficient of determination (R^2) for green entrepreneurial intentions, as the endogenous construct, was calculated. R^2 values indicate the amount of variance in the dependent variable explained by the independent variables in the model. According to Hair et al. (2019), values of 0.75, 0.50, and 0.25 are generally regarded

as substantial, moderate, and weak, respectively. This provides a preliminary assessment of model performance relative to the sampled data. Although R^2 values offer insights into the generalizability of the model to new or unseen data, they are not sufficient on their own. For this reason, PLSpredict was implemented, as Shmueli et al. (2019) identified it as one of the most advanced methods available for assessing a model's out-of-sample predictive relevance. Unlike traditional methods, PLSpredict incorporates cross-validation in which test and training sets are systematically separated and set aside, thereby enhancing predictive accuracy for critical constructs beyond the initial sample used for model estimation. The predictive performance of the model was evaluated using metrics such as Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and Q^2_predict within PLSpredict. A model is considered to have good predictive relevance if the prediction errors are lower than those produced by a naïve linear benchmark model (e.g., linear regression) and if Q^2_predict values are positive (Shmueli et al., 2019; Hair et al., 2022). Thus, the evaluation in this study sought to both explain and predict the factors that determine green entrepreneurial intentions, employing a dual-stage prediction assessment: internal validation through R^2 and external validation using PLSpredict.

Table 5.14 Results of PLS Predication Analysis

Indicators	Q^2predict	PLS-SEM_RMSE	LM_RMSE	PLS-LM RMSE	Predictive Relevance
GEI1	0.441	1.245	1.169	0.076	Medium Predictive Relevance
GEI2	0.578	1.112	1.116	-0.004	
GEI3	0.593	1.176	1.186	-0.01	
GEI4	0.549	1.220	1.221	-0.001	
GEI5	0.562	1.294	1.26	0.034	
GEI6	0.555	1.172	1.15	0.022	

Source: Author Calculated through SmartPLS

All $Q^2_{Predict}$ values in this study fall between 0.441 and 0.593. The other key metric is RMSE comparison which is the RMSE of PLS model is evaluated against a simple linear regression model. The negative differences values indicate that the PLS model is likely to be less erroneous and therefore more predictive. In this research, there are three differences negative and one positive (Table 5.14) suggesting medium predictive relevance of the model.

5.3 To determine the moderating influencing role of entrepreneurship education on relationship between personality traits and green entrepreneurial intentions.

5.3.1 Moderating Effect

The fourth objective of this study is to assess the moderating effect of entrepreneurial education on the relationship between personality traits and green entrepreneurial intentions. Moderation analysis examines the extent to which an additional variable influences the relationship between an independent variable and a dependent variable. Statistical significance is assessed through bootstrapping with 10,000 resamples. The path coefficients and t-values of the interaction terms determine whether entrepreneurial education significantly moderates the relationship between personality traits and green entrepreneurial intentions. A significant moderating effect would imply that changes in the level of entrepreneurial education considerably alter the strength of this relationship.

Moderating variables can be either continuous or categorical. A continuous moderator has a measurable unit that varies within a given range, such as entrepreneurial education that can be rated on a scale. A categorical moderator, by contrast, consists of distinct groups or categories rather than a continuous range of values. In the context of PLS-SEM, there are two predominant approaches to handling categorical moderators: multi-group analysis (MGA) and the two-stage approach. MGA divides the dataset into subgroups defined by the categorical moderator (e.g., low versus high entrepreneurial education) and runs the PLS model independently for each subgroup. The difference in path coefficients between these groups reflects the moderating effect. However, this approach has limitations, as it requires large sample sizes to ensure valid subgroup comparisons.

- **Moderating influence of Entrepreneurial education on the relationship between Personality traits and green entrepreneurial intentions.**

For this research, entrepreneurial education was considered at a categorical level, and its interaction effect was tested using PLS bootstrapping. The main focus was on the interaction between personality traits and green entrepreneurial intentions, with particular attention to the pathway from personality traits to green entrepreneurial intentions. The two-stage procedure was adopted in this study, as it is recognized as the most effective method for categorical moderation in PLS-SEM. This approach, derived from the indicator approach, creates an interaction term between the categorical moderator and the independent variables. It ensures that the moderator effect is calculated without splitting the data into distinct groups, thereby preserving the statistical power of the analysis. The analysis followed two steps. In the first step, bootstrapping was performed to test the significance of the moderator's effect on the relationship between personality traits and green entrepreneurial intentions, thereby assessing whether the interaction effect was significant. In the second step, slope analysis was conducted in the PLS-SEM algorithm to graphically illustrate the moderator's effect on the strength and direction of the relationship between the two variables.

Among the categorical moderation options available, the two-stage approach was deemed more favorable than the alternatives and was found to be the most effective. Accordingly, this study adopted the two-stage approach to ensure rigorous estimation and precise evaluation of the moderating influence of entrepreneurial education. Figure 5.3 presents the moderating effect of entrepreneurial education.

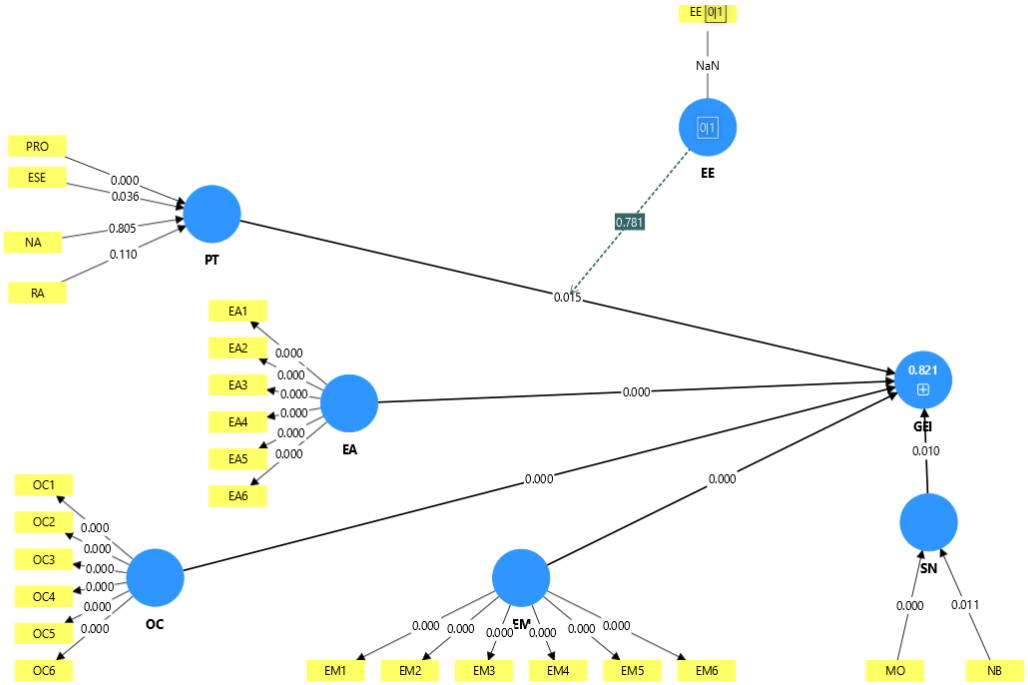

Figure 5.6 Moderating effect of Entrepreneurial Education

Source: Author Calculated through SmartPLS

The direct effect of Entrepreneurial education as a moderator contains β value = 0.979, p value = 0.000 as shown in the Table 5.14. The effect of Entrepreneurial education with the personality traits and green entrepreneurial intention has been found to be positive contain β value = -0.024, p value = 0.781, but insignificant.

Table 5.15: Results of Moderation Analysis of Entrepreneurial Education

Relationship Path	**Original sample (O)**	**Sample mean (M)**	**Standard deviation (STDEV)**	**T statistics (|O/STDEV|)**	**P values**
EE -> GEI	0.979	0.974	0.049	8.921	0.000
EE x Personality Traits -> GEI	-0.024	-0.024	0.086	0.278	0.781
Note (s): EE= Entrepreneurial Education, GEI= Green Entrepreneurial Intentions **Source (s): Researcher's Calculation**					

The impact of moderating effects of entrepreneurial education on the personality traits and green entrepreneurial education relationship has shown to be insignificant, which leads to the rejection of hypothesis 6.

The Slope diagrams have been displayed for EE in figure 5.4.

Figure 5.4 shows the slope diagram of "EE", which stands for (Entrepreneurial Education) as a moderator in the relationship between Personality Traits and GEI (Green Entrepreneurial Intention). The slope lines represent the relationship for two conditions: EE at 1 (Formal entrepreneurial education) and EE at 0 (Informal entrepreneurial education).

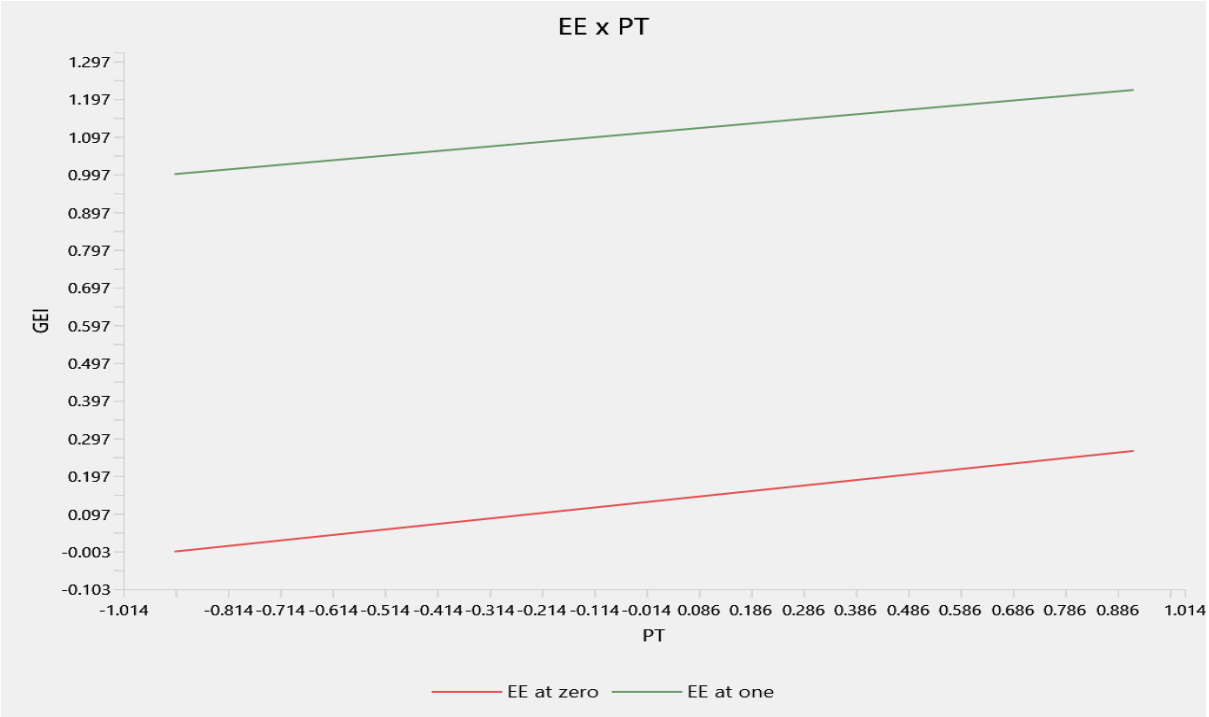

Figure 5.7: Slope of Entrepreneurial education as a moderator

Source: Author Calculated through SmartPLS

This interaction plot presents the relationship between personality traits and GEI under varying levels of entrepreneurial education (EE), distinguishing between informal and formal structures. The green line (EE = 1) displays a steeper slope than the red line (EE = 0). This difference suggests that under higher levels of EE, personality traits strengthen GEI more compared to lower levels of EE, indicating a potential enhancing effect of EE on the relationship. However, it is important to note that this visual indication of moderation lacks empirical support.

The data in Table 4.17 shows that, under the moderating effect of EE, the impact of personality traits on GEI is statistically insignificant ($\beta = -0.024$, $t = 0.278$, $p = 0.781$). Thus, despite the graph implying a moderating effect, the statistical evidence does not support this interpretation.

On the other hand, the direct effect of entrepreneurial education on GEI is significant ($\beta = 0.979$, $t = 8.921$, $p < 0.001$), indicating that entrepreneurial education—whether formal or informal—directly contributes to GEI. While the slope graph suggests that EE may act as a potential moderator in the relationship between personality traits and GEI, the empirical evidence indicates that this moderating effect is not statistically significant. Therefore, the hypothesis that the type of entrepreneurial education substantially alters the relationship between personality traits (PT) and green entrepreneurial intentions (GEI) is not supported.

5.4 Importance Performance Map Analysis (IPMA)

Importance-Performance Map Analysis (IPMA) is an advanced technique within Partial Least Squares Structural Equation Modeling (PLS-SEM) that extends traditional path modeling by not only assessing the relationships between constructs but also evaluating their relative importance and performance (Ringle & Sarstedt, 2016). This technique provides deeper managerial insights by identifying areas where improvements can yield the most significant impact on the dependent variable (Hair et al., 2019). By mapping the importance of independent variables (predictors) against their performance, IPMA helps prioritize strategic actions for optimizing outcomes (Wang et al., 2024).

In this study, Green Entrepreneurial Intention (GEI) is the dependent variable, while its antecedents serve as independent variables. The application of IPMA highlights which antecedents hold the greatest importance in influencing GEI and evaluates their performance levels, thereby guiding targeted interventions to enhance the adoption of green entrepreneurship. The results of the IPMA analysis are presented in Figure 5.5 and Table 5.15.

Table 5.16 IPMA Results

Construct	**Performance**	**Importance (Total effect)**
EA	50.485	0.371
EM	52.923	0.245
OC	53.917	0.510
PT	50.964	0.151
SN	52.832	0.095
Average:	52.2242	0.2744
Note (s): EA= Environmental awareness, EM= Entrepreneurial motivation, OC= Organisational Culture, PT= Personality Traits, SN= Subjective Norms Source: By author		

Based on the results of the analysis, the construct *Organizational Culture* demonstrated the greatest effect, with an importance value of 0.510. If the performance of Organizational Culture improves by one unit (from 53.917 to 54.917), the performance of Green Entrepreneurial Intentions will increase from 48.557 to 49.067. *Environmental Awareness* ranked second in importance. If its performance improves by one unit, Green Entrepreneurial Intentions will increase from 48.557 to 48.928. *Subjective Norms* showed the second-highest performance level (52.832), but its importance was evaluated as the lowest, with a value of 0.095.

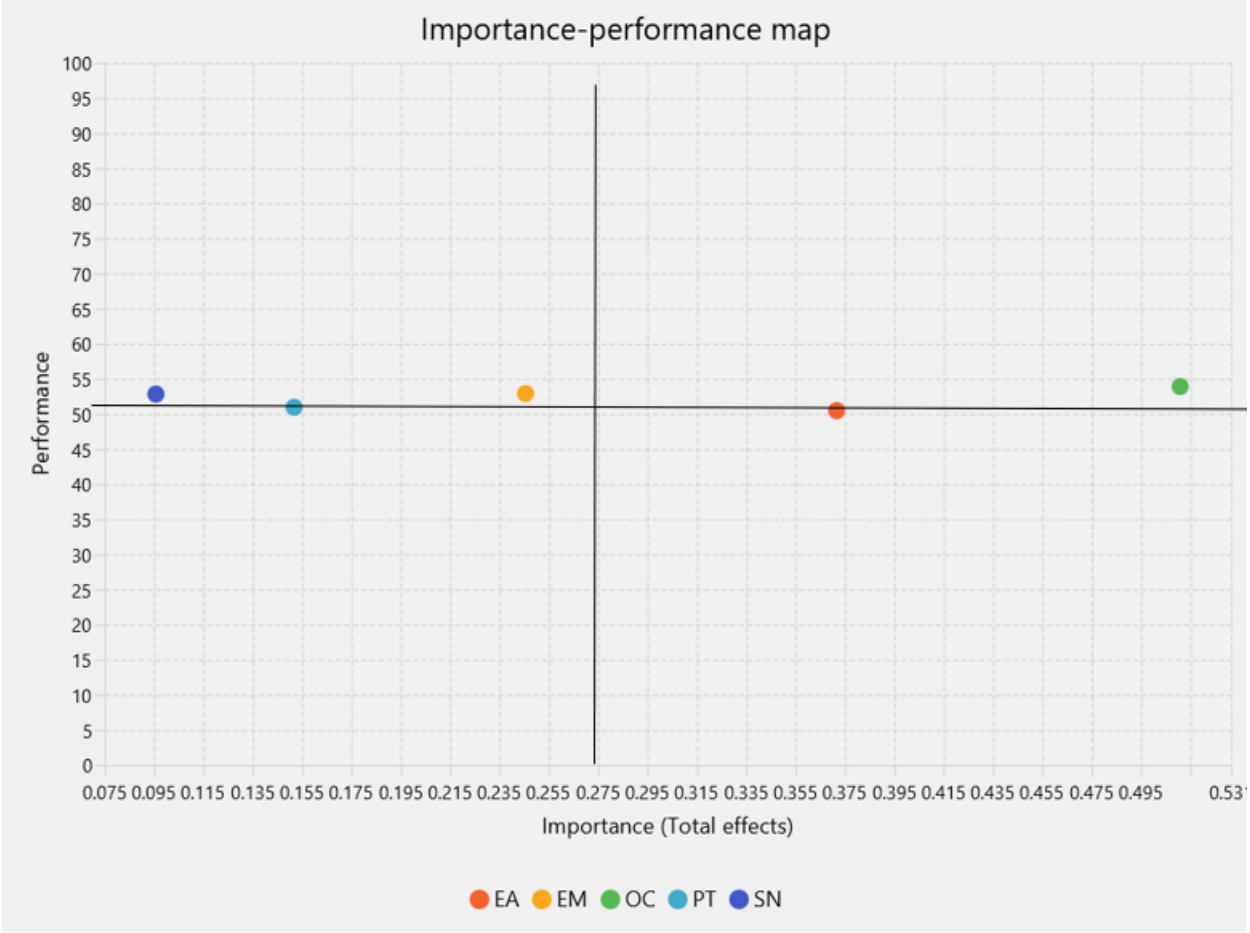

Figure 5.8: IPMA Matrix

Source: By author

5.5 Summary of Data Analysis

This chapter presents a detailed analysis of the antecedents of green entrepreneurial intentions in SMEs. The results indicate that the primary antecedents have a positive effect on green entrepreneurial intentions. Yet, the moderating effect of entrepreneurship education on the relationship between personality traits and green entrepreneurial intentions seems to be absent.

Table 5.17 Hypothesis Result

Hypothesis	**Results**
H1 Personality traits have significant impact green entrepreneurial intentions.	Supported
H1a: Proactiveness has significant impact on green entrepreneurial intentions.	Supported
H1b: Entrepreneurial self-efficacy has a significant impact on green entrepreneurial intentions.	Supported
H1c: Need for achievement has a significant impact on green entrepreneurial intentions.	Supported
H1d: Risk aversion has a significant impact on green entrepreneurial intentions.	Supported
H2: Environmental awareness has a significant impact on green entrepreneurial intentions.	Supported
H3: Organisation Culture has a significant impact on green entrepreneurial intentions.	Supported
H4: Entrepreneurial motivation has a significant impact on green entrepreneurial intentions.	Supported
H5: Subjective norms have a significant impact on green entrepreneurial intentions.	Supported
H5a: Normative beliefs have a significant impact on green entrepreneurial intentions.	Supported
H5b: Moral obligation has a significant impact on green entrepreneurial intentions.	Supported
H6: Entrepreneurial education has moderating role between the personality traits and green entrepreneurial intensions.	Not Supported

Source: By Author

Table 5.17 shows the results of analysed hypothesis of this study. While the moderating effect of Entrepreneurial education between personality traits and green entrepreneurial intentions, these results weren't statistically significant.

Chapter 6

CONCLUSION, IMPLICATIONS AND FUTURE SCOPE OF THE STUDY

6.1 Introduction

This chapter presents the key results and conclusions of the study. It begins with a brief recap of the research purpose, followed by an explanation of how the relationships among the selected variables were analyzed. The chapter then outlines the major conclusions drawn from the statistical analysis conducted to test the hypotheses proposed in the previous chapter. These analyses aimed to determine the green entrepreneurial intentions among SMEs, as well as the levels of awareness, opportunities, and barriers to green entrepreneurship. The reader is provided with a systematic account of the research findings, along with the theoretical and practical implications of the study and directions for future research. Finally, this chapter reflects on the limitations of the research and offers suggestions for future investigations on the topic.

6.1.1 Overview of the Study

The first chapter of this thesis defines green entrepreneurship and green entrepreneurial intentions, with particular emphasis on small and medium-sized enterprises (SMEs). It further examines the contribution of SMEs to the development of green entrepreneurship, with a special focus on the manufacturing sector. This chapter also explains the classification of SMEs, the environmental concerns associated with manufacturing industries, and relevant international treaties aimed at addressing these concerns. In addition, it outlines the rationale, scope, relevance, and significance of the study, thereby justifying the research.

The second chapter reviews green entrepreneurship in the context of the existing literature. Beyond the introduction, it presents the theoretical framework of the study, describing the most relevant theories that could guide the research. This is followed by a review of empirical studies on green entrepreneurship, providing the necessary foundation for the study. The chapter concludes by outlining the research objectives, which are as follows:

1. To examine the awareness of green entrepreneurship among SME owners.
2. To explore the opportunities and barriers of green entrepreneurship among SME owners.
3. To analyze the key antecedents affecting green entrepreneurial intentions among SME owners.
4. To determine the moderating influence of entrepreneurship education on the relationship between personality traits and green entrepreneurial intentions.

Based on the literature review and theoretical framework, the research model is developed, followed by the formulation of hypotheses that guide the study.

The third chapter, a key component of the thesis, presents the research methodology. This study follows a mixed-methods research design using a convergent parallel approach, in which both qualitative and quantitative data are collected simultaneously, analyzed independently, and then integrated to develop a comprehensive understanding of the research problem. To maintain clarity and precision, the methodology is presented in two parts: the first part addresses the qualitative aspect, while the second part covers the quantitative aspect. This chapter describes the methods, tools, sampling procedures, and techniques for data processing and analysis employed in the study.

The fourth chapter presents the data analysis and findings. It addresses the first two research objectives using qualitative data, employing NVivo and thematic analysis for interpretation. The analysis focuses on SME owners' perceptions, opportunities, and challenges regarding green entrepreneurship.

In the same chapter, the third and fourth research objectives are examined using quantitative data analyzed through SmartPLS and Structural Equation Modeling (SEM). This section identifies the specific antecedent factors that drive green entrepreneurial intentions and assesses the moderating effect of entrepreneurial education.

6.2 Conclusion

Research refers to the systematic process of exploring a subject matter. This study seeks to explain the factors influencing green entrepreneurial intentions among SME owners. The primary objectives are to identify the antecedents of green entrepreneurial intention, to develop a conceptual model depicting the variables affecting these intentions, and to analyze the awareness, opportunities, and barriers related to green entrepreneurship.

This research is particularly important as it provides evidence on how sustainable practices can be integrated into the SME sector, assisting policymakers and other stakeholders in promoting eco-friendly entrepreneurship. Data were collected from 421 participants, and the model was validated based on their responses. To the best of our knowledge, this is the first study in India to construct a model of green entrepreneurial intentions specifically for SMEs. The model was found to have a moderate level of predictive relevance, indicating that it is capable of predicting green entrepreneurial intentions with reasonable accuracy. The application of Importance-Performance Map Analysis (IPMA) in this study further enhanced the interpretation of results by evaluating not only the total (importance) impact of each construct on green entrepreneurial intentions but also their performance levels. This perspective allowed identification of constructs that are important but underperforming, highlighting areas where action should be prioritized. For example, *Organizational Culture* was reported as the most important construct. *Environmental Awareness* and *Entrepreneurial Motivation* also demonstrated substantial influence, suggesting that improving performance in these areas could significantly enhance the green entrepreneurial intentions of SME owners.

6.3 Discussion and Theoretical Implication

Green entrepreneurship has emerged as a pivotal concept in contemporary sustainable development discourse, particularly within the context of small and medium enterprises (SMEs). SMEs serve as engines of economic growth, employment creation, and innovation. They play a critical role in balancing economic objectives with environmental preservation, owing to the flexibility of their operations and scope. Given their adaptability and capacity for localized innovation, SMEs are well-positioned to drive green transformation through the adoption of sustainable business models, eco-innovation, and improvements in resource productivity. However, engagement in green entrepreneurship is often influenced by a variety of internal and external factors, including awareness, institutional support, and perceptions of opportunities and challenges. In recent years, both policymakers and academics have increasingly emphasized the role of SMEs and the necessity of adopting green entrepreneurship as a proactive response to escalating environmental challenges, climate change impacts, and evolving consumer preferences. Transitioning to green business models not only addresses sustainability concerns but also offers SMEs competitive advantages through improved cost efficiency, brand value, and resilience. In this context, the present study focuses on the awareness, opportunities, and barriers associated with green entrepreneurship among SMEs in Punjab. Additionally, it examines the primary antecedents influencing green entrepreneurial intentions (GEIs), aiming to explain why SMEs choose to adopt—or refrain from—environmentally friendly practices. A survey conducted by the authors revealed that “green” entrepreneurship is largely concentrated in specific regions of the country, and that dominant practitioners perceive significant untapped opportunities for environmental sustainability both within and beyond national borders.

Green Entrepreneurship Awareness, Opportunities, and Barriers

A thorough analysis of qualitative interviews led to the emergence of six main themes based on the first objective of the study, describing the awareness of green entrepreneurship among SME owners in Punjab. These themes—Green Technology Awareness, Green Education and Skills Awareness, Industry Collaboration Driving Green Awareness, Green Subsidies Awareness, Green Laws Awareness, and Pollution Awareness—provide insight into how entrepreneurs approach environmental sustainability in their business practices.

Each theme was supported by detailed subthemes, highlighting various ways SME owners engage with green entrepreneurship. Some respondents demonstrated a rapid grasp of renewable energy or eco-friendly production methods, while others enhanced their awareness by attending industry events, seminars, and engaging with new policies. Despite these efforts, awareness of green practices remains at a nascent stage among SME owners and needs to be strengthened to accelerate green adoption.

In addressing the second objective, five key themes regarding the opportunities of green entrepreneurship emerged from the thematic analysis: Green Manufacturing Technology, Green Practices Incentives, Meeting Sustainable Demand, Owners’ Visionary Leadership, and Sustainable Workplaces. These findings indicate that

green entrepreneurship is influenced both by external factors and by the owner's personal vision and the company's cultural values. When these factors align with sustainable market needs, government and institutional support for expanding green ventures becomes more accessible.

The study also identified five major barriers limiting the wider adoption of green practices: Ambiguous Regulations, Monetary Resource Constraints, Costly Green Infrastructure, Market Challenges, and Risk Aversion Coupled with a Traditional Mindset. These results highlight that SMEs in Punjab continue to face financial, regulatory, and attitudinal challenges. Unclear environmental laws, insufficient financial resources, and resistance to change constitute systemic issues that must be addressed to facilitate green entrepreneurship.

In sum, the qualitative findings shed light on the existing yet underutilized awareness of green entrepreneurship within the SME community in Punjab. They underscore both the potential and the limitations of current educational, technological, regulatory, and financial frameworks that influence entrepreneurial behavior toward sustainability. While awareness is a necessary first step, its impact is constrained without strategic policy alignment, infrastructural support, and cultural shifts within enterprises. These insights provide a strong foundation for the next phase of the study, which investigates the key antecedents influencing green entrepreneurial intentions and assesses the moderating role of entrepreneurial education.

Antecedents of Green Entrepreneurial Intentions (GEIs)

The third and fourth objectives of this study were to identify the key antecedents influencing Green Entrepreneurial Intentions (GEI) among SME owners and to assess the moderating influence of Entrepreneurial Education (EE). This chapter presents the results of the structural model based on PLS-SEM analysis. The model demonstrated substantial explanatory power, with an R^2 value of 0.777, indicating that 77.7% of the variance in GEI is explained by the independent variables under investigation. According to Hair et al. (2019), this level of explanatory power is considered substantial, suggesting that the model is both reliable and useful for predictive purposes.

The analysis found that Organizational Culture (OC) was the strongest predictor of GEI ($\beta = 0.518$, $t = 8.537$, $p < 0.001$), highlighting that a green work environment is crucial for promoting green entrepreneurial behavior. Environmental Awareness (EA) also significantly influenced GEI ($\beta = 0.373$, $t = 6.489$, $p < 0.001$), indicating that heightened ecological awareness among SME owners positively contributes to green entrepreneurial intentions. Entrepreneurial Motivation (EM) exhibited a meaningful impact as well ($\beta = 0.243$, $t = 5.185$, $p < 0.001$), suggesting that internal entrepreneurial drive and goal orientation are central to the development of green intentions.

Although weaker compared to the primary predictors, Personality Traits (PT) ($\beta = 0.153$, $t = 2.85$, $p = 0.004$) and Subjective Norms (SN) ($\beta = 0.097$, $t = 2.353$, $p = 0.019$) also showed statistically significant effects on GEI. These results indicate that individual disposition and social influence contribute to green entrepreneurial

intentions, albeit to a lesser extent than organizational and motivational factors. The control variable Gender was non-significant ($\beta = 0.260$, $t = 1.680$, $p = 0.093$), suggesting that gender does not substantially influence green entrepreneurial intentions in this context.

Effect size analysis (Table 5.12) revealed that OC had the largest effect ($f^2 = 0.209$), followed by EA (0.155) and EM (0.075), with PT (0.021), SN (0.013), and Gender (0.008) contributing minimally. These values illustrate the relative strength of influence each construct exerts on GEI.

The moderating role of Entrepreneurial Education (EE) on the relationship between Personality Traits and GEI was examined using an interaction plot. While the visual suggested that individuals with higher EE exhibited a steeper increase in GEI when personality traits were strong, the statistical analysis did not support this moderation effect ($\beta = –0.024$, $t = 0.278$, $p = 0.781$), indicating that the graphical interaction was inconclusive in empirical terms.

Nevertheless, EE had a direct and significant effect on GEI ($\beta = 0.979$, $t = 8.921$, $p < 0.001$), demonstrating that both formal and informal entrepreneurial education independently enhance green entrepreneurial intentions, regardless of personality traits.

Taken together, these findings provide robust empirical evidence regarding the antecedents of green entrepreneurial intentions among SMEs in Punjab. They underscore the central role of organizational culture, environmental awareness, and internal motivation, while highlighting entrepreneurial education as a direct enabler. The absence of a significant moderating effect from EE and the limited influence of demographic factors such as gender suggest that structural, cultural, and psychological constructs remain the primary levers for fostering green entrepreneurship in the region. These insights offer critical implications for policymakers, educators, and SME stakeholders seeking to design effective strategies for cultivating and scaling environmentally responsible business practices.

6.4 Theoretical Contribution

This research addresses several empirical gaps in the literature on green entrepreneurship and SME sustainability:

1. **Contextual Enrichment:** A considerable portion of green entrepreneurship literature focuses on Western contexts or large corporations. This study shifts the discussion by examining SMEs in Punjab, thereby broadening the scope and providing region-specific socio-cultural and economic insights into green entrepreneurship in emerging markets.
2. **Combining Qualitative and Quantitative Research:** To achieve both depth and breadth, this study employed a convergent parallel mixed-methods design. The qualitative findings enhance

understanding of awareness, opportunities, and barriers, while the quantitative component tests and extends existing theoretical models on green entrepreneurial intentions (GEIs).

3. **Focus on Under-Explored Antecedents:** This study expands the boundaries of green entrepreneurship research by incorporating constructs such as entrepreneurial self-efficacy, subjective norms, environmental pro-activism, and government sponsorship, thereby adapting elements of the Theory of Planned Behavior and Institutional Theory to this context.
4. **Assessing the Impact of Entrepreneurial Education:** This study is unique in examining both the direct and moderating roles of entrepreneurial education. While the direct relationship aligns with prior research (Roxas & Coetzer, 2012), the absence of a significant moderating effect opens new avenues for inquiry. It suggests that personality traits may exert greater influence than formal training on GEIs, indicating a more robust relationship than previously recognized.
5. **Policy and Practice Relevance:** The findings are relevant for educators, policymakers, and support organizations focusing on SMEs. The study highlights persistent barriers and their actionable precursors, providing a foundation for developing policies, enhancing green entrepreneurship curricula, and designing financial incentive schemes to support SMEs in adopting and sustaining green business practices.

In conclusion, this research contributes to theory by identifying the underlying reasons behind green entrepreneurship and situating them within a broader contextual framework. It demonstrates the need for a comprehensive approach that integrates campaign support, educational provision, regulatory guidance, and financial investment to strengthen the green entrepreneurship ecosystem in Punjab and similar emerging market contexts.

6.5 Managerial Implications

Business owners, policymakers, educators, and support institutions seeking to promote green entrepreneurship among SMEs can benefit from the insights provided by this research. In the context of heightened competition and increasing ecological fragility, green entrepreneurial practices are a necessity rather than an optional strategy. For SMEs, which often operate in resource- and margin-constrained environments, adopting green practices enhances ecological stewardship while simultaneously driving innovation, cost savings, long-term sustainability, and access to new market opportunities.

The study emphasizes that the green entrepreneurial intentions (GEIs) of SME owners and managers are shaped by internal factors—such as personality traits, entrepreneurial motivation, and environmental awareness—as well as external enablers, including organizational culture, social norms, and educational

frameworks. These findings can help SME managers and stakeholders design more effective sustainability strategies. For instance, awareness and motivation can be strengthened through training programs promoting green skills, incentive policies targeting eco-friendly innovation, and communally supported Sustainability Integration Networks (SINs). Embedding green entrepreneurship modules into vocational and business education equips future entrepreneurs to proactively manage the green transition. Additionally, government and local institutions can reduce perceived risks associated with green investments through financial support, streamlined policies, and public-private collaborations. To guide managerial priorities, this study applied Importance-Performance Map Analysis (IPMA), which extends basic PLS-SEM results by capturing both the impact of each construct on GEI (importance) and the performance of each construct in practice (performance level). As highlighted by Hair et al. (2016), IPMA enables managers to focus on areas that are underperforming but have significant potential impact, optimizing the allocation of resources and effort. Constructs with high importance but low performance are strategically critical for growth and sustainability integration. Organizational Culture (OC) was identified as the most impactful factor, with the highest total effect (0.510). This indicates that fostering a sustainability-oriented organizational culture is essential for advancing green entrepreneurial activities in SMEs. For example, a one-point increase in OC performance results in nearly a half-point increase in GEI, emphasizing the need to embed sustainability, green leadership, and eco-friendly practices at the core of organizational operations. Environmental Awareness (EA), the second most important factor (importance = 0.371), reflects SME owners' understanding and consciousness regarding ecological issues. Increasing EA performance by one unit raises GEI from 48.557 to 48.928, suggesting that strategies such as internal knowledge-sharing systems and collaborations with multidisciplinary environmental experts could further strengthen awareness campaigns. Entrepreneurial Motivation (EM) had a moderate importance value (0.245) but high performance (52.923), demonstrating that intrinsic motivations—such as the desire to solve ecosystem problems and act proactively—are key drivers of green entrepreneurship. Initiatives to reinforce this factor may include green business awards, government-sponsored seed funding, or entrepreneur-led motivational programs. Subjective Norms (SN) showed high performance (52.832) but low importance (0.095), indicating that social support alone is insufficient to drive green entrepreneurship unless internal organizational and personal factors are aligned. While community support is valuable, interventions focusing on internal policies, management practices, and organizational culture are likely to yield stronger outcomes. Finally, Personality Traits (PT) had a relatively low importance score (0.151), suggesting that individual characteristics—such as proactivity, risk-taking, and entrepreneurial skills—play a secondary role compared to organizational culture and awareness. Nevertheless, targeted training programs designed to enhance entrepreneurial traits related to green initiatives, such as eco-innovation, resilience, and proactive behavior, could complement broader strategic interventions.

6.6 Societal Implications

The SME sector in Punjab remains highly under-researched, particularly regarding the implications outlined in this study, which consider the intersection of industrial growth and environmental sustainability. SMEs in the state are critical agents of change as they confront escalating pollution, resource depletion, and climate challenges. This research provides crucial insights into sustainable industrialization by demonstrating how green entrepreneurship can be embraced as both an economic and societal imperative.

1. Fostering Corporate Social Responsibility and Public Health

Promoting green entrepreneurship at the micro-level helps shift public perception toward environmentally responsible business practices, thereby creating social value. Punjab is home to highly polluting industries such as leather, textile, and metal processing, which urgently require emission reduction, effective waste management, and contamination abatement. Empowering green entrepreneurship can enhance these practices, improve public health, restore local ecosystems, and contribute to a cleaner environment.

2. Sustainable Economic Development

Adopting environmentally friendly business practices can create job opportunities in emerging green sectors such as renewable energy, green packaging, sustainable agricultural inputs, and recycling industries. In a region like Punjab, where economic diversification and employment generation are pressing needs, enabling SMEs to “go green” can foster inclusive, future-proof livelihoods. As green SMEs expand, they can catalyze sustainable industrial clusters, promoting long-term economic resilience anchored in environmentally responsible practices.

3. Empowering Communities through Awareness and Education

This research highlights the importance of green entrepreneurial education and self-awareness. These factors not only influence entrepreneurial activity but also shape broader social attitudes toward sustainability. By promoting green entrepreneurial concepts at community and educational levels, citizens—especially the youth—can acquire knowledge and skills to actively contribute to sustainable development initiatives. This is particularly valuable in Punjab, where youth and emerging entrepreneurs are well-positioned to become transformational leaders in their communities.

4. Reinforcing Institutions and Policies

The study’s findings support the design of targeted interventions to help SMEs adopt sustainable practices. Understanding the opportunities and barriers faced by SMEs provides policymakers with a framework for action, ranging from financial incentives and policy reforms to vocational education and infrastructural support. Well-informed public policies can enhance SME competitiveness while simultaneously advancing societal conservation efforts.

5. Promoting Inclusive Growth

Green entrepreneurship has the potential to broaden participation in development activities by engaging rural entrepreneurs, women, and micro-enterprise owners, who are often excluded from traditional industrial markets. The dissemination of green business knowledge and the support systems outlined in this study can contribute to more equitable and inclusive sustainable development for marginalized groups.

6. Establishing a Sustainability-Cultural Mindset

Finally, this research emphasizes the cultivation of environmental sustainability within Punjab's industrial sector. By fostering green attitudes, proactive social behavior, and community participation, societal expectations regarding business conduct and leadership can shift. Such cultural changes can strengthen public adoption of sustainable practices, increase demand for green products, and drive systemic change across industries.

6.7 Limitations and Future Scope of the Study

This research has highlighted a significant gap in understanding the factors driving green entrepreneurial intentions among manufacturing SMEs in Punjab. However, like any empirical study, it has certain limitations. These constraints, while inherent, provide context for the findings and can inform the development of self-sustaining alternative frameworks and guide future research directions.

The primary limitation of this study is its geographical scope. Data were collected exclusively from SMEs in Punjab, which may limit the generalizability of the findings to other regions in India or internationally. Variations in green awareness, opportunities, challenges, and entrepreneurial intentions observed in Punjab may not necessarily reflect conditions in other states or countries. Furthermore, the study was confined to the manufacturing sector. Service-oriented SMEs may face different market conditions, regulatory environments, and consumer pressures, leading to distinct motivations and barriers for engaging in green entrepreneurship. Therefore, these findings may not fully apply to non-manufacturing industries.

Collecting data through both qualitative interviews and quantitative surveys posed additional challenges, which may have constrained the breadth and depth of responses, particularly in the qualitative phase. Despite these challenges, the sample size was sufficient for robust analyses using thematic interpretation and structural equation modeling.

Future research could expand this study by incorporating SMEs from other Indian states or conducting cross-country analyses, particularly in regions like South Asia or the Gulf, where environmental policies and entrepreneurial contexts differ significantly. Longitudinal studies could explore how green entrepreneurial intentions evolve into sustained green innovations over time. Additionally, further research could consider additional factors such as institutional support, social perceptions, and educational and technological

infrastructure. Comparative studies across sectors, such as manufacturing versus services, could also help address gaps in understanding sector-specific drivers and challenges. By pursuing these avenues, future research can build upon the current study and provide a more nuanced understanding of the economic, social, and environmental factors facilitating green entrepreneurship.

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ANNEXURE 1

QUALITATIVE QUESTIONNAIRES

Dear Respondent, I am a Ph.D. scholar at Lovely Professional University, India. I am doing Ph.D. in Commerce. My research topic is "**Antecedents Influencing Green Entrepreneurial Intentions among Manufacturing SMEs of Punjab**"I am conducting a survey on the intention of Small and Medium-sized Enterprises (SMEs) Owners or Managers towards Green Entrepreneurship. This survey is part of my dissertation research, and your participation is greatly appreciated. The purpose of this survey is to understand the factors that influence SMEs Owners or Managers' intention to adopt green entrepreneurial practices. The survey will take approximately 10 minutes to complete. All responses will be anonymous and kept confidential.

Section A : Demographic profile

Name of the Respondent ……

Gender of Respondent:

Male ☐ Others ☐

Female ☐

Age of Respondent:

Less than 30 Years ☐ 31 to 40 Years ☐

41 to 50 Years ☐ Above 50 Years ☐

Contact No. …… Email ……

Adress of Enterprise …….

Education

Matric (10th Class) ☐ High Secondary (12th Class) ☐

Diploma ☐ Graduation ☐

Post graduation ☐ Doctorate/Ph.D. ☐

Others ☐

Designation

Owner / Founder ☐ Manager ☐

Company's number of employees:

5-75 ☐ 76-200 ☐

Above 200 ☐

Company's annual Sales turnover

Rs. 0-50 Crore ☐ Rs. 50-250 Crore ☐

Firm age

1-10 ☐ 11-20 ☐

21-30 ☐ Above 30 ☐

Industry type

Textile and Yarn industry ☐ Chemical ☐

Hosiery and Readymade Garments ☐ Hand tools and Machine Tools ☐

Food and Beverage ☐ Rubber and Plastic ☐

Metal ☐ Sciences & Pharmaceutical ☐

Communication & computer related equipment ☐ Electrical equipment ☐

Machinery and engineering ☐ Auto parts ☐

Cycle and Cycle parts ☐ Sports goods and equipment ☐

Section B: Open Ended questions on awareness of green entrepreneurship?

1. How much are you aware about the idea and advantages of green business practices? (Revell & Blackburn, 2007)
2. In your opinion, how can educational institutions contribute to enhancing awareness about environmental sustainability among entrepreneurs? (Yin et al., 2023)
3. How do industry events or conferences or campaign contribute to raising awareness and fostering a culture of green entrepreneurship? (Boldureanu et al., 2020) (Yin et al., 2023) (Ma et al., 2023)
4. What kind of awareness do stakeholder have about the green subsidies and how is this awareness contributing to the adoption of green entrepreneurship? (Walker & Preuss, 2008)
5. Do you have a clear understanding of how environmental legislation is relevant to your business? (Gunningham & Sinclair, 2019)

6. Can you describe the level of awareness regarding pollution and its impact on the environment within your business? (Bansal & Roth, 2000)

- **Questions on Opportunities of green entrepreneurship**

1. How can advancements in technology create new opportunities for sustainable entrepreneurship in your industry? (Bocken et al., 2014)
2. Can you describe government policies or incentives that present opportunities for entrepreneurs to embrace eco-friendly practices? (Demirel & Kesidou, 2011)
3. How can consumer preferences and demand for sustainable products/services be turned into opportunities for green entrepreneurs? (Ottman et al., 2006)
4. How does the personality of a business owner influence the implementation and success of green practices within the venture? (Fontana & Musa, 2017)
5. In what ways does the organizational culture at your venture shape its approach to innovation and sustainability? (Al Doghan et al., 2022)

- **Question on barriers of green entrepreneurship**

1. Can you identify any regulatory challenges that have made it difficult to implement eco-friendly practices in your business? (Delmas & Toffel, 2008)
2. What financial aspects have you encountered when transitioning to greener business models? (Hall et al., 2010)
3. How does the unavailability of technological infrastructure affect your ability to implement eco-friendly business practices? (Bohnsack et al., 2014)
4. How do market trends and competition pose challenges to implementing green initiatives in your sector? (Schaltegger & Wagner, 2011)
5. How do you perceive the influence of key stakeholders in the challenges associated with adopting green business practices? (Ramus & Steger, 2000)

ANNEXURE 2

QUANTITAIVE QUESTIONNAIRES

Dear Respondent, I am a Ph.D. scholar at Lovely Professional University, India. I am doing Ph.D. in Commerce. My research topic is "**Antecedents Influencing Green Entrepreneurial Intentions among Manufacturing SMEs of Punjab** "Green entrepreneurship is a subset of entrepreneurship that focuses on developing solutions to environmental issues and promoting societal change to prevent harm. It involves creativity, risk, a fresh company model, and commitment to the environment.

Section A: Green entrepreneurial intentions

Please indicate your level of agreement or disagreement with each of the following statements, where 1= Strongly Disagree, 2 = Disagree, 3 = Somewhat Disagree, 4 = Neutral, 5 = Somewhat Agree, 6 = Agree, 7 = Strongly Agree.

Under the following are the statements for the variables **[Green entrepreneurial intentions]**

Sr. No.	Statements	1	2	3	4	5	6	7
1.	There is scope to implement green initiatives in my enterprise.	☐	☐	☐	☐	☐	☐	☐
2.	I have given thoughtful consideration to various aspects of green entrepreneurship.	☐	☐	☐	☐	☐	☐	☐
3.	I proactively identify and recognize opportunities for green initiatives.	☐	☐	☐	☐	☐	☐	☐
4.	I have a preliminary concept for a green enterprise to implement in the near future.	☐	☐	☐	☐	☐	☐	☐
5.	I aspire to initiate a green enterprise aimed at addressing environmental issues.	☐	☐	☐	☐	☐	☐	☐
6.	I aspire to transit into new ways of doing green business to save the environment.	☐	☐	☐	☐	☐	☐	☐

The following statements are continued for the variable **[Personality Traits]**

Proactiveness								
1.	I keep myself informed about major trends in the industry.	☐	☐	☐	☐	☐	☐	☐
2.	I am a fairly active member of an industry association at the local/regional/national level.	☐	☐	☐	☐	☐	☐	☐
3.	I am continuously looking for innovative ways to enhance the sustainability.	☐	☐	☐	☐	☐	☐	☐
4.	I am quick to identify environmentally friendly opportunities	☐	☐	☐	☐	☐	☐	☐

5.	I identify the significance of being prepared for the future.	☐	☐	☐	☐	☐	☐	☐
6.	I am ready and eager to take on initiatives.	☐	☐	☐	☐	☐	☐	☐
Entrepreneurial Self-Efficacy								
1.	I can adapt to unexpected changes in the business environment.	☐	☐	☐	☐	☐	☐	☐
2.	I am determined to initiate environmentally friendly projects that will provide a competitive edge for my business.	☐	☐	☐	☐	☐	☐	☐
3.	I am confident in my ability to transform eco-conscious ideas into successful ventures.	☐	☐	☐	☐	☐	☐	☐
4.	I am confident that launching a green business would be highly profitable.	☐	☐	☐	☐	☐	☐	☐
5.	I have the practical knowledge and expertise needed to establish an environmentally responsible business.	☐	☐	☐	☐	☐	☐	☐
6.	I am determined to find innovative ways to contribute in solving environmental problems.	☐	☐	☐	☐	☐	☐	☐
Need for Achievement								
1.	I am driven by a strong desire to achieve success.	☐	☐	☐	☐	☐	☐	☐
2.	I am committed to taking on added responsibilities that enhance the growth of my business.	☐	☐	☐	☐	☐	☐	☐
3.	I will try hard to enhance my performance to ensure the success of my business.	☐	☐	☐	☐	☐	☐	☐
4.	I find satisfaction in accomplishing tasks that promote and enhance my business.	☐	☐	☐	☐	☐	☐	☐
5.	I take responsibility for the success or failure of my business, attributing outcomes to my actions rather than external factors	☐	☐	☐	☐	☐	☐	☐
6.	I consider receiving recognition and feedback for my business crucial for assessing and improving my performance.	☐	☐	☐	☐	☐	☐	☐
Risk Aversion								
1.	I exercise caution when making decisions and prefer situations with predictable outcomes.	☐	☐	☐	☐	☐	☐	☐
2.	I generally avoid situations with uncertain outcomes.	☐	☐	☐	☐	☐	☐	☐
3.	I prefer to make informed decisions and avoid taking unnecessary risks.	☐	☐	☐	☐	☐	☐	☐

4.	I actively seek knowledge, recognizing the importance of understanding the emerging challenges of technology & competition.	☐	☐	☐	☐	☐	☐	☐
5.	I balance risks and benefits, mixing innovation with proven strategies in my decision-making.	☐	☐	☐	☐	☐	☐	☐
6.	I prioritize familiar challenges in my current business model over uncertain new ventures, even if they may offer greater rewards.	☐	☐	☐	☐	☐	☐	☐
7.	Please assess to what extent your traits affect your overall personality.	☐	☐	☐	☐	☐	☐	☐

The following statements are continued for the variable **[Environmental Awareness]**

Sr. No.	**Statements**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Environmental Awareness								
1.	I have a clear understanding of how environmental legislation is relevant to my business.	☐	☐	☐	☐	☐	☐	☐
2.	I am well-informed about what represents "best environmental practice" in my industry.	☐	☐	☐	☐	☐	☐	☐
3.	I pay close attention to business activities that can impact the environment.	☐	☐	☐	☐	☐	☐	☐
4.	I am well-informed about the causes and consequences of environmental pollution	☐	☐	☐	☐	☐	☐	☐
5.	I have a clear understanding of the concept of green development	☐	☐	☐	☐	☐	☐	☐
6.	I am aware that our unsustainable practices can harm to the environment and quality of life on the planet.	☐	☐	☐	☐	☐	☐	☐

The following statements are continued for the variable **[Organizational Culture]**

Sr. No.	**Statements**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1.	The organization consistently drives growth by exploring innovative ideas related to green practices.	☐	☐	☐	☐	☐	☐	☐
2.	The organization focuses on understanding environmental management and preservation.	☐	☐	☐	☐	☐	☐	☐
3.	The organization is attentive to environmental standards and regulations.	☐	☐	☐	☐	☐	☐	☐
4.	The organization designs goods and processes to have a minimal impact on the environment.	☐	☐	☐	☐	☐	☐	☐
5.	The organization integrates environmental goals with other business objectives.	☐	☐	☐	☐	☐	☐	☐

6.	The organization encourages and motivates its employees to embrace environmentally sustainable practices.	☐	☐	☐	☐	☐	☐	☐

The following statements are continued for the variable **[Subjective Norms]**

Norms belief adapted from								
1.	My family members believe that I should embark on green entrepreneurship.	☐	☐	☐	☐	☐	☐	☐
2.	My friends would advocate for me to pursue green entrepreneurship.	☐	☐	☐	☐	☐	☐	☐
3.	My professional network aspires to engage in green entrepreneurship.	☐	☐	☐	☐	☐	☐	☐
4.	I value the opinions and sentiments of society regarding green entrepreneurship.	☐	☐	☐	☐	☐	☐	☐
Moral obligation								
1.	I believe that developing green products and processes is a way to fulfill my duty towards the environment.	☐	☐	☐	☐	☐	☐	☐
2.	I believe in creating green products for the eco-conscious market.	☐	☐	☐	☐	☐	☐	☐
3.	I believe that organizations should proactively promote the notion of environmental protection.	☐	☐	☐	☐	☐	☐	☐
4.	I believe that organizations should motivate employees to support environmental protection through their personal actions.	☐	☐	☐	☐	☐	☐	☐
5.	Please assess to what extend your beliefs and obligation impact your entrepreneurial intentions	☐	☐	☐	☐	☐	☐	☐

The following statements are continued for the variable **[Entrepreneurial Motivation]**

Sr. No.	**Statements**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1.	I aspire to become an environmentally conscious business owner/manager.	☐	☐	☐	☐	☐	☐	☐
2.	I envision a prosperous business future through the establishment of a venture dedicated to environmental sustainability.	☐	☐	☐	☐	☐	☐	☐
3.	I prefer to read books over watching movies.	☐	☐	☐	☐	☐	☐	☐

4.	I seek to establish a green enterprise to gain societal recognition.	☐	☐	☐	☐	☐	☐	☐
5.	I am fully prepared and eager to be a green entrepreneur.	☐	☐	☐	☐	☐	☐	☐
6.	I am driven to start a green enterprise to contribute to national sustainability agenda.	☐	☐	☐	☐	☐	☐	☐
7.	I am committed to establishing a green enterprise to actively participate in the development and preservation of ecological environment.	☐	☐	☐	☐	☐	☐	☐

The following statements are continued for the variable **[Entrepreneurial Education]**

Which type of entrepreneurship education you have?

Formal ☐ Informal ☐

Section B: Demographic Profile

Name of Respondent:

Gender of Respondent:

Male ☐ Others ☐

Female ☐

Age of Respondent:

Less than 30 Years ☐ 31 to 40 Years ☐

41 to 50 Years ☐ Above 50 Years ☐

Contact No. …… Email ……

Name of the Enterprise …….

Address of Enterprise …….

Education

Matric (10th Class) ☐ High Secondary (12th Class) ☐

Diploma ☐ Graduation ☐

Post graduation ☐ Doctorate/Ph.D. ☐

Others ☐

Designation

Owner / Founder ☐ Manager ☐

Company's number of employees:

5-75 ☐ 76-200 ☐

Above 200 ☐

Company's annual Sales turnover

Rs. 1-50 Crore ☐ Rs. 50-250 Crore ☐

Firm age

1-10 ☐ 11-20 ☐

21-30 ☐ Above 30 ☐

Industry type

Textile and Yarn industry ☐ Chemical ☐

Hosiery and Readymade Garments ☐ Hand tools and Machine Tools ☐

Food and Beverage ☐ Rubber and Plastic ☐

Metal ☐ Sciences & Pharmaceutical ☐

Communication & computer related equipment ☐ Electrical equipment ☐

Machinery and engineering ☐ Auto parts ☐

Paper & Printing industry ☐ Sports goods and equipment ☐

Sanitation ☐ Leather & related products ☐

ANNEXTURE 3

FIELD PHOTOS

Photo 1


Jalandhar, Punjab, India
114, C-114, Focal Point, Industrial Area Extension, Jalandhar, Punjab
India
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Long 75.572108°
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Cedaar
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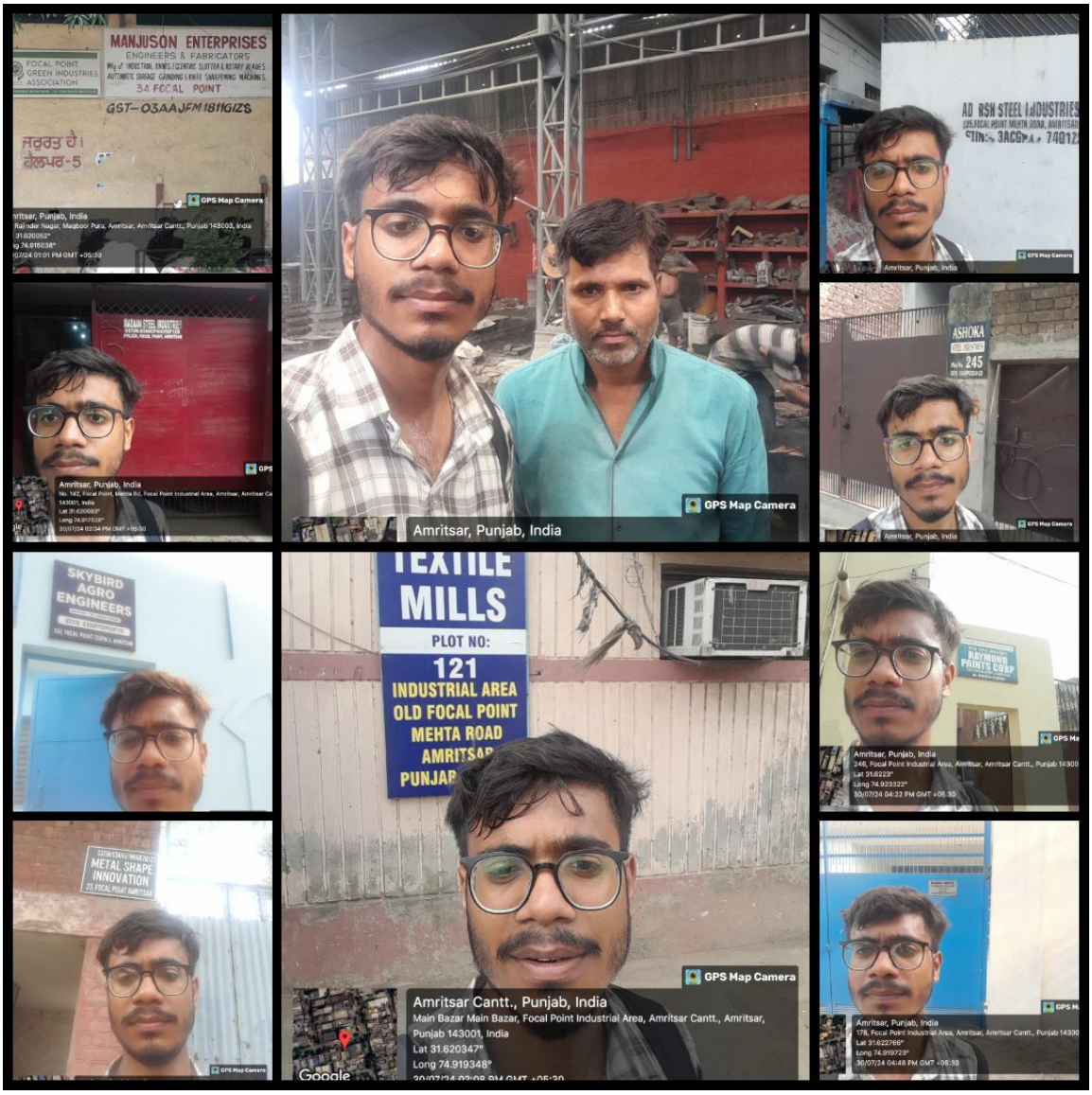
Ludhiana, Punjab, India
Ludhiana, Punjab, India
MADAN DYEING & FINISHING FACTORY
MADAN
Ludhiana, Punjab, India
Jalandhar, Punjab, India
C
18
Jalandhar, Punjab, India

Photo 2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ENGINEERS & FABRICATORS
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Amritsar, Punjab, India
SKYBIRD AGRO ENGINEERS
TEXTILE MILLS
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INDUSTRIAL AREA
OLD FOCAL POINT
MEHTA ROAD
AMRITSAR
PUNJAB
GPS Map Camera
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Main Bazar Main Bazar, Focal Point Industrial Area, Amritsar Cantt., Amritsar, Punjab 143001, India
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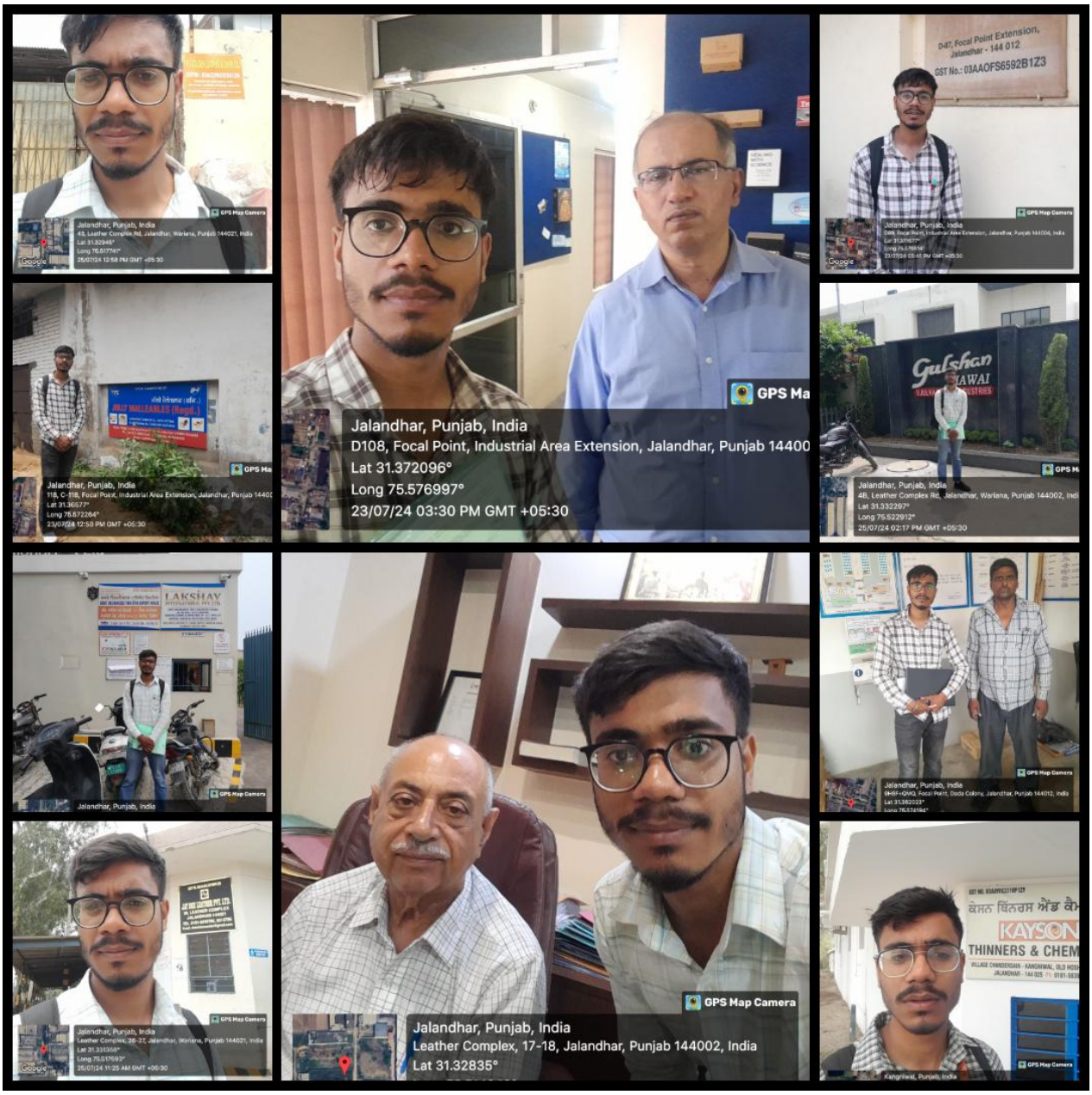
Google
METAL SHAPE INNOVATION
ASHOKA
RAYMOND PAINTS CORP

Photo 3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D47, Focal Point Extension,
Jalandhar - 144 012
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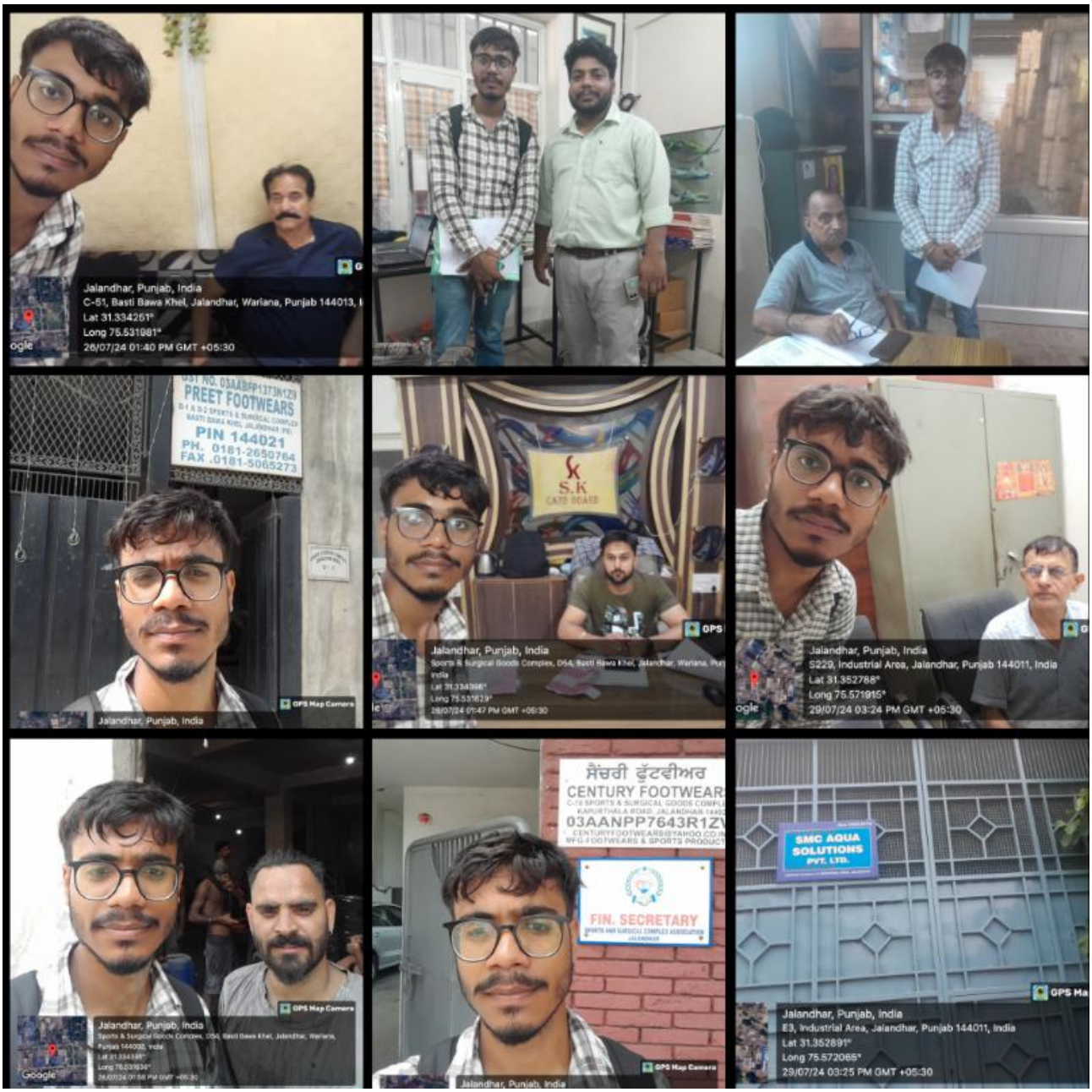
Gulshan
Jalandhar, Punjab, India
LAKSHAY
Jalandhar, Punjab, India
Leather Complex, 17-18, Jalandhar, Punjab 144002, India
Lat 31.32835°
GPS Map Camera
KAYSON
THINNERS & CHEM

Photo 4


OMEGA TOOLS
Jalandhar, Punjab, India
Ludhiana, Punjab, India
GPS Map Camera
Ludhiana, Punjab, India
P-5, Textile Colony, Transport Nagar, Industrial Area- A, Ludhiana, Punjab
Jalandhar, Punjab, India
C
18
SANTEX SPORTS
Jalandhar, Punjab, India

Photo 5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FAX .0181-5065273
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S.K
Jalandhar, Punjab, India
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सैंचरी फुटवीअर
CENTURY FOOTWEAR
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FIN. SECRETARY
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Jalandhar, Punjab, India
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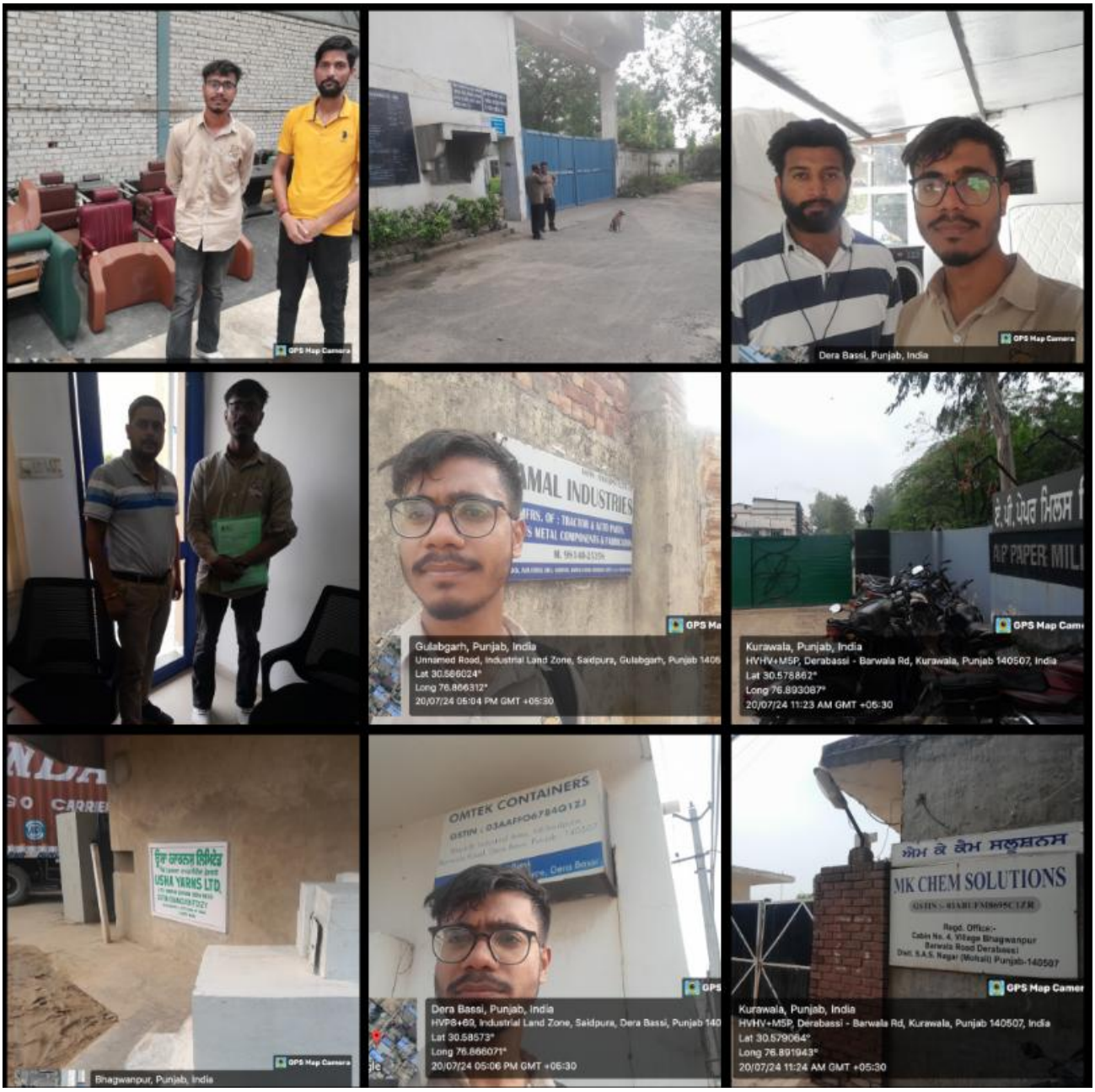
Photo 6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Bhagwanpur, Punjab, India
OMTEK CONTAINERS
Dera Bassi, Punjab, India
HVP8+69, Industrial Land Zone, Saidpura, Dera Bassi, Punjab 140
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Kurawala, Punjab, India
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Photo 7

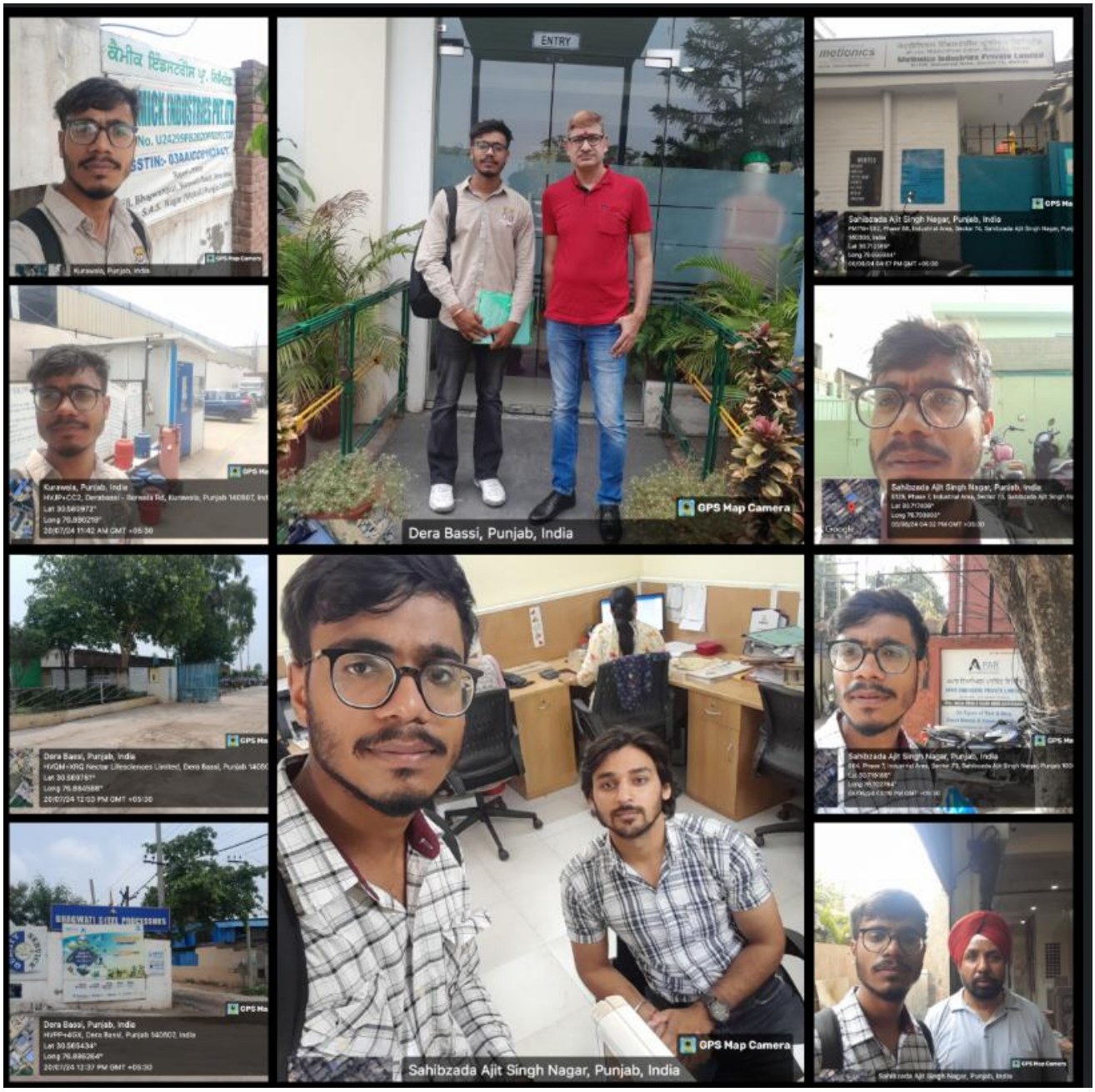
ENTRY
Dera Bassi, Punjab, India
GPS Map Camera
Sahibzada Ajit Singh Nagar, Punjab, India
GPS Map Camera

Photo 8


Sahibzada Ajit Singh Nagar, Punjab, India
Sahibzada Ajit Singh Nagar, Punjab, India
Sahibzada Ajit Singh Nagar, Punjab, India
Sahibzada Ajit Singh Nagar, Punjab, India
Sahibzada Ajit Singh Nagar, Punjab, India
Sahibzada Ajit Singh Nagar, Punjab, India
JOT ELECTRONICS
Sahibzada Ajit Singh Nagar, Punjab, India
DIAMOND INDUSTRIES
Sahibzada Ajit Singh Nagar, Punjab, India
HI TECH
NTERPRISES
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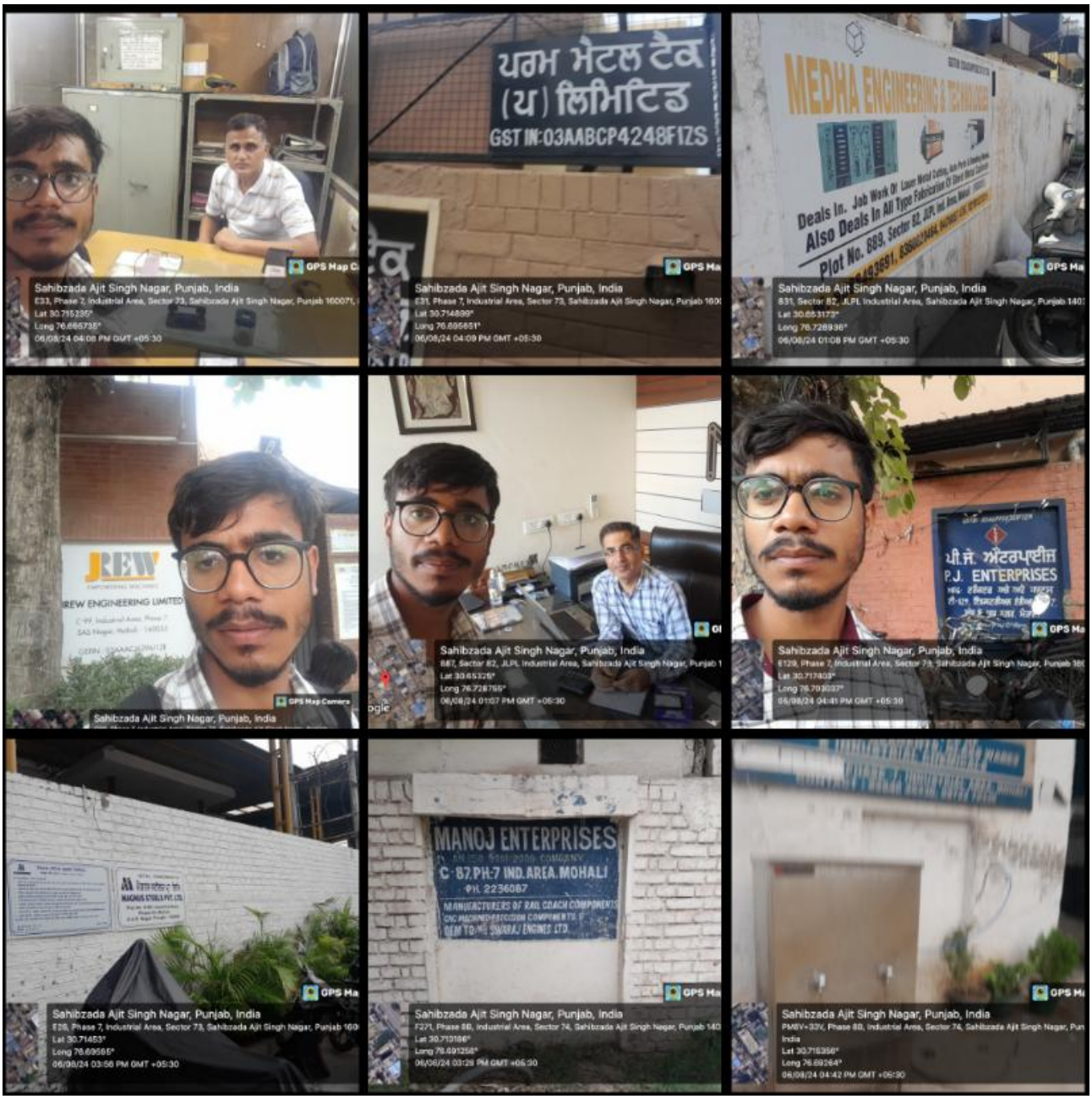
Sahibzada Ajit Singh Nagar, Punjab, India

Photo 9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MANOJ ENTERPRISES
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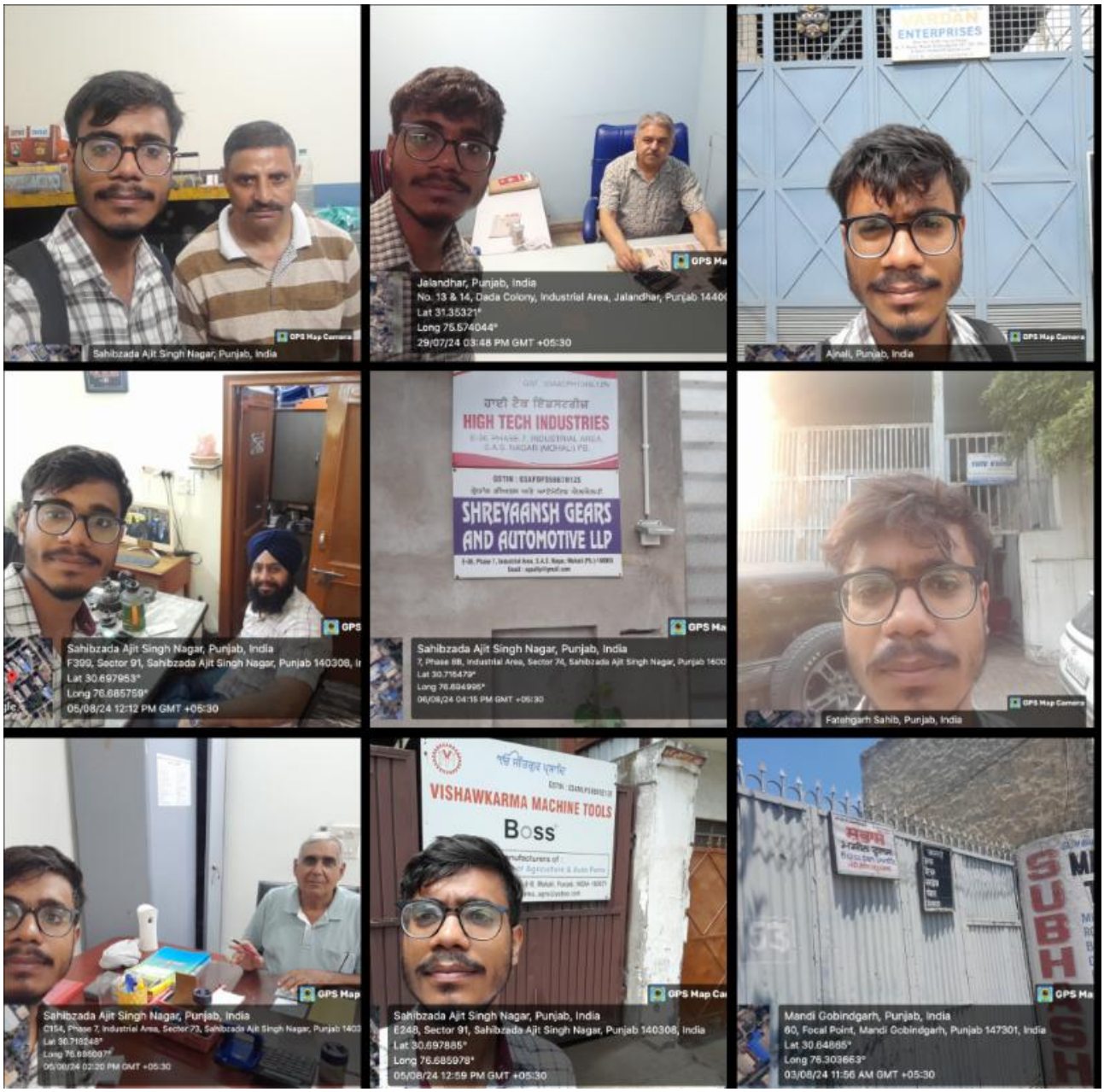
MANUFACTURERS OF RAIL COACH COMPONENTS
Sahibzada Ajit Singh Nagar, Punjab, India

Photo 10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VARDAN ENTERPRISES
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Sahibzada Ajit Singh Nagar, Punjab, India
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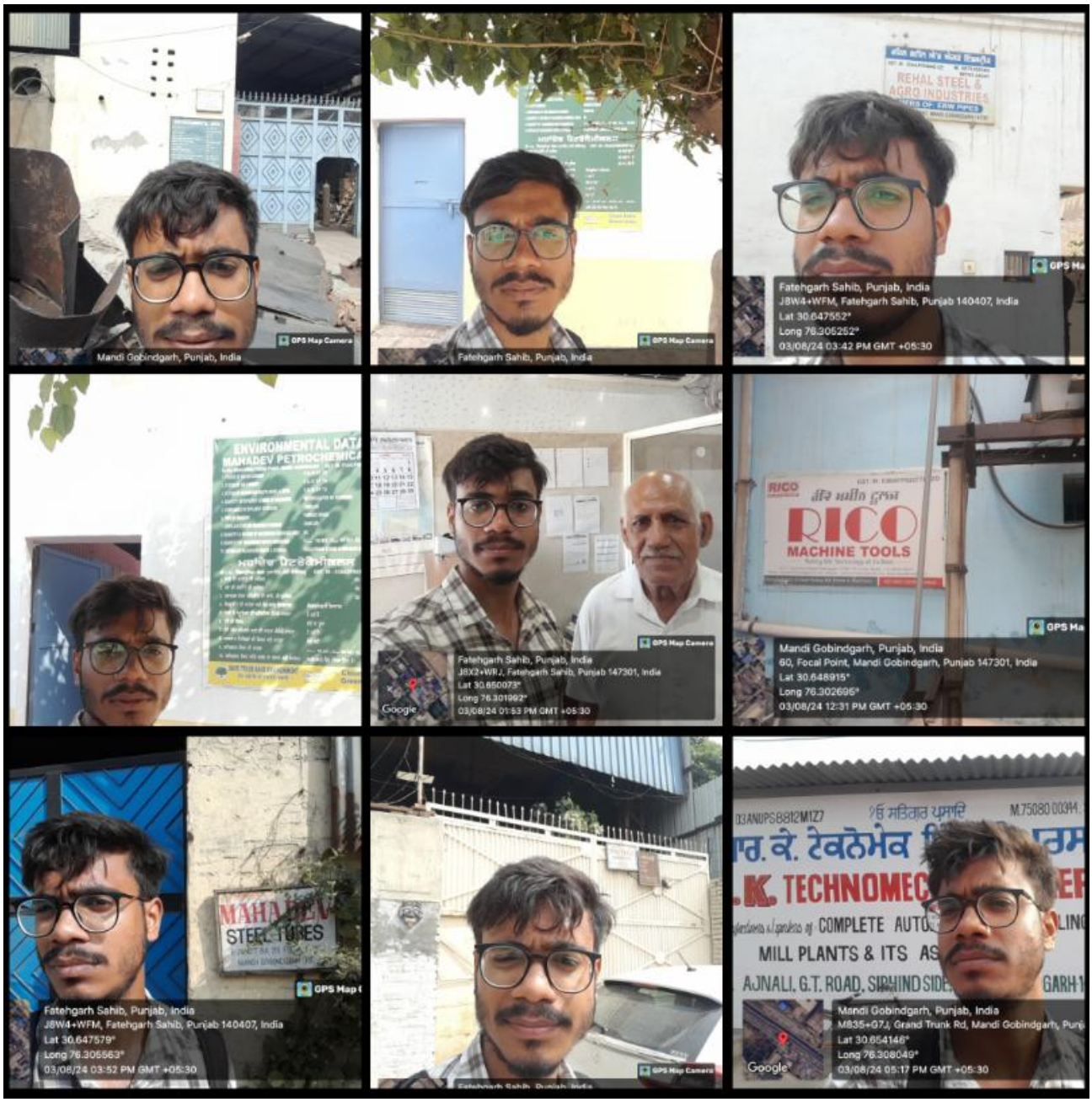
HIGH TECH INDUSTRIES
SHREYAANSH GEARS AND AUTOMOTIVE LLP
Sahibzada Ajit Singh Nagar, Punjab, India
Fatehgarh Sahib, Punjab, India
VISHAWKARMA MACHINE TOOLS
Boss
Sahibzada Ajit Singh Nagar, Punjab, India
E248, Sector 91, Sahibzada Ajit Singh Nagar, Punjab 140308, India
Lat 30.697885°
Long 76.685978°
05/08/24 12:59 PM GMT +05:30
Mandi Gobindgarh, Punjab, India
60, Focal Point, Mandi Gobindgarh, Punjab 147301, India
Lat 30.64865°
Long 76.303663°
03/08/24 11:56 AM GMT +05:30

Photo 11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Fatehgarh Sahib, Punjab, India
REHAL STEEL & AGRO INDUSTRIES
Fatehgarh Sahib, Punjab, India
J8W4+WFM, Fatehgarh Sahib, Punjab 140407, India
Lat 30.647552°
Long 76.306252°
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ENVIRONMENTAL DATA
MAHADEV PETROCHEMICA
Fatehgarh Sahib, Punjab, India
J8X2+WRJ, Fatehgarh Sahib, Punjab 147301, India
Lat 30.650073°
Long 76.301992°
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RICO
MACHINE TOOLS
Mandi Gobindgarh, Punjab, India
60, Focal Point, Mandi Gobindgarh, Punjab 147301, India
Lat 30.648915°
Long 76.302695°
03/08/24 12:31 PM GMT +05:30
MAHADEV
STEEL TUBES
Fatehgarh Sahib, Punjab, India
J8W4+WFM, Fatehgarh Sahib, Punjab 140407, India
Lat 30.647579°
Long 76.305563°
03/08/24 03:52 PM GMT +05:30
TECHNOMEC
COMPLETE AUTO
MILL PLANTS & ITS AS
AJNALI, G.T. ROAD, SIRHIND SIDE
Mandi Gobindgarh, Punjab, India
Lat 30.654146°
Long 76.308049°
03/08/24 05:17 PM GMT +05:30

Photo 12

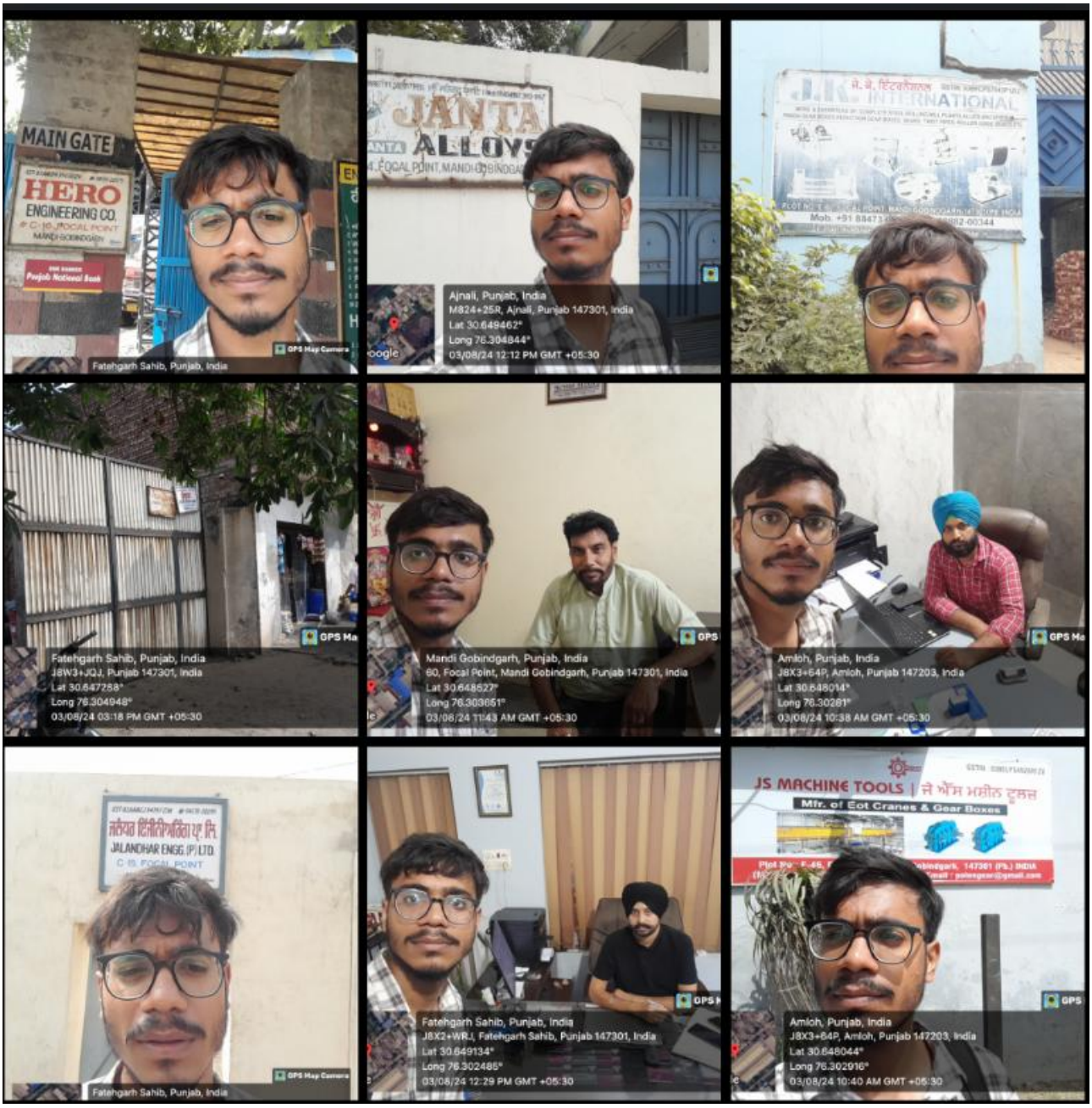
MAIN GATE
HERO
ENGINEERING CO.
Punjab National Bank
Fatehgarh Sahib, Punjab, India
JANTA
ALLOYS
Ajnali, Punjab, India
M824+25R, Ajnali, Punjab 147301, India
Lat 30.649462°
Long 76.304844°
03/08/24 12:12 PM GMT +05:30
INTERNATIONAL
Fatehgarh Sahib, Punjab, India
J8W3+JQJ, Punjab 147301, India
Lat 30.647258°
Long 76.304948°
03/08/24 03:18 PM GMT +05:30
Mandi Gobindgarh, Punjab, India
60, Focal Point, Mandi Gobindgarh, Punjab 147301, India
Lat 30.648527°
Long 76.303651°
03/08/24 11:43 AM GMT +05:30
Amloh, Punjab, India
J8X3+64P, Amloh, Punjab 147203, India
Lat 30.648014°
Long 76.30281°
03/08/24 10:38 AM GMT +05:30
JALANDHAR ENGG.(P) LTD.
C-15, FOCAL POINT
Fatehgarh Sahib, Punjab, India
JS MACHINE TOOLS
Mfr. of Eot Cranes & Gear Boxes
Fatehgarh Sahib, Punjab, India
J8X2+WRJ, Fatehgarh Sahib, Punjab 147301, India
Lat 30.649134°
Long 76.302485°
03/08/24 12:29 PM GMT +05:30
Amloh, Punjab, India
J8X3+64P, Amloh, Punjab 147203, India
Lat 30.648044°
Long 76.302916°
03/08/24 10:40 AM GMT +05:30

Photo 13


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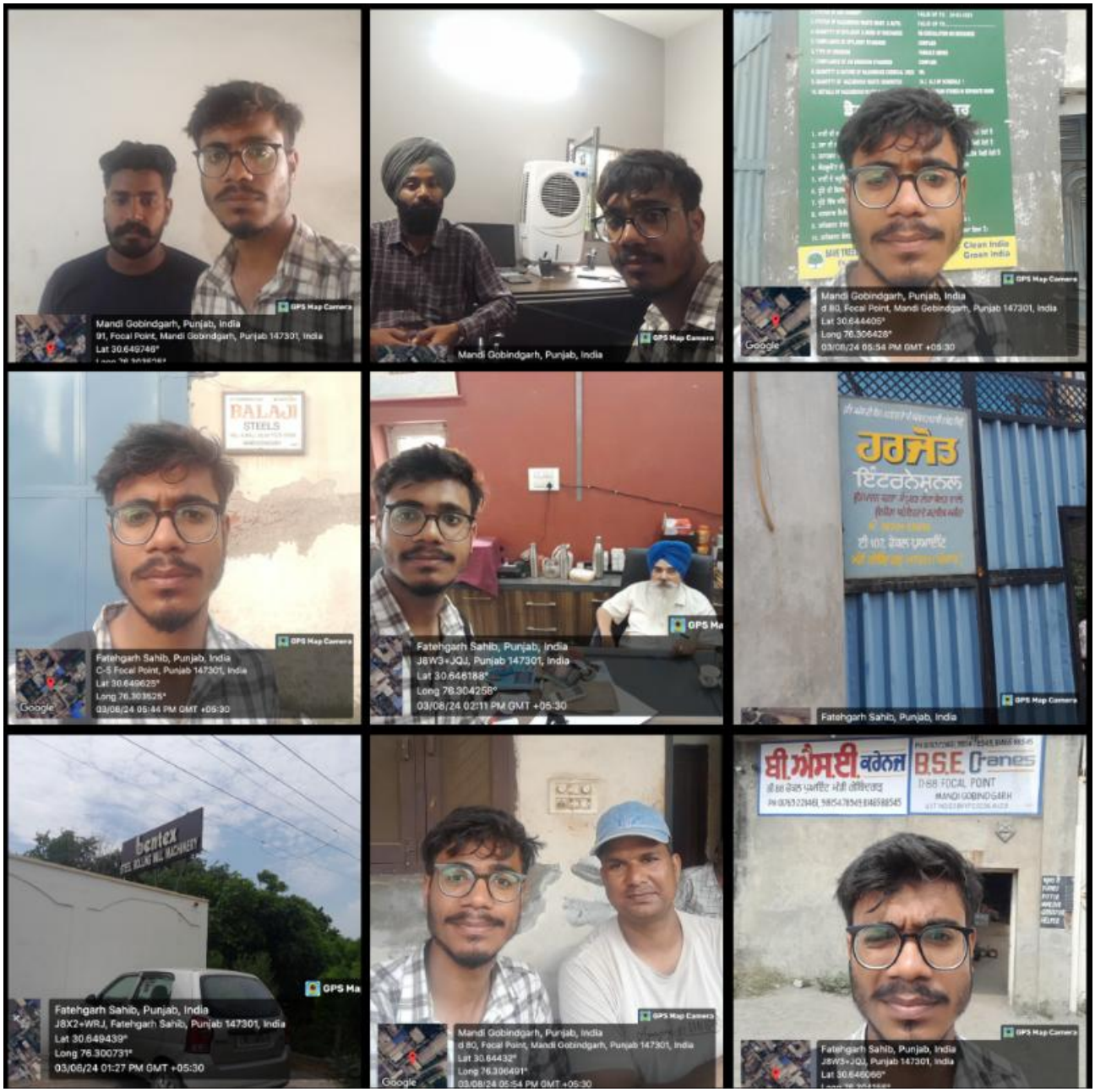
140-141, DADA COLONY IND. AREA,JALANDHAR
GPS Map Camera
Mandi Gobindgarh, Punjab, India
60, Focal Point, Mandi Gobindgarh, Punjab 147301, India
Lat 30.648774°
Long 76.303391°
GPS Map Camera
Fatehgarh Sahib, Punjab, India
AMBER
INDUSTRIES
GPS Map Camera
Mandi Gobindgarh, Punjab, India
J8X3+52J, Focal Point, Mandi Gobindgarh, Punjab 147301, India
Lat 30.648399°
Long 76.30211°

Photo 14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d 80, Focal Point, Mandi Gobindgarh, Punjab 147301, India
Lat 30.644405°
Long 76.306428°
03/08/24 05:54 PM GMT +05:30
BALAJI
STEELS
Fatehgarh Sahib, Punjab, India
C-5 Focal Point, Punjab 147301, India
Lat 30.649625°
Long 76.303525°
03/08/24 05:44 PM GMT +05:30
Fatehgarh Sahib, Punjab, India
J8W3+JQJ, Punjab 147301, India
Lat 30.646188°
Long 76.304256°
03/08/24 02:11 PM GMT +05:30
Fatehgarh Sahib, Punjab, India
bentex
Fatehgarh Sahib, Punjab, India
J8X2+WRJ, Fatehgarh Sahib, Punjab 147301, India
Lat 30.649439°
Long 76.300731°
03/08/24 01:27 PM GMT +05:30
Mandi Gobindgarh, Punjab, India
d 80, Focal Point, Mandi Gobindgarh, Punjab 147301, India
Lat 30.64432°
Long 76.306491°
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B.S.E Cranes
D-88 FOCAL POINT
MANDI GOBINDGARH
Fatehgarh Sahib, Punjab, India
J8W3+JQJ, Punjab 147301, India
Lat 30.646066°

Photo 15