Institutional Drivers and Constraints of Green Entrepreneurship in Saudi Arabia under Vision 2030: An Integrated Analytic Hierarchy Process

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ABSTRACT

Although there is increasing academic interest in green entrepreneurship, there are few empirical studies on the enablers and barriers of green entrepreneurship in Gulf Cooperation Council (GCC) economies. This creates a knowledge gap on how oil-dependent and resource-dependent nations can transition to sustainable business ecosystems. This study investigates the institutional, social and economic drivers and barriers to the development of green entrepreneurship in the Kingdom of Saudi Arabia (KSA) in the strategic context of Vision 2030. The study uses a hybrid methodological design of a SWOT-based survey of 62 civil servants working in Saudi Regional Authorities, an Entrepreneurial Ecosystem Framework (EEF) domain-mapping exercise, and a further Analytic Hierarchy Process (AHP) prioritization exercise with 18 experts from regional authorities, development finance institutions, and green entrepreneurship practitioners. The integrated EEF-AHP analysis shows that the domain with the highest priority weight is the Policy and Regulatory Environment (0.28), followed by Finance (0.22) and Human Capital (0.18). This suggests that institutional and financing gaps are the main systemic constraints. In the SWOT survey, the highest-rated strengths are natural resource endowments and environmentally protected areas. The highest-rated weaknesses are limited natural resource management capacity and a low level of existing green infrastructure, followed by the absence of an appropriate regulatory regime. The highest-rated opportunities are new business start-ups, better environmental quality and higher local income. Key threats are demand-side pressures, especially the perception of green products as luxury goods. The highest-rated green entrepreneurship strategies are organic farming, organic cattle farming and ecotourism. The findings suggest actionable policy recommendations to promote green entrepreneurship in accordance with Saudi Vision 2030.

Keywords*:* green entrepreneurship; entrepreneurial ecosystem; SWOT-AHP analysis; sustainability policy; Saudi Arabia; Vision 2030.

INTRODUCTION

Environmental sustainability has emerged as a critical global issue, impacting strategic objectives for governments, economic sectors, and international development organizations. Green entrepreneurship refers to the act of developing and operating an entrepreneurial venture that produces economic value and provides measurable environmental benefits. It has recently gained considerable attention as a way to achieve sustainable development goals in the face of the dual challenges of rapid climate change and economic recovery from the pandemic (Cao et al., 2021; Muangmee et al., 2021). Recent research shows that green entrepreneurship improves environmental quality, economic diversification, job creation and development of innovative capacities, thus being a strategic imperative for economies to shift from carbon-intensive growth paradigms (Ahmad et al., 2021).

Saudi Arabia offers a particularly interesting and empirically underexplored context for studying green entrepreneurship in the context of a revolutionary national policy. The country's status as the world's largest oil exporter has led it to build up its economic framework on hydrocarbon revenues, resulting in structural dependencies such as energy subsidies, a lack of environmental regulation and, in the wake of a growing

consumer environmental awareness, significant barriers to the development of a green entrepreneurial ecosystem. Launched in 2016, the Vision 2030 program represents a major policy shift with a clear commitment by Saudi Arabia to economic diversification, renewable energy expansion, sustainable tourism development, and SME sector growth (Vision 2030, 2016). In this context, green entrepreneurship is not only an environmental concern, but also a strategic economic necessity.

Nevertheless, empirical studies on green entrepreneurship in the GCC region are scarce and the analytical frameworks used in existing studies, in particular SWOT analysis, have been increasingly criticized methodologically for lacking a theoretical foundation and for not modeling systemic interdependencies between facilitating and obstructing conditions (Anwar and Sulaeman, 2025; Tahmasbi et al., 2025; Farrokhnia et al., 2024; Puyt et al., 2025; Palazzo and Micozzi, 2024). The study addresses these limitations by applying an integrated Entrepreneurial Ecosystem Framework (EEF) with Analytic Hierarchy Process (AHP) and SWOT methodology, which marries the systemic diagnostic capabilities of ecosystem theory with the quantitative precision of multi-criteria decision analysis and contextual depth of SWOT-based survey data (Pratiwi and Noviaristanti, 2025; Nguyen and Tuyen, 2025; Yu et al., 2022; Chen et al., 2025).

The motivation for this study stems from three related gaps. First, there is little research on green entrepreneurship in GCC economies, and particularly in Saudi Arabia. Mostly, empirical research is conducted in European, East Asian, or generally developing-economy contexts. As a result, specific institutional, cultural, and economic dynamics in the oil-rich Gulf countries are largely neglected (Muangmee et al., 2021). The specific institutional features of Saudi Arabia – the prominent role of state-led development organizations, the cultural influence of Islamic finance principles on investment practices and the aspirational objectives of Vision 2030 – are not well-captured by models that are developed from Western or Asian contexts.

Second, analytical frameworks used in green entrepreneurship policy study in developing countries seldom include a systemic ecosystem analysis with quantitative priority-weighting methods. The mere application of SWOT analysis (the prevailing approach in the previous literature) provides descriptive rankings of the factors without disclosing the relative systemic importance of the different constraint categories and their interdependencies (Kajanus et al., 2012; Nguyen & Tuyen, 2025; Pratiwi & Noviaristanti, 2025; Yu et al., 2022; Chen et al., 2025). The usefulness of such studies is limited for policymakers who have to allocate scarce resources between competing intervention priorities without a proper methodological framework.

Third, although recent studies have applied entrepreneurial ecosystem frameworks in sustainability contexts (Stam & Van de Ven, 2021; Wurth et al., 2022), there is a gap in full empirical applications of the EEF in the contexts of green entrepreneurship in MENA region and GCC. The current study addresses all three gaps by providing the first integrated EEF-AHP-SWOT evaluation of green entrepreneurship environments in Saudi Arabia.

This paper addresses a key research gap: what are the systemic institutional, social, and economic factors that enable and constrain green entrepreneurship development in the Kingdom of Saudi Arabia, and how can these be rigorously prioritized to guide Vision 2030-aligned policy action?

The current study is operationalized through four separate study objectives; (1) to identify the main strengths that Saudi Regional Authorities can leverage to promote green entrepreneurship, outlined within an EEF domain framework, (2) to identify the main structural deficiencies that impede the development of green entrepreneurship in Saudi areas, (3) to identify the main possibilities and dangers that affect the green entrepreneurship ecosystem in the Vision 2030 policy framework, and (4) to generate internally consistent AHP priority weights for EEF domains, which can be used to identify the most significant policy leverage points to promote green entrepreneurship in KSA.

In this study we adopt a three-part hybrid approach. A SWOT-based survey instrument was developed consisting of 54 items, 44 covering the four SWOT dimensions and 10 covering green entrepreneurship strategies, rated on a six-point scale. The survey was distributed to 507 government workers in 13 administrative areas of Saudi Arabia. Sixty-two complete responses were received, a response rate of 12.23%. An EEF domain-mapping effort classified SWOT elements into the six EEF domains using an expert panel of 18 members (Stam & Van de Ven, 2021; Wurth et al., 2022). The AHP exercise produced domain-level

priority weights that meet Saaty's consistency criterion, which allows the domains to be compared directly and goes beyond the descriptive limits of a standalone SWOT analysis (Saaty, 1980; Kurttila et al., 2000).

This research makes three contributions. First, drawing on previous research on sustainable entrepreneurial ecosystems, it extends the literature to a Gulf economy and develops four theoretical propositions from the

empirical results. Second, it provides the first combined EEF-AHP-SWOT assessment of green entrepreneurship conditions in Saudi Arabia. Third, methodologically, it sets out a hybrid framework that can be replicated in similar emerging economy contexts.

The paper is structured as follows. Section 2 reviews the literature. Section 3 describes the research methodology. Section 4 presents the findings. Section 5 discusses them and sets out the theoretical propositions. Section 6 concludes with implications for policy, limitations and directions for future research.

LITERATURE REVIEW

Conceptualizing green entrepreneurship

The concept of green entrepreneurship has been well developed in recent literature. Researchers have been progressing from simple definitions to more complex frameworks considering the opportunity recognition, the institutional context and the sustainability results. Green entrepreneurship is defined as the deliberate search for business opportunities related to environmental issues that simultaneously bring benefits for economic, social and ecological areas, showing the triple-bottom-line feature of green companies (Cao et al., 2021).

Recent empirical studies have examined how green entrepreneurial activity affects firm outcomes. In a survey of 226 automotive-parts SMEs in Thailand, Muangmee et al. (2021) found that green innovation had the largest effect on both economic and environmental performance. Ahmad et al. (2021) show that institutional environmental pressures like regulatory, normative, and cognitive dimensions significantly impact the adoption of green entrepreneurship practices by SMEs, which is consistent with the significance of the Policy and Regulatory Environment domain within the EEF framework applied in this study (Ahmad et al., 2021).

The literature presents a dual classification of green entrepreneurship that guides the analytical framework of this study. These are: established firms that adopt environmental management practices driven by competitive strategy, and emerging ventures based on natural and ecological resources, such as ecotourism, organic farming, renewable energy, and biodiversity services (Farooqi et al., 2026; Anwar et al., 2026; Siwiwaliondo & Qutieshat, 2025). Both are applicable to the Saudi Vision 2030 framework. Existing enterprises are encouraged to improve their sustainability practices and new environmental projects are actively promoted in the agricultural, tourist and energy sectors.

Market Failure, Institutional Theory, and Natural Resource-Based View

The present study is based on three theoretical pillars. The market failure perspective is well discussed in the green entrepreneurship literature by Dean and McMullen (2007) and extended by Cao et al. (2021). It holds that environmental market failures (e.g., externalities, public goods deficiencies, information asymmetries) create opportunities for entrepreneurs to fix these failures. This study argues that the exploitation of such opportunities depends heavily on institutional quality, an argument consistent with the high AHP priority weight given to the Policy and Regulatory Environment domain in this study.

Maaßen et al. (2025) highlighted the importance of the regulatory, normative, and cognitive pillars of institutional frameworks for green entrepreneurial behavior. The institutional environment in Saudi Arabia is changing rapidly under Vision 2030 and provides a vibrant interaction of new legislative structures, shifting cultural norms, and increasing acceptance of green entrepreneurship opportunities. The institutional dynamism in Saudi Arabia provides an interesting empirical context to test the predictions of institutional theory on the relationship between policy formulation and the establishment of green entrepreneurial ecosystems.

The natural resource-based view (NRBV) shows that access to unique natural resource endowments may offer a sustainable competitive advantage for green firms (Alkaraan et al., 2024; Clark et al., 2026). Mondal et al. (2025) have revisited this perspective in the context of green entrepreneurship in emerging countries. There is, however, an important caveat. Where governance is weak, an abundance of natural resources can paradoxically act as a barrier to green entrepreneurship because it reduces the perceived need for regulatory reform. This study calls this pattern the asset-governance paradox. The results are consistent with it: Infrastructure and Natural Resources ranks fifth in the AHP priorities (w = 0.11), even though it contains the two highest-rated SWOT strengths.

The Entrepreneurial Ecosystem Framework within Sustainability Contexts

The Entrepreneurial Ecosystem Framework (EEF), proposed by Isenberg (2011) and subsequently enhanced by Stam and van de Ven (2021) and Wurth et al. (2022), characterizes entrepreneurship as an emergent phenomenon situated within a complex, interdependent system of institutional, cultural, financial, human capital, and market components. Recently, the Entrepreneurial Ecosystem Framework (EEF) has been used in the context of sustainability and green entrepreneurship. It is argued that green entrepreneurial ecosystems require additional domain conditions that are not present in conventional entrepreneurial ecosystem evaluations, in particular robust environmental governance frameworks and specialized green finance instruments (Wurth et al., 2022; Sohail et al., 2025).

Stam and van de Ven (2021) provide an alternative significant definition of the EEF. They distinguish between ecosystem output conditions, which refer to the observable entrepreneurial behaviors and innovation outcomes generated by ecosystems, and ecosystem framework conditions, which encompass the institutional, cultural, and physical infrastructure that support and affect entrepreneurial activity. This gap is relevant to the Saudi context where Vision 2030 has set high framework standards, but the output conditions, i.e. environmental innovation and active green enterprises are still underdeveloped. The six EEF domains adopted in this study are based on current ecosystem research literature (Stam & Van de Ven, 2021), namely: Policy and Regulatory Environment, Finance, Culture, Human Capital and Knowledge, Markets, and Infrastructure and Natural Resources.

In GCC environments, the EEF is rarely used. This study addresses the gap by providing the first EEF-based analysis of the Saudi green entrepreneurship ecosystem and by adding AHP priority weighting to assess the relative importance of each domain.

Analytic Hierarchy Process in Environmental and Entrepreneurial Policy Research

The Analytic Hierarchy Process (AHP), formulated by Saaty (1980) and subsequently utilized in green entrepreneurship and sustainable development policy by Kurttila et al. (2000) and Hashim et al. (2021), allows researchers and decision-makers to assess intricate issues with multiple competing criteria via systematic pairwise comparison judgments. The integration of SWOT analysis — a method subsequently refined by Kajanus et al. (2012) and Benzaghta et al. (2021) — mitigates the principal methodological drawback of isolated SWOT analysis by substituting subjective Likert-scale rankings with mathematically derived priority weights that adhere to logical consistency criteria.

Hashim et al. (2021) apply a fuzzy AHP approach to weight sustainable production indicators in the textile supply chain, showing how AHP can rank sustainability criteria with an explicit sensitivity check. Recent SWOT-AHP applications in business strategy and energy planning (Yu et al., 2022; Chen et al., 2025; Nguyen & Tuyen, 2025) support combining the two methods in policy research on developing economies such as Saudi Arabia.

Obstacles to Green Entrepreneurship in Developing and Resource-Abundant Economies

Recent research on developing economies offers benchmarks for interpreting the Saudi results, although few studies address resource-rich Gulf economies directly.

This study uses the term institutional capacity gap for the difference between the ambitions of national sustainability policy frameworks and the operational competencies of implementing institutions to translate those frameworks into effective regulatory, financial and support mechanisms. The gap describes the tension in the present study between the ambitious green entrepreneurship goals of Vision 2030 and the institutional weaknesses identified in the SWOT analysis of weaknesses and threats.

According to Cao et al. (2021), whether green entrepreneurial intentions turn into actual ventures in developing countries depends heavily on access to digital infrastructure and supply chains. Consistent with this, one of the higher-rated weaknesses in the present study, the long distance from essential markets (W3), is a structural restriction that Saudi Arabia must address through its ongoing investment in logistics infrastructure under Vision 2030.

Green Entrepreneurship in Saudi Arabia and the Gulf Cooperation Council

There is little empirical research on green entrepreneurship in Saudi Arabia and the GCC, which leaves a considerable knowledge gap for this study to address. Al-Swidi et al. (2021), studying 614 employees in Qatar's public and private sectors, found that green human resource management, leadership and organisational culture jointly shape employees' green behaviour and organisational environmental performance. The finding is relevant to the Human Capital and Policy domains of the EEF framework.

The Vision 2030 program aims to build an institutional framework that is highly adaptive to promote green entrepreneurship in Saudi Arabia. Major pledges under Vision 2030 with regard to sustainable business practices include generating 50% of electricity from renewable sources by 2030; building a world-class tourism business based on natural and cultural heritage, targeting 100 million tourists a year; achieving food security through sustainable local agriculture; and making Saudi Arabia a significant hub for clean technology innovation (Vision 2030, 2016). Sohail et al. (2025) show that country-level conditions, alongside founder and incubator characteristics, shape start-up performance, which suggests that national policy frameworks such as Vision 2030 can directly affect entrepreneurial ecosystems. This makes the present study timely.

RESEARCH METHODOLOGY

Research Design

This study is carried out within a pragmatist research paradigm and a pluralistic approach to provide policy-relevant results (Tashakkori and Teddlie, 2021). The methodological design is hybrid, combining analysis of quantitative surveys, structured expert elicitation and multi-criteria decision analysis into a coherent research framework. The hybrid approach is commonly accepted in the literature on green entrepreneurship as a way to capture the contextual complexity of ecosystem circumstances and the analytical accuracy required for policy prioritization (Kurttila et al., 2000; Benzaghta et al., 2021). The three methodological components are integrated step-by-step: SWOT analysis, EEF domain mapping and AHP prioritizing, each one improving and building on the results of the previous one.

Why survey government staff in the Saudi Regional Authorities rather than green firms directly? There are three reasons. First, the Regional Authorities are the key public entities in the Saudi institutional setting charged with translating the commitments of Vision 2030 into regional development strategies, regulatory frameworks and resource allocation decisions that directly affect the operating environment for green entrepreneurs. Their view of the barriers to green entrepreneurship is institutionally grounded and concerns conditions the government can change. Second, green entrepreneurship in Saudi Arabia is at an early stage, and the number of active green entrepreneurs is too small and too geographically concentrated to produce regionally generalizable results. Third, recent SWOT-based studies of green entrepreneurship under similar conditions show that public-sector informants can make a valid and reliable assessment of the structural conditions for the growth of green enterprises (Benzaghta et al., 2021). To offset the limits of a single informant group, the AHP expert panel brought together green entrepreneurs, government officials and academics, which allows the survey results to be triangulated.

One recognized disadvantage of the approach is that the views of public authorities on the prerequisites for green entrepreneurship might not reflect the real experiences of entrepreneurs. Future research can improve the comparability of cross-perspectives by collecting direct input from green entrepreneurs.

Phase 1 – SWOT Analysis and Composite Importance Score Generation

The survey was carried out with government officials in 139 governorates across 13 regions of Saudi Arabia.

A total of 507 questionnaires were sent out and 62 complete and valid responses were received, a response rate of 12.23%. Questionnaires with incomplete data were excluded from the study. The final valid sample of 62 respondents is adequate for the descriptive item-level analysis used here, but it is small, and the low response rate means that non-response bias cannot be ruled out. The survey results should therefore be read as indicative of the views of Regional Authority staff rather than as statistically representative of them. Selection bias was reduced by random sampling within each regional authority.

The sample profile is as follows: 51.61% male (n = 32), 48.38% female (n = 30); management level: middle management 62.9% (n = 39), top management 24.19% (n = 15), executive management 12.90% (n = 8). Moreover, 90.32% of respondents were aged under 40 and 43.54% held at least a master's degree. This profile reflects a young and well-educated public service, which makes these respondents suitable informants on the conditions for green entrepreneurship policy. Table 1 summarizes the sociodemographic profile of the 62 survey respondents.

Table 1. Sociodemographic Profile of Survey Respondents (N = 62)

Variable	Category	n	%
Gender	Male	32	51.61
	Female	30	48.38
Management Level	Top Management	15	24.19
	Middle Management	39	62.9
	Executive Management	8	12.9
Age	20–24	8	12.9
	25–29	30	48.38
	30–34	10	16.12
	35-39	8	12.9
	40 and more	6	6.67
Education	Bachelor's degree	35	56.45
	Master's degree	20	32.25
	PhD	7	11.29

Source: Author's Tabulation

The SWOT survey instrument consisted of 54 items: 44 SWOT items across four dimensions, namely strengths (12 items), weaknesses (16 items), opportunities (10 items) and threats (6 items), plus 10 items on green entrepreneurship strategies, all rated on a six-point scale (0 = not important to 5 = very important). A six-point scale was used to remove the neutral midway and necessitate directional significance evaluations (Benzaghta et al., 2021). The instrument was derived from the validated SWOT framework of Nikolaou et al. (2011), the most extensively used tool in the green entrepreneurship SWOT literature, and underwent a content validity evaluation by three academic experts and two senior officials from the Regional Authorities before implementation. Questionnaires were sent online, accompanied by further telephone reminders.

For each item, a Composite High Importance Score (CHIS) was calculated as the proportion of respondents who rated the item as 'Important' (4) or 'Very Important' (5):

$CHIS = [(f_4 + f_5) / N] \times 100,$

where N = 62.

A Composite Low Importance Score (CLIS) was calculated as the proportion of responses evaluating the item as 'Not Important' (0), 'Unimportant' (1), or 'Of Little Importance' (2):

$CLIS = [(f_0 + f_1 + f_2) / N] \times 100$.

Items are ordered inside each dimension in decreasing sequence of CHIS. This empirical approach allows us to compare our results with previous studies on green entrepreneurship based on SWOT analysis (Benzaghta et al., 2021; Nikolaou et al., 2011). For all five dimensions of the survey, the Cronbach's alpha coefficients were computed. The results are presented in Table 2. All alpha values are above the 0.70 level recommended for exploratory social science research (Hair et al., 2019). The total instrument alpha was 0.88 indicating strong internal consistency.

Table 2. Reliability Statistics of SWOT Survey Instrument (N = 62)

Dimension	**N items**	**Cronbach's α**	**Assessment**
Strengths	12	0.81	Good
Weaknesses	16	0.79	Acceptable
Opportunities	10	0.83	Good
Threats	6	0.76	Acceptable
GE Strategies	10	0.84	Good
Overall Instrument	54	0.88	Good

Source: Author's Tabulation

Phase 2: Mapping the six EEF domains

Following the SWOT data collection, the 18-member expert panel participated in a structured 2 round Delphi-style workshop, mapping all 54 survey items to the six EEF domains namely: Policy and Regulatory Environment, finance, culture, human capital and knowledge, markets, and infrastructure and natural resources; in accordance with Stam and van de Ven (2021). In Round 1 experts allocated items to domains independently, in Round 2 disagreements were resolved by facilitated discussion until consensus was reached. Items that could not be clearly assigned to a domain were placed in the domain that was most related to their substantive content, based on the majority judgment of experts. The mapping exercise had two objectives: to structure the SWOT findings against the EEF systemic architecture and to generate qualitative insights on cross-domain interdependencies, which enhanced the quantitative AHP findings.

Phase 3: Prioritization using AHP

The Analytic Hierarchy Process (AHP) is a structured multi-criteria decision making method developed by Saaty (1980) to allow researchers and decision makers to evaluate complex problems with multiple competing criteria. It achieves this by breaking down the problem into a hierarchy of goals, criteria, sub-criteria and alternatives and then deriving priority weights through systematic pairwise comparison judgments.

AHP has been frequently used in environmental management, sustainability assessment and entrepreneurship policy research and has been proposed as a more rigorous alternative to SWOT analysis for strategic environmental planning (Kurttila et al., 2000; Kajanus et al., 2012). The integration of the EEF in the present study with AHP offers a powerful methodological combination, combining the systemic diagnostic power of the ecosystem framework and the quantitative prioritization rigor of AHP.

The AHP methodology proceeds through five consecutive steps:

Problem Breakdown*:* The research problem is broken down into a hierarchy of three levels. The overall objective (Level 1) is to determine the most important factors affecting the development of green entrepreneurship in Saudi Arabia. At the second level (Level 2), the main evaluation criteria are the six EEF

domains - policy and regulatory environment, finance, culture, human capital, markets and infrastructure. At the third level (Level 3) are the specific green entrepreneurship enablers and barriers found through the literature review and expert consultation, which operate as sub-criteria within each domain.

Construction of the pairwise comparison matrix: The experts were asked to make pairwise judgments of the

relative importance of each criterion or sub-criterion compared to every other criterion or sub-criterion at the same level of the hierarchy, using Saaty's (1980) nine-point importance scale (Table 3):

Table 3. Saaty's (1980) AHP-nine-point importance scale

Scale Value	Interpretation
1	Equal importance
3	Moderate importance of one over another
5	Strong importance
7	Very strong importance
9	Extreme importance
2,4,6,8	Intermediate values

Source: Saaty (1980)

These pairwise judgments are then assembled into a square comparison matrix for each level of the hierarchy from which priority weight vectors are derived using the principal eigenvector method (Saaty,1980).

Derivation of Priority Weights: The priority weights for each criterion and sub-criterion are derived from the pairwise comparison matrices by using the following technique. the priority weight vector w associated to a comparison matrix A of size n × n, is obtained by normalization of the principal eigenvector of A and satisfies:

$Aw = \lambda_{max} w$

where λmax is the maximum eigenvalue of A. The priority weights are normalized in such a way that at each level of the hierarchy they equal 1.0. This enables direct comparison of the relative importance of criteria across all EEF domains.

Verification of consistency*:* The essential advantage of AHP over SWOT analysis is that AHP has an internal mechanism for detecting and correcting inconsistent judgment patterns. To assess the consistency of each pairwise comparison matrix, the consistency ratio (CR) is calculated:

$CR = CI / RI$

Where the Consistency Index (CI) is calculated as follows:

$CI = (\lambda_{max} - n) / (n - 1)$

And RI is the Random Consistency Index for a matrix of order n from the standard table of random index values of Saaty (1980). CR value of 0.10 or below indicates acceptable consistency. Matrices with CR > 0.10 were returned to the expert concerned for revision. The verification of this consistency confirms logical coherence of priority ranking that cannot be guaranteed by the SWOT-based ranking in the Likert scale.

Synthesis of Global Priorities: The global priority weights of all Level 3 sub-criteria (specific green entrepreneurship enablers and barriers) were calculated by multiplying the local priority weight of each sub-criterion by the priority weight of the parent Level 2 criterion (EEF domain) and the sum of all domains where applicable. Such synthesis procedure yields a single global ranking of all green entrepreneurship factors, which considers the importance of the factors within their specific EEF domains as well as the relative importance of

the domains themselves, a methodological feature that is not present at all in SWOT analysis. AHP calculations were performed using SuperDecisions v3.2.

FINDINGS

SWOT Analysis findings and Rankings of Green Entrepreneurship Strategies

The full ranking of strengths based on their CHIS is given in Table 4. The three key strengths are: S1 - Availability of appropriate natural resources and conditions (CHIS = 93.54%); S2 - Presence of ecologically protected areas (87.08%); S4 - Status of existing infrastructure (83.88%). The findings suggest strong perceived natural asset bases for green entrepreneurship especially in ecotourism, organic agriculture and biodiversity enterprises. The three least strengths are S6: Existence of colleges teaching about environmental subjects (51.62%); S12: Difficulties of PDO and PGI products (64.52%); and S11: Number of organic farmers is limited (67.74%). The low rating of S6 points to a gap in knowledge infrastructure.

Table 4. Ranking of Strengths by Composite High Importance Score — CHIS (N = 62)

Code	Strength factor	CHIS (%)	Rank
S1	Existence of appropriate natural resources and conditions	93.54	1
S2	Existence of environmentally protected areas	87.08	2
S4	Level of current infrastructure	83.88	3
S3	Current level of entrepreneurship culture	80.63	4
S9	Knowledge of local entrepreneurs on GE opportunities	79.03	5
S5	Level of knowledge and skills for green professions	75.82	6
S7	Level of cooperation with ENGOs	75.8	7
S8	Existence of local certified schemes for green products	69.35	8
S11	Small number of organic farmers	67.74	10
S12	Existence of PDO and PGI product challenges	64.52	11
S6	Presence of universities specialised in environmental topics	51.62	12

Source: Author's Tabulation

Table 5 ranks the weaknesses by CHIS. The highest-rated weaknesses are W16, limited natural resource management capacity, and W7, low level of current green infrastructure (both 80.10%), followed by W13, absence of an appropriate regulatory regime (78.40%). Set against S1 and S2 (abundant natural resources), W16 (weak resource governance) illustrates the asset-governance paradox: Saudi Arabia has substantial natural capital but lacks the governance capacity to use it sustainably. The absence of an appropriate regulatory framework (W13) also has the lowest CLIS of all weaknesses, indicating that very few respondents considered it a minor limitation.

Table 5. Ranking of Weaknesses by Composite High Importance Score — CHIS (N = 62)

Code	Weakness factor	CHIS (%)	Rank
W16	Limited natural resource management capacity	80.10	1
W13	Absence of appropriate regulatory regime	78.40	3
W3	Long distance from essential markets	76.90	5
W14	Absence of society cooperation	73.40	7
W1	Limited know-how of local entrepreneurs on GE	77.90	4
W5	Limited knowledge of green technologies	76.90	5
W8	Absence of green funds	70.70	8

W6	High costs of green investment	56.90	12
W7	Low level of current green infrastructure	80.10	1
W11	Absence of green entrepreneurship experts	67.30	9
W15	Absence of new GE opportunities	67.20	10
W4	Absence of institutional support for GE	63.60	11

Source: Author's Tabulation. Note: tied values share the same rank.

Table 6 ranks the opportunities by CHIS. The highest-rated opportunities are O2, new business start-ups (87.50%), O6, better environmental quality (86.30%), and O3, increase in local income (85.50%). Respondents rated the fiscal and social items lowest: O8, better handling of public funds for the environment (62.10%), and O7, social cohesion (41.60%), which is the lowest-rated opportunity.

Table 6. Ranking of Opportunities by Composite High Importance Score — CHIS (N = 62)

Code	Opportunity factor	CHIS (%)	Rank
O2	New business start-ups	87.50	1
O6	Better environmental quality	86.30	2
O3	Increase in local income	85.50	3
O1	New jobs	80.50	4
O4	Gain competitive advantage of local businesses	78.00	5
O9	Create niche market for local products	76.90	6
O5	Increase attractiveness of area	72.90	8
O10	Increasing national and international fund inputs	74.90	7
O8	Better handling of public funds for the environment	62.10	9
O7	Social cohesion	41.60	10

Source: Author's Tabulation

Table 7 ranks the threats by CHIS. The three highest-rated threats are T4, a future decline in consumer demand for green products (61.30%); T5, the perception of green products as luxury items with low demand during recessions (56.90%); and T1, future environmental degradation (56.60%). Demand-side vulnerabilities dominate, which suggests that market receptivity, rather than supply-side constraints, is the most immediate short-term threat to green entrepreneurship in KSA.

Table 7. Ranking of Threats by Composite High Importance Score — CHIS (N = 62)

Code	Threat factor	CHIS (%)	Rank
T4	Future decline in consumer demand for green products	61.30	1
T5	Green products perceived as luxury goods — low demand during recessions	56.90	2
T1	Future environmental degradation	56.60	3
T2	Increasing competition from other areas	56.20	4
T6	Low level of diffusion of green technology	45.90	5
T3	Prospective requirements for further green investments	5.10	6

Source: Author's Tabulation

Table 8 ranks the green entrepreneurship strategies by CHIS. The highest ranked are organic farming (GES4, 85.1%), organic cattle farming (GES5, 82.6%) and ecotourism (GES6, 74.9%), in line with the food security and tourism development targets of Vision 2030. Renewable energy (GES3, 69.8%) is fourth, which may reflect its capital intensity compared with agricultural and tourism activities. Mine site rehabilitation (GES7) is last at 26.2%.

Table 8. Ranking of Green Entrepreneurship Strategies by CHIS (N = 62)

Code	Green Entrepreneurship Strategy	CHIS (%)	Rank
GES4	Organic farming	85.1	1

GES5	Organic cattle farming	82.6	2
GES6	Ecotourism	74.9	3
GES3	Renewable energy	69.8	4
GES8	Biodiversity	62.1	5
GES1	Biotechnology	42.6	7
GES9	Recycling	46.7	6
GES10	Green R&D businesses	31.3	8
GES2	Wastewater treatment	28.8	9
GES7	Mine site rehabilitation	26.2	10

Source: Author's Tabulation

EEF Domain Mapping Outcomes and AHP Priority Weight Outcomes

Table 9 outlines the distribution of different SWOT elements among different domains of entrepreneurial ecosystem framework EEF based on the expert panel mapping process.

Table 9: Distribution of SWOT Items Across EEF Domains (Expert panel mapping, N = 18)

EEF Domain	Items (n)	Dominant SWOT Dimension	Key Mapped Items
Policy & Regulatory Environment	12	Weakness	W13, W4, W15, S3, T1, T2
Finance	9	Weakness	W6, W8, O8, O10, T3
Culture	8	Threat	T4, T5, W14, O7, S3
Human Capital & Knowledge	10	Weakness	W1, W5, W11, S6, S9
Markets	9	Opportunity	O1, O2, O3, O4, W2, W3
Infrastructure & Natural Resources	16	Strength	S1, S2, S4, W7, W16, GES4–6

Based on findings of AHP methodology, the domain level priority weights are shown in Table 10. All the pairwise comparison matrices satisfied the CR ≤ 0.10 consistency criterion, which proves that the expert judgments were consistent logically in all domain comparisons.

Table 10. AHP Domain-Level Priority Weights — Expert Panel (N = 18; CR ≤ 0.10)

EEF Domain	Priority Weight	Rank	CR	Consistency
Policy & Regulatory Environment	0.28	1	0.07	Acceptable
Finance	0.22	2	0.06	Acceptable
Human Capital & Knowledge	0.18	3	0.08	Acceptable
Markets	0.14	4	0.05	Acceptable
Infrastructure & Natural Resources	0.11	5	0.09	Acceptable
Culture	0.07	6	0.07	Acceptable

The Policy and Regulatory Environment domain (w = 0.28) has the greatest priority weight, indicating that institutional and regulatory deficiencies represent the most significant systemic limitation. Finance is ranked second (w = 0.22), followed by Human Capital (w = 0.18). Infrastructure and Natural Resources is placed fifth (w = 0.11), while including the two highest-rated SWOT strengths, so empirically validating the asset-governance conundrum. Sensitivity study verifies the stability of rankings: even with a 20% reduction in the weight of the Policy domain, Finance maintains Rank 2 and Human Capital remains Rank 3.

Figure 1 is the main integrative visualization of this study. It combines the SWOT survey data and the AHP priority weights in a single two-dimensional quadrant map. The SWOT factors are plotted on the same Cartesian plane so that clusters of strategic priorities can be compared across quadrants, which is not possible in tabular or single-dimension presentations. The horizontal axis shows the Composite High Importance Score (CHIS, %), which indicates the level of consensus among survey respondents on the importance of each factor.

The vertical axis represents the AHP domain priority weight (×100), which encodes the expert panel's assessment of the systemic importance of each factor's EEF domain. Bubble size corresponds to the composite signal (CHIS × AHP), and marker shape corresponds to the EEF domain.

Figure 1 is best read across quadrants rather than within them. Three strategic clusters stand out. The Policy and Regulatory cluster (purple diamonds) is at the top half of the figure, with S7 (ENGO cooperation) in the top right and W13 (Absent regulatory regime) in the top left. The symmetric position relative to the Y-axis shows the asset (existing ENGO network) and the gap (lack of regulation) in the same highest priority domain. Saudi authorities have the most significant policy action available to them: bridge the gap from W13 to S7 by leveraging existing NGO partnerships to fast-track the development of standardized regulatory structures.

Secondly, the Finance cluster (blue squares) encompasses the top-left weaknesses (W8: Absent green funds) and the bottom-right opportunities (O10: International funds; O8: Public fund handling). Their cross-quadrant positioning captures the challenge of the financial ecosystem: the financing mechanisms that would trigger market opportunities already exist in latent form, but the domestic green financing infrastructure that would channel them into green ventures is not in place. Third, the Human Capital cluster (amber triangles) is fully contained in the upper half of the figure – not only as strengths (S9, S5), but also as weaknesses (W1, W5, W11) – and absent from the opportunities and threats quadrants. Their absence from the opportunity and threat quadrants suggests that human capital conditions are perceived as a problem of the present state and not as an opportunity or risk of the future. This further supports the argument for immediate investment in green entrepreneurship education and development of expert capacity.

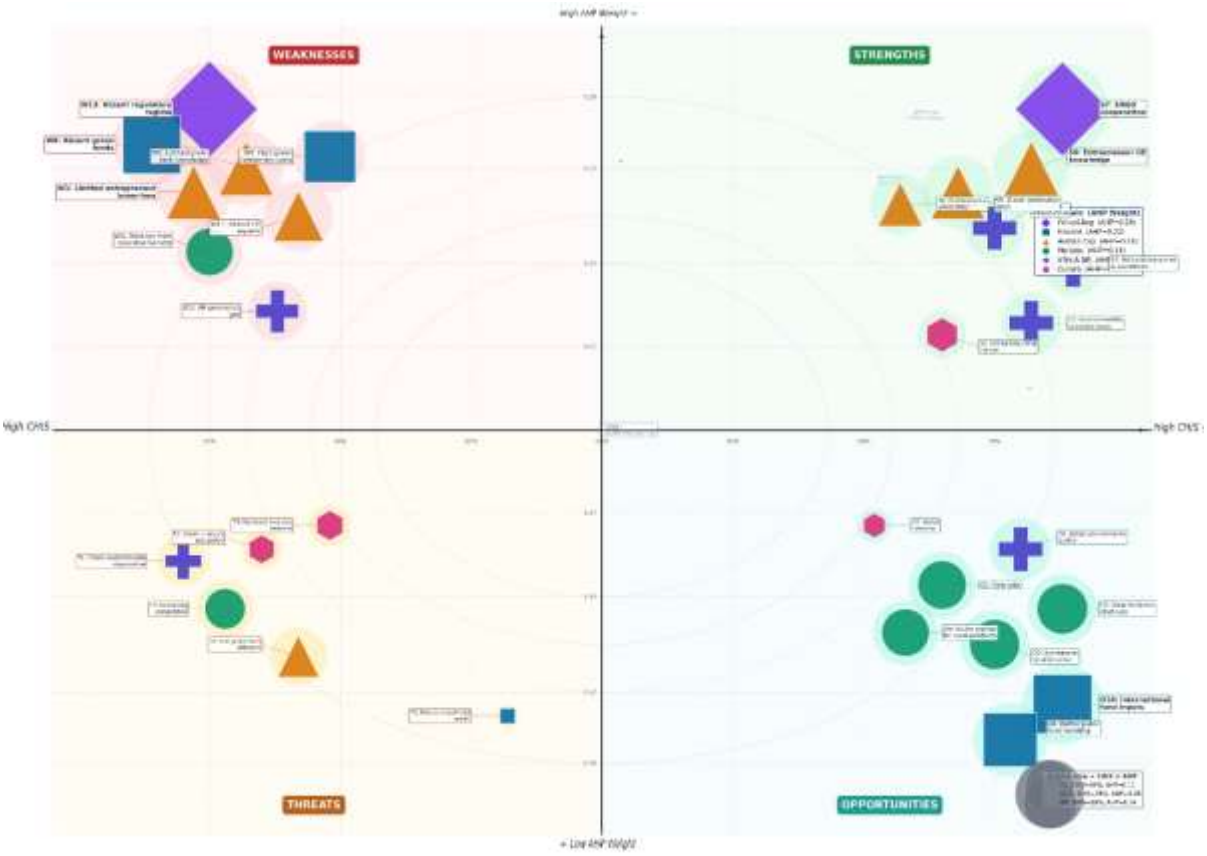

Figure 1. Quadrant Map of Green Entrepreneurship Enablers and Barriers in Saudi Arabia

Note: Integrated SWOT–EEF–AHP (N Survey = 62; N Experts = 18). X-axis: CHIS (%); Y-axis: AHP domain priority weight (×100); bubble size ∝ CHIS × AHP; marker shape = EEF domain.

DISCUSSION

The most theoretically interesting finding of the study is the asset-governance paradox. Infrastructure and Natural Resources, which contains Saudi Arabia's strongest SWOT strengths (S1: 93.54%; S2: 87.08%) as

well as W16 (limited natural resource management capacity), ranks fifth in AHP priority (w = 0.11), while the Policy and Regulatory Environment, which contains W13 (absence of an appropriate regulatory regime), ranks first (w = 0.28). This result supports the view that natural resource abundance is a necessary but not sufficient condition for the growth of green entrepreneurship, with the quality of institutional governance playing the decisive mediating role.

The result also illustrates the institutional capacity gap defined in Section 2: Saudi Arabia has a significant gap between the vision of its Vision 2030 sustainability framework and the reality of how the institutions' capabilities to implement that framework translate into effective regulatory standards, enforcement procedures and infrastructure to support green businesses. Closing this gap requires the creation of additional environmental policies and the systematic strengthening of the institutional framework – regulatory agencies, enforcement agencies and standard-setting agencies – that implement those policies.

The Finance domain, which ranks second (w = 0.22), contains clear weaknesses, such as W8 (absence of green funds) and W6 (high costs of green investment), and opportunities, such as O8 (better handling of public funds for the environment) and O10 (increasing national and international fund inputs). This configuration indicates that, after regulatory clarity, the availability of green financing is the most significant factor for the sustainability of green companies. The inclusion of international fund inputs among the opportunities (O10, 74.90%) reflects the financial realities of capital-intensive green sectors such as renewable energy and wastewater treatment, where private market financing is often insufficient in the early stages of ecosystem development.

The correspondence between the AHP priorities for the Finance sector and the focus in Vision 2030 on attracting foreign direct investment and enhancing the roles of the NDF, CEDA and SFD as engines of development finance suggests that Saudi Arabia has the institutional set-up to tackle the patient capital deficit but this potential has not been sufficiently exploited for green entrepreneurship specifically. Green financing instruments (green SME loan programs, blended finance approaches, green bond frameworks, etc.) would directly address such limitation.

The third position in the AHP ranking (w = 0.18) of the Human Capital and Knowledge domain reflects the weaknesses W1 (limited know-how of local entrepreneurs), W5 (limited knowledge of green technologies) and W11 (absence of experts), as well as the low rating of S6 (universities specialised in environmental topics, CHIS = 51.62%). The pattern is consistent with Al-Swidi et al. (2021), who show in neighbouring Qatar that human resource practices, leadership and organisational culture shape employees' green behaviour.

The low ratings of universities in green entrepreneurship are particularly concerning according to the finding of Wurth et al. (2022). They declared that the relationship between university and industry is a crucial catalyst for the advancement of green entrepreneurial ecosystems, particularly in developing countries where industrial green knowledge capacity remains in an embryonic state. To bridge this gap, concerted efforts to improve the infrastructure of environmental education, the curriculum of green entrepreneurship, the framework of university-industry research collaboration are needed, investments that are in line with the human capital development objectives of Vision 2030.

The Markets domain (w = 0.14) links to the demand-side risks in the threat dimension of the SWOT analysis: T4 (future decline in consumer demand, Rank 1) and T5 (green goods perceived as luxury items, Rank 2). Demand-side conditions may therefore be a more immediate constraint on green entrepreneurship in Saudi Arabia than supply-side ones.

The lowest AHP weight, for the Culture domain (w = 0.07), does not mean that cultural change is unimportant. It indicates expert agreement that regulatory, financial and knowledge constraints are more readily actionable policy levers than the gradual process of cultural change. Social cohesion (O7) received the lowest CHIS of all opportunities (41.60%), which fits the low weight the experts gave to the Culture domain.

The top green entrepreneurship strategies, organic farming (85.1%), organic cattle farming (82.6%), and ecotourism (74.9%) are in alignment with food security and tourist development objectives of Vision 2030. Green entrepreneurship strategies will influence the ecosystem most effectively when aligned with national

policy priorities, natural resource endowments, and cultural competencies (Cao et al., 2021). Organic agriculture and ecotourism satisfy these conditions in the Saudi setting. The fourth-place ranking of renewable

energy (69.8%) may be an underestimation of its strategic importance given Vision 2030's target of 50% renewable electricity; future research should focus on the barriers to renewable energy SME establishment in KSA to understand why RA civil servants rank it lower than agriculture and tourism.

The consolidated EEF-AHP-SWOT results lead to the following four theoretical propositions:

1. The development of green entrepreneurship ecosystems in resource-rich Gulf economies transitioning towards sustainability is driven predominantly by the quality of institutional governance capacity rather than natural resource endowments, leading to an asset-governance paradox where natural wealth coexists with limited green entrepreneurial activity.

2. Across emerging Gulf economies, public institutional bodies consistently emphasize the regulatory and financial ecosystem conditions, rather than natural asset or cultural conditions, recognizing that institutional and financial shortcomings are the most important barriers to the activation of the green entrepreneurship ecosystem.

3. Demand-side cultural barriers, especially the perception of green products as luxury products, are more significant constraints to market viability of green entrepreneurship in Saudi Arabia than supply-side barriers. Policy interventions targeted at consumers, as well as regulatory and financing reforms on the supply side, are necessary.

4. National policy frameworks based on Vision 2030 create a systematic bias in the prioritization of green entrepreneurship strategies by regional authorities in favor of sectors directly related to food security and tourism development. This is indicative of the co-evolutionary relationship between national policy goals and sub-national institutional preferences in sustainability transitions of the GCC.

CONCLUSION

An integrated EEF-AHP-SWOT approach was used to provide the first priority-weighted evaluation of the enablers and barriers of green entrepreneurship in Saudi Arabia. The main contribution is an empirical illustration of the asset-governance paradox. Saudi Arabia's abundant natural resources provide a strong basis for green entrepreneurship, but the regulatory, financial, and human capital frameworks needed to exploit these resources are underdeveloped. It is these institutional and knowledge gaps, not any shortage of natural resources, that pose the greatest obstacles to the growth of the green entrepreneurial ecosystem. This finding adds to the natural resource-based view (NRBV) literature and to work on institutional capacity, with domain-specific evidence from a GCC context.

The study also makes a methodological contribution. It introduces a replicable hybrid framework that integrates EEF domain mapping and AHP prioritization with SWOT survey analysis, addressing the methodological limitations of standalone SWOT analysis, such as its atheoretical approach and lack of modeling systemic interdependencies (Kajanus et al., 2012; Nguyen & Tuyen, 2025; Benzaghta et al. 2021), while maintaining the contextual richness and ease of understanding associated with SWOT for policy audiences. This paradigm is relevant to evaluate green entrepreneurship ecosystems in similar developing economies in the MENA region and beyond.

The consolidated findings lead to six policy proposals:

1. Develop a comprehensive regulatory framework for green entrepreneurship by converting Vision 2030's environmental commitments into actionable standards, incentive mechanisms and compliance support mechanisms. The highest AHP priority weight of 0.28 for the Policy and Regulatory Environment domain indicates that it is the foremost policy intervention priority.

2. Develop dedicated green finance instruments – such as green SME loan schemes, blended public-private co-investment facilities, and a Saudi Green Bond Framework – through the NDF, CEDA and SFD – to address the patient capital gap identified in the Finance sector (w = 0.22).

3. Create university green innovation centers, develop environmental management curricula, and create structured industry-academia partnerships for green research to strategically engage Saudi higher education institutions as knowledge hubs on green entrepreneurship and address gaps in the Human Capital domain (w = 0.18).

4. Launch and implement a national green consumer education program that leverages the high social media penetration in Saudi Arabia and the national branding of Vision 2030, to change the perception of green products as luxury commodities and to encourage green consumption practices at the national level among different income groups.

5. Develop region-specific initiatives to promote green entrepreneurship in each Regional Authority, based on local natural asset strengths (e.g., Red Sea coastal ecosystems, mountain terrains, agricultural zones and protected areas) to boost ecotourism, organic agriculture and biodiversity businesses that fit regional comparative advantages.

6. Proactively engage with international green entrepreneurship networks, multilateral green finance institutions (GCF, IFC) and technology transfer programmes to accelerate the diffusion of green technologies and best practices, positioning KSA as a regional centre for green innovation in the Gulf and MENA region.

This study has several limitations. First, the survey sample is small (62 respondents, a response rate of 12.23%), so the CHIS rankings are indicative, and items with close scores should not be over-interpreted. A larger survey would allow differences between items and regions to be tested statistically. Second, the use of public personnel as surrogate informants omits the views of green entrepreneurs, consumers, and private sector participants. Future studies could survey present and future green entrepreneurs in KSA to provide cross-perspective triangulation, and could use qualitative approaches such as in-depth interviews or focus groups to capture experiences that survey tools cannot reach. Third, the cross-sectional design means that the results reflect the situation at a single point in time. Longitudinal studies that track the ecosystem during the Vision 2030 implementation period would show how policy implementation and the green entrepreneurial ecosystem evolve together. Fourth, although an AHP panel of 18 experts is within the usual range, it limits the generalizability of the domain priority weights. Future research with larger and more diverse panels may improve their stability. Fifth, a comparative study among GCC member states would allow regional benchmarking and contribute to a GCC-specific theoretical framework for green entrepreneurship ecosystems.

The transition to green entrepreneurship in Saudi Arabia is happening but it is at a very early and critical stage. The Vision 2030 program has opened up an unprecedented opportunity for policy change – but such opportunities are not forever. The integrated EEF-AHP-SWOT results of this study affirm that the Kingdom possesses the essential natural resources, institutional commitment, and growing regional authority acceptance for a successful green entrepreneurship ecosystem. The remaining tasks are hard institutional work: closing the regulatory gap, raising patient capital, developing the human capital infrastructure, and transforming consumer culture. This study offers an empirically grounded policy framework that provides a structured, priority-weighted roadmap to help Saudi policymakers, development finance institutions and regional authorities implement the green entrepreneurship objectives of Vision 2030.

AI Use Statement

During the preparation of this manuscript, I used QuillBot (quillbot.com) solely for language editing and Napkin.ai to generate figure. I reviewed and edited all content and take full responsibility for the manuscript.

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