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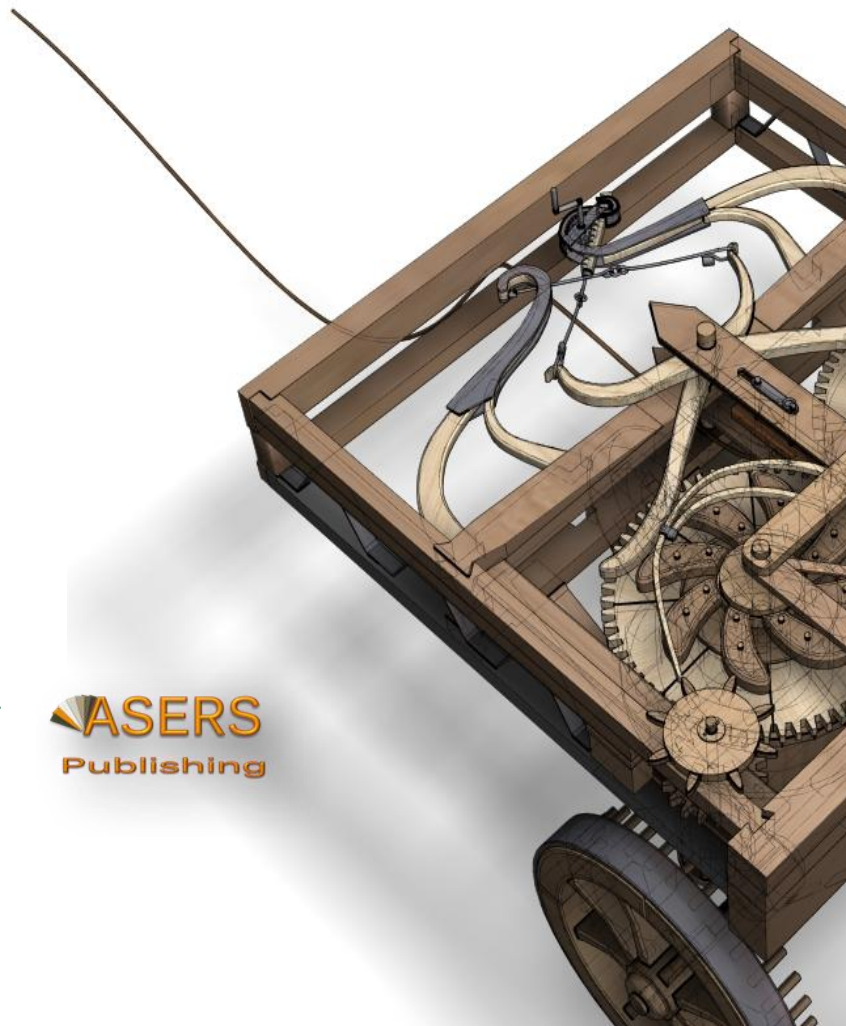
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Journal of Environmental Management and Tourism

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Sustainability Transition in Tunisian Companies: Challenges, Dynamics, and Comparative Perspectives

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Abstract: This article explores the sustainability transition of Tunisian companies in a context characterized by institutional instability, limited access to green financing, and weak regulatory incentives. Using a mixed-methods approach, the study combines a quantitative survey of 120 companies, 20 semi-structured interviews with key stakeholders, an international comparative analysis (France, Germany, Morocco), and a broader regional perspective encompassing MENA countries (Middle East and North Africa). Results show growing awareness of sustainability, but implementation remains limited. The study identifies internal/external barriers and highlights levers to overcome them. The integration of the MENA regional perspective enriches the analysis by situating the findings within a broader framework, revealing both convergences and specificities. The article offers concrete recommendations for policymakers, entrepreneurs, and researchers, emphasizing the need for systemic change involving managerial innovation, policy reforms, and greater stakeholder engagement.

Keywords: sustainability transition; Tunisian companies; Corporate Social Responsibility; institutional barriers; circular economy; international and regional comparison.

JEL Classification: Q01; Q56; M14; O17; Q53; O55.

Introduction

Today, the transition towards sustainable business models has become a strategic priority for companies. They must respond to environmental degradation, increasingly stringent regulations, and evolving societal expectations. The United Nations'2030 Agenda, with its Sustainable Development Goals (SDGs), reinforces these requirements (UNDP, 2015). At the global level, sustainable transition has become imperative to address the challenges of the climate crisis, social inequalities, and economic imbalances.

Tunisia, as an emerging economy, particularly illustrates these issues. Successful sustainability transition requires coordinated mobilization of all stakeholders: companies, government, financial institutions, and civil society. Innovation – both technological and managerial – plays a crucial role in accelerating this transition, enabling the creation of new business models and solutions tailored to local realities.

In Tunisia, while corporate sustainability is attracting growing interest among entrepreneurs, academics, and institutional actors, its implementation remains uneven and often marginal within business strategies. While some pioneering initiatives emerge, most Tunisian companies lag in integrating environmental and social concerns. This situation can be explained by a set of structural constraints, such as institutional instability, limited access to green financing, and the absence of an enabling regulatory framework.

Similar to other countries in the MENA region, these structural challenges are particularly pronounced. Companies in this region face comparable issues, including inadequate infrastructure, unsuitable regulatory frameworks, and restricted access to sustainable financing (El-Kassar & Singh, 2019; OECD, 2021). Socio-political dynamics also play a role. Heydemann (2020) notes post-2011 Arab regimes adopted exclusive social pacts, limiting companies' capacity for sustainable practices.

Within this context, a key question arises: How can Tunisian companies overcome structural and institutional challenges to achieve a successful sustainability transition? This question guides the analysis in this

article, which aims to identify the strategic and institutional levers necessary to transform these constraints into opportunities.

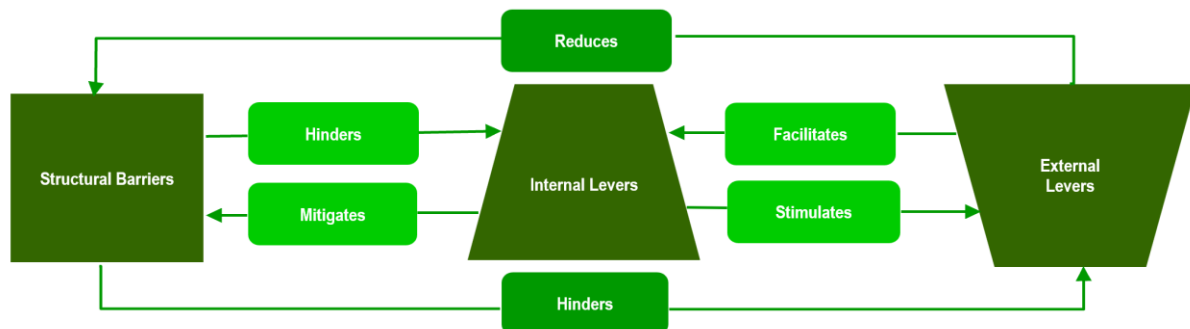
This study fills a literature gap on sustainability transition in developing countries and MENA, highlighting obstacles in “institutional voids.” Based on local empirical analysis (a survey of 120 companies and qualitative interviews) and an international comparative perspective (France, Germany, Morocco), this article aims to identify relevant levers to accelerate the sustainability transition in Tunisia and the MENA region.

The article is structured into four main sections. First, the methodology is detailed, combining quantitative and qualitative approaches to analyze obstacles and opportunities. Next, the study’s results are presented, highlighting the main barriers and levers for the transition of Tunisian companies. A thorough discussion follows, analyzing these results from a regional and international perspective, notably by comparing them with the experiences of France, Germany, and Morocco. Finally, the article concludes with concrete and operational recommendations for key stakeholders – policymakers, entrepreneurs, and researchers – to support an effective sustainability transition in Tunisia and the MENA region.

1. Literature Review: Corporate Sustainability as a Strategic Paradigm

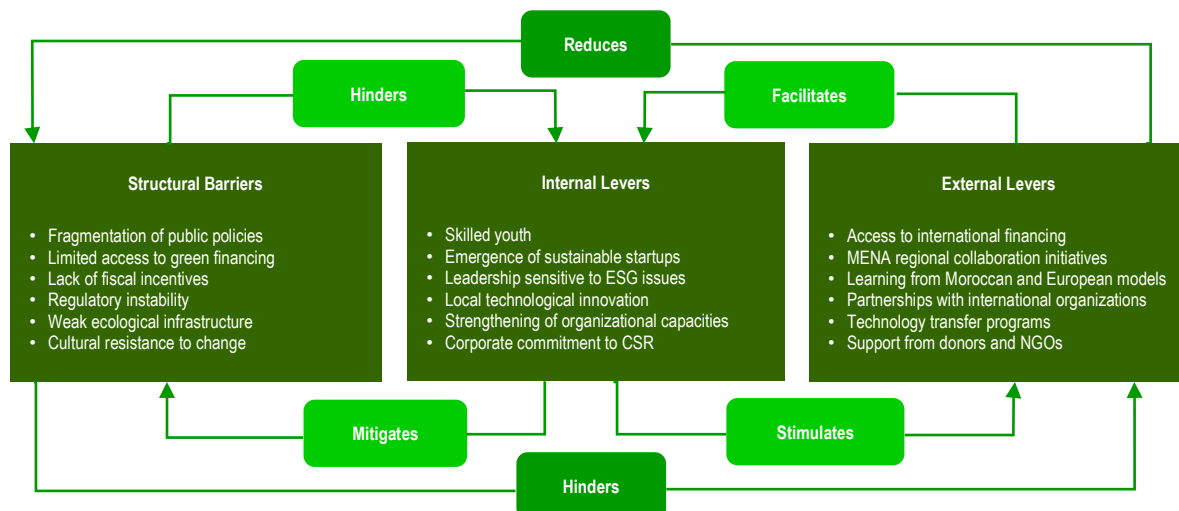
Corporate sustainability has become a key paradigm in management research, recognized as a lever for value creation and resilience (Dyllick & Muff, 2016; Baumgartner & Rauter, 2017). The dominant conceptual framework is based on the “triple bottom line” model, introduced by Elkington (1997) and updated in the context of the Sustainable Development Goals (SDGs). This model encourages companies to integrate their economic, social, and environmental performance in a holistic manner. However, the specific dynamics of regions such as MENA introduce particularities that require adaptation of Western theoretical frameworks. To analyze the sustainability transition in Tunisia, an enriched and adaptive conceptual framework is proposed. This framework adopts a cyclical structure to illustrate the ongoing interactions and interdependent dynamics between three main dimensions: structural barriers, internal levers, and external levers.

Figure 1. Conceptual Framework: Levers and Barriers to Sustainability in Tunisia



Source: Author's own elaboration.

Figure 2. Enriched Conceptual Framework: Levers and Barriers to Sustainability in Tunisia



Source: Author's own elaboration.

The arrows in the model illustrate the direct and feedback influences between these dimensions, highlighting their key role in the transition towards sustainability in Tunisia. Each of these dimensions is enriched by key variables, enabling a deeper understanding of the barriers, opportunities, and levers related to this transition.

1.1 Structural Barriers Hindering Sustainability

Structural barriers – such as institutional, economic, and cultural challenges – impede sustainability. These include the fragmentation of public policies, characterized by a lack of coordination between ministries and agencies, as well as limited access to green financing, which constrains SMEs and startups due to inadequate mechanisms. Additional obstacles include the absence of fiscal incentives to promote sustainable business models, regulatory instability caused by frequent changes in laws, weak ecological infrastructure, and cultural resistance to change, often associated with traditional models that hinder innovation. These barriers directly limit the effectiveness of both internal and external levers, hampering their deployment. Nevertheless, concrete actions and increased support can help mitigate or alleviate them.

1.2 Internal Levers: National Potential for Sustainability

Internal levers include dynamic youth and an innovative entrepreneurial ecosystem with emerging sustainable startups. A leadership increasingly aware of ESG (environmental, social, and governance) issues and the development of local solutions through technological innovation further reinforce this momentum. Additionally, the strengthening of organizational capacities and the growing commitment of companies to corporate social responsibility (CSR) complete this promising picture (Baumgartner & Rauter, 2017). The functional economy is a key internal lever. It refers to a business model in which companies prioritize the use of goods over their ownership, for example by offering services (leasing, maintenance) instead of selling products. This model promotes more efficient resource use, thereby reducing environmental impact. These internal levers also stimulate external levers by making the environment more attractive for partnerships and funding, while attenuating structural barriers through local and innovative approaches.

1.3 External Levers: Global Resources for Local Sustainability

External levers encompass numerous international opportunities to support the sustainability transition. Access to green financing, such as that available from the World Bank, is essential. Furthermore, regional collaborations within the MENA region and international partnerships provide valuable strategic and technical support. International standards, such as the European Sustainability Reporting Standards (ESRS), also offer useful tools for structuring sustainability approaches in Tunisia. Finally, integrating recent research on sustainability transitions in other emerging regions, such as Southeast Asia or Latin America, would enrich the analysis. In countries such as Thailand or Vietnam, innovative strategies for integrating the circular economy in key sectors like agriculture or manufacturing have shown promising results. Similarly, in Latin America, initiatives such as decarbonization projects in Chile or sustainable resource management in Costa Rica demonstrate how collaborative institutional frameworks can overcome constraints similar to those faced in Tunisia.

1.4 Dynamic Interactions and Systemic Approach

These three dimensions interact in a dynamic and interdependent manner. Structural barriers inhibit the deployment and impact of internal and external levers. However, a robust internal ecosystem, represented by internal levers, stimulates the interest of international partners, while external levers strengthen internal capacities through funding, technology, and expertise. Together, these levers create a virtuous cycle – a process in which each improvement drives further progress. For example, the strengthening of internal capacities attracts external funding, which in turn supports new local initiatives. Environmental indicators play a crucial role in quantifying the progress of Tunisian companies toward sustainability. Of the 120 companies surveyed, 31% have implemented actions to reduce their waste, achieving an average reduction of 15% in total volume. Industrial sectors stand out for initiatives such as source separation and material recycling, achieving the most significant results. Regarding CO₂ emissions, 25% of companies have invested in solutions to improve energy efficiency, enabling 12% of them to reduce their emissions by 10–20%. Furthermore, 22% of companies have adopted technologies aimed at reducing energy consumption, with an average reduction of 8%. These modest efforts show progress, especially among export-oriented companies, but remain limited without strong institutional and financial support. This dynamic model, based on an integrated cycle, reflects ongoing interactions in which each lever or barrier influences the others. It thus underscores the importance of a systemic and simultaneous approach to these three

dimensions in order to maximize synergies, foster continuous improvement, and build a sustainable ecosystem in Tunisia.

1.5 Specificities of the MENA Context

In the MENA region, significant structural challenges persist. Low awareness of environmental issues and the absence of strong demand for sustainable products constitute major barriers (Jamali & Karam, 2018). For example, in Morocco, although national strategies such as the NSDS have been implemented, their impact in the private sector remains limited due to a lack of coordination between public and private actors (UNDP, 2022). In North Africa, “institutional voids” refer to the absence or inadequacy of regulatory frameworks, support mechanisms, and tailored incentives to support sustainable initiatives (Sinkovics *et al.* 2014). These voids limit the structuring of efforts and hinder the emergence of innovative solutions. Such obstacles directly reduce the effectiveness of internal and external levers, hampering their deployment. Nonetheless, concrete actions and increased support can help to mitigate or alleviate them.

1.6 Global and Multi-Level Perspectives

Companies that successfully transition to sustainability often adopt business models that integrate sustainability as a core component of their value proposition (Bocken & Short, 2016; Geissdoerfer *et al.* 2018). These models rely on systemic innovation – technological, organizational, and social – and use strategies like circular and functional economy, and resource pooling. Nevertheless, in MENA countries such as Tunisia, institutional and cultural constraints hinder the widespread adoption of these models, especially among SMEs, which constitute the bulk of the economic fabric. At the global level, corporate sustainability is influenced by both internal and external factors. From an internal perspective, literature underscores the role of leadership, organizational culture, employee engagement, and innovation capacity (Aguinis & Glavas, 2019). Leaders who promote a strategic vision of sustainability are better able to drive cultural change and integrate ESG considerations into decision-making processes. Externally, the institutional framework plays a decisive role. In developed countries, clear regulations, sectoral standards, and fiscal incentives serve as drivers of transformation (Kiron *et al.* 2017; Ranta *et al.* 2018). In contrast, in developing countries, these drivers are often absent or fragmented, limiting the impact of sustainable initiatives. Sustainable transition cannot be analyzed solely at the company level. It is part of a “multi-level dynamic” involving interactions among economic actors, public authorities, educational institutions, and civil society. The so-called “ecosystemic” approach to sustainability emphasizes the co-evolution of companies and their institutional, technological, and cultural environment. This approach is particularly relevant in contexts such as Tunisia, where ecological transition requires increased coordination across different levels of governance. This theoretical framework thus enables the identification of levers and barriers to sustainability transition, while considering the structural and cultural specificities of developing countries such as those in the MENA region.

2. Research Methodology

This research is based on a mixed-methods approach, combining quantitative techniques (a survey of 120 companies) and qualitative techniques (20 semi-structured interviews), following a triangulation logic inspired by Creswell's work (2014). This approach aims to provide an integrated and contextualized understanding of the dynamics of sustainability transition in Tunisian companies. By cross-referencing the perceptions of economic actors, the analysis of reported practices, and the experiences of countries facing similar challenges, the study seeks to identify national specificities while situating them within an international and regional framework, including a comparative perspective with countries from the MENA region.

Table 1. Overview of the methodological framework

Triangulated Methodological Approach		
120 Questionnaires	20 Semi-structured Interviews	France, Germany, Morocco, MENA countries vs. Tunisia
Analysis Tool: SPSS	Analysis Tool: NVivo	Analysis Tool: SWOT

Source: Author's own elaboration.

2.1 Quantitative Approach: Survey of Tunisian Companies

A quantitative survey was conducted (March–June 2024) with 120 Tunisian companies, balancing feasibility and representativeness. Methodological limitations, like selection bias, are discussed in the study limitations section. Geographical sampling covers the North, Center, and South regions of the country. These regions were selected

to reflect the economic and social disparities in Tunisia, thereby providing a comprehensive view of sustainability dynamics in diverse contexts. The surveyed companies come from three main sectors: industry, services, and agriculture. The table below presents the distribution of companies by sector.

Table 2. Distribution of companies by sector

Sector	Percentage
Industry	42%
Services	38%
Agriculture	20%

Source: Survey data collected and processed by the author.

2.1 Quantitative Approach: Survey of Tunisian Companies

The sampling was purposively designed to include companies of various sizes, ranging from very small enterprises (VSEs) to large companies, while ensuring balanced geographical coverage. This choice guarantees a diversity of experiences and contexts, reflecting regional and sectoral variations in the adoption of sustainable practices. Statistical analysis reveals a significant association between company size and the level of engagement in sustainability, as confirmed by the Chi-square test (see Appendix C, Table C.1).

The data collected were enriched by key insights from interviews. For example, a Tunisian manager stated:

“Our European clients impose sustainable standards on us, but locally, there is no support to comply with them.” This remark illustrates the international pressures faced by some Tunisian companies in the absence of adequate local support mechanisms. The questionnaire, based on literature (Sinkovics *et al.* 2014; Kiron *et al.* 2017; Geissdoerfer *et al.* 2018), covers company information, adoption of sustainable practices, motivations, obstacles, and stakeholder relationships.

The analysis of correlations between the different dimensions of sustainability reveals significant associations: governance is positively correlated with environmental (0.45) and social (0.32) scores, just as the environmental dimension is correlated with the social dimension (0.61). These results are detailed in the correlation matrix presented in Appendix C (Table C.3).

The questionnaire included closed questions, notably five-point Likert scales, as well as open-ended questions. A pre-test was conducted with ten companies to ensure the clarity and relevance of the questions. Data were analyzed using SPSS software (version 26). Descriptive analyses, such as means, frequencies, and standard deviations, were performed, as well as bivariate analyses, including Chi-square tests and Pearson correlations.

An exploratory factor analysis (EFA) was also conducted to identify the underlying structural dimensions of observed sustainability practices. The results of the exploratory factor analysis confirm the multidimensional structure of sustainable practices, with three main factors explaining 77.5% of the total variance. The detailed factor loadings for each variable attest to the coherence of the identified dimensions (see Appendix C, Table C.4). The table below summarizes major barriers faced by Tunisian companies during the sustainability transition.

Table 3. Barriers to the adoption of sustainable practices

Barriers to Adoption	Number of Responses	Percentage (%)
Lack of funding	9	45
Lack of internal skills	8	40
Low customer interest	6	30
Regulatory constraints	5	25
Resistance to change	7	35
Other	3	15

Source: Survey data collected and processed by the author.

Lack of funding (45%) and internal skills (40%) are main barriers, highlighting the need for grants, training, and tax incentives. Resistance to change (35%) and regulatory constraints (25%) also call for a better institutional framework and awareness.

The exploratory factor analysis enabled the construction of a typology of Tunisian companies according to their level of commitment to sustainability. The following table summarizes the characteristics, barriers, and opportunities associated with these categories:

Table 4. Typology of Tunisian companies and their characteristics

Category	%	Description	Main Barriers	Opportunities / Key Levers
Passive	42	No formal sustainability measures	Weak institutional incentives	Green investment tax credits
Reactive	37	Ad hoc actions under external pressure	International client pressure	Simplified access to green financing
Proactive	21	Strategic and cross-cutting integration of sustainability	Limited local recognition	Creation of national labels for visibility

Source: Survey data collected and processed by the author.

Company strategies form three groups: Innovators (20%), Followers (majority), and Traditionalists (Appendix C, Table C.2). These profiles underline the diversity of approaches adopted by Tunisian companies regarding sustainability. They also reveal their specific needs in terms of institutional support, capacity building, and funding. These observations confirm the conclusions of Sinkovics *et al.* (2014), who note that “institutional voids” hinder the systematic integration of sustainability in companies in developing countries.

2.2 Qualitative Approach: Semi-Structured Interviews

In addition to the quantitative survey, semi-structured interviews were conducted between April and July 2024. This qualitative method made it possible to deepen the understanding of internal dynamics and often implicit patterns of action within Tunisian companies. A total of twenty interviews were carried out with key actors from the Tunisian entrepreneurial ecosystem. The panel included ten business leaders – five of whom were engaged in sustainability initiatives and five who were not – four experts in Corporate Social Responsibility (CSR) and sustainable development, three representatives of Tunisian public institutions, and three representatives of international funding agencies such as GIZ and UNDP.

The diversity of the interview panel was ensured by a balanced distribution of participants among business leaders, CSR and sustainability experts, public sector representatives, and funding agencies. The detailed breakdown of participants by professional category is presented in Appendix D (Table D.2). Interviews were conducted either face-to-face or via video conference, with an average duration of sixty minutes. The interview guide was structured around five main themes: respondents’ perceptions of sustainability, strategies implemented within companies, internal and external constraints encountered, the role of stakeholders in sustainability dynamics, and perspectives on future trajectories. Qualitative data were analyzed using NVivo software, following an inductive approach. Interview transcripts were thematically coded, enabling the identification of recurrent themes, divergences, and contextual specificities. This analysis enriched the quantitative results by highlighting subjective and contextual elements often absent from questionnaire responses.

The circular economy, a major theme in interviews, offers Tunisia a way to reduce resource dependence via reuse, recycling, and eco-design. 17% of companies use circular principles (12% recycling, 7% eco-design). Agri-food firms valorize waste, but adoption faces regulatory, funding, and awareness obstacles. Drawing on international models such as the “Noor Ouarzazate” project in Morocco, public-private partnerships, tax credits, and national certification labels could catalyze the adoption of the circular economy in Tunisia. For example, a manager of an industrial SME based in the central region stated: *“We know we should integrate sustainable practices, but without financial support or clear incentives, it’s almost impossible.”*

This testimony illustrates both the awareness among certain managers and the financial obstacles they face. Another example comes from a sustainable development expert, who emphasized: *“Tunisian companies, especially the smaller ones, view sustainability as an additional cost rather than a long-term investment. There needs to be a shift in mindset, supported by strong public policies.”*

This observation highlights a widespread perception that hinders the adoption of sustainable practices, especially among small and medium-sized enterprises. The interviews also revealed generational divergences. A young executive in the technology sector stated: *“For me, integrating sustainability is an opportunity to stand out in the international market. Foreign clients value these practices, and it gives us a competitive edge.”*

In contrast, a more experienced leader of an agricultural company expressed reservations: *“Sustainability is good, but our priorities remain survival and profitability. We cannot afford to take additional risks.”*

These quotes illustrate contrasting views of sustainability, shaped by age, sector, and managerial experience. Finally, participants unanimously emphasized the importance of stakeholders in sustainability

dynamics. A representative of a public institution noted: “*There is a real need for coordination among businesses, public institutions, and funding agencies. Without this, efforts remain isolated and ineffective.*”

This comment reflects a systemic issue of fragmented initiatives, frequently mentioned in the discussions.

In conclusion, this qualitative approach provided analytical depth to the quantitative results by illustrating the challenges, perceptions, and opportunities related to the sustainability transition in Tunisian companies. The anonymized quotations from participants strengthen the validity and richness of the analysis by offering varied and contextual perspectives.

2.3 International Comparative Analysis and the Sustainability Transition in Tunisia: SWOT Perspective

To contextualize the Tunisian case within a broader perspective, a comparative documentary analysis was conducted using the SWOT method (Strengths, Weaknesses, Opportunities, Threats). Three countries – France, Germany, and Morocco – as well as a regional MENA perspective, were selected for this analysis. The choice of these countries and the MENA region is based on their geographical, cultural, or economic proximity to Tunisia, as well as their varying degrees of institutional maturity in terms of sustainability. Documentary sources included national and regional sustainable development strategies, public policy evaluation reports, scientific publications, and reports from international organizations such as the OECD, UNIDO, and UNDP. The results of this analysis are summarized in the following table, which is further enriched with specific examples for each country to enhance the relevance of recommendations for Tunisia:

Table 5. Comparative SWOT analysis supporting strategic reflection on the sustainability transition in Tunisia

Country/ Region	Strengths	Weaknesses	Opportunities	Threats
France	Structured regulatory framework, support networks	Administrative complexity	Energy transition, European green market	Inflation, political instability
Germany	Green industry, support for R&D	High labor costs	Technological leadership	Asian competition
Morocco	Clear national strategy, royal backing	Weak CSR culture in SMEs	South-South cooperation	Dependence on donors
Tunisia	Entrepreneurial dynamism, skilled youth	Weak incentives, regulatory instability	International partnerships	Institutional voids
MENA	Abundant natural resources, growing market	Weak institutional frameworks, regional fragmentation	International green financing, regional integration	Geopolitical conflicts, economic instability

Source: Author's own elaboration.

This comparison reveals practices adaptable to Tunisia's context. France's FRET21 (an initiative aimed at reducing the environmental impact of freight transport in France) shows collaboration's value, Germany highlights R&D's role in innovation, and Morocco provides an example of institutional mobilization for renewables (Noor Ouarzazate). In the case of the MENA region, the abundance of natural resources and demographic growth offer unique opportunities, but institutional and geopolitical challenges remain major obstacles to a coordinated and sustainable transition. This regional perspective contributes to the reflection on the institutional and strategic levers needed to accelerate the sustainability transition of Tunisian companies, while strengthening regional collaborations to maximize the impact of initiatives.

3. Research Results and Discussions

Findings show that, while most respondents recognize the importance of sustainability, operational implementation remains limited and fragmented. Recent studies show that the adoption of sustainable practices is directly linked to pressure from international supply chains (Kittinun, 2024). This gap between awareness and concrete action reflects significant structural and institutional constraints. For example, some companies report difficulties accessing green funds despite international commitments or encounter the absence of clear regulations supporting sustainable investments.

3.1 Contribution to Literature

This study contributes to enriching existing literature by providing new theoretical perspectives. It deepens the concept of "institutional voids" within the framework of sustainability transition. These voids – characterized by the absence of clear regulatory frameworks, financial support mechanisms, and fiscal incentives – hinder the adoption of sustainability practices, as confirmed by the work of Sinkovics *et al.* (2014). Unlike advanced

economies, where institutional frameworks are generally well established, this study shows that these gaps can slow progress and exacerbate sectoral and generational disparities. Furthermore, the results challenge and enrich two major theoretical frameworks. First, the Triple Bottom Line (TBL) is revisited through the lens of dominant economic priorities in Tunisia, with social and environmental dimensions less integrated. Second, although the principles of the circular economy are mentioned by some companies, their systematic application remains limited. This underscores the need to adapt these frameworks to the specificities of developing countries, where institutional and financial resources are limited. Finally, the study highlights the role of young leaders as key actors in the sustainability transition due to their heightened sensitivity to ESG issues, reinforcing arguments in favor of an intergenerational approach. As mentioned in the introduction, Arab regimes, in response to the 2011 uprisings, adopted repressive and exclusive social pacts, thereby restricting universal economic and social rights and redefining them as selective privileges (Heydemann, 2020). This context broadens our understanding of the structural obstacles observed in Tunisia, particularly regarding limited access to green financing and the absence of fiscal incentives - a finding consistent with dynamics observed in other MENA countries, where companies face similar challenges (OECD, 2021).

3.2 Quantitative Survey Results

Only 38% of surveyed Tunisian companies have a formal CSR policy, similar to Algeria and Egypt (El-Kassar & Singh, 2019). Of these, just 22% publish sustainability reports, usually for foreign partners such as donors or international clients. This dependence on external requirements reflects a sporadic and unsystematic diffusion of sustainability-related information. Tunisian companies focus on visible actions (waste reduction 31%, energy savings 25%); complex practices like eco-design (12%) or stakeholder engagement (14%) are rarer due to higher costs and weak institutional support. These trends are consistent with regional and international dynamics: many companies, though mentioning concepts like the circular economy in their reports, struggle to integrate them fully into their strategies (Opferkuch *et al.* 2022). The following table summarizes the main sustainable practices, their adoption frequency among Tunisian companies, and their perceived positive impact:

Table 6. Sustainable practices, adoption frequency, and perceived impact

Sustainable Practice	Description	Adoption Frequency (%)	Perceived Positive Impact (%)
Waste reduction	Strategies to minimize waste	31	75
Energy savings	Measures to reduce energy consumption	25	70
Internal recycling	In-company recycling processes	21	65
Diversity policy	Promoting diversity and equality	19	50
Stakeholder dialogue	Collaboration with stakeholders	14	80
Eco-design	Environmentally friendly product design	12	65
Other local initiatives	Local initiatives and philanthropy	9	60

Source: Survey data collected and processed by the author.

These results show that Tunisian companies prioritize short-term strategies offering immediate benefits, notably in terms of operational cost reduction. However, this approach limits the development of long-term initiatives, such as eco-design or the circular economy, which could strengthen their competitiveness in the international market. Wider adoption requires strong institutional support, financial incentives, targeted training, and better awareness of sustainability's benefits (Hanna *et al.* 2023).

The stakeholder priorities identified in this study highlight diverse motivations. Awareness-raising (80%), brand image enhancement (65%), and the adoption of renewable energy (60%) are among the main strategic priorities of the interviewed leaders and experts. These priorities are reinforced by pressure from international partners and the desire to innovate, although the latter remains less prioritized (35%). Table 7 summarizes these priorities.

These figures indicate a still limited adoption of advanced environmental practices. The absence of a systemic transformation in the strategies of Tunisian companies is constrained by organizational barriers and a lack of institutional support.

Table 7. Stakeholder priorities in the sustainability transition

Priority/ Motivation	Business Leaders (%)	Experts (%)	Public Institutions (%)	Donors (%)	Average (%)	Key Observations
Awareness-raising	80	90	80	70	80	Main priority for collective engagement
Social responsibility	50	80	70	80	70	Required by international partners
Renewable energy	70	60	60	50	60	Strategic opportunity in the Tunisian context
Brand image	70	80	60	50	65	Important for exporting companies
Waste reduction	60	70	50	40	55	Initiative that can strengthen ecological practices
Technological innovation	40	50	30	20	35	Low priority due to high initial costs

Source: Survey data collected and processed by the author.

In the MENA region, the adoption of green technologies and practices within companies is influenced by both organizational and institutional factors. A study by Ayouni and Zouiri (2024) shows that proactive environmental management, supported by environmental regulation, plays a decisive role. Financial exposure to environmental obstacles acts as a moderator, revealing complex relationships between financial constraints and the adoption of green technologies and practices. These results underscore the importance of appropriate institutional frameworks to encourage sustainable practices in companies. In this context, indicators such as the Just Transition Score, proposed by Htitch (2024), could enable a comprehensive assessment of social and environmental sustainability at the country level. In Tunisia, such measures, combined with institutional reforms and targeted incentives, are essential to accelerate the adoption of sustainable practices and transform current obstacles into economic and strategic opportunities.

3.3 Qualitative Interview Results

Interview data nuanced the survey results and revealed internal dynamics. Many leaders want to transition to sustainability but face structural barriers. Among these are a lack of access to green financing, the absence of appropriate tax incentives, and a regulatory framework considered unclear and not sufficiently supportive. A manager of an industrial SME based in Sfax stated: *"We want to do well, but there is little concrete support. And our local clients are not yet sensitive to these arguments."*

This testimony highlights the gap between the willingness to act and the economic and institutional reality. Moreover, several interviewed experts pointed out the fragmentation of public policies related to sustainability. Existing mechanisms are often poorly coordinated, and their implementation remains largely centralized, with insufficient involvement from local authorities. To address these institutional voids, it would be relevant to propose specific reforms, such as the creation of a simplified regulatory framework to encourage SMEs to adopt sustainable practices. Furthermore, tax incentives, such as tax credits for green investments or subsidies for energy audits, could catalyze broader adoption of sustainable practices in Tunisia. Another important observation concerns the difference in approach between generations. Younger leaders seem much more attuned to ESG issues and the opportunities offered by sustainable innovation.

An expert based in Morocco noted: *"The future of sustainability in the region depends on the younger generation, who are more open to responsible innovation."*

This generational shift could be a medium-term driver of transformation.

These results are in line with the work of Hahn *et al.* (2016), who stress the importance of strategic leadership in promoting organizational sustainability. They highlight that young leaders, thanks to their increased sensitivity to ESG issues, could play a central role in developing more responsible and innovative business models.

3.4 International Comparative Analysis Results

The SWOT-based comparative analysis shows Tunisia's institutional lag, mainly due to unclear regulations, weak subsidies, and lack of policy evaluation. These gaps limit the capacity of Tunisian companies to fully engage in sustainable practices.

The comparison of regulatory frameworks for sustainability highlights marked differences among the countries studied. While France and Germany have structured frameworks with strong institutional support, Morocco and Tunisia are characterized by emerging mechanisms and specific challenges. A comparison of regulatory frameworks and levels of sectoral engagement in different countries illustrates these disparities. The table below summarizes the strengths, weaknesses, and engagement levels observed in France, Germany, Morocco, and Tunisia:

Table 8. Regulatory frameworks, strengths, weaknesses, and sectoral engagement levels

Country/ Sector	Regulatory Framework	Strengths	Weaknesses	Engagement Level (%)
France	Structured	Support networks	Administrative complexity	Industry: 40
Germany	Structured	Support for R&D	High labor costs	Services: 35
Morocco	Emerging	Royal backing	Weak CSR culture in SMEs	Agriculture: 25
Tunisia	Emerging	Entrepreneurial dynamism	Weak incentives, regulatory instability	-

Source: Author's own elaboration.

This table shows that countries like France and Germany benefit from well-structured frameworks that foster innovation and the adoption of sustainable practices through support networks and substantial R&D investments. These frameworks pose administrative and financial challenges, particularly for SMEs.

Conversely, emerging countries such as Morocco and Tunisia display promising entrepreneurial dynamism but suffer from institutional weaknesses, notably a lack of CSR culture in SMEs and limited financial incentives. Morocco, however, has distinguished itself through ambitious initiatives within its National Sustainable Development Strategy (NSDS), offering a possible model for Tunisia.

3.4.1 The Case of Morocco: A Promising Regional Model

In comparison, Morocco stands out for significant progress through international partnerships and a strategic vision promoted at the highest level of the State, particularly through the National Sustainable Development Strategy (NSDS). Although it shares certain structural constraints with Tunisia, Morocco has effectively mobilized stakeholders around common objectives through targeted and better-coordinated public policies.

According to research by Sakhraoui *et al.* (2024), Morocco has significantly reduced its dependence on fossil fuels by investing in renewable energy, especially solar and wind. Since 2009, large-scale projects have been implemented, recently followed by decentralized initiatives such as MG-Farms, enabling the country to reach 38% renewable energy in 2022. To reinforce this analysis, it would be relevant to integrate concrete examples such as Moroccan initiatives in renewable energy, notably the Noor Ouarzazate solar project. Details on how Morocco managed funding and mobilized local actors could provide valuable lessons for Tunisia.

Nevertheless, challenges remain, notably centralized governance and limited engagement of local stakeholders. Greater decentralization and a more robust institutional framework would be necessary to sustain these advances and offer a reproducible model for other emerging economies, including Tunisia.

3.4.2 European Lessons: Innovation and Collaboration

In Europe, the European Green Deal constitutes a major strategic framework aiming for carbon neutrality by 2050. A recent study on the Visegrád Group (Poland, Hungary, Slovakia, and the Czech Republic) by Kwilinsk *et al.* (2025) reveals that technological innovation plays a key role in ecological transition and green economic growth. However, this study also highlights significant disparities between these countries, requiring tailored policies to maximize the benefits of innovation.

In France, it would be relevant to deepen the analysis of programs such as FRET21 or the energy renovation plan. These initiatives have helped reduce CO₂ emissions while fostering collaboration between companies and public authorities. Simplifying these models to adapt them to the Tunisian context could be an effective lever for transformation. Touratier-Muller and Ortas (2021) show that the FRET21 program, aimed at sustainable freight transport, improved stakeholder collaboration, although corporate efforts relied more on internal dynamics than on regulatory constraints. These lessons are pertinent for Tunisia, where similar initiatives could be implemented to promote a sustainable transport system.

Nadel and SavèsMarra (2025) add that corporate governance plays a key role in promoting green investments. Their study, conducted on the French manufacturing industry, reveals that the adoption of sustainable management tools is more effective than the symbolic integration of stakeholders for fostering

decisions aligned with sustainability objectives. These findings highlight the need for companies, including in Tunisia, to move beyond symbolic approaches and implement structural reforms to effectively align ecological and social interests.

In Germany, strong technological leadership and substantial support for research and development are major assets. However, the country faces difficulties in mobilizing SMEs in the ecological transition. This observation underscores the importance for Tunisia of supporting innovation among small businesses while adapting accessible reporting standards to encourage their participation. Filho *et al.* (2025) showed that the adoption of European sustainability reporting standards (ESRS) enabled the standardization of transparency in the performance of European companies, but SMEs suffer from a lack of resources and support. These conclusions offer pathways to structure sustainability practices in Tunisia, with specific support for medium-sized and small enterprises.

3.4.3 Contributions from the MENA Region: Common Challenges and Opportunities

A recent study by Senturk *et al.* (2025) conducted in 12 MENA countries analyzes the effects of the subcomponents of economic freedom on the load capacity factor (LCF). The results show that elements such as judicial efficiency and economic freedoms (business, trade, investment) improve LCF, while monetary and financial freedom have negative effects. This underlines the importance of appropriate economic frameworks and structural reforms for successful sustainable transitions in this region. These findings are also applicable to Tunisia, where institutional reforms and targeted incentives could catalyze sustainable transitions. For example, Morocco's efforts in renewable energy demonstrate that international partnerships and targeted investments can transform environmental challenges into economic opportunities.

3.4.4 Global Perspectives: Transferable Lessons

In other contexts, such as Thailand, strategic and holistic approaches have been adopted in certain sectors, such as the cosmetics industry. Suphasomboon and Vassanadumrongdee (2023) show that multinational companies in this country have integrated sustainability into their activities, unlike small local firms, which lack resources and an understanding of life cycle impacts. These findings highlight the importance of enhancing the transparency of business practices and consumer trust through mandatory sustainability reporting, expanded regulations, and financial incentives. These measures provide interesting pathways for Tunisia, where similar regulatory and resource challenges hinder sustainable transitions. Finally, according to Marra *et al.* (2024), the availability of natural resources influences how countries approach the sustainability transition. In countries with low resource depletion, such as Tunisia, sustainability relies on historical trajectories, but these countries do not benefit as much from the positive effects of structural and technological change as do countries with high resource depletion. These results reinforce the necessity for Tunisia to implement strategic management of its natural resources and to reduce economic inequalities to succeed in its ecological transition.

3.4.5 Synthesis of Results and Recommendations

This study examines the challenges and dynamics facing Tunisian companies in their transition towards sustainable practices. To connect results to recommendations and international best practices, analysis is provided at both international and Tunisian levels.

3.4.5.1 International Comparative Perspective

The table below summarizes the strengths, weaknesses and recommendations resulting from the analysis of international approaches:

Table 9. Comparative SWOT analysis and recommendations for Tunisia

Country/ Region	Strengths & Advances	Weaknesses & Challenges	Recommendations for Tunisia
MENA (incl. Morocco)	- Green energy projects (Morocco: 38% renewable energy in 2022) - International partnerships - Economic freedoms supporting resilience	- Centralized governance (Morocco) - Limited local stakeholder engagement - Lack of adapted regulatory frameworks - Weak fiscal and financial incentives	- Encourage decentralization of initiatives - Reform institutional frameworks - Introduce targeted fiscal incentives, especially for SMEs - Mobilize stakeholders around common objectives

Europe	- European Green Deal (carbon neutrality by 2050) - Technological leadership (Germany) - Structured public policies (France) - Advanced reporting standards - Collaborative programs (e.g., FRET21)	- Administrative complexity (France, a barrier for SMEs) - Difficulties mobilizing SMEs (Germany) - Regional and generational disparities in ecological engagement	- Simplify administrative processes for SMEs - Support SME innovation with targeted incentives - Develop policies tailored to Tunisian specificities - Promote standard tools for measuring environmental impacts
Other (Thailand, etc.)	- Strategic approaches in sectors like cosmetics - Importance of mandatory reports and transparency	- Lack of resources for local companies - Regulatory gaps	- Enhance transparency in sustainable practices - Develop financial incentives for emerging industries

Source: Author's own elaboration.

3.4.5.2 Focus on Tunisian Specificities

The following table links specific observations in Tunisia to concrete recommendations, enriched by international inspirations adapted to the local context.

Table 10. Link between Tunisian observations, concrete recommendations, and international inspirations

Observed Results	Examples from Collected Data	Proposed Recommendations	International Inspiration
42% "passive" companies do not adopt sustainability	<i>"Our priorities remain survival and profitability."</i> (Manager of an agricultural SME)	Implement fiscal mechanisms such as tax credits for green investments	France: Tax credits for building energy renovation
Lack of coordination among companies, public institutions, and donors	<i>"Efforts remain isolated and ineffective without coordination."</i> (Public sector representative)	Establish collaborative platforms for sharing best practices and fostering partnerships	France: Collaborative programs like FRET21 for CO ₂ reduction in transport
37% "reactive" companies act under external pressure (international clients)	<i>"Our European clients impose sustainable standards, but locally, there is no support."</i> (Industrial manager)	Simplify access to green finance with a one-stop shop for SMEs	Germany: Public support for green innovation via specialized agencies
Financial barriers perceived by SMEs as a major obstacle to adopting sustainable practices	<i>"Without financial support or clear incentives, it's almost impossible."</i> (Industrial SME manager)	Offer low-interest credit lines for small businesses	Germany: Subsidies for solar and wind energy projects
21% "proactive" companies integrate sustainability strategically	<i>"Integrating sustainability is an opportunity to stand out in the international market."</i> (Young tech leader)	Create national labels and awards to highlight pioneering companies	Morocco: Labels for renewable energy projects (e.g., Noor Ouarzazate)
Absence of a strategic and stable vision in Tunisian institutions	<i>"A mindset change supported by strong public policies is needed."</i> (Sustainable development expert)	Develop a clear and coherent regulatory framework to enhance institutional stability	Morocco: National Sustainable Development Strategy (NSDS)
Need for clear indicators to measure progress in sustainable initiatives	<i>"We don't really know how to measure the impact of our efforts."</i> (Agricultural SME manager)	Create specific indicators and publish annual reports on sustainability progress	OECD: Recommendations on using indicators to track environmental performance
Generational differences in perceptions of sustainability	Young leaders see sustainability as a strategic lever, while experienced managers focus on immediate profitability	Develop cross-generational mentoring programs	USA: Intergenerational mentoring to foster SME innovation

Source: Author's own elaboration.

These results confirm the conclusions of Schröder *et al.* (2019), who emphasize the importance of strong institutional frameworks to mobilize stakeholders around sustainability. Tunisia must overcome institutional

fragmentation and promote an inclusive vision of sustainability, involving businesses, public authorities, educational institutions, and civil society.

To accelerate the sustainable transition, it is essential to support Tunisian companies by strengthening financing mechanisms and institutional frameworks. A one-stop shop could simplify access to green finance and subsidies, particularly for SMEs. Furthermore, the integration of mandatory environmental audits for medium and large companies would help standardize sustainability efforts. International collaborations are also a key lever for promoting technology transfer and the sharing of best practices. Inspired by examples such as Morocco's renewable energy initiatives, Tunisia could also develop national labels to promote circular companies and their innovations. Finally, the establishment of national indicators to measure reductions in waste, CO₂ emissions, and energy consumption would enhance transparency and encourage companies to intensify their efforts.

A co-construction and shared governance approach would ensure a sustainable transition tailored to local realities and inspired by international best practices. Free environmental audits, training, and sharing platforms would accelerate the sustainable transition. Inspired by Moroccan and European examples, these measures would help structure a framework adapted to the Tunisian context and encourage local innovation.

3.5 Link between Results and Recommendations

The results of this study combine quantitative and qualitative data to provide a comprehensive analysis of sustainable practices in Tunisian companies. This cross-approach highlights both convergences and divergences between the two types of data, justifying the recommendations made. Qualitative observations enrich the quantitative findings by offering explanations for the statistical figures. For example, quantitative data show that 31% of companies reduce their waste, but only 17% integrate circular economy principles. Qualitative interviews reveal that this limited adoption is linked to financial and institutional obstacles. A manufacturing sector leader stated: *"Recycling is expensive and not profitable without subsidies."* These insights explain why the figures remain modest despite increased awareness. Similarly, the 37% of companies classified as "reactive" in the quantitative data are echoed in qualitative testimonies. These companies take ad hoc measures, mainly in response to external pressures. An industrial company executive explained: *"We started investing in sustainable practices only because our European clients demanded it."* This complementarity between quantitative and qualitative data allows for a clear identification of the external motivations influencing these behaviors. The recommendations from this study are directly justified by the data collected. Qualitative observations highlight marked generational divergences in the perception and adoption of sustainable practices. Young leaders are more sensitive to ESG issues and see sustainability as a long-term strategic opportunity. In contrast, more experienced leaders often prioritize immediate profitability and express reluctance to invest in sustainable initiatives due to economic uncertainty. For example, a tech entrepreneur stated: *"Environmental issues are not just a constraint, but an opportunity to stand out in the international market."* Conversely, an agricultural SME manager said: *"Our priorities remain survival and profitability. Sustainability is a luxury we cannot afford."* These divergences justify the establishment of intergenerational mentoring programs. Such programs would allow young leaders to share their vision and innovative practices with more experienced generations, while benefiting from their operational and strategic expertise. This synergy could not only reduce internal resistance but also accelerate the adoption of sustainable models in Tunisian companies by aligning strategic priorities with long-term perspectives. The data also show that 21% of companies surveyed take a proactive approach, strategically integrating sustainability into their business models. These companies, often led by young leaders, stand out for their willingness to comply with international standards and position themselves as exemplary actors in their sector. However, the same qualitative data reveal that these efforts remain largely invisible nationally, due to a lack of institutional recognition or local valorization. A proactive company manager said: *"We invest in sustainability to satisfy our international partners, but there is no advantage or recognition locally."*

In this context, the introduction of national labels could fill this gap. These labels would offer several advantages. First, they would recognize and incentivize pioneering companies, thus strengthening their visibility and credibility in the national market. Then, they would create a ripple effect by encouraging other companies to adopt sustainable practices, highlighting the competitive advantages gained. Finally, unlike other international mechanisms often perceived as inaccessible, these national labels would be designed to reflect local specificities, especially economic and institutional constraints. The success of Moroccan initiatives, such as labels for renewable energy projects (e.g., Noor Ouarzazate), illustrates the effectiveness of such recognition in similar contexts. In Tunisia, these labels could play a key role in structuring a sustainable ecosystem and mobilizing local stakeholders around common objectives. The recommendations proposed in this study are not generic solutions, but measures directly justified by the data collected. Intergenerational mentoring programs address the

generational divergences observed, while national labels offer a response adapted to the needs for recognition and valorization of pioneering companies. These initiatives, rooted in Tunisian realities, aim to transform the identified obstacles into opportunities to accelerate the transition to sustainable practices.

3.6 Study Limitations

Despite providing an in-depth analysis, the study has methodological limitations, notably sampling bias. The 120-company sample, while useful for trends, is limited for robust national analysis. Since 68% of the sample are exporting SMEs, results may be biased toward practices shaped by international pressures; local-market companies are underrepresented. Another significant bias lies in the self-selection of surveyed companies. Businesses already aware of sustainability issues or with relevant experiences are more likely to participate in surveys and interviews. This can lead to an overestimation of sustainable practices within the studied sample. While these biases do not negate the relevance of the results, they should be considered in interpretation. These limitations also highlight the need for complementary methodological approaches to enrich future results and better reflect the realities of Tunisian companies.

3.7 Methodological Limitations and Improvement Perspectives

Beyond sampling-specific biases, this study presents more general methodological limitations worth discussing for future research improvements. Quantitative surveys, while efficient for identifying broad trends, are subject to response biases, especially when respondents aim to present their company favorably. Qualitative interviews, though rich in contextual details, are influenced by participant subjectivity, which can limit the generalization of findings. Additionally, the absence of a longitudinal approach prevents capturing the evolution of sustainable practices over time, limiting the understanding of change dynamics. To overcome these limitations, several improvement avenues can be considered. First, diversifying the sample to include more locally operating firms, as well as micro-enterprises and informal economy actors, would better represent the Tunisian economic landscape. Next, a longitudinal approach, following the same companies over several years, would offer a more complete perspective on triggers and obstacles to sustainability. Additionally, triangulating data by cross-referencing questionnaire and interview results with secondary data such as financial reports or environmental certifications would strengthen the robustness of conclusions. Finally, implementing incentive mechanisms, such as offering participants personalized results or practical recommendations, could encourage the participation of less aware actors, thus reducing self-selection biases. These methodological proposals aim to transform current limitations into improvement opportunities. They lay the groundwork for future, more robust and representative research, contributing to a deeper understanding of sustainability dynamics in Tunisian companies.

Conclusion

The study shows a significant gap between Tunisian companies' sustainability awareness and actual implementation, mainly due to unclear regulations, insufficient incentives, and poor stakeholder coordination. These "institutional voids," observed in several MENA countries, require tailored solutions to transform these challenges into strategic opportunities. To overcome these obstacles, it is imperative to implement a coherent national strategy aligned with sectoral priorities, with clear laws and fiscal mechanisms such as tax credits for green investments. Simplifying access to green finance, notably through one-stop shops for SMEs, could reduce administrative barriers. SMEs, which play a central role in the Tunisian economy, require specific measures to support their transition to sustainability. This could include free environmental audits, specialized training, and collaborative platforms for sharing best practices. Furthermore, initiatives such as national labels or awards for sustainable innovations would enhance the visibility of pioneering companies. Finally, to ensure the effectiveness of the actions undertaken, it is crucial to establish monitoring and evaluation mechanisms. This includes defining specific indicators to measure progress, publishing annual sustainability reports, and holding regular stakeholder consultations. Inspired by successful models, such as those in Morocco or Europe, Tunisia can capitalize on its entrepreneurial dynamism to accelerate its sustainable transition. In sum, the sustainability of Tunisian companies represents a complex challenge but also a major strategic opportunity. With dynamic youth, entrepreneurship, and a structured approach, Tunisia can overcome constraints and become a model for emerging economies.

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Credit Authorship Contribution Statement

Mohamed Farhoud: Conceptualization, Investigation, Methodology, Data collection, Software, Formal analysis, Writing – original draft, Visualization.

Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-Assisted Technologies

The author declares that he has not used generative AI and AI-assisted technologies during the preparation of this work.

Appendices

List of Acronyms and Abbreviations

1. **UNDP:** United Nations Development Programme.
2. **OECD:** Organisation for Economic Co-operation and Development.
3. **GIZ:** The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
4. **UNIDO:** United Nations Industrial Development Organization.

Appendix A – Survey Questionnaire

Sections	Questions
1: General Information	1. Sector of activity: ☐ Industry ☐ Services ☐ Agriculture ☐ Other (please specify): 2. Company size: ☐ <10 employees ☐ 10–49 employees ☐ 50–249 employees ☐ >250 employees 3. Location: 4. Year of establishment:
2: Governance and Social Responsibility	1. Does your company have a formalized Corporate Social Responsibility (CSR) policy? ☐ Yes (since which year?): ☐ No 2. If yes, which areas are covered? (multiple answers possible) ☐ Waste reduction ☐ Energy efficiency ☐ Social inclusion and professional equality ☐ Stakeholder dialogue ☐ Other (please specify): 3. Do you publish a sustainability report? ☐ Yes ☐ No
3: Environmental Practices	1. Have you integrated circular economy practices? ☐ No ☐ Yes 2. If yes, which ones? (multiple answers possible) ☐ Material recycling ☐ Eco-design of products ☐ Reduction of energy consumption ☐ Reduction of CO₂ emissions ☐ Other:
4: Motivations and Obstacles	1. What are your main objectives for adopting sustainable practices? Questions (Likert scale from 1 to 5 (1 = Not important, 5 = Very important)) Enhance brand image ☐ ☐ ☐ ☐ ☐ Meet client requirements ☐ ☐ ☐ ☐ ☐ Access to new markets ☐ ☐ ☐ ☐ ☐ Cost reduction ☐ ☐ ☐ ☐ ☐ Personal commitment of the manager ☐ ☐ ☐ ☐ ☐ 2. What are the main obstacles encountered?

	☐ Lack of funding ☐ Lack of internal skills ☐ Regulatory constraints ☐ Others (please specify):
5: Future Outlook	Do you plan to strengthen your sustainability actions? ☐ Yes, within the year ☐ In the medium term (2–5 years) ☐ No

Thank you for your participation!

Appendix B – Semi-structured Interview Guide

Themes	Interview objectives
Introduction: Presentation of the interview objective	- Understanding the internal and external dynamics influencing the sustainable transition of Tunisian companies. - Guarantee the confidentiality of responses and explain the use of the data.
1: Understanding of Sustainability	- How do you define sustainability in your sector of activity? - In your view, what are the strategic advantages of integrating sustainable practices?
2: Sustainable Practices and Circular Economy	- What concrete actions have you implemented in terms of sustainability? - Have you adopted circular economy principles (e.g., recycling, eco-design)? If yes, can you provide examples?
3: Internal and External Levers	- What internal levers have facilitated your sustainable transition? (Leadership, innovation, corporate culture...) - What are the most useful external levers for you? (Access to funding, international partnerships...)
4: Challenges Encountered	- What are the main barriers to implementing sustainable practices in your company? ✓ Institutional (regulation, funding...) ✓ Cultural (resistance to change, lack of awareness...)
5: Future Outlook	- In your opinion, how could Tunisia better support companies in their sustainable transition? - What are your medium-term sustainability objectives (2–5 years)?

Thank you for your participation and valuable contributions!

Appendix C: Statistical Analyses and Additional Results

1. Assessment Test of the Association between Company Size and Engagement

Table C.1: Chi-square Test on the Association between Company Size and Engagement

Level of Engagement	Weakly Engaged	Moderately Engaged	Proactively Engaged	Total
Observed	50	45	25	120
Expected	42	42	36	120
Chi-square: 8.76; df: 2; p-value: 0.012				

Source: Survey data collected and processed by the author.

This table presents the results of the Chi-square test assessing the association between company size and their level of engagement in sustainability. The results show a statistically significant association (p -value = 0.012), indicating that company size influences the degree of engagement.

2. Classification of Companies Based on Characteristics and Sustainability Strategy

Table C.2: Cluster Analysis of Companies by Sustainability Strategy

Cluster	Main Characteristics	% of Companies
Innovators	Strong R&D investment, rapid adoption of green tech	20%
Followers	Moderate adoption, wait for evidence before investing	50%
Traditionalists	Low adoption, focus on short-term cost reduction	30%

Source: Survey data collected and processed by the author.

This table groups companies into three distinct clusters according to their characteristics and sustainability strategy. "Innovators" represent 20% of companies, while the majority (50%) fall into the "Followers" group.

3. Assessment of Correlations between Governance, Environmental, and Social Scores

Table C.3: Pearson Correlation Matrix

Variable	Environmental Score	Social Score
Governance Score	0.45*	0.32*
Environmental Score		0.61*

Source: Survey data collected and processed by the author.

This matrix presents the correlations between governance, environmental, and social scores. Correlations significant at the 0.05 level are marked with an asterisk.

4. Exploratory Factor Analysis

Table C.4: Exploratory Factor Analysis (Explained Variance and Factor Loadings)

Explained Variance

Factor	Eigenvalues	Explained Variance (%)	Cumulative Variance (%)
1	3.2	40.0	40.0
2	1.8	22.5	62.5
3	1.2	15.0	77.5

Factor Loadings

Variable	Factor 1	Factor 2	Factor 3
Sustainable Governance Score	0.75	0.30	0.10
Environmental Score	0.60	0.50	0.20
Social Score	0.40	0.70	0.30

Source: Survey data collected and processed by the author.

The results of the exploratory factor analysis show that three factors explain 77.5% of the total variance. Factor loadings for each variable are also presented.

Appendix D: International Comparisons and Participant Profiles

1. Distribution of Participants by Category

Table D.1: Distribution of Participants by Category

Category	Number of Participants	Percentage (%)
Business leaders	10	50
CSR and sustainable development experts	4	20
Public sector representatives	3	15
Donor representatives	3	15
Total	20	100

Source: Survey data collected and processed by the author.

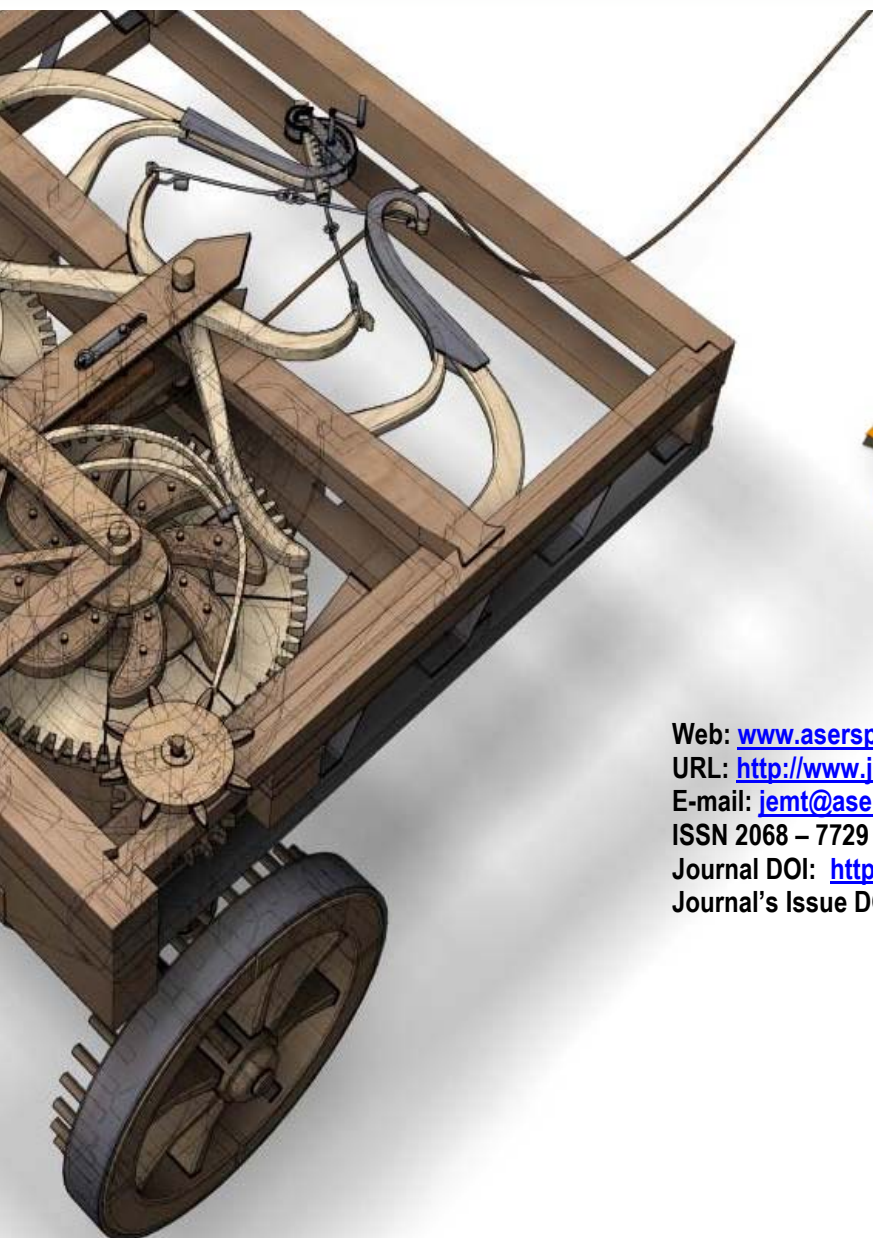
The following table presents the distribution of participants by professional category.

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