

Innovative Combinations of ESG and Green Finance: FSQCA Insights into Moroccan SMEs' Water Resilience

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Abstract:

Water resilience is becoming a strategic concern for SMEs operating in water-stressed environments, yet limited research has examined how ESG practices and green finance combine configurationally to support resilience, particularly among water-sector SMEs in emerging economies. This study addresses this gap by examining alternative configurations of environmental practices (E), social practices (S), governance (G), and green finance (GF) associated with high water resilience (WR) in Morocco. Using fuzzy-set Qualitative Comparative Analysis (fsQCA) on 73 cases, the study evaluates necessity and sufficiency relationships and identifies multiple pathways to the outcome. The necessity analysis shows that no individual condition is necessary for high WR. The intermediate solution identifies three sufficient configurations: ES, EGF, and G*GF, with overall solution consistency of 0.843, PRI of 0.740, and coverage of 0.807. These results demonstrate equifinality, meaning high water resilience can be achieved through different combinations of sustainable organizational practices and financial conditions, not through one best practice or pattern. This paper adds a configurational perspective to the ESG, green finance, and water-resilience research streams and has policy implications for differentiated resilience and financing support for water-sector SMEs.

Keywords: Green finance; ESG practices; water resilience; water-sector SMEs; FsQCA; configurational analysis.

JEL Classification: Q01; Q25; G23; M14.

Paper type: Empirical research article.

1. Introduction:

Water scarcity and climate variability are increasingly reshaping firms' operational landscapes, particularly in emerging economies where environmental constraints intersect with structural vulnerabilities. Small and Medium-Sized Enterprises (SMEs), which account for a significant share of economic activity and employment, are especially exposed to water-related risks because of their limited adaptive capacity and constrained access to financial resources. At the same time, SMEs are recognized as key actors in sustainability transitions, yet their ability to align environmental objectives with economic performance remains uneven (OECD, 2023). The academic literature also documents this vulnerability, showing that SMEs often face water- and climate-related risks with comparatively limited financial, technical, and organizational capacities, constraining their ability to undertake proactive adaptation measures (Nikolaou et al., 2016; Ho & Iyke, 2026).

Additionally, the Moroccan context offers a particularly relevant setting for examining these challenges. Over recent decades, the country has experienced increasing water stress driven by recurrent droughts, climate variability, population growth, and rising industrial and agricultural water demand. As water availability continues to decline, firms operating in water-dependent sectors face growing operational and financial risks. In this study, “**water-sector SMEs**” refer to small and medium-sized enterprises whose core activities, services, technologies, or investments are directly related to the water sector and water-resource management. This includes firms operating in areas such as water supply and treatment, wastewater management, irrigation and water-efficiency solutions, water infrastructure and services, and related environmental technologies. Water-sector SMEs are especially vulnerable because of their limited access to resources and adaptive capacity, making water resilience an increasingly strategic requirement for business continuity and sustainable development. In this context, Environmental, Social, and Governance (ESG) practices have gained prominence as strategic tools enabling firms to enhance resilience, improve risk management, and strengthen their legitimacy in sustainability-oriented markets. ESG integration supports environmental performance and improves firms' access to capital by reducing information asymmetry and signalling long-term viability to investors (Mitra & Bui, 2024). In parallel, the rapid expansion of sustainable finance markets reflects a growing commitment to channel financial resources toward environmentally aligned investments, particularly in emerging economies where financing gaps remain significant (UNCTAD, 2025).

Despite this growing interest, a critical gap persists in understanding how ESG practices translate into tangible environmental outcomes at the firm level. In particular, the role of green finance in operationalizing ESG commitments remains insufficiently explored. While recent studies highlight green finance's potential to strengthen corporate sustainability performance, its effects may vary with firms' organizational and governance characteristics (Qian & Yu, 2024). The study draws on three complementary theoretical perspectives. The Resource-Based View emphasizes the role of organizational resources and capabilities in building competitive and adaptive capacity (Barney, 1991), while stakeholder theory highlights firms' relationships with actors whose expectations and resources can shape sustainability responses (Freeman, 1984). Institutional theory further explains how regulatory, normative, and market pressures influence organizational sustainability practices (DiMaggio & Powell, 1983). Together, these perspectives provide an organizational, stakeholder, and institutional basis for understanding how ESG practices and green finance may contribute to water resilience. Within this framework, ESG practices can be viewed as organizational capabilities that enhance firms' capacity to anticipate and respond to environmental risks, while green finance provides the financial resources needed to implement sustainability-oriented investments. However, this relationship is unlikely to be uniform across firms. SMEs differ considerably in terms of

governance quality, stakeholder engagement, environmental commitment, and access to financial resources. Consequently, resilience may emerge through different combinations of ESG dimensions and green finance conditions rather than through a single linear pathway. Exploring these interactions, therefore, requires analytical approaches that capture causal complexity and multiple routes to successful sustainability outcomes. Moreover, this study addresses this gap by examining how combinations of ESG practices and green finance relate to water resilience among Moroccan water-sector SMEs. Moving beyond traditional linear approaches, the research adopts a configurational perspective to capture the complexity and heterogeneity of sustainability strategies. Specifically, it seeks to answer the following research question: *What configurations of ESG practices and green finance conditions lead to high water resilience in Moroccan water-sector SMEs?*

By doing so, this study contributes to the literature in three complementary ways. Theoretically, it extends ESG research by linking ESG practices and green finance to water resilience within a configurational perspective. Methodologically, it applies fsQCA to uncover equifinal and conjunctural pathways that linear approaches may overlook. Empirically and practically, it examines the underexplored context of Moroccan water-sector SMEs, generating insights relevant to differentiated resilience strategies and policy support.

2. Literature review:

2.1 ESG Practices and SME Sustainability:

ESG practices have emerged as a central framework for assessing and guiding corporate sustainability, encompassing environmental stewardship, social responsibility, and governance quality. For SMEs, ESG adoption is increasingly linked to improved competitiveness, stronger stakeholder trust, and better risk management (Mitra & Bui, 2024). Beyond compliance, ESG practices help firms build internal capabilities that support long-term adaptation to environmental and institutional pressures.

Recent research emphasizes that ESG integration strengthens organizational resilience by improving resource efficiency and promoting sustainable operational practices. Environmental practices directly influence resource management and ecological performance, while governance mechanisms ensure the effective implementation and monitoring of sustainability strategies. Social practices contribute indirectly by fostering stakeholder engagement and organizational legitimacy (Shalhoob & Hussainey, 2023). However, these effects should not be assumed to be uniform. Evidence on the relationship between sustainability practices and firm outcomes remains heterogeneous, with benefits depending on organizational, governance, and contextual conditions (Velte, 2022). For resource-constrained SMEs, environmental initiatives may improve resource efficiency and adaptive capacity, social practices may strengthen stakeholder coordination, and governance may support the implementation and monitoring of sustainability strategies. Yet each dimension's effectiveness may depend on its combination with other organizational capabilities and access to external resources. This suggests that environmental (E), social (S), and governance (G) practices represent potentially complementary rather than universally sufficient conditions for resilience.

2.2 Green Finance as an Enabling Mechanism:

Green finance has become a critical driver of sustainable development by facilitating investments in environmentally friendly technologies and practices. The expansion of sustainable financial instruments, including green bonds, sustainability-linked loans, and climate funds, has significantly increased capital availability for environmental projects (UNCTAD, 2025).

However, access to green finance remains uneven for SMEs, particularly in emerging economies. Structural barriers such as limited financial literacy, insufficient collateral, and lack of awareness often constrain SMEs' ability to benefit from sustainable finance mechanisms (OECD, 2023). Policy mechanisms such as green credit guarantees, public support, and risk-sharing arrangements have therefore been proposed to reduce financing barriers and encourage private participation in green investment (Taghizadeh-Hesary & Yoshino, 2019).

Importantly, green finance can provide the financial capacity required to translate sustainability commitments into investments in cleaner technologies, resource efficiency, and environmental innovation (Wang & Zhi, 2016; Zhou et al., 2020). However, financial availability alone does not guarantee environmental or resilience outcomes. Financing effectiveness may depend on firms' environmental capabilities, governance arrangements, investment readiness, and ability to direct resources toward sustainability objectives. Green finance (GF) is therefore conceptualized here as an enabling condition whose contribution to water resilience may depend on the organizational conditions with which it is combined.

2.3 Water Resilience in SMEs:

Water resilience refers to a firm's capacity to anticipate, adapt to, and recover from water-related risks, including scarcity, variability, and regulatory pressures. For water-sector SMEs, resilience is closely linked to operational continuity, resource efficiency, and long-term sustainability.

Recent studies highlight the increasing importance of water resilience as a strategic priority, particularly in regions facing heightened climate stress. Global water vulnerability reflects the combined pressures of climatic change, growing demand, and socioeconomic development, making adaptive water management increasingly important for organizations operating within water-related systems (Vörösmarty et al., 2000; UNESCO World Water Assessment Program, 2024). For SMEs, building water resilience requires adaptive organizational and governance capabilities that enable actors to respond to changing and uncertain water-related conditions (Saikia & Jiménez, 2023). However, the relationship between sustainability practices and water resilience remains underexplored, especially at the firm level in emerging economies. Consequently, water resilience should be understood not only as an ecological objective but also as a determinant of organizational sustainability and long-term performance.

2.4 A Configurational Perspective on ESG, Green Finance, and Water Resilience:

Traditional sustainability research often relies on linear models that assume uniform relationships between variables. However, sustainability transitions are inherently complex and context-dependent, involving multiple interacting factors. A configurational perspective instead recognizes causal complexity, whereby outcomes may depend on combinations rather than isolated conditions (Ragin, 2008; Fiss, 2011; Greckhamer et al., 2018). Three principles are particularly relevant to this study. Equifinality implies that different configurations may be associated with the same outcome; conjunctural causation means that the relevance of a condition may depend on the other conditions with which it is combined; and causal asymmetry recognizes that configurations associated with the presence of an outcome cannot automatically be assumed to be the inverse of those associated with its absence. These principles make a configurational perspective particularly appropriate for heterogeneous SMEs whose sustainability responses depend on different combinations of resources and organizational conditions.

Applied to this study, the literature suggests that E, S, G, and GF may contribute to water resilience through complementary mechanisms: environmental practices support resource management, social practices facilitate stakeholder coordination, governance strengthens implementation and accountability, and green finance enables sustainability-oriented investment (Shalhoob & Hussainey, 2023; Qian & Yu, 2024). However, their relevance may

vary with firms' resources, capabilities, and institutional conditions, meaning no single factor can be assumed to operate uniformly across SMEs (Velte, 2022). The remaining gap therefore concerns how these conditions combine into alternative configurations associated with high water resilience, particularly among water-sector SMEs in emerging economies.

3. Methodology:

3.1 Research Design and Configurational Approach:

This study adopts a configurational research design based on fuzzy-set Qualitative Comparative Analysis (fsQCA) to examine how combinations of environmental (E), social (S), governance (G), and green finance (GF) conditions are associated with high water resilience (WR) in the context of Moroccan water-sector SMEs. Rather than estimating the independent net effect of each condition, fsQCA examines set-theoretic relationships and identifies combinations of conditions that are sufficient or necessary for an outcome (Ragin, 2008; Fiss, 2011). This approach fits the research question because water resilience may depend on the joint presence or absence of organizational, governance, stakeholder, and financial conditions rather than on a single factor operating independently.

The configurational perspective rests on three principles relevant to this study. First, conjunctural causation recognizes that one condition's contribution may depend on the presence or absence of other conditions. Second, equifinality allows different combinations of ESG practices and green finance to be associated with the same outcome of high-water resilience. Third, fsQCA accommodates causal asymmetry, meaning that configurations associated with the presence of an outcome cannot automatically be reversed to explain its absence (Ragin, 2008; Fiss, 2011; Greckhamer et al., 2018). These properties make fsQCA particularly suitable for examining heterogeneous organizational responses to sustainability and water-related challenges.

Accordingly, the analysis focuses on whether alternative configurations of E, S, G, and GF constitute sufficient pathways to high WR, while also examining whether any individual condition or its absence is necessary. This design preserves the study's configurational character and avoids interpreting individual conditions as universally sufficient or independently determinant of water resilience.

3.2 Unit of Analysis, Sample and Data Structure:

The study uses purposive sampling and includes 73 respondent-level cases: SME managers and employees, consultants, academics, and public-sector actors with expertise in sustainability, water management, governance, or green finance, particularly in the context of Moroccan water-sector SMEs. The individual respondent is therefore the unit of analysis, and WR is perceived as an organizational outcome rather than as an objective firm-level measure. This double-stakeholder setting captures views informed by the wider water/ hydric sector SME milieu, while respondent heterogeneity impedes direct firm-level generalization.

Four causal conditions (E, S, G, and GF) yield 16 logically possible configurations (2^4). The 73 retained cases provide sufficient configurational diversity for the specified model. The study applied a minimum frequency threshold of two cases per configuration to reduce dependence on patterns weakly embodied in the data. Informed by the purposive sampling strategy, the study pursues configurational rather than statistical population-level generalization.

3.3 Operationalization and Measurement of Conditions and Outcome:

Five constructs were operationalized using Likert-type measures: environmental practices (E), capturing sustainability and resource-management practices; social practices (S), reflecting

stakeholder engagement and social responsibility; governance (G), capturing governance and decision-making mechanisms; green finance (GF), reflecting access to and use of environmentally oriented financing; and water resilience (WR), representing perceived adaptive capacity and sustainable water-management outcomes. The analysis relies on the retained aggregate scores for each construct, which constitute the raw values subsequently calibrated into fuzzy sets. A limitation of the retained dataset is that the original item-level responses are not available, preventing retrospective assessment of internal consistency measures such as Cronbach's alpha. This limitation is explicitly acknowledged when interpreting the findings.

3.4 Calibration of Fuzzy Sets:

Following fsQCA methodological guidelines, raw data were transformed into fuzzy-set membership scores ranging from 0 (full non-membership) to 1 (full membership). We calibrated the data using the direct method based on three qualitative anchors: full non-membership, indicating a low level of the condition; the crossover point, representing maximum ambiguity in set membership; and full membership, indicating a high level of the condition. We defined thresholds based on both theoretical considerations and the data's empirical distribution. Specifically, we used 2.5, 3.6, and 4.5 as the full non-membership, crossover, and full-membership anchors, respectively, for E, S, GF, and WR, while applying slightly higher thresholds of 3.0, 3.9, and 4.8 for governance. We established the calibration thresholds with reference to fsQCA guidelines and adapted them to the characteristics of the Likert-type measures used in the study.

To increase transparency, the revised analysis complements the calibration anchors with descriptive statistics and quartiles of the original construct scores, allowing the thresholds to be assessed relative to the observed empirical distributions. We also paid particular attention to cases located exactly at the crossover point. Rather than slightly adjusting membership scores of 0.50, as in the initial analysis, the revised procedure retains these observations at 0.50, thereby preserving their interpretation as cases of maximum ambiguity in set membership. The calibrated scores obtained through this procedure were subsequently used consistently for the necessity, truth-table, and sufficiency analyses.

3.5 Necessity, Sufficiency and Logical Minimization Procedures:

The analysis followed established set-theoretic guidelines through a sequential necessity and sufficiency procedure (Schneider & Wagemann, 2012; Duşa, 2019; Woodside, 2013). First, we assessed each condition (E, S, G, and GF) and its absence to determine whether any condition was necessary for high water resilience. Necessity was evaluated using consistency and coverage. Second, a truth table was constructed to represent the 16 logically possible configurations generated by the four causal conditions. Each configuration was evaluated according to its empirical frequency, sufficiency consistency, and proportional reduction in inconsistency (PRI). To strengthen the initial analytical procedure, the revised analysis applies a minimum frequency threshold of two cases, a sufficiency consistency threshold of 0.80, and a PRI threshold of 0.50. Configurations represented by fewer than two cases were not treated as empirically sufficient configurations in the main truth-table analysis.

We then used logical minimization to identify sufficient configurations associated with high water resilience. Complex, parsimonious, and intermediate solutions were examined, with the intermediate solution incorporating theoretically consistent directional expectations for the presence of E, S, G, and GF. Comparing the intermediate and parsimonious solutions also allows assessment of the stability and structure of the resulting configurations. The solutions were evaluated using consistency, PRI, raw coverage, and unique coverage. Consistency indicates the degree to which membership in a configuration is associated with membership in

high WR, while raw coverage reflects the empirical relevance of each pathway and unique coverage captures the portion of outcome membership covered uniquely by that configuration relative to the other pathways. All analyses were conducted in R 4.5.2 within the RStudio environment. The QCA package (version 3.24) was used for fuzzy-set calibration, necessity analysis, truth-table construction, and logical minimization, while readxl (version 1.5.0) imported the dataset. The same calibration anchors and model specifications were maintained across the necessity, sufficiency, and sensitivity analyses to ensure procedural consistency and analytical reproducibility.

3.6 Robustness and Sensitivity Analysis:

A sensitivity analysis followed the main configurational analysis to test the stability of the identified sufficient configurations under a more stringent consistency criterion. The base truth-table specification employed a sufficiency consistency threshold of 0.80, a PRI of 0.50, and a minimum frequency of two cases per configuration. As a sensitivity test, the consistency threshold was raised from 0.80 to 0.85, keeping the same PRI and frequency requirements. The truth table was subsequently built, and the intermediate solution was re-estimated using the same expectations for the direction of E, S, G, and GF.

This method directly tests the sensitivity of the configurational results to a higher sufficiency criterion without changing the underlying calibration or model structure. The comparison evaluates how robust the identified pathways and their solution parameters are across the two specifications. Thus, the revised analysis examines the robustness of the initial solution as an empirical property of an alternative threshold specification, rather than an intrinsic property of the initial solution. The sensitivity analysis results follow the main configurational results.

4. Main Results:

4.1 Calibration thresholds - Conditions and Outcome:

All variables were calibrated into fuzzy sets using the direct method. The resulting membership scores ranged between 0 and 1, with sufficient dispersion across cases to support configurational analysis. The absence of excessive clustering around the crossover point ensured clear set membership and minimized ambiguity in subsequent analysis. Table (1) presents descriptive statistics for the raw scales, along with the qualitative anchors for fsQCA calibration. The variation appears moderate across the five constructs. Environmental practices (E) and green finance (GF) had the same mean value of 3.65, but social practices (S) had a slightly lower average score of 3.47. G was the strongest control factor ($M = 3.98$), with relatively low variation ($SD = 0.58$), while WR was the weakest control factor ($M = 3.70$, $SD = 0.47$).

The descriptive distributions provide an empirical backdrop for evaluating the calibration anchors used in the study. For E, S, GF, and WR, the qualitative anchors were 2.5 for full non-membership, 3.6 for the crossover point, and 4.5 for full membership. Governance was calibrated with slightly higher anchors of 3.0, 3.9, and 4.8, respectively. The observed medians range from 3.5 for S to 4.1 for G, yet the first and third quartiles show decent dispersion around the crossover areas, helping distinguish between low and high set-membership levels. Cases located exactly at a fuzzy-set membership score of 0.50 were retained at the crossover point, meaning maximum ambiguity towards set membership.

Table 1: Descriptive Statistics and Calibration Anchors:

Construct	Mean	SD	Q1	Median	Q3	Full non-membership	Crossover	Full membership
(E)	3.65	0.77	3.0	3.6	4.3	2.5	3.6	4.5
(S)	3.47	0.87	2.8	3.5	4.3	2.5	3.6	4.5
(G)	3.98	0.58	3.5	4.1	4.4	3.0	3.9	4.8
(GF)	3.65	0.88	3.0	3.7	4.4	2.5	3.6	4.5
(WR)	3.70	0.47	3.4	3.7	4.0	2.5	3.6	4.5

Source: Authors' calculations.

4.2 Truth Table Analysis:

The truth table summarizes all logically possible configurations of causal conditions and their empirical association with water resilience. After calibration, a truth table was constructed to examine the configurations, in this case, of environmental practices (E), social practices (S), governance (G), and green finance (GF) associated with high water resilience (WR). With four causal conditions, the analysis generated 16 logically possible configurations. Consistent with the analytical procedure described in Section 3, we evaluated configurations using three criteria: a minimum frequency of two cases, a sufficiency consistency threshold of 0.80, and a PRI threshold of 0.50. We considered PRI alongside consistency to reduce the risk of retaining configurations that simultaneously show substantial membership in both the outcome and its negation. Therefore, as shown in Table 2, the truth-table results reveal substantial configurational diversity, with seven of the sixteen logically possible configurations satisfying the combined frequency, consistency, and PRI criteria for high water resilience. Importantly, high consistency alone does not systematically indicate sufficiency: several configurations, including Rows 5, 7, and 11, exhibit consistency values above 0.80 but fail to reach the PRI threshold of 0.50. Moreover, the retained configurations involve different combinations of present and absent conditions, suggesting that high water resilience may be associated with multiple conjunctural pathways rather than requiring the simultaneous presence of all four conditions. This pattern underpins the subsequent necessity assessment and logical minimization, which determine whether any individual condition is required and identify the simplified sufficient pathways associated with high water resilience.

Table 2. Simplified Truth Table for High Water Resilience:

Row	E	S	G	GF	n	Consistency	PRI	Outcome
1	0	0	0	0	4	0.731	0.000	0
2	0	0	0	1	4	0.811	0.236	0
3	0	0	1	0	4	0.781	0.253	0
4	0	0	1	1	7	0.891	0.650	1
5	0	1	0	0	2	0.888	0.078	0
6	0	1	0	1	1	0.922	0.550	?
7	0	1	1	0	4	0.876	0.493	0
8	0	1	1	1	5	0.982	0.948	1
9	1	0	0	0	7	0.761	0.171	0
10	1	0	0	1	4	0.864	0.504	1
11	1	0	1	0	2	0.916	0.495	0
12	1	0	1	1	5	0.989	0.968	1
13	1	1	0	0	5	0.880	0.539	1
14	1	1	0	1	2	1.000	1.000	1
15	1	1	1	0	1	0.998	0.988	?
16	1	1	1	1	8	0.994	0.987	1

Note: 1 and 0 indicate the presence and absence of each causal condition, respectively. In the outcome column, 1 identifies configurations that satisfy the specified frequency, consistency, and PRI criteria; 0 identifies configurations that do not satisfy the combined inclusion criteria; and ? denotes configurations below the minimum frequency threshold ($n < 2$), which were treated as remainders during minimization.

Source: Authors' calculations.

The distribution of configurations suggests that high water resilience is associated with a variety of sustainability profiles rather than a single dominant pattern. This observation supports the principle of equifinality underlying configurational research, indicating that firms may achieve similar resilience outcomes through different combinations of environmental, social, governance, and financial conditions. The diversity of observed configurations further highlights the heterogeneous nature of sustainability transitions among SMEs. The truth table reveals a high concentration of configurations exceeding the consistency threshold, particularly those involving governance (G) and green finance (GF). Notably, several configurations without social conditions (~S) still achieve high consistency, suggesting compensatory mechanisms among causal factors.

4.3 Necessity Analysis:

In fsQCA, necessity analysis examines whether a condition must be present, or absent, whenever the outcome occurs. It complements the subsequent sufficiency analysis by determining whether high water resilience depends on any single condition before examining how multiple conditions combine into sufficient configurations. In this study, we therefore applied necessity analysis to the presence and absence of E, S, G, and GF to assess whether any individual condition is systematically required for high water resilience. Table 3 shows the consistency and coverage for each condition's presence and absence. No condition reaches the usual high level of consistency to claim necessity. Governance (G) and green finance (GF) have the highest consistency values (0.757), and their necessity coverage values are 0.790 and 0.784, respectively. Environmental practices (E) and social practices (S) have lower consistency values of 0.703 and 0.651, while the negation of all four conditions is below all these values, with consistency values between 0.469 and 0.553.

Thus, the results do not suggest that any single ESG dimension or green finance condition is necessary to achieve high water resilience. The relatively higher values for G and GF suggest empirical relevance but are too low to label them as necessary. This finding aligns with the study's configurational logic that high water resilience can be achieved through multiple conjuncts of conditions rather than hinging on any single condition. The analysis thus uses logical minimization to derive the alternative sufficient conditions linked to high water resilience.

Table 3. Necessity Analysis for High Water Resilience:

Condition	Consistency	Coverage
E	0.703	0.763
~E	0.544	0.637
S	0.651	0.780
~S	0.553	0.588
G	0.757	0.790
~G	0.505	0.618
GF	0.757	0.784
~GF	0.469	0.580

Note: E = environmental practices; S = social practices; G = governance; GF = green finance; ~ denotes the absence of a condition.

Source: Authors' calculations.

4.4 Configurational Solutions:

Logical minimization identified three sufficient configurations associated with high water resilience: (ES, EGF, and G*GF). The intermediate solution (ES + EGF + G*GF) achieved an overall consistency of 0.843, PRI of 0.740, and solution coverage of 0.807. As shown in Table 4, the parsimonious solution produced the same three configurations and identical solution-level parameters. The complex solution was more restrictive, expressing the environmental-

social pathway as (ES~G) while retaining (EGF) and (GGF). The convergence of the intermediate and parsimonious solutions therefore provides a concise representation of the sufficient configurations without additional peripheral conditions.

Table 4. Configuration Model/Solution Comparison:

Solution	Configuration	Consistency	PRI	Coverage
(M1) Intermediate	ES + EGF + G*GF	0.843	0.740	0.807
(M2) Parsimonious	ES + EGF + G*GF	0.843	0.740	0.807

*Note: E = environmental practices; S = social practices; G = governance; GF = green finance. The symbol * denotes conjunction (AND), while + separates alternative sufficient pathways (OR).*

Source: Authors' calculations.

The pathway-level results in Table 5 show both commonalities and distinctions across the three configurations. (E*S) achieves a consistency of 0.910 and unique coverage of 0.101, identifying a sufficient pathway that combines environmental and social practices. (E*GF) attains the highest consistency (0.915) and PRI (0.843), while (G*GF) records the most extensive raw coverage (0.601) and unique coverage (0.163). Green finance appears in two of the three configurations, whereas (E*S) offers an alternative pathway without GF. This pattern aligns with the preceding necessity results, which showed that no single condition is universally required for high WR.

Moreover, to provide a detailed view of the causal patterns, Table 5 presents the individual configurations contributing to the intermediate solutions. Each configuration represents a distinct pathway to water resilience.

Table 5. Detailed Sufficient Configurations for High Water Resilience:

Pathway	Configuration	Consistency	PRI	Raw Coverage	Unique Coverage
P1	E*S	0.910	0.825	0.491	0.101
P2	E*GF	0.915	0.843	0.543	0.048
P3	G*GF	0.908	0.839	0.601	0.163
Overall solution	ES + EGF + G*GF	0.843	0.740	0.807	Not applicable

Note: P1, P2, and P3 identify alternative pathways and do not imply a ranking. Raw coverage captures the empirical relevance of each configuration, including overlap with other pathways, whereas unique coverage captures the outcome membership associated exclusively with that pathway.

Source: Authors' calculations.

Overall, the results demonstrate equifinality and conjunctural causation, with three distinct pathways associated with high water resilience.

- The first pathway (ES) reflects the joint role of environmental and social practices, simply:
 - P1 = ESG-based route → environmental + social
- The second (EGF) combines environmental engagement with green finance, simply:
 - P2 = environmental-financial route → environmental + green finance
- The third pathway (GGF) associates governance mechanisms with green financial resources, simply:
 - P3 = governance-financial route → governance + green finance

Taken together, these configurations show that high WR is not associated with a single uniform combination: it can emerge through an ESG-based pathway without green finance, represented by ES, as well as through finance-enabled pathways, where green finance operates jointly with either environmental practices or governance. This configurational diversity is particularly relevant given the preceding necessity analysis, as no individual condition is required across all pathways.

To assess the stability of these findings, we increased the sufficiency consistency threshold from 0.80 to 0.85 while maintaining PRI at 0.50 and the frequency threshold at two cases. The sensitivity analysis reproduced the same three configurations (ES, EGF, and G*GF) with identical solution-level parameters (consistency = 0.843; PRI = 0.740; coverage = 0.807). The configurational structure is therefore stable under this stricter specification.

5. Discussion:

5.1 Interpretation of Configurational Results and Research Implications:

The findings support the study's configurational premise by showing that high water resilience is associated with three distinct combinations of ESG practices and green finance: (ES, EGF, and G*GF). The environmental-social pathway (ES) suggests that environmental practices can work with stakeholder-oriented and socially responsible practices to support resilience, even without green finance. By contrast, the environmental-financial pathway (EGF) links environmental engagement with green financial resources, while the governance-financial pathway (G*GF) combines access to green finance with organizational governance mechanisms. Together, these pathways demonstrate that resilience is associated not with balanced strength across every ESG and financial dimension, but with different combinations of complementary conditions.

This configurational pattern extends the theoretical interpretation of water resilience beyond isolated organizational factors. From a Resource-Based View perspective, firms differ in the resources and capabilities they can mobilize and combine to respond to environmental pressures (Barney, 1991). The (EGF) and (GGF) configurations suggest that financial resources become relevant when combined with environmental or governance capabilities rather than operating independently. The (E*S) pathway, meanwhile, is consistent with a stakeholder perspective in which environmental action and engagement with employees, communities, and other stakeholders can jointly contribute to organizational adaptation (Freeman, 1984). Institutional theory further helps situate the governance-finance configuration, as governance arrangements can shape how firms respond to external financial, regulatory, and sustainability expectations. These pathways therefore support a view of water resilience as a configurational capability, arising from different combinations of internal resources, stakeholder relationships, and institutional and financial conditions. The findings also have practical implications for water-sector SMEs and their supporting institutions. Rather than assuming that all SMEs require the same combination of ESG improvements and financial instruments, resilience strategies can build on the capabilities already available within the firm. SMEs with established environmental practices may strengthen them through stronger stakeholder engagement or appropriate green financing, while firms accessing green finance may benefit from governance arrangements that direct these resources toward resilience-oriented investments. For policymakers and financial institutions, the findings support differentiated support mechanisms that pair financing with governance capacity, environmental implementation, or stakeholder-oriented initiatives based on firms' existing capabilities. This approach aligns better with the configurational evidence than a uniform intervention based on a single presumed driver of water resilience.

5.2 Methodological Rigor and Validity of the Findings:

Methodologically, fuzzy-set Qualitative Comparative Analysis (fsQCA) is particularly well suited to capturing the complexity of sustainability dynamics in SMEs. The approach allows for the identification of equifinal solutions, causal asymmetry, and conjunctural causation, all of which are clearly reflected in the results.

Several elements strengthen the revised analysis's analytical rigor. Calibration was complemented by descriptive statistics to enhance transparency about the empirical distribution of the construct scores. Necessity analysis was conducted before the sufficiency assessment, and truth-table configurations were evaluated jointly using frequency, consistency, and PRI criteria. Logical minimization further incorporated complex, intermediate, and parsimonious solutions, and comparison of the latter two yielded the same three sufficient configurations. The distinction between raw and unique coverage also provides a more precise assessment of the empirical relevance and overlap of the identified pathways. Finally, the sensitivity analysis explicitly assesses solution stability. Increasing the sufficiency consistency threshold from 0.80 to 0.85 reproduced the same configurational solution and solution-level parameters. The findings are therefore stable under the stricter specification tested in this study. This does not imply invariance across all possible analytical choices, but it further supports the stability of the reported configurations within the specified calibration and analytical framework.

5.3 Limitations and Directions for Future Research:

Despite its contributions, this study presents several limitations that define the boundaries within which the findings should be interpreted. First, the cross-sectional design captures the examined conditions at a single point in time and therefore does not reflect how ESG practices, green finance, and water resilience may evolve dynamically. Second, the respondent-level approach incorporates heterogeneous profiles from the hydric SME ecosystem. While this diversity provides multiple informed perspectives, it also introduces variation in how organizational practices and water resilience may be perceived and limits direct generalization of the configurations to the firm level. The purposive and context-specific nature of the sample also means the identified pathways should be interpreted primarily within the Moroccan water sector-oriented SME setting, rather than assumed to apply uniformly across sectors or countries. Measurement limitations should also be acknowledged. The analysis relies on aggregate construct scores and perceptual assessments, while the retained data do not permit retrospective item-level psychometric validation, including internal-consistency testing. The configurational findings should therefore be interpreted with appropriate caution regarding measurement precision. Future research could address these limitations through longitudinal and firm-level designs, broader and more homogeneous samples, and measurement instruments retaining complete item-level information for psychometric assessment. Combining perceptual measures with objective indicators of water use, environmental performance, or resilience would further strengthen measurement, while comparative studies across sectors and institutional contexts could examine whether the three identified pathways persist under different organizational and environmental conditions.

6. Conclusion:

This paper offers a configurational perspective on the drivers of water resilience in hydric and water-sector SMEs by examining how environmental, social, governance, and green finance conditions interact to produce sustainable outcomes. Moving beyond linear approaches, this study examined how environmental practices, social practices, governance, and green finance combine to support water resilience in Moroccan water-sector SMEs. The fsQCA results identify three sufficient configurations: (ES, EGF, and G*GF), with an overall solution consistency of 0.843, PRI of 0.740, and coverage of 0.807. No individual condition was necessary for high water resilience, confirming that resilience is associated with alternative combinations rather than a single required factor. The findings therefore contribute a configurational understanding of the ESG-green finance-water resilience relationship, showing

that environmental practices can combine either with social practices or green finance, while governance provides a distinct resilience pathway when combined with green finance. These findings have direct implications for SMEs and the institutions supporting their sustainability transition. Rather than promoting a uniform ESG-finance model, interventions can be aligned with firms' existing capabilities: strengthening stakeholder-oriented practices where environmental capabilities are already established, linking environmental investment needs with appropriate green financing, or combining financial support with stronger governance mechanisms. Financial institutions and policymakers can consequently complement green financing instruments with governance support, environmental implementation assistance, and targeted capacity-building mechanisms. Within the contextual and measurement boundaries acknowledged in this study, the results provide a basis for designing more differentiated approaches to water resilience in resource-constrained SMEs and for further testing these configurations across firms, sectors, and institutional settings.

References:

- (1). Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- (2). DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160. <https://doi.org/10.2307/2095101>
- (3). Duşa, A. (2019). *QCA with R: A comprehensive resource*. Springer. <https://doi.org/10.1007/978-3-319-75668-4>
- (4). Fiss, P. C. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *Academy of Management Journal*, 54(2), 393–420. <https://doi.org/10.5465/amj.2011.60263120>
- (5). Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.
- (6). Greckhamer, T., Furnari, S., Fiss, P. C., & Aguilera, R. V. (2018). Studying configurations with qualitative comparative analysis: Best practices in strategy and organization research. *Strategic Organization*, 16(4), 482–495. <https://doi.org/10.1177/1476127018786487>
- (7). Ho, S.-Y., & Iyke, B. N. (2026). Strategies and implications for climate change resilience in small enterprises. *Discover Environment*, 4, 277. <https://doi.org/10.1007/s44274-026-00812-2>
- (8). Mitra, J., & Bui, H. T. (2024). *ESG and SMEs: The state of play*. International Network for SMEs. [Official INSME report](#)
- (9). Nikolaou, I. E., Nikolaidou, M. K., & Tsagarakis, K. P. (2016). The response of small and medium-sized enterprises to potential water risks: An eco-cluster approach. *Journal of Cleaner Production*, 112, 4550–4557. <https://doi.org/10.1016/j.jclepro.2015.09.068>
- (10). Organisation for Economic Co-operation and Development. (2023). *OECD SME and entrepreneurship outlook 2023*. OECD Publishing. [OECD SME and Entrepreneurship Outlook 2023](#)
- (11). Qian, S., & Yu, W. (2024). Green finance and environmental, social, and governance performance. *International Review of Economics & Finance*, 89, 1185–1202. <https://doi.org/10.1016/j.iref.2023.08.017>
- (12). Ragin, C. C. (2008). *Redesigning social inquiry: Fuzzy sets and beyond*. University of Chicago Press. <https://doi.org/10.7208/chicago/9780226702797.001.0001>
- (13). Saikia, P., & Jiménez, A. (2023). Governance attributes for building water resilience: A literature review. *Water International*, 48(7), 809–838. <https://doi.org/10.1080/02508060.2023.2274162>

- (14). Schneider, C. Q., & Wagemann, C. (2012). *Set-theoretic methods for the social sciences: A guide to qualitative comparative analysis*. Cambridge University Press. <https://doi.org/10.1017/CBO9781139004244>
- (15). Shalhoob, H., & Hussainey, K. (2023). Environmental, social and governance (ESG) disclosure and the small and medium enterprises (SMEs) sustainability performance. *Sustainability*, 15(1), 200. <https://doi.org/10.3390/su15010200>
- (16). Taghizadeh-Hesary, F., & Yoshino, N. (2019). The way to induce private participation in green finance and investment. *Finance Research Letters*, 31, 98–103. <https://doi.org/10.1016/j.frl.2019.04.016>
- (17). UNESCO World Water Assessment Program. (2024). *The United Nations world water development report 2024: Water for prosperity and peace*. UNESCO. [Official UN publication record](#)
- (18). United Nations Conference on Trade and Development. (2025). *World investment report 2025: International investment in the digital economy*. United Nations. [Official UNCTAD report](#)
- (19). Velte, P. (2022). Archival research on integrated reporting: A systematic review of main drivers and the impact of integrated reporting on firm value. *Journal of Management and Governance*, 26(3), 997–1061. <https://doi.org/10.1007/s10997-021-09582-w>
- (20). Vörösmarty, C. J., Green, P., Salisbury, J., & Lammers, R. B. (2000). Global water resources: Vulnerability from climate change and population growth. *Science*, 289(5477), 284–288. <https://doi.org/10.1126/science.289.5477.284>
- (21). Wang, Y., & Zhi, Q. (2016). The role of green finance in environmental protection: Two aspects of market mechanism and policies. *Energy Procedia*, 104, 311–316. <https://doi.org/10.1016/j.egypro.2016.12.053>
- (22). Woodside, A. G. (2013). Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory. *Journal of Business Research*, 66(4), 463–472. <https://doi.org/10.1016/j.jbusres.2012.12.021>
- (23). Zhou, X., Tang, X., & Zhang, R. (2020). Impact of green finance on economic development and environmental quality: A study based on provincial panel data from China. *Environmental Science and Pollution Research*, 27(16), 19915–19932. <https://doi.org/10.1007/s11356-020-08383-2>