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Leadership Commitment and Environmental Management System Effectiveness: The Moderating Role of ISO 14001:2015 Implementation Maturity

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Abstract

This study examined how leadership commitment may relate to environmental management system (EMS) implementation effectiveness and proposes ISO 14001:2015 implementation maturity as a moderator. The study employed a review approach, identifying literature published between 2018 and 2026 through targeted searches of Scopus and Web of Science and synthesising it thematically with foundational theory and the ISO 14001:2015 standard. Exact search dates and stage-by-stage retrieval counts were not preserved, so the review is not presented as a fully reproducible systematic review. The study found that leadership support, communication, involvement and resource allocation can support EMS implementation, although evidence varies by context and outcome. The synthesis distinguishes certification, implementation maturity, implementation effectiveness and longer-term environmental sustainability. The study concluded that the review integrates Institutional Theory, Upper Echelons Theory, and Resource Allocation Theory into a conceptual framework; however, the proposed moderating role of maturity remains empirically untested. It recommends that future research operationalise maturity and effectiveness separately and directly test the proposed interaction.

Key words: EMS implementation effectiveness, environmental management systems, environmental sustainability, implementation maturity, ISO 14001:2015, leadership commitment.



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INTRODUCTION

This study examined how leadership commitment may relate to environmental management system (EMS) implementation effectiveness and proposes ISO 14001:2015 implementation maturity as a moderator. Organisations use environmental management systems (EMS) to manage environmental impacts and pursue operational benefits (Camilleri, 2022). ISO 14001 provides a framework for identifying impacts, setting objectives, assigning responsibilities, and continually improving. Certification alone, however, does not show that requirements are embedded in everyday practice or that environmental outcomes are equivalent (Boiral et al., 2018).

EMS internalisation research finds variation in how certified organisations integrate environmental management into routines and decisions (Daddi et al., 2022). Formal adoption, substantive implementation and environmental performance are related but distinct; evidence on certification outcomes varies by study and measure (Boiral et al., 2018; Erauskin-Tolosa et al., 2020).

Leadership commitment and management support matter for EMS implementation and ISO 14001 certification, though evidence varies by design, setting, and outcome (Botchway & Gbedemah, 2018; Waxin et al., 2020). Based on semi-structured interviews with environmental managers in 14 UAE public- and private-sector organisations, Waxin et al. (2020) identify senior-management support and sufficient organisational resources as implementation success factors and report perceived certification outcomes. Ojiako et al. (2025) examine critical success factors associated with using ISO 14001 certification to signal sustainability equivalence. Here, commitment comprises strategic direction, communication, visible involvement and resource allocation; the cited evidence does not establish a uniform causal effect on effectiveness.

Leadership priorities may translate into implementation more consistently when supported by responsibilities, resources, monitoring and review. This review therefore proposes implementation maturity—the depth of EMS embedding—as a potential condition affecting the commitment–effectiveness relationship. This remains a conceptual proposition, not an established empirical result. Prior syntheses address ISO 14001 adoption and outcomes (Boiral et al., 2018), environmental

performance (Erauskin-Tolosa et al., 2020) and EMS internalisation (Daddi et al., 2022). This review integrates those strands with leadership and resource-allocation perspectives, distinguishing commitment, maturity, implementation effectiveness and longer-term environmental sustainability. The study focuses on ISO 14001:2015 as the edition underpinning its literature and framework. This defines the analytical scope; it does not claim that the 2015 edition remains the latest edition. Testing the framework’s applicability to later standards developments requires consideration in current settings.

Therefore, the study synthesises literature published from 2018 to 2026, together with foundational theoretical work, to explain how leadership commitment may relate to EMS implementation effectiveness and how implementation maturity may condition that relationship. The review also distinguishes implementation effectiveness from broader environmental sustainability outcomes.

Three perspectives inform the framework. Institutional Theory explains external pressures to adopt environmental management; Upper Echelons Theory explains how senior leaders interpret priorities and shape organisational choices; Resource Allocation Theory explains how priorities are translated into resource commitments. Together, they provide complementary explanations for variation in EMS implementation.

The study addresses three objectives: (1) synthesise evidence on leadership commitment and EMS implementation effectiveness; (2) examine implementation maturity as a potential moderator of that relationship; and (3) clarify how effective implementation may relate to longer-term environmental sustainability.

LITERATURE REVIEW

Theoretical Framework

The framework integrates three complementary perspectives: institutional pressures, senior-leadership interpretation and resource allocation. Together, they explain why certification alone may not produce uniform implementation practices or outcomes. Institutional Theory explains how coercive, normative and mimetic pressures encourage organisations to adopt and maintain formal environmental management arrangements (Aksom & Firsova, 2021; Roszkowska-Menkes, 2023).

These pressures help explain adoption but do not establish that implementation is substantive or effective. Upper Echelons Theory proposes that organisational choices reflect senior leaders' values, experiences and interpretations (Hambrick & Mason, 1984; McHugh & Duane, 2026). Applied here, it helps explain how leaders prioritise environmental management and communicate its strategic importance. This theoretical connection explains the relationship, but it is not direct evidence that leadership has a uniform effect across all certified organisations.

Resource Allocation Theory highlights how organisational priorities are translated into choices about scarce resources (Bower, 2018; Maritan & Lee, 2017). EMS implementation may require staff time, expertise, training, monitoring and infrastructure. Wong et al. (2020), using survey data from manufacturing firms in Hong Kong and Thailand, found different resource-allocation patterns across small and large firms: larger firms used more resource-demanding practices, while smaller firms relied more on resource-light practices. The study links these practice patterns to environmental, cost-reduction and business outcomes, but it does not test leadership commitment or the proposed leadership-maturity relationship. The theories play different roles: Institutional Theory explains external pressure; Upper Echelons Theory explains leadership interpretation and priority-setting; Resource Allocation Theory explains how priorities are supported with resources. The framework links these processes to implementation maturity and effectiveness without treating any one theory as a complete explanation.

Implementation maturity reflects how deeply EMS is embedded in strategy, responsibilities, operational routines, monitoring, review, and organisational learning. It is distinct from leadership commitment (an organisational influence) and effectiveness (what the system achieves). In this review, maturity is a conceptual construct proposed for future operationalisation, not an established validated scale.

The integrated argument is that external pressures encourage adoption, leaders interpret and prioritise environmental management, and resource decisions help determine whether commitments become embedded practices. Differences in maturity may therefore help explain variation in implementation effectiveness. This proposed mechanism requires empirical testing.

METHODOLOGY

The study adopted a review approach. This focused conceptual review selected literature iteratively for conceptual integration rather than statistical aggregation. It combined empirical studies, reviews, theoretical sources and ISO 14001:2015. Targeted Scopus and Web of Science searches used terms for EMS/ISO 14001, leadership commitment, implementation or internalisation, maturity, effectiveness and environmental performance. A representative Boolean combination reconstructed from these concepts—not an archived verbatim string—was: ("environmental management system*" OR EMS OR "ISO 14001") AND ("leadership commitment" OR "top management" OR leadership) AND (implementation OR internalisation OR maturity OR effectiveness OR "environmental performance"). The search covered contemporary literature from 2018–2026; older foundational sources were retained separately. Exact search dates and database-specific strings were not preserved. The search was restricted to English-language publications; stage-wise retrieval and exclusion counts were not retained. Titles and abstracts were assessed before relevant full texts. Sources were retained for relevance to leadership, EMS implementation, internalisation/maturity, effectiveness or environmental outcomes. Adjacent constructs and settings were treated as indirect evidence. Stage-wise retrieval and exclusion counts were unavailable and were not reconstructed.

Ultimately, sources were mapped by context, design, constructs, findings and contribution to the framework. The synthesis distinguishes reported findings, related evidence and author-developed propositions. Table 3 maps 36 scholarly publications indicating thematic relevance; the ISO 14001:2015 standard is treated separately.

Ethical Considerations

This conceptual study only used published literature and the ISO 14001:2015 standard. It involved no human participants, personal data, or primary data collection; therefore, formal research-participant ethical approval was not applicable. Sources are acknowledged through citations and the reference list, and the synthesis preserves the methods and findings reported by the original authors without altering or misrepresenting their results.

Table 1: Review Process, Evidence Synthesis and Count-Reporting Status

Review stage	Procedure used	Numerical reporting status
Literature identification	Targeted searches of Scopus and Web of Science using combinations of terms related to EMS, ISO 14001, leadership commitment, implementation, effectiveness, maturity and environmental performance.	Not recoverable from retained records: exact search dates and the number of records retrieved from each database.
Relevance assessment	Titles and abstracts assessed for conceptual relevance; full texts examined when potentially useful to the review objectives.	Not recoverable: duplicate-removal totals and the number screened at title/abstract stage were not preserved.
Eligibility	Scholarly publications addressing at least one core construct within the contemporary evidence period; foundational theoretical sources retained where justified.	Not recoverable: the number of full texts assessed and excluded at eligibility review was not preserved.
Evidence mapping	Sources mapped by evidence type, study context, constructs addressed, key findings and contribution to the framework.	Final evidence base: 36 scholarly publications. ISO 14001:2015 is counted separately as a normative source (37 source items overall).
Cross-study synthesis	Evidence compared to identify recurring relationships, convergence, divergence and explanatory gaps.	Qualitative cross-study comparison; no numerical aggregation or pooled effect-size analysis was undertaken.
Framework development	Synthesized evidence integrated into the proposed relationships among leadership commitment, implementation maturity and EMS implementation effectiveness.	Conceptual output, not a screening stage or record count.

Table 2: Geographical and Study-Setting Classification of the 28 EMS-Context Publications

Primary study setting/scope	Number of publications
Global / Multiregion	4
Asia / Middle East	9
Africa	4
Europe	7
South America	1
Not stated	3
Total	28

The 28 publications classified here are the EMS-context publications assigned a primary study setting or scope. The study excluded the remaining nine sources from this geographical count because they are not EMS-context publications. They provide broader organisational-theory, resource-allocation, upper-echelons, institutional-theory, or country-level sustainability context rather than a single empirical EMS setting for this table.

FINDINGS AND DISCUSSION

Evidence Synthesis

The synthesis distinguishes (1) findings reported by individual studies, (2) patterns recurring across sources, and (3) propositions developed by this review. This distinction is important because many studies address adjacent constructs or specific contexts rather than directly testing the proposed leadership-maturity-effectiveness model.

The evidence base comprises 36 scholarly publications and ISO 14001:2015 as a separate normative source (37 items). Table 2 classifies the settings of 28 EMS-context publications; Table 3 maps all 36 scholarly works to review themes. Thematic marks do not establish direct measurement, causality or moderation.

Leadership Commitment and EMS Implementation Effectiveness

In this study, leadership commitment is treated as an important organisational condition for EMS implementation, although the available evidence varies in design and directness. ISO 14001:2015 normatively requires top leadership to demonstrate commitment to the EMS (International Organisation for Standardisation [ISO], 2015). A single-company case study of ISO 14001 implementation in a Ghanaian cable manufacturer describes management actions around energy-efficiency goals, staff accountability and resource provision (Botchway & Gbedemah, 2018).

Astuti et al. (2025) discuss ISO 14001 implementation for cleanliness and garden maintenance at the Jakarta Presidential Palace, including leadership commitment, staff awareness, documentation, training and monitoring. The article's abstract describes a literature and documentation-based approach, while the Methods section also reports interviews with 15 informants and three months of observation; this internal inconsistency means the method should be described cautiously. The article does not report a statistical test of the effects of leadership commitment. In this review, leadership commitment is therefore examined through strategic direction, communication, visible involvement and resource support, without assuming that every cited study directly measures all four dimensions.

The evidence links top-management commitment to implementation-related relationships, but outcomes and designs differ. Burki and Ersoy (2022), using 181 ISO 14001-certified Turkish manufacturing firms, examine top-management commitment in the relationship between green innovation and customer cooperation—not EMS effectiveness directly. Riwayadi (2024) reviews leadership in ISO implementation and reports differing views about leadership as a success factor. McHugh and Duane (2026) discuss senior-executive characteristics in a broader organisational context. These sources support including leadership commitment in the framework, but

do not establish a uniform causal effect on EMS effectiveness.

The literature suggests that commitment must be reflected in organisational practices, not statements alone. Management support is linked to ISO 14001 certification success, although practices and settings vary (Waxin et al., 2020). This review therefore treats environmental-priority discussions, resource provision, participation in reviews and audits, and accountability as possible expressions of commitment—not behaviours independently established by Waxin et al. Such practices may signal whether environmental management is an organisational priority or mainly a specialist compliance function.

Deyassa (2019) analysed nearly 5,000 responses from the ISO 2013 Continuous Improvement Survey across 110 countries, supplemented by 19 semi-structured interviews in Norway. The study examined adoption motivations and perceived environmental/business value; survey comparisons by motivation type were not statistically significant at the .05 level. It offers context on perceived value, not a direct test of leadership commitment or the proposed leadership-by-maturity interaction. The evidence therefore leaves open how far maturity explains variation in the relationship between leadership commitment and effectiveness.

ISO 14001:2015 Implementation Maturity and Organisational Embedding

In this study, implementation maturity refers to the degree to which an EMS is internalised and embedded across organisational strategy, routines, processes, and decision-making. It is treated as a developing organisational capability, emphasising the depth of embedding rather than the mere presence of certification. This definition frames the review; the cited literature distinguishes formal adoption from internalisation but does not establish this exact definition as a validated construct (Daddi et al., 2022).

The literature distinguishes formal EMS adoption from substantive internalisation. Boiral et al. (2018) identify limitations and variation in evidence on ISO 14001 adoption and outcomes, while Bravi et al. (2020) report perceived benefits and implementation barriers among certified Italian companies. Daddi et al. (2022) examine internalisation in EMAS-registered organisations, so their findings inform the broader concept but do not reflect

ISO 14001-certified firms alone. These sources support distinguishing adoption from substantive implementation, but do not test the full maturity dimensions proposed here.

Implementation depth may vary rather than follow automatically from certification. Studies address adoption and outcomes, implementation experiences, internalisation and sector-specific contexts (Boiral et al., 2018; Bravi et al., 2020; Daddi et al., 2022). For example, Ace de Oliveira Monteiro et al. (2019) applied an ISO 14001:2015 diagnostic checklist in a Brazilian electronics company and found that 65 per cent of mandatory items required further compliance. This illustrates a gap between requirements and practice, but does not establish a general maturity scale or fixed stages. The continuum below is therefore this review's analytical synthesis.

The reviewed studies do not provide a consistently operationalised maturity construct or universally validated stages. The review synthesises recurring signs of deeper embedding: organisational ownership, integration into routines and decisions, systematic use of environmental information, learning, management review and continual improvement. These are proposed conceptual dimensions, not a validated scale.

Based on these recurring characteristics, this review proposes four conceptual levels of implementation maturity. Level 1, formal or symbolic adoption, is dominated by documentation, formal conformity and certification requirements, with environmental management remaining largely compliance-oriented. Level 2, partial implementation, involves selected operational EMS practices but fragmented ownership and inconsistent application. Level 3, integrated or substantive implementation, involves cross-functional ownership, integration into routine operations and management decisions, and systematic use of environmental information. Level 4, proactive and continuously improving implementation, involves strategic embedding, organisation-wide learning, management-oriented review and improvement beyond minimum compliance.

The four levels are a conceptual synthesis, not an empirically validated scale. Organisations may show features of several levels, and the framework assumes neither a fixed nor universal progression. Empirical

operationalisation and validation are needed before the continuum can classify organisations or serve as a measurement instrument.

EMS Implementation Effectiveness and Environmental Sustainability

Here, EMS implementation effectiveness refers to the extent to which an implemented EMS achieves its intended objectives and produces observable operational or environmental results. Potential indicators include environmental objectives, compliance, resource efficiency, waste management and emissions control, each clearly defined and measured. Deyassa (2019) examines adoption motivations and perceived value; Mungai et al. (2020) examine Kenyan firms' wastewater recycling, solid-waste reuse and safe disposal in relation to voluntary EMSs. Because that category includes both ISO 14001 and the UN Global Compact, the reported association with environmental performance cannot be attributed to ISO 14001 alone. These sources offer different types of evidence; certification alone does not prove that intended outcomes have been achieved.

Johnstone (2022), using qualitative cross-case interviews with people responsible for EMS implementation in ISO 14001-certified SMEs, explains how environmental management control systems and monitoring may support substantive performance improvement. The study is not a quantitative test of the full effectiveness construct. Mungai et al. (2020) link voluntary EMSs to waste-management performance and include ISO 14001 and the UN Global Compact; Onkangi et al. (2018) examine Kenyan construction projects and provide sector-specific context. These findings should not be generalised without qualification to all certified manufacturing firms.

Effectiveness concerns what an implemented EMS achieves; maturity concerns how deeply it is embedded. They are analytically distinct, and the evidence does not justify treating them as synonymous or assuming that deeper embedding guarantees specific outcomes.

Environmental sustainability is a broader, longer-term outcome than EMS implementation effectiveness. Effectiveness concerns achievement of EMS objectives; sustainability concerns whether environmental improvements endure and contribute to longer-term performance. The distinction concerns both outcome level and time horizon.

Environmental outcomes are studied at different levels. A meta-analysis of 53 studies and 182,926 companies found an overall positive association between ISO 14001/EMAS and environmental performance, with variation by conditions including environmentally innovative adoption and certification maturity (Erauskin-Tolosa et al., 2020). This does not test the proposed leadership-commitment by implementation-maturity interaction. Zhang et al. (2024) report a positive association between EMS certification and green innovation in Chinese firms, with social-responsibility disclosure mediating the relationship; green innovation is not the same as EMS effectiveness or sustained environmental performance.

Khan et al. (2025) analyse 244 managers in Pakistani textile firms and link environmental transformational leadership to EMS and environmental performance, with EMS partially mediating the leadership-performance relationship; this leadership construct differs from broad commitment, and mediation is not moderation. Gorlova (2024) uses Polish national-level data, so its correlations between ISO 14001 prevalence and green-economy indicators are at the macro level. Cestau-Oyhantçabal and Arocena (2025) use a dynamic panel of 512 international non-service firms over 2013–2022 and associate ISO 14001 adoption with lower energy intensity, lower greenhouse-gas emission rates, and greater renewable-energy use, but not a significant effect on carbon intensity from non-renewable energy. These findings are relevant but heterogeneous; none proves that every certified organisation achieves sustained improvement.

Oyelakin and Johl (2022) examine ISO 14001 as a mediator between green servitization and sustainable performance in manufacturing firms; this is adjacent evidence, not a test of leadership commitment or maturity moderation. Deyassa (2019) examines adoption motivations and perceived value, while Camilleri (2022) reviews certification rationales, potential benefits, costs and constraints. Bakkass et al. (2025) report that an ISO

14001-based action plan at a Casablanca construction site improved waste separation, increased solid-waste recovery by 30 per cent and reduced disposal costs. This site-level example should not be generalised across sectors. Collectively, these sources do not establish that strategic embedding or continual improvement invariably produces long-term sustainability; that relationship remains a conceptual proposition.

For measurement, effectiveness should capture whether the EMS is implemented as intended and achieves defined objectives; environmental sustainability should capture the durability and longer-term trajectory of outcomes. Toha et al. (2020) propose a conceptual model in which ISO 14001:2015 moderates the relationship between eco-innovation and firm sustainability; it sets a precedent for considering conditional relationships, not an empirical test of the interaction proposed in this review. Teixeira et al. (2025) compare economic growth and environmental sustainability across 20 countries using 1990–2019 data; this country-level analysis does not establish an EMS-level pathway. For example, achieving a waste-reduction target in one period is an effectiveness result, while sustainability assessment would also examine whether the reduction is maintained. These distinctions are proposed for future research; the reviewed studies do not use a uniform indicator set.

Environmental sustainability should not be treated as an automatic consequence of certification or as a one-time measure of effectiveness. Vera Solano et al. (2025) use a literature review and MICMAC Godet structural analysis to identify 30 interrelated factors affecting environmental performance in ISO 14001-certified companies. This identifies the relevant factors but does not show that improvements are necessarily maintained over time. Sustainability is therefore treated as a broader, longer-term outcome to which sustained EMS effectiveness may contribute.

Table 3: Evidence Synthesis and Theoretical and Thematic Contributions of the 36 Scholarly Publications

No.	Study	Year	Theory	Leadership Commitment	EMS Implementation Effectiveness	Implementation Maturity	Environmental Sustainability
1	Aksom and Firsova (2021)	2021	✓	—	—	—	—
2	Astuti et al. (2025)	2025	—	—	✓	✓	—
3	Bakkass et al. (2025)	2025	—	—	✓	✓	—
4	Boiral et al. (2018)	2018	—	—	✓	—	—
5	Bravi et al. (2020)	2020	—	—	✓	—	—
6	Botchway and Gbedemah (2018)	2018	—	✓	✓	—	—
7	Bower (2018)	2018	✓	—	—	—	—
8	Burki and Ersoy (2022)	2022	—	✓	—	—	—
9	Camilleri (2022)	2022	—	—	✓	✓	—
10	Cestau-Oyhantçabal and Arocena (2025)	2025	—	—	—	—	✓
11	Chen et al. (2020)	2020	—	—	—	—	✓
12	Cristofaro et al. (2025)	2025	—	✓	—	—	—
13	Daddi et al. (2022)	2022	—	—	—	✓	—
14	Deyassa (2019)	2019	—	—	✓	—	—
15	Díaz de Junguitu and Allur (2019)	2019	—	—	—	✓	—
16	Erauskin-Tolosa et al. (2020)	2020	—	—	—	—	✓
17	Gorlova (2024)	2024	—	—	—	—	✓
18	Hambrick and Mason (1984)	1984	✓	—	—	—	—
19	Jabbar et al. (2025)	2025	—	—	✓	—	—
20	Johnstone (2022)	2022	—	—	✓	—	—
21	Khan et al.	2025	—	—	—	—	✓

	(2025)						
22	Maritan and Lee (2017)	2017	✓	—	—	—	—
23	McHugh and Duane (2026)	2026	✓	—	—	—	—
24	Monteiro et al. (2019)	2019	—	—	✓	—	—
25	Mungai et al. (2020)	2020	—	—	✓	—	—
26	Ojiako et al. (2025)	2025	—	✓	—	—	—
27	Onkangi et al. (2018)	2018	—	—	✓	—	—
28	Oyelakin and Johl (2022)	2022	—	—	—	—	✓
29	Riwayadi (2024)	2024	—	✓	—	—	—
30	Roszkowska-Menkes (2023)	2023	✓	—	—	—	—
31	Teixeira et al. (2025)	2025	—	—	—	—	✓
32	Toha et al. (2020)	2020	—	—	—	—	✓
33	Vera Solano et al. (2025)	2025	—	—	—	—	✓
34	Waxin et al. (2020)	2020	—	✓	—	—	—
35	Wong et al. (2020)	2020	—	✓	—	—	—
36	Zhang et al. (2024)	2024	—	—	—	—	✓

A check mark indicates a source's interpreted contribution to a review theme. A dash means no central thematic contribution was coded, not that a source is irrelevant. The Theory column identifies foundational theory sources and selected broader scholarship used to frame the review's theoretical lenses; McHugh and Duane (2026) provide broader Upper Echelons scholarship, not direct EMS leadership evidence. A mark under leadership commitment does not mean related constructs, such as resource allocation, employee involvement, or environmental transformational leadership, are identical to leadership commitment. Environmental sustainability marks include literature on environmental performance or sustainability outcomes, but they do not, by themselves, establish that gains persisted over time. Mungai et al. (2020) is coded under

EMS implementation effectiveness because it examines waste-management outcomes under voluntary EMS; the study does not isolate ISO 14001 or establish long-term sustainability. Waxin et al. (2020) informs certification drivers and implementation challenges rather than directly measuring EMS outcome effectiveness, so it is discussed in the narrative but not marked as a central effectiveness study.

Ojiako et al. (2025) examine certification signalling and critical success factors for implementation; Deyassa (2019) provides evidence on adoption motivations, perceived environmental/business value, and implementation experience; Jabbar et al. (2025) assess clause-level ISO 14001:2015 compliance in two Iraqi hospitals. Astuti et al. (2025) and Bakkass et al. (2025)

provide descriptive implementation examples; Bakkass et al. (2025) report site-specific waste-management outcomes. Onkangi et al. (2018) examine adoption barriers and drivers in Kenyan construction projects. Díaz de Junguitu and Allur (2019) support variation in EMS internalisation across a small qualitative SME sample, but not a validated maturity scale.

Monteiro et al. (2019) report a single-company compliance-gap diagnosis based on an ISO 14001:2015 checklist; this illustrates implementation gaps but does not operationalise maturity, so its maturity mark has been removed. A check mark under implementation maturity therefore indicates only an indirect conceptual contribution to understanding implementation depth, unless a source explicitly operationalises maturity. Zhang et al. (2024) remains unmarked under environmental sustainability because it measures green innovation performance; this is relevant adjacent evidence, but not a direct measure of sustained environmental performance. Camilleri (2022) reviews certification rationales, potential operational benefits and implementation costs or constraints; it is not coded as a central EMS implementation-effectiveness study.

Wong et al. (2020) inform the resource-allocation discussion and report environmental and cost-performance outcomes; its main analysis compares resource-allocation patterns across firm sizes. Deyassa (2019) and Jabbar et al. (2025) are marked for EMS implementation effectiveness because they explicitly examine perceived EMS value/effectiveness and ISO 14001:2015 implementation compliance, respectively; Onkangi et al. (2018) is marked for implementation effectiveness only as indirect context on adoption and

implementation practices in Kenyan construction projects; it is not a direct measured-effectiveness test, and the participating firms were not ISO 14001-certified. Bakkass et al. (2025) is marked for effectiveness because it reports site-specific waste-management outcomes. Astuti et al. (2025) and Bakkass et al. (2025) are marked for maturity only as interpretive examples of implementation embedding; neither operationalises or validates the proposed maturity construct.

B. Development of the Conceptual Framework

The framework proposes that institutional pressures shape the context for EMS adoption, while senior leaders interpret environmental priorities and direct communication, involvement and resources. Implementation maturity captures how deeply those priorities are embedded in routines and decision-making. The model positions maturity as a potential moderator of the relationship between leadership commitment and EMS implementation effectiveness; effectiveness may then contribute to longer-term environmental sustainability.

The moderation mechanism is a proposition, not an established finding. The literature provides relevant but heterogeneous evidence on leadership support, implementation practices, internalisation and environmental outcomes. The review theorises that deeper embedding may strengthen the translation of leadership commitment into effective implementation; this remains to be tested directly.

EMS Implementation Maturity as a Proposed Moderator

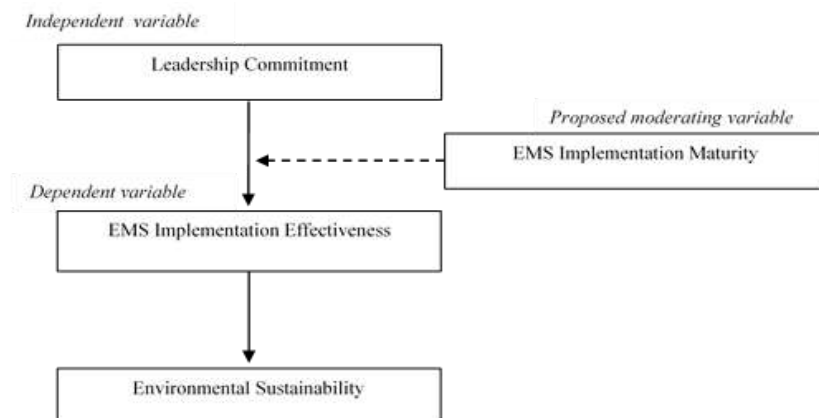


Figure 1: Conceptual Framework Showing Implementation Maturity as a Proposed Moderator

Note. The framework proposes a positive relationship between leadership commitment and EMS implementation effectiveness, with ISO 14001:2015 implementation maturity moderating this relationship. EMS implementation effectiveness may, in turn, contribute to broader environmental sustainability outcomes.

C. Propositions

The propositions distinguish relationships suggested by the reviewed literature from the proposed moderation mechanism, which is derived from the theoretical synthesis and requires empirical validation.

P1: Leadership commitment is proposed to be positively associated with EMS implementation effectiveness. Strategic direction, communication, visible involvement and resource support may create conditions for effective implementation, although the relationship may vary by context.

P2: ISO 14001:2015 implementation maturity is proposed to moderate the relationship between leadership commitment and EMS implementation effectiveness. The positive relationship is expected to be stronger where EMS requirements are embedded in routines, decisions, monitoring and continual improvement. This proposition requires empirical testing.

P3: EMS implementation effectiveness is proposed to contribute to environmental sustainability by supporting environmental objectives and performance improvements maintained over time. This is not assumed to be automatic or uniform across organizations; longer-term outcomes should be measured separately.

Discussion

Leadership commitment may support EMS implementation through strategic direction, communication, involvement and resources. Because studies vary in context and design, they do not establish a uniform causal effect; commitment enables effectiveness but does not guarantee it. (Botchway & Gbedemah, 2018; Waxin et al., 2020).

The theories complement each other: Institutional Theory explains external pressures (Aksom & Firsova, 2021; Roszkowska-Menkes, 2023), Upper Echelons Theory explains leaders' priorities (Hambrick & Mason, 1984), and Resource Allocation Theory explains resource decisions (Bower, 2018; Maritan & Lee, 2017). This study synthesises their integration, rather than validating a relationship through a single study.

Certification and implementation are not equivalent. ISO 14001:2015 provides a formal framework, but certification alone does not establish organisational embedding or equivalent outcomes. Reviews identify variation in ISO 14001 outcomes (Boiral et al., 2018; Camilleri, 2022), while Daddi et al. (2022) examine internalisation in EMAS-registered—not ISO-only—organisations.

Implementation maturity refers to how deeply EMS is embedded across strategy, responsibilities, operations, monitoring, review, and learning. It concerns integration, not achieved outcomes. The reviewed studies do not establish a universally validated maturity measure; this review's conceptual synthesis is the dimensions and four-level continuum.

Maturity may shape how leadership commitment translates into effectiveness: embedded responsibilities and information and review routines may help enact priorities consistently, while weaker embedding may leave implementation uneven or compliance-oriented. This mechanism is proposed, not directly demonstrated by the reviewed evidence.

EMS effectiveness concerns whether the system achieves intended objectives; environmental sustainability is a broader, potentially longer-term outcome. Maturity is distinct from both and does not guarantee results. The literature measures different outcomes—including perceived benefits (Deyassa, 2019), waste management (Mungai et al., 2020), green innovation (Zhang et al., 2024) and environmental performance (Erauskin-Tolosa et al., 2020)—which should not be treated as interchangeable.

The framework positions leadership commitment as the explanatory construct, maturity as the proposed moderator, effectiveness as the proximal outcome and environmental sustainability as a broader outcome that effective implementation may support.

The theoretical contribution connects institutional pressures, leadership interpretation, resource allocation, and organisational embedding in one framework. Each theory explains a distinct part of the proposed account;

maturity is the hypothesised condition shaping the leadership–effectiveness relationship. The moderation proposition is developed from the review’s theoretical synthesis and evidence mapping. It specifies a testable question.

For practitioners, certification status alone may provide an incomplete picture of implementation. Organisations can also assess whether environmental objectives inform strategy and operations, whether responsibilities and resources are adequate, and whether monitoring, management review and continual improvement are functioning. These checks identify gaps without assuming maturity guarantees performance.

Future research should validate a multidimensional maturity measure and test its moderating role in the leadership–effectiveness relationship. Interaction analysis, maturity-group comparisons and longitudinal or cross-sector studies could test the proposition and assess whether effectiveness predicts sustained environmental outcomes.

CONCLUSION AND RECOMMENDATIONS

Conclusion: The study concludes that leadership commitment may support EMS effectiveness through strategic direction, communication, involvement, accountability and resources. The varied evidence does not establish commitment alone as sufficient to explain implementation differences. ISO 14001:2015 implementation maturity as a moderator of the leadership

commitment–effectiveness relationship. Maturity concerns organisational embedding, distinct from leadership commitment and achieved outcomes. This proposition remains untested and warrants further research. Effective EMS implementation may contribute to environmental sustainability, but sustained gains cannot be inferred from certification or a single effectiveness measure. Therefore, future studies should measure implementation effectiveness and longer-term environmental outcomes separately.

Recommendations: The study recommends that organisations evaluate EMS implementation beyond certification by checking whether environmental objectives inform strategy and operations, whether responsibilities and resources are adequate, and whether monitoring and review support continual improvement. Leaders can enable these processes through communication, involvement and accountability. Researchers should validate a multidimensional measure of ISO 14001:2015 implementation maturity and test its proposed moderating role through interaction analysis, maturity-group comparisons and longitudinal designs. Ultimately, cross-sector research should also assess whether effective implementation is associated with sustained environmental improvements.

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