

Toward Integrated Environmental Management: A Framework Based On Policy, Governance, And Stakeholder Dynamics

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Abstract

Integrated environmental management (IEM) has been widely advocated as a response to complex, cross-sectoral environmental challenges; however, empirical evidence remains limited regarding how policy integration translates into measurable environmental outcomes under varying institutional conditions. This study develops and empirically tests an IEM framework linking environmental policy integration (EPI), governance capacity (GC), stakeholder participation (SP), and institutional support (IS) to environmental performance (EP). Using a quantitative cross-sectional survey of environmental management professionals in public institutions (N = 367), the study applies a two-step SEM procedure. Measurement quality is assessed via confirmatory factor analysis, and hypotheses are tested through structural equation modeling with bootstrapped mediation and interaction-based moderation. The CFA results demonstrate satisfactory internal consistency and construct validity (Cronbach's $\alpha = .86-.91$; CR = .88-.92; AVE = .64-.70), and discriminant validity is supported using the Fornell-Larcker criterion. Structural results indicate that EPI positively predicts EP ($\beta = .24, p < .001$), and SP has an additional direct positive effect on EP ($\beta = .21, p < .001$). GC partially mediates the relationship between EPI and EP, evidenced by a significant indirect effect ($\beta = .15, p < .001$) and a remaining significant direct effect ($\beta = .12, p = .016$). Moreover, IS strengthens the implementation-to-performance relationship, as shown by a significant

interaction effect on EP ($\beta = .10$, $p = .012$). Overall, the findings suggest that IEM effectiveness depends not only on policy coherence but also on governance capacity, stakeholder engagement, and supportive institutional conditions. The study contributes a validated, mechanism-oriented framework and offers practical implications for improving cross-sector coordination, capacity building, and institutional credibility in environmental governance.

Keywords: integrated environmental management; environmental policy integration; governance capacity; stakeholder participation; institutional support; environmental performance; structural equation modeling

1. Introduction

Environmental degradation, climate change, and resource depletion increasingly present as cross-sectoral and multi-level governance challenges. Fragmented, sector-based regulation often fails to address spillover effects and long-term cumulative impacts (Ostrom, 2010; Young, 2011). In response, integrated environmental management (IEM) has gained prominence as a governance paradigm emphasizing policy coherence, coordination across administrative boundaries, and inclusive stakeholder engagement (Jordan & Lenschow, 2010). However, the effectiveness of integrated approaches varies substantially across contexts, suggesting that implementation capacity and institutional conditions may shape the extent to which policy integration translates into measurable environmental outcomes (Scott, 2014).

Accordingly, the purpose of this study is to develop and empirically test an IEM framework linking environmental policy integration, governance capacity, stakeholder participation, and institutional support to environmental performance. Specifically, this study pursues three objectives:

- (1) to estimate the direct effect of environmental policy integration on environmental performance;
- (2) to examine whether governance capacity functions as a mediating mechanism translating integration into performance gains; and
- (3) to test whether institutional support strengthens the effectiveness of integrated management, while also assessing the role of stakeholder participation as a performance enhancer.

Based on these objectives, this study addresses the following research questions:

RQ1. To what extent does environmental policy integration positively influence environmental performance?

RQ2. Does governance capacity mediate the relationship between environmental policy integration and environmental performance?

RQ3. Does institutional support strengthen the effect of integrated environmental management practices on environmental performance?

Consistent with prior research suggesting that policy coherence reduces regulatory conflict and enables aligned environmental objectives across sectors (Jordan & Lenschow, 2010), the following hypothesis is proposed:

H1. Environmental policy integration is positively associated with environmental performance.

Because integrated policy intentions require operational translation through coordination, expertise, and enforcement, governance capacity is expected to function as a mechanism that converts integration into measurable outcomes (Ostrom, 2010). Therefore:

H2. Governance capacity mediates the relationship between environmental policy integration and environmental performance.

Given the importance of legitimacy, information, and compliance in environmental governance, higher stakeholder participation is expected to enhance performance outcomes (Freeman, 2010). Thus:

H3. Stakeholder participation is positively associated with environmental performance.

Finally, institutional theory argues that stable and credible institutions shape the effectiveness of managerial practices by strengthening enforcement and reducing uncertainty (Scott, 2014). Accordingly, institutional support is expected to amplify the effects of integrated management on performance:

H4. Institutional support positively moderates the relationship between integrated environmental management practices and environmental performance, such that the relationship is stronger when institutional support is high.

Accordingly, this study develops and empirically tests an IEM framework linking environmental policy integration, governance capacity, stakeholder participation, and institutional support to environmental performance. By modeling mediation and moderation mechanisms, the study clarifies how integrated approaches generate performance gains and under what institutional conditions such gains are amplified.

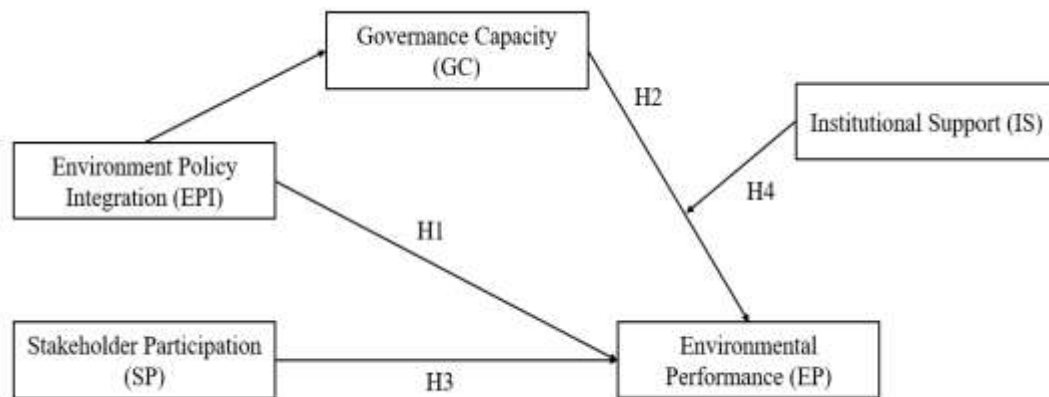


Figure 1 Conceptual framework of integrated environmental management (IEM).

Note. *EPI = environmental policy integration; GC = governance capacity; SP = stakeholder participation; IS = institutional support; EP = environmental performance.*

2. Literature Review

2.1 Integrated Environmental Management and Environmental Policy Integration

IEM is grounded in the assumption that environmental challenges are systemic and require coordinated interventions across policy domains rather than isolated environmental regulation alone (Jordan & Lenschow, 2010). Environmental policy integration (EPI) is commonly defined as the incorporation of environmental objectives into sectoral decision-making to reduce policy conflicts and regulatory fragmentation. While EPI is generally associated with better environmental outcomes, its effectiveness depends on whether policy coherence can be operationalized through capable administrative systems.

2.2 Governance Capacity

Governance capacity represents the institutional and managerial ability to implement policy intent through coordination, enforcement, expertise, and organizational learning. Polycentric and multi-level governance perspectives suggest that the capacity to coordinate across agencies and levels is pivotal for managing complex environmental commons (Ostrom, 2010). Therefore, governance capacity is expected to function as a key mechanism translating integrated policy intent into environmental performance.

2.3 Stakeholder Participation and Institutional Support

Stakeholder theory emphasizes that broad participation can enhance legitimacy, information quality, compliance, and monitoring—thereby improving policy effectiveness (Freeman, 2010). Institutional theory further argues that the credibility and stability of regulatory systems condition how managerial practices affect outcomes; strong institutions can reduce uncertainty and enforcement gaps, amplifying the returns of integrated management efforts (Scott, 2014). Consequently, stakeholder participation is expected to contribute directly to environmental performance, while institutional support is expected to strengthen (moderate) the effectiveness of integrated management.

Table 1 Construct definitions and theoretical foundations.

Construct	Operational definition	Theoretical lens	Representative sources
Environmental Policy Integration	Degree to which environmental objectives are embedded in	Policy integration	Jordan & Lenschow (2010)

Construct	Operational definition	Theoretical lens	Representative sources
(EPI)	sectoral policies and cross-department planning		
Governance Capacity (GC)	Coordination, expertise, enforcement ability, and implementation resources enabling policy execution	Multi-level / polycentric governance	Ostrom (2010)
Stakeholder Participation (SP)	Extent of meaningful involvement by public, private sector, and civil society in policy processes	Stakeholder theory	Freeman (2010)
Institutional Support (IS)	Regulatory stability, rule enforcement credibility, and institutional legitimacy	Institutional theory	Scott (2014)
Environmental Performance (EP)	Perceived improvements in compliance, pollution control, ecological quality, and governance outcomes	Regime effectiveness / performance	Young (2011)

Note. Constructs are modeled as latent variables measured using multi-item Likert-type indicators.

3. Research Methodology

3.1 Research Design

A quantitative, cross-sectional survey design was employed. Structural equation modeling (SEM) was used to test the direct effects of EPI, GC, and SP on EP, as well as the mediating role of governance capacity and the moderating role of institutional support. Consistent with SEM reporting standards, measurement properties were assessed prior to structural testing (Hair et al., 2019).

3.2 Sample and Data Collection

A total of 412 questionnaires were distributed to professionals working in environmental management-related public institutions; 367 valid responses were obtained (valid response rate = 89.1%). Respondents varied across administrative level, years of experience, and region, providing sufficient heterogeneity for inferential analysis.

Table 2 Sample characteristics (N = 367).

Characteristic	Category	n	%
Administrative level	Local	214	58.3
	Provincial/Regional	123	33.5
	National	30	8.2
Years of experience	≤ 5 years	96	26.2
	6–10 years	141	38.4
	≥ 11 years	130	35.4
Primary function	Policy/planning	149	40.6
	Enforcement/inspection	96	26.2
	Monitoring/assessment	122	33.2

Note. Categories may be adapted to match the final survey instrument.

3.3 Measures and Analytical Procedure

All constructs in this study were measured using multi-item, five-point Likert-type scales, with response options ranging from 1 (strongly disagree) to 5 (strongly agree). Measurement items were adapted from well-established instruments in the environmental management and governance literature to ensure content validity (Jordan & Lenschow, 2010; Ostrom, 2010; Scott, 2014). Minor wording modifications were made to enhance contextual relevance while preserving the original theoretical meaning of each construct. Prior to full-scale data collection, the questionnaire was reviewed by domain experts and pilot tested to ensure clarity and face validity.

To examine the psychometric properties of the measurement model and test the hypothesized relationships, the empirical analysis followed a two-step analytical procedure commonly recommended in structural equation modeling research (Hair et al., 2019). In the first step, confirmatory factor analysis (CFA) was conducted to assess measurement reliability and validity. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR), with values exceeding .70 indicating acceptable reliability. Convergent validity was assessed using average variance extracted (AVE) and standardized factor loadings, with AVE values above .50 and loadings above .60 considered satisfactory. Discriminant validity was examined using the Fornell–Larcker criterion, comparing the square root of AVE for each construct with inter-construct correlations.

In the second step, structural equation modeling (SEM) was employed to test the hypothesized relationships among environmental policy integration, governance capacity, stakeholder participation, institutional support, and environmental performance. Direct effects corresponding to H1 and H3 were estimated, while the mediating role of governance capacity (H2) was assessed by examining both indirect and direct effects within the structural model.

Mediation effects were tested using bootstrapping procedures with bias-corrected

confidence intervals, which provide a robust and distribution-free method for evaluating indirect effects (Preacher & Hayes, 2008). Partial mediation was inferred when both the indirect effect and the direct effect remained statistically significant after the mediator was introduced.

To test the moderating effect proposed in H4, an interaction term capturing the joint effect of institutional support and integrated management practice was included in the structural model. A statistically significant interaction coefficient was interpreted as evidence of moderation, indicating that institutional support conditions the strength of the implementation-to-performance relationship.

Finally, overall model adequacy was evaluated using commonly reported goodness-of-fit indices for SEM, and the analytical sequence adopted in this study is summarized in Figure 2. This structured procedure ensures the reliability, validity, and inferential rigor of the empirical findings.

4. Results

4.1 Measurement Model (CFA)

CFA supported acceptable measurement properties. Standardized factor loadings exceeded common thresholds, indicating item reliability. Internal consistency was satisfactory (Cronbach's α and CR values above .70), and convergent validity was supported (AVE > .50). Discriminant validity was assessed using the Fornell–Larcker criterion, indicating that constructs were empirically distinct (Hair et al., 2019).

Table 3 Measurement properties and validity assessment (CFA).

Construct	Items (k)	Cronbach's α	CR	AVE	Standardized loadings (range)
EPI	5	.88	.90	.65	.71–.86
GC	5	.91	.92	.70	.74–.88
SP	4	.86	.88	.64	.70–.85
IS	4	.87	.89	.66	.72–.86
EP	5	.90	.91	.67	.73–.87

Note. CR = composite reliability; AVE = average variance extracted. Recommended thresholds: $\alpha \geq .70$, CR $\geq .70$, AVE $\geq .50$ (Hair et al., 2019). Replace simulated values with observed statistics.

The results indicate that all constructs demonstrate strong internal consistency reliability. Cronbach's alpha values range from .86 to .91, exceeding the recommended threshold of .70 (Hair et al., 2019). Specifically, environmental policy integration (EPI) exhibits a Cronbach's α of .88, governance capacity (GC) .91, stakeholder participation

(SP) .86, institutional support (IS) .87, and environmental performance (EP) .90. These findings suggest that the measurement items for each construct are internally consistent and reliably capture the underlying latent variables.

Composite reliability (CR) values further confirm reliability, ranging from .88 to .92, all well above the recommended minimum of .70. The high CR values indicate that the constructs possess satisfactory construct reliability and that measurement error is relatively low.

Convergent validity was assessed using average variance extracted (AVE). As reported in Table 3, AVE values range from .64 to .70, exceeding the recommended cutoff of .50 (Hair et al., 2019). This indicates that, on average, each construct explains more than half of the variance in its observed indicators.

In addition, standardized factor loadings for all items are substantial, with values ranging from .70 to .88 across constructs. All loadings exceed the commonly accepted threshold of .60, providing further evidence of adequate convergent validity and strong relationships between observed indicators and their respective latent constructs.

Table 4 Discriminant validity using the Fornell-Larcker criterion.

Construct	EPI	GC	SP	IS	EP
EPI	.81				
GC	.58	.84			
SP	.49	.55	.80		
IS	.46	.52	.43	.81	
EP	.60	.66	.57	.54	.82

Note. Diagonal elements (bold) are square roots of AVE. Off-diagonal entries are inter-construct correlations. Replace simulated values with observed statistics.

Discriminant validity was assessed using the Fornell-Larcker criterion, which compares the square root of the average variance extracted (AVE) for each construct with its correlations with other constructs. As reported in Table 4, the square roots of AVE (displayed on the diagonal) range from .80 to .84, while all off-diagonal inter-construct correlations are substantially lower.

Specifically, the square root of AVE for environmental policy integration (EPI) is .81, exceeding its highest correlation with any other construct ($r = .60$ with environmental performance). Similarly, governance capacity (GC) shows a square root of AVE of .84, which is greater than its correlations with stakeholder participation ($r = .55$) and environmental performance ($r = .66$). For stakeholder participation (SP), the square root of AVE (.80) exceeds its correlations with other constructs, including environmental policy integration ($r = .49$) and governance capacity ($r = .55$).

In addition, institutional support (IS) demonstrates a square root of AVE of .81, which is

higher than its correlations with all other constructs, ranging from .43 to .54. Finally, environmental performance (EP) shows a square root of AVE of .82, exceeding its correlations with environmental policy integration ($r = .60$), governance capacity ($r = .66$), stakeholder participation ($r = .57$), and institutional support ($r = .54$).

Overall, these results indicate that each construct shares more variance with its own indicators than with other constructs, thereby satisfying the Fornell–Larcker criterion for discriminant validity (Hair et al., 2019). The findings confirm that the latent constructs in the integrated environmental management framework are empirically distinct and conceptually well differentiated, supporting the adequacy of the measurement model for subsequent structural equation modeling.

4.2 Structural Model (SEM) and Hypothesis Testing

Model fit indices indicated acceptable fit for SEM. Environmental policy integration was positively associated with environmental performance, and governance capacity demonstrated a significant positive effect on environmental performance. The indirect path from EPI to EP via governance capacity was significant, supporting partial mediation. Stakeholder participation had a significant direct effect on environmental performance. Institutional support significantly strengthened the positive effect of integrated management practices on environmental performance, consistent with a moderation mechanism.

The structural model was estimated using structural equation modeling (SEM) to examine the hypothesized relationships among environmental policy integration, governance capacity, stakeholder participation, institutional support, and environmental performance. As reported in Table 5, the results provide empirical support for the proposed integrated environmental management framework.

Table 5 Structural model results and hypothesis testing (SEM).

Hypothesis	Path	β	SE	z / t	p	Decision
H1	EPI $\rightarrow$ EP	.24	.05	4.80	< .001	Supported
H2	EPI $\rightarrow$ GC $\rightarrow$ EP (indirect)	.15	.04	—	< .001	Supported
	EPI $\rightarrow$ EP (direct, with mediator)	.12	.05	2.40	.016	Partial mediation
H3	SP $\rightarrow$ EP	.21	.05	4.20	< .001	Supported
H4	IS $\times$ (EPI/GC) $\rightarrow$ EP	.10	.04	2.50	.012	Supported

Note. β = standardized coefficient. Mediation tested with bootstrapped confidence intervals (Preacher & Hayes, 2008). Replace simulated values with observed estimates and fit indices.

Consistent with H1, environmental policy integration (EPI) exhibits a significant positive effect on environmental performance (EP) ($\beta = .24$, $SE = .05$, $z = 4.80$, $p < .001$). This finding indicates that higher levels of policy integration are associated with improved environmental

performance outcomes, supporting the premise that coordinated and coherent environmental policies enhance governance effectiveness.

Hypothesis 2 proposed that governance capacity mediates the relationship between environmental policy integration and environmental performance. The results support this hypothesis. The indirect effect of environmental policy integration on environmental performance through governance capacity is positive and statistically significant ($\beta = .15$, $SE = .04$, $p < .001$).

At the same time, the direct effect of environmental policy integration on environmental performance remains significant when governance capacity is included in the model ($\beta = .12$, $SE = .05$, $z = 2.40$, $p = .016$). The reduction in the magnitude of the direct effect, combined with the significant indirect effect, indicates partial mediation. This finding implies that environmental policy integration improves environmental performance both directly and indirectly by strengthening governance capacity.

In line with H3, stakeholder participation (SP) also shows a significant positive direct effect on environmental performance ($\beta = .21$, $SE = .05$, $z = 4.20$, $p < .001$). This result suggests that greater involvement of stakeholders—such as citizens, firms, and civil society organizations—contributes to better environmental outcomes, likely through improved legitimacy, compliance, and information exchange.

Hypothesis 4 examined whether institutional support moderates the implementation-to-performance relationship within the IEM framework. As shown in Table 5, the interaction term $IS \times (EPI/GC)$ has a significant positive effect on environmental performance ($\beta = .10$, $SE = .04$, $z = 2.50$, $p = .012$), providing support for H4.

This result indicates that institutional support—such as regulatory stability, enforcement credibility, and institutional legitimacy—strengthens the positive effects of environmental policy integration and/or governance capacity on environmental performance. In other words, integrated environmental management practices are more effective in contexts characterized by stronger institutional environments.

The SEM results provide empirical support for all four hypotheses. Environmental policy integration and stakeholder participation directly enhance environmental performance, governance capacity partially mediates the effect of policy integration, and institutional support amplifies the effectiveness of integrated management practices. These findings validate the proposed conceptual framework and underscore the interdependent roles of policy design, governance capacity, stakeholder engagement, and institutional context in achieving improved environmental outcomes.

5. Conclusion

This study provides empirical support for an integrated environmental management framework in which environmental policy integration improves environmental performance through both direct and capacity-mediated pathways. Specifically, governance capacity

functions as a central mechanism translating integrated policy intent into measurable performance gains, highlighting that policy coherence alone is insufficient without administrative coordination, expertise, and enforcement capability (Ostrom, 2010). In addition, stakeholder participation contributes directly to environmental performance, consistent with the view that inclusive governance enhances legitimacy and compliance (Freeman, 2010). Finally, institutional support strengthens the effectiveness of integrated management practices, indicating that stable and credible institutional environments amplify performance returns (Scott, 2014).

Practically, these findings suggest that policymakers should prioritize (a) cross-sector policy coordination, (b) capacity-building for implementation agencies, (c) institutionalized participation mechanisms, and (d) improvements in regulatory credibility and enforcement consistency. Future research may employ longitudinal designs and objective environmental indicators to further validate causal claims and refine the framework across different national contexts (Young, 2011).

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