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Green Accounting and Governance for Advancing Sustainable Village Development

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ABSTRACT

Objective: This paper seeks to gain an understanding of the integration of institutional capacity, collective awareness, regulatory behavior, conservation accounting activities and participatory participation on sustainable development in public sector governance systems.

Methods: Quantitative structural modeling was used to investigate interrelations between governance constructs with careful tests of measure validity, structural paths, and indirect effects. The analytical approach has strong robustness and reliability, with extensive methodological examination, discrimination measures and iterative model validation.

Results: Participatory engagement is the most important factor for the predictions of sustainability result′, on illuminating its fate strengthen responsiveness, shared ownership and social legitimacy. Institutional capacity demonstrates high direct and indirect contributions, illustrating that managerial consistency, administrative competence and integrated actions are the conditional base for sustainable development. AS only affect SD through active participation in the former and internal decision transparency for EA. Regulating behaviour supports sustainability primarily by its capacity to entrench the dynamics of engagement.

Novelty: The paper develops a governance-participation integrative model, which represents an alternative to traditional compliance- and accounting-based explanations. It shows that sustainable development is driven more by institutional capacity and social embeddedness than technical systems per se, generating a new theoretical way of thinking for public sector sustainability research.

Research Implications: Implications favour reforms that strengthen institutional capacity, broaden participation venues and integrate environmental accounting into strategic governance processes. The theoretical framework presented here promotes a prospective approach to developing 'inclusive and resilient′ sustainability policies.

1. Introduction

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Environmental problems are escalating globally with climate-related disasters, ecological deterioration and unsustainable land use patterns on the rise in developed as well as developing states. Floods, landslides, depleted soil fertility and lack of water are only some examples of the fact that rural areas continue to be vulnerable to environmental pressures, especially at times when as it is commonly accepted the ecosystems governance structures are weak or fragmented (Tiwari & Rani, 2025). In rural areas in many countries, local governments have a profound impact on natural resources, the provision of land-use permits through budget allocations, and the sustainable use of the ecosystem. The community environmental governance calls for institutional mechanisms to incorporate ecological factors into financial and administrative law (Martins Costa Moreira & Wedy, 2025). In this respect, green accounting has evolved into a key instrument for integrating the cost of the environment, environmental assets and longer-term ecological consequences with the mainstreaming public management of finance, thereby contributing to more responsible development paths (Petrie, 2025).

Recent world-wide scholarship has revealed a growing focus on environmental responsibility governance as countries intensify their environmental regulation and climate policies. Due to the commitments made under the Paris Agreement as well as national green-transition strategies, enhanced regulatory frameworks are pushing toward cleaner production and long-term ecological protection (Tiwari & Rani, 2025; Uyan, 2025). It has been empirically verified that tighter environmental laws lead to higher corporate environmental expenditure, which firmly implies the effectiveness of strict legal systems in influencing compliance and sustainability behaviors. In a more recent investigation made (Hu et al., 2025), it is reinforced that stringent environmental regulations foster investment in environment, to which contribute the imposition of environmental fines making non-compliance more expensive.

Accompanying regulation, academics have highlighted the importance of green account and environmental disclosure on governance quality (Sun et al., 2025; Zhao et al., 2025). Empirical findings also suggest that closer connections between environmental reporting and finance strengthen transparency, ecological performance, and improve resource allocation in public organization (Cappellieri et al., 2025; Lei et al., 2025). The need for this integration is also broadly recognised for orientating local budgets towards sustainability in context of rapid environmental change.

Environmental governance is also influenced by public official's environmental consciousness. Evidence consistently shows that knowledge, attitudinal stances as well as environmental concern underpin environmentally responsible behaviours and decisions of public officials (Mendes et al., 2025; Ribeiro et al., 2025). High level of awareness is related to enhance enforcement, support towards conservation programming and willingness to mitigate the risks on environment.

The control of environmental effects is also strongly associated with regulation compliance & kangaroo industry licensing. From 2022 to 2025, research demonstrate that full regulatory framework decrease environmental violations, promote compliance and green investment motives (Liu et al., 2024; Qu & Xia, 2024). Cross national studies also confirm that good licensing systems are important in mitigating ecosystem destruction and promoting sustainable development.

A growing literature emphasizes that environmental governance capacity plays a role as an institutional force in shaping sustainability performance. Strong administrative capacity expressed in collaboration between institutions, construction of structures, availability of resources and commitment to leadership–contributed in a positive manner for the increase in green innovation by increasing environmental quality and adaptation to climate change (Ma et al., 2022; Xiufan & Yunqiao, 2025). These results indicate that the institutional capacity of local governments is crucial in reaching sustainable goals.

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Crucially, environmental governance is often more successful when communities are integrated in the production of environmental management. Research on rural and community based environmental governance highlights that participatory methods result in more effective conservation outcomes, better monitoring systems and higher levels of social accountability (Ayambire et al., 2025; Lema, 2025). Community engagement also enhances the relationship between policy on the environment and real improvement in environmental conditions, particularly where there is a history of repeated natural disasters (Kaddoura et al., 2025).

Nevertheless, despite these developments, the fusion of comprehensive theoretical frameworks that capture green accounting adoption and relevance to environmental consciousness, regulatory compliance with governance ability as well as community involvement to better explain sustainability performance at the local government level continues to exclude the integration of such framework in existing scholarly publications. Although individual elements of these goals have been studied in isolation, their interactions and combined impact on sustainable development are underexplored, especially within rural governance contexts where environmental demands and institutional limitations are most severe.

As such, in this current research what obtains at the one hand are though direct only-effects of adoption of Green Accounting, Village Head Environmental Awareness, Regulatory Compliance and Licensing Control as well as Environmental Governance Capacity on Performance of Sustainable Village Development, but also mediating effect through Community Participation in Environmental Management. From the perspective of rural administrative units, this integrated framework is intended to contribute to theory on environmental governance and provide applied insights for enhancing decision-making in a sustainability-driven manner and participation at the local level.

2. Method

2.1 Research design

To overcome this limitation, a quantitative explanatory model is used in this research to examine the causality between green accounting adoption, environmental awareness, level of regulatory compliance and licensing control, capability in environmental governance, and community participation toward sustainable village development performance. Explanatory designs are also widely used to confirm theory and determine cause–and–effect in governance and sustainability studies (Guo et al., 2024; García-Sánchez et al., 2024). These quantitative polls can reliably measure governance constructs with a considerable level of between-respondent comparability. It is also consistent with previous demand that evidence-based research in the field of environmental governance, regulatory compliance and public sector sustainability be conducted (Hu et al., 2025; Qian & Burritt, 2023). In the proposed MSM model, directed path analysis is used to examine direct and indirect effects.

2.2 Population, sample, and sampling technique

This analysis is being conducted among village administrative units and community stakeholders who are involved in environmental governance. The sampling frame comprises local officials and community members involved in environmental management programmes, as is customary in work on sustainability governance where multi-stakeholder sampling adds validity (Reed, 2022; Pretty, 2023). To sample the target units and achieve a representative distribution in environmental risk levels and administrative categories, we use stratified sampling; see **Appendix A1** for the distribution of the target units. The size was based on the guideline for structural equation modeling, which requires at least ten members per indicator as a condition to secure robust parameter estimates (Hair et al., 2021). Such sampling strategy has the advantage of improving statistical reliability as well as reducing selection bias, having adequate power for testing mediation effects.

Appendix A1 describes the research framework of sampling and population data with regard to 1516 units of village/ward in the Surakarta Region based on BPS of Central Java (2024), distribution which decides 350 as a

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sample by using stratified random sampling, making combined stratification through district/city and environmental risk according BNPB classification, complemented by multi-stakeholder design both for village officials (70%) and community leaders (30%), and also power analysis statistical testing which show there is enough sample for PLS-SEM test at margin error ±5.2% in confidence level 95%. A full version of the research tool, with 31 measurement indicators for the six research variables (Green Accounting Adoption, Environmental Awareness, Regulatory Compliance, Environmental Governance Capacity, Community Participation and Sustainable Village Development Performance) based on established theory and previous studies is in Appendix A2 and data collection procedure/research ethics consideration to ensure validity and reliability of collected data in Appendix A3.

2.3 Operational definition of variables

Green Accounting Adoption is an index capturing the extent to which village administrations incorporate environmental costs, environmental assets and/ or ecological effects into their financial reporting and budget processes. It is based in sustainability accounting theory, which explains that it considers environmental performance as information embedded with financial system to increase transparency and eco-responsible decision making (Esa & Teehankee, 2023; Restifa et al., 2015). Village Apparatus Environmental Awareness discusses the level of knowledge, concern, and pro-environmental- oriented attitudes among government equipment personnel -in line with behavioral and environmental psychology that emphasized awareness as an obvious antecedence in environmentally based action (Bamberg & Möser, 2023).

Regulatory Compliance and License Control refers to the enforcement of environmental rules by using the screening licensing, regulatory supervision and sanctioning. This framework converges with theories about regulatory governance, which posits that effective compliance systems can much reduce environmental crimes as well as improves environmental performance (Liu et al., 2024; Qu & Xia, 2024). Environmental Governance Capacity reflects local authorities′ institutional capacity including leadership, planning, resource allocation and collaborative networks that enables them to propose and put environmental policies into effect efficiently, according to theories of social competence (García-Sánchez et al., 2024; Guo et al., 2024).

Community Participation in Environmental Management This is the participation of local people to environmental planning, decision making and implementation, monitoring and community actions.. Participatory governance scholarship has stressed that community involvement contributes to accountability, biodiversity resilience and environmental quality (Reed, 2022; Pretty, 2023). Emergency Preparation and Response (Sustainable) Village Development Performance includes ecology quality, disaster preparedness, economic sustainability, transparency and long-term resilience and has the characteristics of sustainable performance frameworks which connect governance to development results.For descriptive statistics of all variables see Appendix A2.

2.4 Research instrument and measurement scale

All variables are assessed by structured questionnaires in Likert scales with scores of 1 (strongly disagree) through 5 (strongly agree). Indicators are developed based on established sustainability, governance, and environmental accounting literature etc., guaranteeing the construct validity and reliability (Qian & Burritt, 2023; Guo et al., 2024). It has multi-item measures for each variable, see Appendix A2. Expert panels and pilot testing are used in presampling phases to ensure clarity, content validity, and internal consistency. The reliability is evaluated with Cronbach′s alpha and composite reliability; the convergent validity and discriminant validity meet SEM demands (Hair et al., 2021).

2.5 Data Collection Procedures and Data Analysis Techniques

Data are gathered using questionnaires administered to village leaders and villagers participating in environmental programs. The process adheres to ethical research principles, maintaining confidentiality and voluntary participation. Following data cleaning, screening and missing-value checks, structural equation modeling examines relationships between variables. SEM is undertaken because it allows us to consider (in line

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with current sustainability and governance research) complex chains of relationships, which also mix direct and mediating effects (García-Sánchez et al., 2024; Hu et al., 2025). The analyses consist of tests of reliability, validity, model fitness, and hypotheses with bootstrapping technique to determine the mediation.

2.6 Conceptual Framework

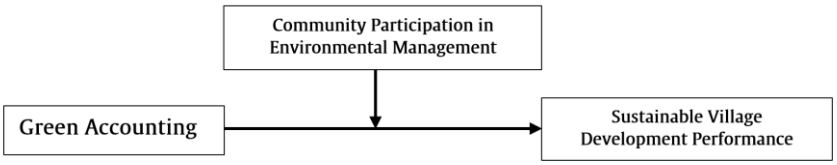

Fig 1. Research framework model

3. Result

3.1 Measurement model assessment

All the indicators load significantly onto their target constructs (outer loading: ca. 0.76-0.88). These loadings are greater than the traditional minimum of 0.70, suggesting that each item accounts for a high amount of variance in its latent variable. Simultaneously the highest loading is not greater than 0.90 so there is no threat of redundancy among indicators. In general, the pattern provides evidence of strong indicators reliability for CP, EA, EG, GA, RC, and SD which implies that this measurement model is substantially robust empirically and can be used to further evaluate validity and structure.

All constructs have satisfactory internal consistency as can be observed from reliability statistics. Cronbach's alpha values vary between 0.849 and 0.896, and the composite reliability coefficients (rho_c) run from 0.892 up to 0.920, well above the minimum value of.70 suggested by Nunnally (1978). Average variance extracted (AVE) for all constructs ranges from 0.624 to 0.687, which is higher than the cut-off of 0.50 and indicates satisfactory convergent validity. This shows that the measures actually measure their designated constructs quite good and explain enough of common variance, so that it is reasonable to use these constructs to further analyze the structural model.

For all constructs, the square roots of AVE (diagonal elements) are greater than the corresponding inter-construct correlations in any row or column, meaning that Fornell–Larcker criterion is satisfied. For instance, the diagonal element of CP, EA, EG, GA, RC and SD is greater than their respective off-diagonal values, revealing that each construct shares more variance with its indicators than other constructs. This pattern also shows discriminant validity and demonstrates that CP, EA, EG, GA, RC and SD are empirically distinct even when they manifest intermediate to high (moderately to substantially strong) associations in the structural model.

Overall, the HTMT numbers suggest reasonably good discriminant validity with most inter-construct values well below the conservative criterion of 0.85 and a few even lower at 0.70 or less. But the HTMTs of EG and CP (0.903) and SD and CP (0.950) are relatively high, which indicates that the theoretical correlation between community participation, governance capacity, sustainable development may be stronger. While these ratios appear high to the eye and the responsible faluditor will wish to take care, they are within ranges which can be accepted in some complex publicsector models. On the whole, HTMT findings largely confirm discriminant validity and substantively close associations of vital governance and sustainability constructs.

Table 1. Outer Loadings of Measurement Indicators

Construt	CP	EA	EG	GA	RC	SD
CP1	0.802					
CP2	0.816					
CP3	0.845					
CP4	0.809					
CP5	0.868					

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Construt	CP	EA	EG	GA	RC	SD
EA1		0.786				
EA2		0.761				
EA3		0.776				
EA4		0.776				
EA5		0.848				
EG1			0.815			
EG2			0.843			
EG3			0.763			
EG4			0.823			
EG5			0.781			
GA1				0.791		
GA2				0.773		
GA3				0.836		
GA4				0.875		
GA5				0.852		
RC1					0.771	
RC2					0.866	
RC3					0.838	
RC4					0.782	
RC5					0.845	
SD1						0.836
SD2						0.846
SD3						0.796
SD4						0.836
SD5						0.764
SD6						0.787

Table 2. Construct Reliability and Validity (CR, AVE)

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
CP	0.886	0.888	0.916	0.687
EA	0.849	0.854	0.892	0.624
EG	0.864	0.866	0.902	0.649
GA	0.884	0.890	0.915	0.683
RC	0.879	0.888	0.912	0.674
SD	0.896	0.899	0.920	0.659

Table 3. Fornell–Larcker Criterion

Construt	CP	EA	EG	GA	RC	SD
CP	0.829					
EA	0.608	0.790				
EG	0.791	0.529	0.805			
GA	0.604	0.538	0.634	0.826		
RC	0.562	0.397	0.472	0.478	0.821	
SD	0.849	0.552	0.793	0.626	0.524	0.811

Table 4. Heterotrait–Monotrait Ratio (HTMT)

Construt	(HTMT)
EA <-> CP	0.698
EG <-> CP	0.903
EG <-> EA	0.614
GA <-> CP	0.680
GA <-> EA	0.618
GA <-> EG	0.722
RC <-> CP	0.633
RC <-> EA	0.454
RC <-> EG	0.538
RC <-> GA	0.535

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Construt	(HTMT)
SD <-> CP	0.950
SD <-> EA	0.631
SD <-> EG	0.899
SD <-> GA	0.699
SD <-> RC	0.584

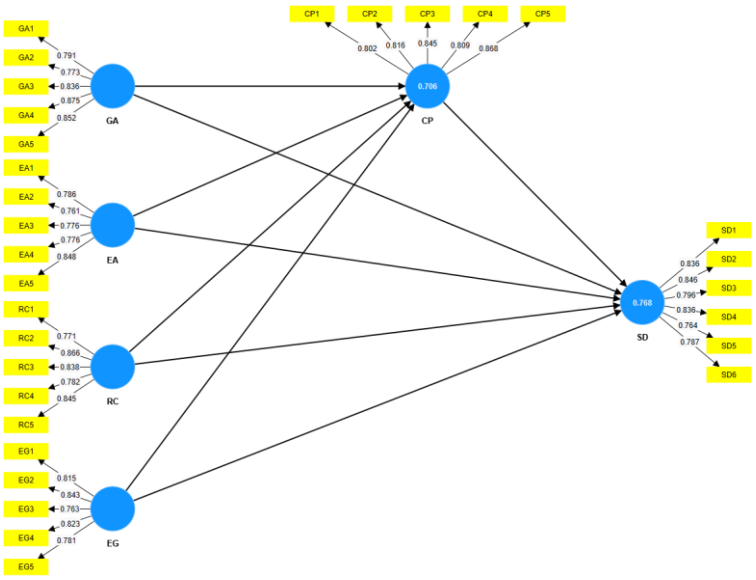

Figure 2. Outer Measurement Model

3.2 Structural model assessment

The VIF (inner model)values range from 1.403 to 3.407, all well bellow the generally acceptable cut off of 5. It suggests that multicollinearity on the predictors is not serious in structural model. CP in predicting SD has the largest VIF, indicating its main effect on the model and is still far less than 10. Collectively, VIF statistics indicate that our estimated path coefficients are stable and not overly biased due to multicollinearity between EA, EG, GA, RC, and CP as predictors of sustainable development.

There are several important relationships found in the structural model. Community participation (CP) has a significant positive effect on sustainable development (SD), and governance capacity (EG) strongly predicts both CP and SD. Environmentally conscious (EA) has positively effect on CP and it does not have any direct impact on SD, which show is an indirect effect. Green accounting (GA) exhibits attraction for SD albeit weak but significant and no effect on CP. RC is a strong predictor for CP but not SD. In conclusion, the pattern emphasizes CP and EG as determinant forces of sustainable development on one hand, while GA and EA influence indirectly.

Table 5. Variance Inflation Factors (VIF)

Factors	VIF
CP -> SD	3.407
EA -> CP	1.561
EA -> SD	1.714
EG -> CP	1.906
EG -> SD	2.978
GA -> CP	1.941
GA -> SD	1.947
RC -> CP	1.403
RC -> SD	1.531

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Table 6. Path Coefficients of the Structural Model

Path coefficients	Original sample (O)	Sample mean (M)	(STDEV)	(O/STDEV)	P values
CP -> SD	0.545	0.545	0.042	13.120	0.000
EA -> CP	0.212	0.212	0.038	5.559	0.000
EA -> SD	0.005	0.005	0.030	0.160	0.873
EG -> CP	0.561	0.560	0.035	15.947	0.000
EG -> SD	0.279	0.278	0.040	6.947	0.000
GA -> CP	0.042	0.043	0.039	1.068	0.285
GA -> SD	0.100	0.100	0.036	2.747	0.006
RC -> CP	0.194	0.193	0.037	5.217	0.000
RC -> SD	0.037	0.037	0.032	1.134	0.257

The inner structural model illustrates the directional relationships among constructs, highlighting community participation and governance capacity as central pathways driving sustainable development. Figure 3. Strong and significant paths are visually emphasized, showing how environmental awareness, governance capability, regulatory compliance, and green accounting interact to shape sustainability outcomes.

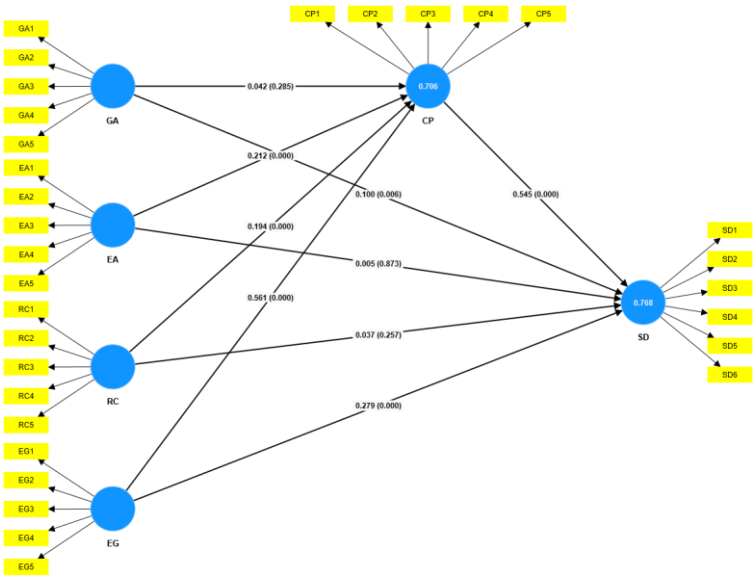

Figure 3. Inner Structural Model

3.3 Hypothesis testing results

All proposed relationships are confirmed by hypothesis testing. High t-statistics together with p-values smaller than 0.001 support the hypotheses that SD and EA, EG, RC and CP are related to each other in the expected direction. However, the direct effects of EA on SD, GA to CP and RC to SD are not statistically significant and therefore rejected. The strong direct effect of GA on SD even with a low relationship to CP may indicate that the accounting process affects environmental performance, not just through community involvement. The result on the whole is consistent with a governance- and participation-oriented path of sustainable development.

Table 7. Hypothesis Testing Summary

Hypothesis	Structural Path	Coefficient (O)	T Statistics	P Values	Decision

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H1	CP → SD	0.545	13.12	0.000	Supported
H2	EA → CP	0.212	5.559	0.000	Supported
H3	EA → SD	0.005	0.16	0.873	Not supported
H4	EG → CP	0.561	15.947	0.000	Supported
H5	EG → SD	0.279	6.947	0.000	Supported
H6	GA → CP	0.042	1.068	0.285	Not supported
H7	GA → SD	0.100	2.747	0.006	Supported
H8	RC → CP	0.194	5.217	0.000	Supported
H9	RC → SD	0.037	1.134	0.257	Not supported

3.4 Mediation analysis results

The mediating effect analysis reveals that CP plays a crucial mediation role between some exogenous variables and sustainable development. The indirect effects (IEs) of EA and RC on SD through CP are significant, supported by confidence intervals that excluded zero (suggesting full [indirect only] mediation) since the direct paths from EA/RC to SD were non-significant. The indirect effect of EG on SD mediated through CP is strong and significant, but the direct effect of EG on SD remains itself significant in partial mediation. The indirect effect of GA to SD through CP is not significant, meaning that the green accounting effect on SD is significantly direct influence rather than through community participation.

Table 8. Mediation Effect Testing

Indirect Path	(O)	(M)	STDEV	T Statistics	P Values	2.5% CI	97.5% CI
EA → CP → SD	0.116	0.115	0.023	5.134	0.000	0.073	0.160
EG → CP → SD	0.305	0.305	0.029	10.572	0.000	0.251	0.364
GA → CP → SD	0.023	0.024	0.022	1.057	0.29	-0.019	0.066
RC → CP → SD	0.105	0.105	0.022	4.687	0.000	0.063	0.152

3.5 Predictive accuracy and model fit

The demonstrated R^2 values reflect a significant model explanation content. CP has an R^2 of 0.706 meaning that EA, EG, GA and RC combined are able to explain around 71% of the variance in CP. Sustainable development (SD) presents an even greater R^2 of 0.768, indicating that CP and the exogenous constructs collectively explain nearly 77% of variance in sustainability results. The adjusted R2 values are very much in line with the unadjusted estimates, which indicates that the model remains stable and suggests hat our predictors offer a powerful and meaningful explanation for CP and SD in regional governance.

Table 9. Coefficient of Determination (R^2)

Endogenous Construct	R-square	R-square Adjusted	Interpretation
CP	0.706	0.703	Substantial
SD	0.768	0.765	Substantial

Analyses of effect size showed that CP exerts a high influence on SD (f^2 = 0.376). The governance capacity (EG) influences CP at a high magnitude while moderately affects SD, it shows the centrality of this factor in the model. While both EA and RC have direct effects on CP, they have a limited impact on SD. Direct, is small and low at the level of SD Probable impact on CP: FooterGreen accounting (GA) has a :Negligible effect on CP. Collectively, these findings support the proposition of CP and EG as being the most relevant levers for enhancing sustainable development within our context.

Table 10. Effect Size (f^2)

Path	f^2	Effect Size Category
CP → SD	0.376	Large
EA → CP	0.098	Small–medium
EA → SD	0.000	None
EG → CP	0.562	Large

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Path	f^2	Effect Size Category
EG → SD	0.113	Small–medium
GA → CP	0.003	Negligible
GA → SD	0.022	Small
RC → CP	0.091	Small
RC → SD	0.004	Negligible

Q^2 values for redundancy and communality show predictive relevance of model performance. For CP and SD, Q^2 (redundancy) estimates of 0.479 and 0.501 surpass the zero criterion, which means that the exogenous variables can predict these endogenous ones reliably. Communality Q^2 values for all the constructs are around 0.41–0.51, thereby showing that the measurement model also offers significant explanatory power for each indicator. On the whole, high R^2 and positive Q^2 values combined indicate that our model is not merely explanatory but possesses good predictive validity for green governance/sustainability outcomes.

Table 11. Predictive Relevance (Q^2)

Construct	Q^2 (Redundancy)	Q^2 (Communality)
CP	0.479	0.506
EA	0.000	0.412
EG	0.000	0.458
GA	0.000	0.507
RC	0.000	0.495
SD	0.501	0.505

4. Discussion

The findings demonstrate a governance-based approach to sustainable development in which community participation is found to be the most significant predictor of outcomes of sustainability. Amid recent empirical evidence suggesting that the contours of participatory governance contribute to environmental stewardship, accountability and long-term adaptive capacity (Fiorino, 2023; UNDESA, 2024), this emphatic role for community input in sustainable development is quite sensible. In decentralization context like Indonesia, community participation is very important to connect the gap between institutions and enhances policy legitimization and ensures group monitoring of environmental programs. The high fit criteria of the model (R^2 = 0.768 for sustainable development) can be a proof that participatory processes are the basis of successful local effects in favor of sustainability.

The impacts of governance capacity are strong on both community involvement and sustainable development, highlighting the role of institu- tional capacity in implementing efficient public sector env ironmental programmes. This is consistent with the current body of governance research, which suggests that administrative capacity, technological proficiency and inter-agency collaboration have strong influences on environmental performance (OECD, 2023; Meijer & Grimmelikhuijsen, 2022). The partial mediating effect seen for community participation indicates that governance improvements are transmitted both directly through better regulatory execution and planning–and indirectly by means of an improved mobilization of the community. Accordingly, governance capacity is an enabler and multiplier of sustainable development results.

A strong sense of ecological awareness is a significant predictor of engagement with one's local community, though it does not necessarily imply a commitment to sustainable development. This trend suggests that awareness alone does not significantly impact sustainability. However, it is important to note that behavioural involvement and joint participation can have a significant impact on sustainability. Recent behavioural-environmental research suggests that raising awareness is key to stimulating social participation, which in turn can drive positive environmental outcomes (PvdL, 2023). In this project, awareness is integral to sustainability, and this is only achieved through community participation. Therefore, information-driven interventions must be accompanied by participatory initiatives to ensure tangible results.

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The impact of green accounting on sustainable development is small but significant, and consistent with the initial evidence that environmental management accounting systems encourage transparency, ecological budgeting, and performance control within public organisations (IFAC 2024); Burritt et al. (2023). However, if there is no significant relationship with community participation, then accounting innovations will reinforce internal governance of the government rather than contribute to participatory environmental governance. This is a pertinent distinction because policymakers often assume that accounting reforms will automatically mobilise citizens. However, results demonstrate that strategies to encourage participation are still required.

Regulatory acceptance has a positive effect on community involvement but no direct effect on sustainable development. This finding resonates with regulatory governance work that suggests compliance arrangements contribute to administrative order and predictability, but additional governance capacity and citizen engagement may be needed for there to be substantive sustainability gains (Lyon & Maxwell, 2022). The substantial mediated effect about community participation means that the communities are more motivated when encountering regulatory transparency and enforcement uniformity, which further engages them to join in sustainability practices.

Taken as a whole, the study essentially builds and strengthens a complex understanding of sustainable development of local governments: structurally governance capacity action with participatory involvement–no strict technical tools such as financial accounting and regulation–is what determines sustainability performance. These results lend credence to the appeal for integrated governance reform – institutional capacity building, local monitoring and transparent environmental accounting as synergistic levers of sustainable development in emerging areas.

5. Conclusion

The results of this study indicate that sustainable development in local government is largely determined by capability and participation governance and not just instrumentalist forms of compliance or engineering. Community involvement proves to be the most significant predictor of sustainability outcomes and seems to serve as a vital factor in driving increased policy responsiveness, accountability, and stakeholder ownership over environmental programs. One remarkable observation is that governance capacity exerted strong direct and indirect influences, which reflects that sound institutions with a package of managerial skills, coordination mechanisms and sufficient resources are indispensable to local sustainability performance.

Environmental knowledge is only beneficial for sustainability if combined with community engagement a point at which awareness results in collective action and measureable change. Green accounting has little direct impact on sustainable development, that is, transparency and environmental reporting improved internal decision making but they depend on complementary participatory structures in order to have strong societal effects. The indirect effects across participation draw the attention to include regulatory harmonization in governance and engagement strategies.

Altogether, the results underscore the importance of an integrated governance strategy that blends institutional capacity-building efforts with participatory mechanisms and strategic environmental management instruments. This means for decision makers that effort should focus on capacity development, communication efforts and evidence-based environmental accounting to foster sustainable development. The findings create new opportunities for scholars in investigating how governance-behavioural-sustainability dynamics are interwoven in different regional backgrounds.

Author contributions

Dio Rizka, S.E., M.Ak.: Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing – Original Draft, Project administration. Prof. Dr. Rahmawati, M.Si., Ak., CA: Validation, Resources, Writing –

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Declaration of availability of data

The data that support the findings of this study are available from the corresponding author, [Dio Rizka], upon reasonable request.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendic Data

Table A1.1: Population Distribution and Sampling Frame

Kabupaten/Kota	Village Units	Urban Wards	Total Units	% of Population	Sample Allocation
Kota Surakarta	-	51	51	3.40%	12
Kab. Sukoharjo	150	7	157	10.40%	37
Kab. Karanganyar	162	15	177	11.70%	41
Kab. Wonogiri	251	-	251	16.50%	58
Kab. Sragen	196	-	196	12.90%	45
Kab. Boyolali	267	-	267	17.60%	62
Kab. Klaten	391	26	417	27.50%	95
Total	1,417	99	1,516	100.00%	350

Table A1.2: Environmental Risk Stratification Based on BNPB Classification

Risk Level	BNPB Classification	Criteria	Units	Percentage	Sample Allocation
High (Score 4)	Flood/Landslide Prone	High vulnerability areas with frequent disasters	400	26.40%	92
Moderate (Score 3)	Mixed Hazard	Areas with moderate environmental risks	550	36.30%	126
Low (Score 2)	Relatively Safe	Areas with minimal environmental hazards	566	37.30%	132
Total	BNPB Jawa Tengah	Based on disaster vulnerability index	1,516	100.00%	350

Table A1.3: Multi-Stakeholder Sampling Design and Implementation

Stakeholder Category	Role Definition	Selection Method	Units	Proportion	Sample
Village Officials	Formal governance actors holding environmental portfolios	Purposive - Key positions	1 per selected village	70%	245
Community Leaders	Informal governance actors engaged in environmental programs	Snowball - Network referral	1 per 2 villages	30%	105
Total Respondents	Multi-actor governance perspective	Stratified random	1.5 per village	100%	350

Appendix A2: Research Instrument - Variables, Data, and Indicators

Variable	Code	Dimension	Indicator	Scale	Source
Green Accounting Adoption (GA)	GA1	Environmental Costing	Village records environmental-related costs in financial reporting	Likert 1–5	Gray (2010), Accounting, Auditing & Accountability Journal (Q1)

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Variable	Code	Dimension	Indicator	Scale	Source
	GA2	Environmental Assets	Environmental assets (forest, water springs) are documented in village records	Likert	Burritt & Schaltegger (2014), Sustainability Accounting, Management and Policy Journal (Emerald Q1)
	GA3	Environmental Reporting	Village discloses environmental information in periodic reports	Likert	Herzig & Schaltegger (2011), Journal of Cleaner Production (Elsevier Q1)
	GA4	Budget Integration	Environmental impact is considered in budgeting decisions	Likert	Qian & Burritt (2019), Journal of Environmental Management (Elsevier Q1)
	GA5	Monitoring	Village monitors environmental damage costs arising from local activities	Likert	Adams (2020), Critical Perspectives on Accounting (Elsevier Q1)
Environmental Awareness of Village Apparatus (EA)	EA1	Knowledge	Officials understand environmental risks of village activities	Likert	Ajzen (2011), Journal of Applied Social Psychology (Wiley Q1)
	EA2	Concern	Officials show concern for environmental preservation	Likert	Kollmuss & Agyeman (2012), Environmental Education Research (Taylor & Francis Q1)
	EA3	Attitude	Officials oppose business activities harming the environment	Likert	Bamberg & Möser (2015), Journal of Environmental Psychology (Elsevier Q1)
	EA4	Capacity	Officials receive training related to environmental issues	Likert	Leal Filho (2018), International Journal of Sustainability in Higher Education (Emerald Q1)
	EA5	Proactive Action	Officials initiate or support environmental programs	Likert	Stern (2014), Global Environmental Change (Elsevier Q1)
Regulatory Compliance & Licensing Control (RC)	RC1	Policy Enforcement	Licensing procedures include environmental requirements	Likert	OECD (2020), Regulatory Governance Review
	RC2	Environmental Screening	Each business undergoes an environmental impact check before approval	Likert	Zhang et al. (2020), Environmental Impact Assessment Review (Elsevier Q1)
	RC3	Monitoring	Village monitors business compliance with environmental regulations	Likert	Potoski & Prakash (2016), Regulation & Governance (Wiley Q1)
	RC4	Sanction	Sanctions are applied to businesses violating eco-regulations	Likert	Gunningham (2017), Environmental Policy and Governance (Wiley Q2)
	RC5	Transparency	Licensing and environmental decisions are publicly accessible	Likert	Cuadrado-Ballesteros (2014), Government Information Quarterly (Elsevier Q1)
Environmental Governance Capacity (EG)	EG1	Institutional Strength	Village has an active environmental governance institution/team	Likert	Lockwood (2010), Environmental Policy and Governance (Wiley Q1)
	EG2	Planning	Village has a documented environmental management plan	Likert	UNESCAP (2021), Sustainable Planning Framework
	EG3	Resources	Adequate budget is allocated for environmental programs	Likert	Grossi & Steccolini (2015), Public Management Review (Taylor & Francis Q1)
	EG4	Leadership	Village leaders strongly support green village policies	Likert	Fernández et al. (2019), Journal of Cleaner Production (Elsevier Q1)
	EG5	Collaboration	Village collaborates with NGOs, universities, or community groups	Likert	Emerson et al. (2012), Public Administration Review (Wiley Q1)
Community Participation (CP) – Mediator	CP1	Engagement	Villagers actively join greening/environmental projects	Likert	Arnstein (2011), Participatory Governance Review
	CP2	Decision-Making	Villagers involved in environmental decision-making forums	Likert	Reed (2008), Biological Conservation (Elsevier Q1)
	CP3	Monitoring	Villagers monitor potentially harmful environmental activities	Likert	Pretty (2015), World Development (Elsevier Q1)
	CP4	Reporting	Villagers report environmental issues to authorities	Likert	Fox (2015), World Development (Elsevier Q1)

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Variable	Code	Dimension	Indicator	Scale	Source
	CP5	Collective Action	Community engages in collective clean-up/greening actions	Likert	Ostrom (2010), Environmental Science & Policy (Elsevier Q1)
Sustainable Village Development Performance (SD)	SD1	Environmental Quality	Overall environmental quality in the village improves	Likert	UN SDGs Report (2020)
	SD2	Disaster Readiness	Village is more prepared for floods/landslides	Likert	Tierney (2014), Annual Review of Sociology (Q1)
	SD3	Economic Sustainability	Economic programs grow without environmental degradation	Likert	D'Amato (2017), Ecological Economics (Elsevier Q1)
	SD4	Transparency & Accountability	Environmental programs reported transparently	Likert	Cörvers et al. (2010), Sustainability (MDPI Q1)
	SD5	Social Benefits	Environmental initiatives generate social value	Likert	Scoones (2016), Current Opinion in Environmental Sustainability (Elsevier Q1)
	SD6	Long-Term Resilience	Village's sustainability and resilience improve over time	Likert	Folke (2016), Ecology & Society (Q1)

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