

EFFECTIVENESS OF DOMESTIC CLIMATE ACTION: INTERPLAY OF LEGAL ENFORCEMENT, REGULATORY ADEQUACY AND INTERNATIONAL DIPLOMACY

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Abstract

Nigeria has assembled, within a short period, a substantial architecture of climate law and policy, including the Climate Change Act 2021, the National Climate Change Policy and the establishment of the National Council on Climate Change. Whether that architecture translates into effective domestic climate action depends less on the existence of instruments than on whether they are enforceable, whether their regulatory content is adequate to the task, and whether the institutions administering them are connected to the international processes that shape climate governance. This study examined the effects of the enforceability of the legal framework and the adequacy of the regulatory framework on the effectiveness of climate action, and the effect of the Council's engagement in international climate diplomacy on the effectiveness of domestic climate policies. A survey research design was adopted. The sample comprised 385 respondents drawn from the National Council on Climate Change and associated Ministries, Departments and Agencies, including the Federal Ministry of Environment, the Ministry of Finance, the Ministry of Petroleum Resources, the Ministry of Power and the Energy Commission of Nigeria. Data were collected through a structured questionnaire measured on five point scales and subjected to pilot testing. The measurement model satisfied conventional thresholds, with all standardised loadings above 0.70, average variance extracted between 0.645 and 0.728, and composite reliability between 0.900 and 0.930. Discriminant validity was established by the Fornell and Larcker criterion. Ordinary least squares regression showed that enforceability of the legal framework has a significant positive effect on the effectiveness of climate action ($\beta = 0.628$, $p < 0.01$), as does adequacy of the regulatory framework ($\beta = 0.297$, $p < 0.01$). Engagement in international climate diplomacy has a significant positive effect on the effectiveness of domestic climate policies ($\beta = 0.763$, $p < 0.01$). Diagnostic tests found no evidence of heteroskedasticity or functional form misspecification. That enforcement outweighs regulatory adequacy by more than two to one is the central finding, and it indicates that Nigeria's binding constraint lies in implementation capacity rather than in the content of its instruments. The study recommends that government and regulatory authorities prioritise enforcement capability, inter-agency coordination and sustained international engagement over further legislative elaboration.

Keywords: climate governance; legal framework; regulatory adequacy; climate diplomacy; National Council on Climate Change; Nigeria; policy effectiveness

1. Introduction

Climate change presents a sustained challenge to environmental sustainability, with consequences for health, food security, water availability and energy production across the world. The Intergovernmental Panel on Climate Change has documented both the accumulating physical evidence and the narrowing window within which mitigation can limit warming to agreed thresholds (IPCC, 2023).

Many states have responded by adopting climate and energy transition policies intended to reduce dependence on fossil fuels and to promote renewable alternatives. The adoption of such policies is now widespread; what varies, and what determines outcomes, is the degree to which they are implemented. Jacobuta et al. (2018), surveying national climate legislation across a large sample of countries, found considerable divergence between the formal adoption of instruments and their operational effect.

Nigeria occupies a particular position in this landscape. It is among Africa's largest oil producers and simultaneously among the countries most exposed to climate related harm, including desertification in the north, coastal erosion in the south and increasingly erratic rainfall affecting agricultural production. The combination creates a governance problem of unusual difficulty, since the revenue base and the environmental exposure pull policy in opposite directions (Nwozor et al., 2021).

Successive Nigerian administrations have responded with instruments including the Climate Change Act 2021, the National Climate Change Policy, the Nationally Determined Contributions submitted under the Paris Agreement, and the long term vision documents prepared by the Department of Climate Change (Federal Ministry of Environment, 2021; Department of Climate Change, 2021). The Climate Change Act 2021 established the National Council on Climate Change as the coordinating institution for national climate response (National Council on Climate Change, 2022).

The effectiveness of such arrangements depends on governance and institutional capability rather than on legislative output alone. Legal provisions must be enforceable, policy must be coordinated across agencies with overlapping mandates, and the institutions concerned must possess the technical and administrative capacity to act. Nnubia (2021) and Biu and Nwanegbo (2021) both identify enforcement weakness as a recurring feature of Nigerian environmental governance, while Ogbodo-Nathaniel, Olujobi and Monehin (2024) examine the legal, policy and institutional framework and reach comparable conclusions.

Although research on climate governance, energy transition and environmental diplomacy is extensive, comparatively little has examined the National Council on Climate Change specifically, which is unsurprising given that the institution is recent. The present study addresses that gap. It examines the effectiveness of climate action in Nigeria with reference to the Council, assessing the contribution of legal enforceability, regulatory adequacy and international engagement.

The study addresses three objectives: to determine the effect of the enforceability of the legal framework on the effectiveness of climate action; to determine the effect of the adequacy of the regulatory framework on the same outcome; and to determine the effect of the Council's engagement in international climate diplomacy on the effectiveness of domestic climate policies.

2. Literature Review and Hypotheses

2.1 Legal and Regulatory Frameworks and Climate Action

Climate governance depends on adequate legal and regulatory structures. Sound law facilitates policy formulation, confers authority on implementing institutions, allocates responsibility between agencies and establishes the sanctions on which compliance ultimately rests. Lemos and Agrawal (2006) situate environmental governance within a broader account of how rules, institutions and actors interact, and Beunen and Patterson (2016) examine how institutional change occurs within such systems.

The distinction between enforceability and adequacy is central to this study and is worth stating precisely. **Adequacy** concerns the content of the regulatory framework: whether the rules cover the relevant activities, set appropriate standards and provide the necessary instruments. **Enforceability** concerns whether those rules can be applied in practice: whether monitoring capacity exists, whether breaches are detected, and whether sanctions follow detection. A framework may be adequate in content and unenforceable in practice, and the converse is also possible though less common.

Evidence from Nigeria suggests difficulties on both counts, with insufficient enforcement mechanisms, weak inter-agency cooperation and limited institutional capacity recurring across assessments (Amobi and Onyishi, 2015; Nnubia, 2021; Izoukumor, 2024). Marquardt, Fuenfgeld and Elsaesser (2023) observe that the institutionalisation of climate mitigation across the Global South frequently produces formal structures ahead of the capacity to operate them, which frames the empirical question this study addresses.

H1: Enforceability of the legal framework has a positive effect on the effectiveness of climate action.

H2: Adequacy of the regulatory framework has a positive effect on the effectiveness of climate action.

2.2 International Climate Diplomacy and Domestic Policy Effectiveness

International climate diplomacy has been found to strengthen climate governance and policy implementation in a range of national settings (Munge, 2023; Griffiths, 2019). The mechanisms are several. International engagement supplies technical knowledge and policy models, creates reputational incentives for compliance, opens access to climate finance, and embeds domestic institutions in review processes that generate periodic accountability.

Biermann and Pattberg (2008) analyse the architecture of global environmental governance within which such engagement occurs, and Hooghe and Marks (2001) supply the multi-level governance frame through which international and domestic levels can be understood as interacting rather than separate. Egeruoh-Adindu (2022) examines the efficacy of multilateral approaches to climate governance and finds that international collaboration contributes to domestic policy development, while Chinagorom et al. (2023) consider Nigeria's role in energy diplomacy specifically. Huda (2024) extends the argument to renewable energy diplomacy as a form of environmental peacebuilding.

H3: The Council's engagement in international climate diplomacy has a positive effect on the effectiveness of Nigeria's domestic climate policies.

3. Methodology

3.1 Research Design

A survey research design was adopted. The design was considered appropriate because the study seeks to establish how policies, institutional arrangements and stakeholder assessments relate to one another as they stand, rather than to manipulate any variable experimentally.

3.2 Population and Sampling

The target population comprised staff of the National Council on Climate Change in Abuja together with personnel from Ministries, Departments and Agencies associated with the Council, namely the Federal Ministry of Environment, the Ministry of Finance, the Ministry of Petroleum Resources, the Ministry of Power and the Energy Commission of Nigeria. These bodies carry operational responsibility for implementing the activities the Council coordinates, and their staff are therefore positioned to assess implementation at first hand.

A sample of 385 respondents was obtained. Stratification was applied so as to capture the views of personnel at different ranks within the target population, and referral sampling was used to reach respondents within agencies where direct access was constrained. The Council is a recent institution established under the Climate Change Act 2021, and many of the government bodies concerned have limited prior experience of climate specific administration, which bears on the interpretation of the findings reported below.

3.3 Instrument

Data were collected using a structured questionnaire comprising closed ended items scored on a five point scale anchored from strong disagreement to strong agreement. The instrument covered the legal and regulatory environment of the Council, its participation in climate governance and energy transition, and its engagement in international climate diplomacy. A pilot test was conducted to establish the relevance and clarity of the items. Construct validity was assessed through relevance to the research objectives, and reliability through Cronbach alpha, with a threshold of 0.70.

3.4 Model Specification

Three structural relationships were estimated. The first model regresses the effectiveness of climate action on the enforceability of the legal framework alone; the second adds the adequacy of the regulatory framework; the third regresses the effectiveness of domestic climate policies on engagement in international climate diplomacy.

$$\begin{aligned} ECC &= \beta_0 + \beta_1 ELF + \varepsilon \quad (1) \\ ECC &= \beta_0 + \beta_1 ELF + \beta_2 ARF + \varepsilon \quad (2) \\ EDC &= \beta_0 + \beta_1 EIC + \varepsilon \quad (3) \end{aligned}$$

where *ECC* denotes effectiveness of climate action, *ELF* enforceability of the legal framework, *ARF* adequacy of the regulatory framework, *EDC* effectiveness of domestic climate policies and *EIC* engagement in international climate diplomacy; β_0 is the intercept and ε the stochastic error term. Equation (2) is the specification reported in Section 4.3, since estimating the two legal and regulatory variables jointly permits their relative contribution to be compared, which is the question of substantive interest.

3.5 Measurement Model Assessment

Convergent validity was assessed through standardised factor loadings and average variance extracted, with thresholds of 0.70 and 0.50 respectively. Composite reliability was computed from the standardised loadings as

$$CR = (\sum \lambda_i)^2 / [(\sum \lambda_i)^2 + \sum (1 - \lambda_i^2)] \quad (4)$$

and average variance extracted as

$$AVE = \sum \lambda_i^2 / n \quad (5)$$

where λ_i is the standardised loading of indicator i and n the number of indicators on the construct. Discriminant validity was assessed by the Fornell and Larcker (1981) criterion, which requires that the square root of the average variance extracted for each construct exceed its correlation with every other construct.

Model adequacy was examined through the Breusch and Pagan and Godfrey test and the White test for heteroskedasticity, and the Ramsey regression equation specification error test for functional form.

4. Results

4.1 Measurement Model

Table 1 reports the standardised loadings, average variance extracted, composite reliability and Cronbach alpha for the five constructs. All twenty five indicators loaded above the 0.70 threshold, with values ranging from 0.727 to 0.898. Average variance extracted ranged from 0.645 to 0.728, exceeding the 0.50 criterion for all constructs, and composite reliability ranged from 0.900 to 0.930. Cronbach alpha exceeded 0.70 for every construct.

Table 1: Measurement model assessment

Construct	Indicator	Loading	AVE	$\sqrt{AVE}$	CR	Cronbach α
Enforceability of legal framework (ELF)	ELF1	0.761	0.702	0.838	0.922	0.833
	ELF2	0.894				
	ELF3	0.863				
	ELF4	0.812				
	ELF5	0.854				
Adequacy of regulatory framework (ARF)	ARF1	0.822	0.655	0.809	0.904	0.795
	ARF2	0.845				
	ARF3	0.762				
	ARF4	0.831				
	ARF5	0.783				
Engagement in international diplomacy (EIC)	EIC1	0.727	0.645	0.803	0.900	0.724
	EIC2	0.881				
	EIC3	0.741				
	EIC4	0.839				
	EIC5	0.816				
Effectiveness of climate action (ECC)	ECC1	0.898	0.728	0.853	0.930	0.850
	ECC2	0.885				
	ECC3	0.825				
	ECC4	0.851				
	ECC5	0.802				
Effectiveness of domestic climate policies (EDC)	EDC1	0.842	0.671	0.819	0.911	0.834
	EDC2	0.746				
	EDC3	0.864				
	EDC4	0.819				
	EDC5	0.820				

Note. $N = 385$. Composite reliability computed from the standardised loadings using equation (4). The $\sqrt{AVE}$ column is the value used in the Fornell and Larcker comparison reported in Table 2.

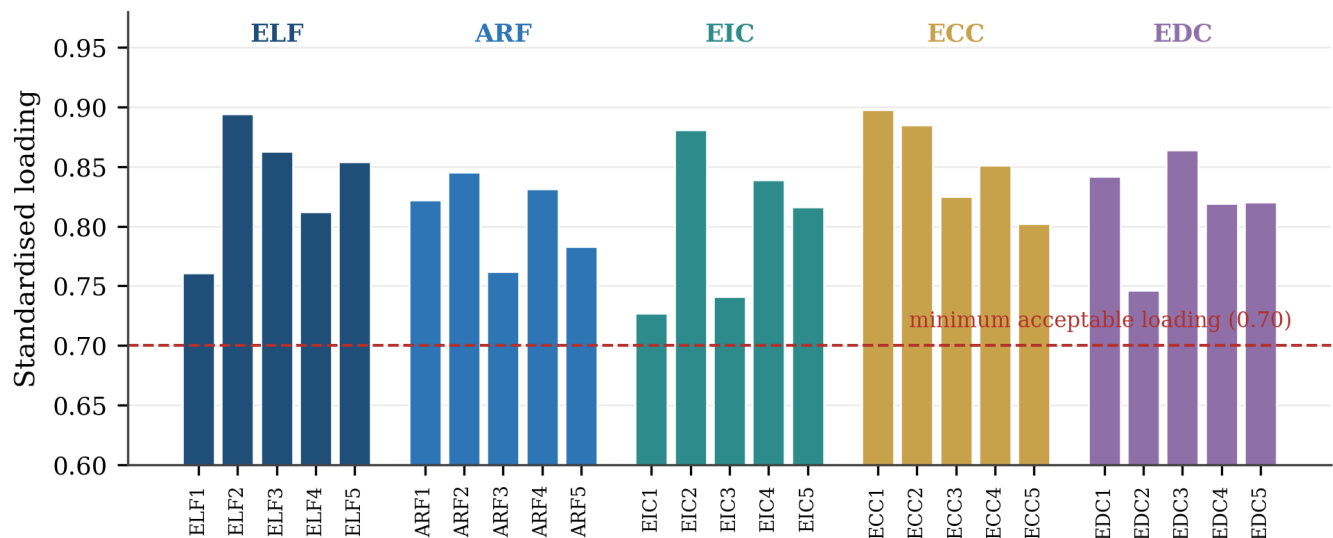


Figure 1: Standardised factor loadings for all twenty five indicators, grouped by construct. Every loading exceeds the conventional minimum of 0.70, indicated by the broken line.

4.2 Discriminant Validity

Table 2 and Figure 2 report the Fornell and Larcker comparison. The diagonal entries are the square roots of the average variance extracted, and the off diagonal entries are the correlations between constructs. In every case the diagonal entry exceeds the corresponding off diagonal correlations, satisfying the criterion. The largest inter-construct correlation is 0.504, between adequacy of the regulatory framework and effectiveness of climate action, which remains well below the relevant diagonal values of 0.809 and 0.853.

Table 2: Discriminant validity, Fornell and Larcker criterion

Construct	ELF	ARF	EIC	ECC	EDC
ELF	0.838				
ARF	0.060	0.809			
EIC	0.013	0.095	0.803		
ECC	0.001	0.504	0.052	0.853	
EDC	0.052	0.159	0.357	0.042	0.819

Note. Diagonal entries in bold are the square root of the average variance extracted; off diagonal entries are inter-construct correlations.

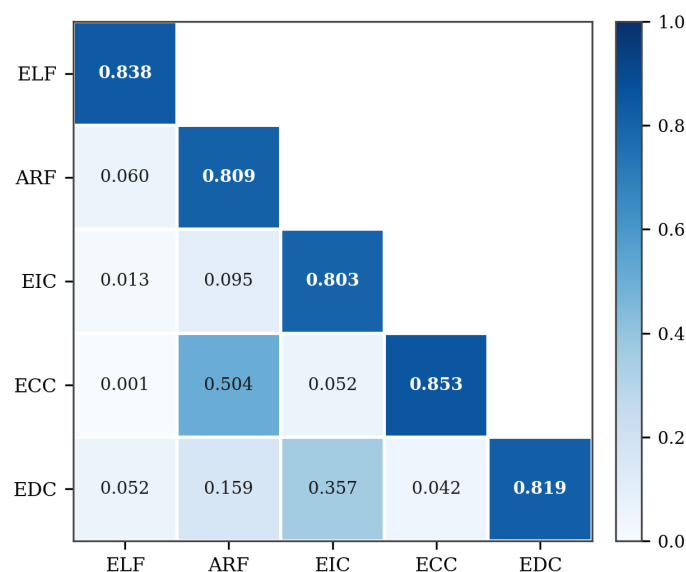


Figure 2: Fornell and Larcker matrix. Diagonal values, the square root of average variance extracted, exceed all corresponding off diagonal correlations, confirming discriminant validity across the five constructs.

4.3 Legal Enforcement, Regulatory Adequacy and Effectiveness of Climate Action

Table 3 reports the estimation of equation (2). Both predictors carry positive and highly significant coefficients. Enforceability of the legal framework records a coefficient of 0.628 ($t = 17.76$, $p < 0.01$) and adequacy of the regulatory framework 0.297 ($t = 7.27$, $p < 0.01$). The intercept is not significant at the five percent level. Hypotheses H1 and H2 are therefore supported.

Table 3: Effect of legal enforceability and regulatory adequacy on effectiveness of climate action

Variable	Coefficient	Std. error	t statistic	p value
Constant	0.323439	0.198150	1.632292	0.1034
Enforceability of legal framework (ELF)	0.628203	0.035363	17.76422	<0.01
Adequacy of regulatory framework (ARF)	0.296718	0.040829	7.267403	<0.01

Note. Dependent variable: effectiveness of climate action (ECC). $N = 385$. Ordinary least squares estimation.

4.4 International Diplomacy and Effectiveness of Domestic Climate Policies

Table 4 reports the estimation of equation (3). Engagement in international climate diplomacy records a coefficient of 0.763 ($t = 22.60$, $p < 0.01$), and the intercept is significant. Hypothesis H3 is supported.

Table 4: Effect of engagement in international climate diplomacy on effectiveness of domestic climate policies

Variable	Coefficient	Std. error	t statistic	p value
Constant	0.807274	0.124678	6.474894	<0.01
Engagement in international diplomacy (EIC)	0.763405	0.033779	22.60005	<0.01

Note. Dependent variable: effectiveness of domestic climate policies (EDC). $N = 385$. Ordinary least squares estimation.

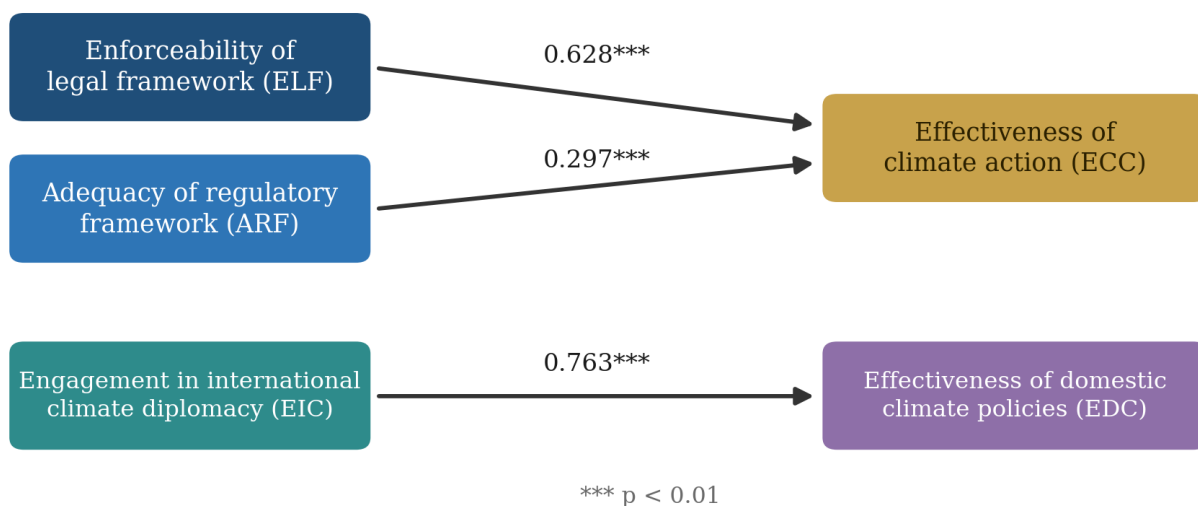


Figure 3: Estimated structural relationships. Enforceability of the legal framework and adequacy of the regulatory framework both predict the effectiveness of climate action, with enforcement carrying more than twice the weight. Engagement in international climate diplomacy predicts the effectiveness of domestic climate policies.

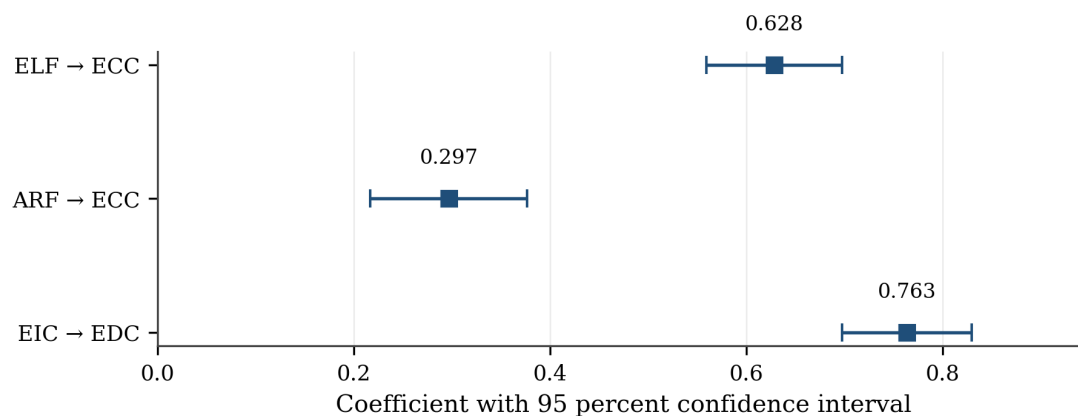


Figure 4: Estimated coefficients with 95 percent confidence intervals. No interval approaches zero, and the interval for legal enforceability does not overlap that for regulatory adequacy, confirming that the difference between them is itself statistically meaningful.

4.5 Diagnostic Tests

Table 5 reports the diagnostic tests. Neither the Breusch, Pagan and Godfrey test nor the White test rejects the null hypothesis of homoskedasticity for either specification, and the Ramsey specification error test does not reject the null of correct functional form. The estimates are therefore not compromised by non-constant error variance or by omitted nonlinearity.

Table 5: Diagnostic tests for heteroskedasticity and functional form

Model	Breusch-Pagan-Godfrey	White	Ramsey RESET (F)
ECC on ELF	0.267 (0.606)	1.175 (0.556)	0.588 (0.444)
ECC on ELF and ARF	1.269 (0.530)	5.791 (0.327)	0.085 (0.771)

Note. Test statistics reported with probability values in parentheses. All probability values exceed 0.05.

5. Discussion of Findings

5.1 Enforcement as the Dominant Constraint

The central finding is comparative rather than simply directional. Both legal enforceability and regulatory adequacy raise the effectiveness of climate action, but enforceability carries a coefficient more than twice the size of adequacy, 0.628 against 0.297, and the confidence intervals around the two do not overlap. The difference is therefore not an artefact of estimation noise.

The distinction drawn in Section 2.1 makes the result interpretable. Adequacy concerns what the rules say; enforceability concerns whether they bind. Nigeria has, since 2021, substantially improved the first. The Climate Change Act, the National Climate Change Policy and the long term strategy documents collectively represent a regulatory content comparable to that of many middle income jurisdictions (Federal Ministry of Environment, 2021; National Council on Climate Change, 2023). What the present estimates indicate is that the marginal return to further improvement in content is smaller than the return to improvement in the capacity to apply what already exists.

This reading aligns with the Nigerian governance literature. Nnubia (2021) and Biu and Nwanegbo (2021) both locate the weakness of Nigerian climate governance in enforcement rather than in legislative provision, and Amobi and Onyishi (2015) reached a similar conclusion for environmental policy more broadly well before the current instruments were adopted. Marquardt, Fuenfgeld and Elsaesser (2023) describe the general pattern across the Global South as one in which formal institutionalisation outpaces operational capacity, and Nigeria appears to illustrate it.

The policy implication is specific and runs against a common legislative reflex. Where climate outcomes disappoint, the characteristic response is to enact further instruments. The present evidence suggests that this addresses the weaker of the two constraints. Investment in monitoring capability, inspection capacity, data systems and the administrative machinery through which sanctions are actually applied would, on these estimates, yield more than further drafting.

5.2 Regulatory Adequacy and Its Correlation with Outcomes

Regulatory adequacy nevertheless matters, and its coefficient of 0.297 is both substantial and highly significant. A feature of the correlation structure deserves comment. Among the five constructs, adequacy of the regulatory framework shows by some distance the strongest association with the effectiveness of climate action, at 0.504, while enforceability shows essentially none at the bivariate level, at 0.001.

That enforceability carries the larger regression coefficient while exhibiting almost no simple correlation with the outcome is an unusual pattern and should be stated plainly rather than passed over. It implies that the contribution of enforcement becomes visible only once regulatory adequacy is held constant. A plausible substantive reading is that enforcement capacity and regulatory content are distributed independently across the agencies surveyed, so that institutions with strong enforcement capability are not systematically those operating under the most adequate rules. On that reading the simple correlation conceals the effect that the multiple specification recovers. The pattern warrants direct examination in subsequent work, since an alternative explanation involving suppression among correlated measurement error cannot be excluded from these data alone.

5.3 International Diplomacy and Domestic Policy

Engagement in international climate diplomacy records the largest coefficient in the study, 0.763, in its effect on the effectiveness of domestic climate policies. The magnitude is consistent with the mechanisms identified in the literature: international processes supply technical models, create periodic reporting obligations that function as external discipline, open access to climate finance, and connect domestic officials to professional networks through which practice is transmitted (Munge, 2023; Egeruoh-Adindu, 2022; Griffiths, 2019).

For a recently established institution the last of these may matter most. The National Council on Climate Change was created in 2021 and operates across agencies with limited prior experience of climate specific administration. International engagement offers such an institution an accelerated route to practice that would otherwise be acquired slowly through domestic experience, which is consistent with the multi-level governance account in which national and international levels are

mutually constitutive rather than sequential (Hooghe and Marks, 2001; Biermann and Pattberg, 2008).

A caution attaches to the interpretation. The estimate is cross sectional and rests on perceptual measures reported by officials of the institutions concerned. Officials who regard their institution as internationally engaged may for related reasons regard its domestic policies as effective, and the design cannot separate that possibility from a genuine causal contribution.

5.4 Measurement Quality and a Note on Reporting

The measurement model performs well. All loadings exceed 0.70, average variance extracted exceeds 0.50 for every construct, composite reliability lies between 0.900 and 0.930, and discriminant validity is satisfied throughout. The diagnostic tests give no indication of heteroskedasticity or functional form misspecification.

One reporting matter should be recorded for transparency. In the source analysis the column labelled composite reliability contained the values 0.838, 0.809, 0.803, 0.853 and 0.819, which are the square roots of the corresponding average variance extracted figures rather than composite reliability. These are the values correctly used on the diagonal of the Fornell and Larcker matrix, so the discriminant validity assessment is unaffected. Composite reliability has been computed here from the reported loadings using equation (4), and both quantities are presented separately in Table 1. The substantive conclusion is strengthened rather than weakened, since the computed composite reliability values are higher than the figures originally reported under that heading.

5.5 Limitations

Several limitations qualify the findings. All constructs were measured perceptually through self report from officials of the institutions being assessed, which raises both common method variance and the possibility of favourable institutional bias; objective indicators such as enforcement actions taken, emissions trajectories or project completion rates would provide a stronger test. The design is cross sectional, so causal direction is not established. The sampling procedure combined stratification with referral recruitment, which limits the basis for treating the sample as statistically representative of the target population. The study examines a single national case and a recently established institution, so the findings describe an early phase of institutional development that may not persist. Finally, the relationship between enforceability and outcomes noted in Section 5.2 requires direct investigation with a design capable of distinguishing suppression from substantive independence.

6. Conclusion and Recommendations

This study examined the effectiveness of domestic climate action in Nigeria with reference to the National Council on Climate Change, assessing the contribution of legal enforceability, regulatory adequacy and international engagement. All three exerted positive and statistically significant effects. Enforceability of the legal framework and adequacy of the regulatory framework both raised the effectiveness of climate action, with enforcement carrying more than twice the weight, and engagement in international climate diplomacy raised the effectiveness of domestic climate policies.

The study concludes that the effectiveness of climate action in Nigeria is determined by policy related and institutional factors operating together, and that the binding constraint at present lies in implementation capacity rather than in the content of the legal and regulatory instruments. Nigeria has built the architecture; the question that now determines outcomes is whether the institutions charged with operating it possess the capability to do so.

The following recommendations are made.

1. **Prioritise enforcement capability over further legislation.** Government and regulatory authorities should invest in monitoring systems, inspection capacity, compliance data and the administrative machinery through which sanctions are applied, since enforceability carries the larger estimated effect.
2. **Strengthen inter-agency coordination.** The Council should be equipped with clear authority and operational mechanisms for coordinating across the Ministries, Departments and Agencies that implement climate related activity, since fragmentation is a recurrent finding in the Nigerian literature.
3. **Sustain and institutionalise international engagement.** Participation in international climate processes should be treated as a core institutional function with dedicated capacity rather than as episodic representation, given the magnitude of its estimated effect.
4. **Build technical capacity within implementing agencies.** Structured training in climate policy, measurement and reporting should be provided across the associated agencies, many of which have limited prior experience of climate specific administration.
5. **Establish objective performance indicators.** The Council should publish measurable indicators of implementation, including enforcement actions and project delivery, so that future assessment can rely on recorded outcomes rather than on perceptual assessment.
6. **Review regulatory content periodically rather than continuously.** Given that adequacy contributes less at the margin than enforcement, regulatory revision should proceed on a planned cycle rather than as the default response to disappointing outcomes.

Conflict of Interest

The author declares no conflict of interest relating to the research, authorship or publication of this article.

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Ethical Statement

Participation in the survey was voluntary and informed consent was obtained from all respondents. Responses were anonymised and are reported only in aggregate, and no individual or agency is identifiable from the results presented.

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