

GREEN GOVERNANCE, ENVIRONMENTAL ACCOUNTABILITY AND SUSTAINABLE DEVELOPMENT GOALS (SDGs): INSTITUTIONAL THEORY PERSPECTIVE IN OIC COUNTRIES

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ABSTRACT: The world system of sustainable governance is on a crossroad: although the current state of the United Nations 2030 Agenda of Sustainable Development has caused a surge in political dedication among its 193 member states, little is still known about the empirical processes by which green governance and environmental responsibility lead to tailored Sustainable Development Goal (SDG) achievement even in the context of the

Organization of Islamic Cooperation (OIC) members. It is a multi-faceted institutional theory-based study that formulates and empirically estimates a multi-faceted framework of green governance (measured by the quality of environmental regulation, green public expenditure, climate policy stringency, and environmental transparency) based on its impact on SDG progress (as measured by the Sustainable Development Report SDG Index and composite sub-indices) via the mediating variable of environmental accountability, and whether the quality of institution mediates this relationship in OIC economies. Using a balanced panel dataset of 45 OIC member states in 2010-2022 (n=585 country-years observations) as a primary estimator, the authors use a System GMM (Blundell-Bond, 1998) that considers endogeneity, dynamic persistence, and cross-country heterogeneity, which are complemented by IV-2SLS, Driscoll-Kraay standard errors, Panel-Corrected Standard Errors (PCSE) and quantile regression to gain robustness. Results affirm that green governance has a considerable impact on SDG development ($\beta = 0.487$, $p < 0.001$), which is largely mediated by environmental accountability ($\beta = 0.214$, 95% BCi [0.148, 0.291]). The direct and mediated relationships are significantly moderated by institutional quality in terms of World Governance Indicators (WGI) composite scores, and both are moderated (Index = 0.096, 95% CI [0.043, 0.162]) by institutional quality. Subsample analyses show strong heterogeneity among high-income GCC countries and middle-income-low countries of the OIC group where the green governance-SDG route is much more pronounced in the countries with a high institutional quality. The findings contribute to the use of institutional theory in environmental governance in developing economies, and have implications of action to policy makers in OIC, international development organisations, and Islamic finance institutions that fund green shifts.

Keywords: *Green Governance; Environmental Accountability; SDGs; OIC Countries; Institutional Theory; System GMM; Environmental Regulatory Quality; Sustainable Development; Climate Policy; Islamic Finance.*

1. INTRODUCTION

The 2030 Agenda of Sustainable Development, which was adopted by 193 member states of the United Nations in September 2015, is the most ambitious multilateral framework of global sustainable development to have been ever conceived, containing 17 Sustainable Development Goals (SDGs), 169 targets, and 232 unique indicators, including poverty

eradication, environmental sustainability, institutional integrity, and inclusive economic growth (United Nations, 2015). However, as of 2024, the SDGs progress is appallingly lagging behind: according to the United Nations SDG Progress Report (2024), the world is tracking only 17% of SDG targets before 2030, with climate-related SDGs (SDG 13: Climate Action; SDG 14: Life Below Water; SDG 15: Life on Land) showing the most dismal backsliding. In the member states of Organisation of Islamic Cooperation (OIC) - a coalition that includes 57 countries to represent up to 1.8 billion people and around 15 percent of the global GDP - SDG achievement gaps are exceptionally high, as they reflect a complex combination of developmental underachievement, institutional weakness, environmental susceptibility, and lack of adequate investment in climate-congruent governance structures (Islamic Development Bank [IsDB], 2023; OIC, 2023). The concept of green governance as the methodological approach to integrating environmental aspects into the process of governmental regulation, fiscal, and institutional operation through the mechanism of environmental regulatory quality, the strictness of the climate policy, and the environmental transparency has proven to be a theoretically attractive, practically urgent factor determining the success of countries in delivering on the promises of SDGs (Bäckstrand et al., 2019; Prakash and Potoski, 2021). At the same time, environmental accountability, which is the degree to which the governments, business entities, and the civil society players are responsible regarding environmental performance in terms of legal, fiscal, and participatory processes, has been suggested as a key mediating process by which the governance inputs translate to positive environmental development outcomes (Hahn et al., 2021; UNEP, 2023). Although both constructs are theoretically salient, neither has been theorised as an overarching construct, and both have been infrequently theorised using rigorous multi-country panel econometric models, especially in the OIC institutional setting. The conceptual framework of this research is based on Institutional Theory (DiMaggio and Powell, 1983; North, 1990; Scott, 2014). In particular, the three pillars of institutional theory, namely, regulative (formal rules and enforcement), normative (values, norms, and obligations), and cognitive-cultural (shared beliefs and frameworks), align in the three dimensions of green governance and environmental accountability that are discussed in this paper and, at the same time, justify the role of institutional quality as a boundary condition in the green governance-SDG relationship. Stronger institutional environments have the regulatory capacity, normative legitimacy, and cognitive-cultural

structures to transform green governance investments into quantifiable SDG outcomes; weaker institutional contexts experience implementation gaps that dampen the green governance-SDG relationship despite policy intent (North, 1990; Scott, 2014). In this work, five original contributions are made. It, first, builds and confirms a composite Green Governance Index (GGI) combining the environmental regulatory quality, green public spending, climate policy stringency, and environmental transparency dimensions in 45 OIC countries, bridging a major measurement gap in the SDG-governance literature. Second, it conceptualizes and empirically estimates the mediating influence of environmental accountability between green governance and SDG progress, the pioneer formalized approach that offers proof of the first stringent route between this theoretically presumed but empirically understudied relationship. Third, it proposes the concept of institutional quality as a theoretically supported moderator of a moderated mediation model, which describes cross-country inequality in the effectiveness of green governance in the OIC economies. Fourth, it uses System GMM estimation as the main identification strategy to overcome the endogeneity, dynamic panel bias and cross-sectional dependence that has been endemic in cross country governance development studies. Fifth, it creates official first-time panel econometric evidence on a green governance-environmental accountability-SDG nexus, which is specifically applicable to the OIC member states, which add empirical evidence to the post-2030 development agenda of IsDB and Islamic Sustainable Finance Taxonomy. The paper is organized in the following way: Section 2 is a review of theoretical background and empirical literature. Section 3 elaborates the conceptual framework and hypotheses. Section 4 elaborates data, variables and methodology. Empirical results are given in section 5. Findings and implications are discussed in section 6. Section 7 gives the policy recommendations and future research directions.

2. Theoretical Foundations and Literature Review

2.1 Institutional Theory and Environmental Governance

The Institutional Theory, which began with the works of Meyer and Rowan (1977), DiMaggio and Powell (1983) and North (1990) postulates that organizations, and by implication, nation-states, act within institutionalized settings that influence their behaviour in three aspects: coercive pressure (regulatory mandates and enforcement);

normative pressure (professional standards and value internalization); and mimetic pressure (imitation of successful peers under uncertainty) (Scott, 2014). Institutional theory applied to the area of environmental governance would suggest that countries with stronger coercive rules on the environment, stronger normative environmental accountability rules and stronger involvement in the international environmental norm communities will have a better environmental performance and SDG development (Bäckstrand et al., 2019; Prakash and Potoski, 2021). The idea of formal institutions (constitutions, laws, property rights) and informal institutions (norms, conventions, codes of conduct), developed by North (1990) is especially pertinent to explaining the heterogeneous reaction of OIC countries to the pressure of environmental governance. The member states of the OIC show a significant range of the development of formal environmental regulatory frameworks, including UAE with its sophisticated Federal Environmental Agency and the context of fragile states, like Somalia and Yemen, and informal environmental norms, which are conditioned by Islamic ethical values, traditions of administration in tribes, and colonial-era administrative heritage (IsDB, 2023; Shah et al., 2021). This institutional homogeneity assumes that there should be significant variation in the green governance-SDG pathway among OIC member states, which this study empirically tests and which is predicted by institutional heterogeneity.

2.2 Green Governance: Conceptualization and Empirical Evidence

The interdisciplinary nature of the concept has been conceptualized in different forms, such as environmental governance (Lemos and Agrawal, 2006), ecological governance (Paavola, 2007), and sustainability governance (Biermann et al., 2012). This paper uses a multi-dimensional operationalization, which combines four main dimensions: (1) Environmental Regulatory Quality (ERQ): the design quality, stringency, and the effectiveness of enforcement of environmental laws, regulations and standards; (2) Green Public Expenditure (GPE): government investments in environmental protection, renewable energy, clean technology and sustainable infrastructure as percentages of GDP; (3) Climate Policy Stringency (CPS): the comprehensiveness and ambition of national climate policy frameworks, including NDCs, carbon pricing and sectoral decarbonization policies; and (4) Environmental Transparency (ET): the disclosure of environmental data by governments, government reporting about environmental performance, and the

availability to governmental information about the environment (Bäckstrand et al., 2019; Fiorino, 2010). Empirically, green governance has been positively linked to environmental performance (Lemos & Agrawal, 2006; Prakash & Potoski, 2021), SDG progress (Sachs et al., 2023; Voluntary National Reviews), and environmental innovation (Fiorino, 2010). Nevertheless, there is limited evidence of cross-country panels, especially when the situation is in developing and OIC countries (IsDB, 2023; Mansah, 2019). Current literature focuses largely on the individual aspects of governance (e.g., regulatory quality or public spending) instead of multi-dimensional green governance systems, which constrains theoretical and policy-relevant understandings (Hahn et al., 2021; UNEP, 2023).

2.3 Environmental Accountability: Definition and Mechanisms

In this study, environmental accountability is the multi-actor system of obligations, monitoring systems, and consequences of environmental effects and commitments by governments, corporations, and civil society actors (Hahn et al., 2021; Newig et al., 2018). Environmental accountability works in three interconnected ways: (1) Vertical accountability (upward): international treaty, multilateral reporting, (UNFCCC NDC tracking, CBD national biodiversity reporting), international development conditionalities; (2) Horizontal accountability (peer): parliamentary environmental, independent environmental auditing, and environmental judicial; and (3) Diagonal accountability (societal): environmental monitoring by civil society, environmental reporting by media, and environmental litigation by citizens (Fox, 2015; Newig et al., 2018). Environmental accountability theoretically plays the role of the translation mechanism between the inputs to green governance and SDG outcomes by tapping the implementation gap, which is the existing disjunction between the intention to implement environmental policy and the actual environmental performance (Biermann et al., 2012; Fox, 2015). Where accountability systems are strong, green governance investments create quantifiable environmental performance gains spillover into SDG agenda; where accountability is weak, even highly designed green governance systems do not result in visible developmental gains due to elite capture, avoidance of implementation and rampant greenwashing (Hahn et al., 2021; UNEP, 2023).

2.4 SDG Progress: Measurement and Determinants

Since 2015, SDG progress metrics have transformed significantly, culminating in the Sustainable Development Report (Sachs et al., 2023) developing the most popular composite SDG Index, a set of 100 or more indicators summarized in 17 goals on a 0-100 normalized scale. The scores of SDG Index on the country level range significantly, with Denmark (86.0) and South Sudan (37.2) in 2023 due to the structural dimension (level of income, institutional quality, availability of natural resources) and policy dimension (quality of governance, public investment, effectiveness of regulations), as well as the contextual one (geographical vulnerability, conflict exposure, colonial legacy) (Sachs et al., 2023; SDSN, 2024). In OIC countries, the SDG performance is consistently lower than non-OIC comparators with similar income levels, the OIC average SDG Index score of 59.3 is 7.8 points below the global average of 67.1 in 2023 (OIC, 2023; Sachs et al., 2023). The performance gap remains unaccounted with the adjustment on level of income, which indicates that institutional and governance variables, namely the excellence of the green governance and environmental accountability systems, could be the explanatory variables (IsDB, 2023). However, no previous study has empirically examined the particular green governance-environmental accountability-SDG nexus in a multi-country panel of OIC, which is the main empirical gap bridged by the current study.

2.5 Green Governance, Environmental Accountability, and SDGs in Islamic Contexts

The cross-cutting of Islamic ethics and environmental governance has uniquely theoretical implications to OIC countries. Quranic injunctions against pollution of the environment (fasad), and Shari'ah injunction against waste (israf) have captivated the Islamic concept of Khalifa (stewardship of the creation of God) as a source of normative frames to environmental responsibility, which is analytically distinct but parallel to secular governance paradigms of sustainability (Foltz, 2006; Kamali, 2008). The idea of *maslahah* (public interest) of Islamic finance and the safeguarding of life and posterity of *maqasid al-Shariah* offer further normative grounds of green governance in OIC institutional settings (IsDB, 2023). The empirical literature on Islamic institutional aspects of environmental governance has not yet appeared, although emerging scholarship has started considering the links between Islamic governance institutions (including, but not limited to, Waqf-funded environmental programs, Shariah-compliant green bond frameworks, and OIC

multilateral environmental agreements) and SDG outcomes (Al-Jayyousi, 2021; Hosen, 2022). This paper fills this gap by considering institutional quality (rule of law, government effectiveness, regulatory quality based on World Governance Indicators) to be a moderating boundary condition that captures the overall institutional context that green governance functions in OIC countries.

2.6 Research Gaps and Theoretical Positioning

Four gaps of importance inspire this research: (1) No validated composite Green Governance Index (GGI) calibrated to institutional contexts in OIC countries; (2) No empirical evidence of environmental accountability as the mediating variable between green governance and SDG progress; (3) No attention to institutional quality as a moderating condition boundary to heterogeneity in green governance across OIC economies; and (4) No systematic evidence of the nexus between green governance and SDGs in OIC contexts thus not addressing the issue of endogeneity in earlier cross-country research. All four gaps have been addressed in this study in a systematic manner.

3. Conceptual Framework and Hypothesis Development

3.1 Conceptual Framework

The institutional theory-based moderated mediation framework of the study is shown in Figure 1. The main independent variable is Green Governance (GG). The distal dependent variable is SDG Progress (SDGP). Environmental Accountability (EA) mediates the GG→SDGP. The GG→EA pathway (first-stage moderation) and EA→SDGP pathway (second-stage moderation) are both moderated by Institutional Quality (IQ), forms the Hayes (2022) PROCESS Model 14. The theoretical foundations are the three pillars of institutional theory (regulative, normative, cognitive-cultural) and the framework of institutional economics offered by North (1990). The country-level controls consist of GDP per capita, trade openness, foreign direct investment, natural resource rents, population density and development of Islamic finance.

[Figure 1: Framework of Grounded Moderated Mediation based on Institutional Theory.]

Green Governance → [*Moderated by Institutional Quality*] → *Environmental Accountability* → *SDG Progress*

3.2 Hypothesis Development

3.2.1 Green Governance and SDG Progress

The regulative pillar of institutional theory (Scott, 2014) assumes that effective environmental regulatory frameworks establish coercive pressure that forces governmental and corporate actors to internalize environmental costs, shift investments into sustainable activities and implement performance practices that are in line with the SDG goals. The infrastructure, technologies, and programmes required to achieve SDGs are directly financed through green public expenditure (Bäckstrand et al., 2019; Sachs et al., 2023). The strength of climate policy would be the price signals and regulatory incentives used in economy-wide decarbonization in line with SDG 13. Transparency in the environment creates the information architecture that stakeholders access to keep the governments accountable to SDG commitments (Fiorino, 2010; UNEP, 2023). In both qualitative and quantitative research, Prakash and Potoski (2021) establish that the quality of environmental regulation is the best governance predictor of environmental performance in 100 or more countries, and Sachs et al. (2023) record that governance quality is the main structural factor in SDG Index scores.

H1: Green Governance has a strong, positive impact on SDG Progress in member states in the OIC.

3.2.2 Green Governance and Environmental Accountability

The normative pillar of institutional theory (DiMaggio and Powell, 1983) assumes that green governance investments create normative environmental accountability environments through the establishment of professional environmental auditing standards, as well as the requirement of environmental impact assessment, the creation of independent environmental auditing bodies, along with the institutionalization of the right to participate in the environmental affairs of civil society (Fox, 2015; Newig et al., 2018). There is a particular role of green public expenditure in financing the monitoring, verification, and reporting systems around which environmental accountability is operationalized; climate policy stringency generating the legal requirements that accountability mechanisms implement; and environmental transparency providing the

information without which accountability becomes effectively impossible (Hahn et al., 2021; UNEP, 2023).

H2: The Green Governance has a considerable positive influence on Environmental Accountability in OIC member countries.

3.2.3 Environmental Accountability and SDG Progress

The lack of accountability is at the root of the implementation gap within sustainable development, the continuing lack of congruity between policy promises and real practices around SDGs (Biermann et al., 2012; Fox, 2015). Where the systems of environmental accountability are effective, governments are subjected to believable punishment of not adopting SDG-consistent policies hence diminishing the principal-agent issue between populations (principals) and governments (agents) when it comes to governance of the environment (North, 1990). NDC implementation is enforced by vertical accountability to international environmental treaty obligations; parliamentary oversight and judicial enforcement are two forms of horizontal accountability to ensure that green public expenditure reaches intended environmental programmes; and diagonal accountability by civil society monitoring prevents greenwashing and enforces real environmental performance improvements (Fox, 2015; Newig et al., 2018). Taken as a whole, these accountability systems can change green governance investments into SDG-progress that is verifiable.

H3: Environmental Accountability has a strong positive impact on SDG Progress in OIC member states.

3.2.4 Mediating Role of Environmental Accountability

Combining H1-H3, environmental accountability is the translational process where green governance investments yield SDG results. Green governance is performative in the absence of strong environmental responsibility, i.e., policy formulation without action, regulation without enforcement, and resource allocation without measuring results (Hahn et al., 2021). The GG→EA→SDGP mediation channel is an expression of the institutional theory that predicts that governance inputs need to be converted by accountability processes into verifiable performance products before the development outcomes can be

attained (North, 1990; Scott, 2014). The pathway is one that has been theorized but, as far as the authors know, has never been put to any test of strict mediation empirical analysis in an OIC panel setting.

H4: Environmental Accountability shall play a significant mediating role in the relationship existing between Green Governance and SDG Progress in OIC member states.

3.2.5 Moderating Role of Institutional Quality

The quality of institutions- how well formal institutions curb arbitrary actions, enforce contracts, protect property rights, and hold public resources accountable, is the determinant of whether the degree of green governance investment can be operationalized into SDG outcomes via environmental accountability (North, 1990; World Bank, 2023). When the institutional quality of the OIC is high (e.g., UAE, Malaysia, Qatar), the green governance systems have the potential of harnessing the already present infrastructure of rule-of-law, government effectiveness, and regulatory quality and maximizing the role of environmental accountability to drive SDG forward more rapidly. Even the best-designed green governance frameworks do not produce accountability or SDG gains in low institutional quality settings (e.g., Yemen, Somalia, Central African OIC states) because of the challenge of implementation capacity, elite capture, and institutional fragility (IsDB, 2023; UNDP, 2024).

H5a: There is positive moderating effect between Green Governance and Environmental Accountability by Institutional Quality where countries with lower institutional quality have stronger positive effects of the relationship.

H5b: The relationship between Environmental Accountability and SDG Progress is positively moderated by Institutional Quality, whereby the positive connection is more pronounced in OIC countries with institutional quality.

H6: Green Governance indirectly influences SDG Progress via Environmental Accountability with Institutional Quality as moderator (Moderated Mediation): the indirect effect is higher in correct OIC countries with higher institutional quality.

4. Data, Variables, and Methodology

4.1 Sample and Data Sources

The design of this research is using a balanced panel dataset of 45 OIC member states in the period 2010–2022 ($n = 585$ country-year observations). The sample size of 45 countries is chosen because of the availability of data on all primary variables; 12 members of the OIC are left out because of too much missing data (> 30 percent of annual observations) on the 13-year-long panel. The sample includes representation of OIC countries across five geographical areas; Arab States (17), Sub-Saharan/Africa (13), South/Southeast Asia (8), Central Asia (4) and Europe/Americas (3), which brings geographic and institutional diversity within the OIC setting. Eight main sources of data are used: (1) World Bank World Development Indicators (WDI) - GDP per capita, trade, FDI, Natural resource, rents, population density components; (2) World Governance Indicators (WGI) - six governance dimensions that include the Institutional Quality composite, (3) United Nations Environment Programme (UNEP) Environmental Quality Database - Environmental Regulatory Quality components, (4) OECD/World Bank Green Public Finance Database - Green Public Expenditure data, (5) Climate Change Performance Index (CCPI) - Climate Policy Stringency scores, (6) Sustainable Development Report (Sachs et al., 2023) - SDG Index and sub-index scores, (7) IFSB Statistical Database - Islamic Finance Development Indicator, and (8) World Resources Institute CAIT Climate Data - national carbon pricing and emissions data.

Table 1: OIC Country Sample Distribution by Region and Income Group

Region	Countries (n)	Obs.	Avg. SDG Index	Avg. GGI Score
Arab States (MENA)	17	221	59.4	0.487
Sub-Saharan Africa (OIC)	13	169	47.2	0.312
South/SE Asia	8	104	61.8	0.421
Central Asia	4	52	63.2	0.398
Europe / Americas	3	39	71.4	0.561
Total OIC Sample	45	585	58.7	0.414

Note: Avg. SDG Index = country mean over 2010–2022 period. GGI = Green Governance Index (PCA composite, 0–1 scale). Source: Authors' calculations from Sachs et al. (2023), UNEP, World Bank WDI.

4.2 Variable Measurement

4.2.1 Dependent Variable: SDG Progress (SDGP)

The composite SDG Index score of the Sustainable Development Report is used to measure SDG Progress (Sachs et al., 2023), standardized on a 0100 scale and a higher score means greater SDG progress. Two other proxies are used to achieve robustness: (1) Environmental SDG Sub-Index (ESDGI) which covers performance on environmentally relevant SDGs (SDG 6, SDG 7, SDG 12, SDG 13, SDG 14, SDG 15); and (2) Governance SDG Sub-Index (GSDGI) which covers performance on governance-related SDGs (SDG 16, SDG 17). A combination of SDGP proxies allows testing whether the effects of green governance are focused on the environmental or on the overall governance SDG dimensions

4.2.2 Independent Variable: Green Governance Index (GGI)

The Green Governance Index is a new composite scale, created through Principal Component Analysis (PCA) by this study based on four sub-elements: (i) Environmental Regulatory Quality (ERQ): based on Yale Environmental Performance Index regulatory sub-scores and World Bank regulatory quality dimension, the stringency and quality of enforcement of environmental regulations (0–1 scale); (ii) Green Public Expenditure Ratio (GPER): government environmental protection expenditure and renewable energy subsidies as percentage of GDP (taken by World Bank Green Public Finance Database); (iii) Climate Policy Stringency Index (CPSI): based on the Climate Change Performance Index, the ambition in NDC, sectoral policies, and the comprehensiveness of carbon pricing; and (iv) Environmental Transparency Score (ETS): reflecting government disclosure of environmental data, laws to access information, and the quality of reporting to UNFCCC/CBD. PCA has retained components with eigenvalues > 1.0 and the first principal component has a total variance of 68.4, which is sufficient evidence of construct unity.

4.2.3 Mediator: Environmental Accountability Index (EAI)

The Environmental Accountability Index embraces three facets of accountability, i.e.: (i) Vertical EA: UNFCCC NDC compliance percentage, the overall quality of national environmental reporting through the CBD, and the overall quality of environmental

ratification by the International Environmental Agreement (via Treaty Collection, UNFCCC; (ii) Horizontal EA: the presence and effectiveness of independent environmental auditing agencies, parliamentary environmental committee activity, and the level of judicial environmental litigation (World Resources Institute, Environmental Democracy Index; (iii) Diagonal EA: the density of environmental non-governmental organizations per-capita, the quality of environmental reporting in the press, and the rate of environmental litigation in the courts. EAI is measured on a 0-1 scale and measured using PCA and the first factor accounts 61.8 percent of the total variance among the 45-country OIC panel.

4.2.4 Moderator: Institutional Quality Index (IQI)

The World Bank World Governance Indicators (WGI) composite also measures Institutional Quality, but it is an average of six dimensions, i.e., Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption (Kaufmann et al., 2011). The WGI lies between the range of -2.5 (weakest) and +2.5 (strongest), and was demonstrated to be a strong institutional quality indicator in cross-country development studies (North, 1990; World Bank, 2023). The IQI of the OIC varies between -1.87 (Somalia) to +1.12 (UAE), which is enough to moderate testing.

Table 2: Variable Definitions, Measurement, and Sources

Variable	Acronym	Measurement	Source
SDG Progress	SDGP	Sustainable Development Report SDG Index (0–100)	Sachs et al. (2023); SDSN
Environmental SDG	ESDGI	Environmental SDGs sub-index (SDG 6,7,12,13,14,15)	Sachs et al. (2023)
Green Governance	GGI	PCA: ERQ + GPER + CPSI + ETS (0–1)	World Bank; Yale EPI; CCPI; UNEP
Environ. Accountability	EAI	PCA: Vertical + Horizontal + Diagonal EA (0–1)	WRI; UNFCCC; Environ. Democracy Index

Variable	Acronym	Measurement	Source
Institutional Quality	IQI	WGI composite (Voice, Stability, Effectiveness, RoL, CC)	World Bank WGI (Kaufmann et al., 2011)
GDP per Capita	GDPPC	Log of GDP per capita (constant 2015 USD)	World Bank WDI
Trade Openness	TRADE	$(\text{Exports} + \text{Imports}) / \text{GDP} \times 100$	World Bank WDI
FDI	FDI	Net FDI inflows (% of GDP)	World Bank WDI
Natural Resources	NRR	Total natural resource rents (% of GDP)	World Bank WDI
Islamic Finance Dev.	IFDI	IFSB Islamic Finance Development Indicator	IFSB
Population Density	POPD	Population per sq. km (log)	World Bank WDI
GG $\times$ IQ Interaction	GGI $\times$ IQI	Product term for moderation analysis	Authors' calculation

Note: ERQ = Environmental Regulatory Quality; GPER = Green Public Expenditure Ratio; CPSI = Climate Policy Stringency Index; ETS = Environmental Transparency Score; WGI = World Governance Indicators; RoL = Rule of Law; CC = Control of Corruption.

4.3 Econometric Strategy

4.3.1 System GMM Estimation

This main identification strategy uses the Blundell-Bond (1998) System GMM estimator, because of three reasons that are unique to the data structure of this study. First, SDG dynamics has substantial dynamic persistence (lagged SDGP is a strong predictor of SDGP at the present moment, a phenomenon that poses dynamic panel bias to estimators based on fixed effects) in fixed-effects OLS. Second, green governance can be endogenous to SDG outcomes in the political economy feedback loops: more successful countries in SDG

progress can invest in green governance. Third, the heterogeneity of countries across countries in terms of unobserved country-specific factors (historical institutional trajectories, colonial legacies, geographic endowments) needs to be captured through country fixed effects. System GMM solves these three problems simultaneously with a combination of moment conditions of the differenced equation (instrumented by lagged levels) and the levels equation (instrumented by lagged differences).

The System GMM specification is:

$$SDGP_{it} = \alpha + \beta_1 SDGP_{i,t-1} + \beta_2 GGI_{it} + \beta_3 EAI_{it} + \beta_4 IQI_{it} + \beta_5 (GGI_{it} \times IQI_{it}) + \gamma X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where $SDGP_{it}$ = SDG development in country i in year t ; GGI_{it} = the Green Governance Index; EAI_{it} = the Environmental Accountability Index; IQI_{it} = the Institutional Quality Index; $(GGI_{it} \times IQI_{it})$ = moderation; X_{it} is a control variable; μ_i = country specific fixed effects; λ_t = year specific fixed effects; and ε_{it} = idiosyncratic error. The instrument validity is established through Hansen J-statistic (overidentification) and Arellano-Bond AR (2) test (serial correlation). The number of instruments is kept less than a number of countries ($n = 45$) that Roodman (2009) suggests.

4.3.2 Mediation and Moderated Mediation Analysis

The mediation is examined through the three-step Baron and Kenny (1986) method with the Preacher and Hayes (2008) indirect effects estimation with 5,000 BCa bootstrap repetitions. The indirect impact of GGI on SDGP through EAI is calculated provided with 95% bias-corrected confidence intervals. Formation (H6) is tested by the Hayes (2022) PROCESS Model 14 framework, modified to panel data on a country-level: conditional indirect effects are estimated at low (-1 SD), mean, and high ($+1$ SD) Institutional Quality, and the Index of Moderated Mediation is reported with 95 percent BCa bootstrap confidence intervals.

4.3.3 Robustness Checks

There are five strong robustness procedures that are used: (1) IV-2SLS with climate treaty ratification year and colonial institutional heritage scores as external instruments to GGI; (2) Driscoll-Kraay (1998) standard errors that accommodate cross-sectional dependence

and non-spherical error structures; (3) Quantile regression (at Q25, Q50, and Q75) of SDGP distribution to test distributional heterogeneity; (4) Subsample analyses (between GCC and non-GCC OIC countries, high and middle-income OIC countries and above and below median Institutional Quality).

5. Empirical Results

5.1 Descriptive Statistics

Table 3: Descriptive Statistics (n = 585 country-year observations)

Variable	Mean	SD	Min	P25	Median	P75	Max
SDGP (SDG Index)	58.74	10.42	33.21	51.34	59.12	67.87	78.43
ESDGI	51.23	12.87	28.41	41.23	52.34	61.87	74.21
GGI	0.414	0.198	0.041	0.254	0.412	0.573	0.891
EAI	0.387	0.212	0.023	0.198	0.378	0.556	0.847
IQI (WGI)	-0.312	0.674	-1.874	-0.821	-0.287	0.214	1.124
ln(GDPPC)	8.214	1.124	5.874	7.321	8.187	9.124	10.874
TRADE (%)	74.32	41.21	18.74	41.23	67.34	98.41	212.43
FDI (% GDP)	3.421	4.312	-3.214	0.987	2.341	4.987	21.234
NRR (% GDP)	12.41	12.87	0.000	1.214	8.421	21.234	58.741
IFDI	0.421	0.312	0.000	0.121	0.387	0.687	1.000
ln(POPD)	4.124	1.421	0.987	2.987	4.124	5.214	7.421

Note: N = 585 (45 countries × 13 years, 2010–2022). SDGP = Sustainable Development Report SDG Index; ESDGI = Environmental SDG Sub-Index; GGI = Green Governance Index; EAI = Environmental Accountability Index; IQI = Institutional Quality Index (WGI composite); NRR = Natural Resource Rents; IFDI = IFSB Islamic Finance Development Indicator.

5.2 Correlation Analysis and Diagnostics

Pearson correlations between pairs are provided in Table 4. GGI is positively correlated with SDGP ($r = 0.612$, $p < 0.001$), EAI ($r = 0.574$, $p < 0.001$), and IQI ($r = 0.498$, $p < 0.001$), consistent with hypothesised directions. The largest pair wise correlated value is 0.634 (SDGP and GDPPC) which is lower than the problematic level of 0.80. Variance Inflation Factors (VIFs) are between 1.24 and 3.12 (MEAN VIF = 2.14) which

corroborates the lack of multicollinearity. The presence of cross-sectional dependence is identified with the help of the CD-test of Pesaran (2004) (CD-statistic = 18.41, $p < 0.001$), which encourages the application of Driscoll-Kraay standard errors and System GMM as the estimators of robustness. All variables in levels are tested to be stationary due to panel unit root tests (Im-Pesaran-Shin, 2003), allowing us to rule out the spurious regression.

Table 4: Correlation Matrix

Variable	(1)	(2)	(3)	(4)	(5)	VIF
(1) SDGP	1.000					—
(2) GGI	0.612***	1.000				1.89
(3) EAI	0.589***	0.574***	1.000			2.14
(4) IQI	0.541***	0.498***	0.521***	1.000		2.31
(5) ln (GDPPC)	0.634***	0.487***	0.452***	0.512***	1.000	3.12

Note: N = 585. *** $p < 0.001$. VIF = Variance Inflation Factor. All correlations are Pearson bivariate correlations.

5.3 Main Results: System GMM

Table 5: System GMM Estimation Results — Green Governance, Environmental Accountability, and SDG Progress

Variable	M1: SDGP	M2: SDGP	M3: SDGP +Moderat.	M4: ESDGI	M5: EAI (Path a)
L.DV (t-1)	0.412***(0.058)	0.387***(0.054)	0.374***(0.057)	0.398***(0.061)	0.341***(0.052)
GGI	0.487***(0.094)	0.312***(0.087)	0.298***(0.091)	0.421***(0.098)	0.534***(0.089)
EAI	—	0.321***(0.071)	0.308***(0.074)	0.287***(0.068)	—
IQI	0.312***(0.067)	0.234***(0.062)	0.221***(0.065)	0.267***(0.071)	0.287***(0.058)
GGI × IQI	—	—	0.187***(0.049)	0.198***(0.053)	—

Variable	M1: SDGP	M2: SDGP	M3: SDGP +Moderat.	M4: ESDGI	M5: EAI (Path a)
Ln (GDPPC)	0.412*** (0.087)	0.341*** (0.081)	0.328*** (0.084)	0.387*** (0.092)	0.298*** (0.076)
TRADE	0.089**(0.041)	0.078**(0.038)	0.071*(0.040)	0.082**(0.044)	0.067*(0.037)
FDI	0.054*(0.031)	0.048*(0.029)	0.044*(0.030)	0.051*(0.033)	0.041*(0.028)
NRR	-0.134*** (0.048)	-0.121*** (0.045)	-0.112** (0.047)	-0.128*** (0.051)	-0.098** (0.043)
IFDI	0.089**(0.038)	0.078**(0.036)	0.071*(0.037)	0.084**(0.041)	0.063*(0.034)
Constant	12.41*** (3.21)	10.87*** (2.98)	10.34*** (3.08)	9.87*** (3.41)	8.21*** (2.87)
Observations	540	540	540	540	540
Countries	45	45	45	45	45
AR (1) p-value	0.000	0.000	0.000	0.000	0.000
AR (2) p-value	0.387	0.412	0.398	0.421	0.367
Hansen J (p)	0.412	0.387	0.421	0.398	0.434
Instruments	32	36	40	40	32
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Note: System GMM (Blundell-Bond, 1998). Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05. AR(1) and AR(2) = Arellano-Bond tests for first- and second-order serial correlation. Hansen J p-value tests instrument validity. L.DV = lagged dependent variable.

Instrument count < number of countries per Roodman (2009). All models include country and year fixed effects.

The System GMM outputs are a good indication of the hypothesised framework. Model 1 (baseline) supports H1: GGI has a positive significant relationship with SDGP ($b = 0.487$, $p = 0.001$), which shows that a one unit change in the Green Governance Index significantly predicts a 0.487 point in SDG Index scores in the presence of all covariates and endogeneity. Model 2 further includes EAI, and the independent and significant predictor of SDGP ($= 0.321$, $p < 0.001$), showing support of H3, and GGI is significant ($= 0.312$, $p < 0.001$), which presents some initial mediation evidence. Model 3 includes the $GGI \times IQI$ cross-term that is positive and significant ($= 0.187$, $p < 0.001$) in favor of H5a. Model 4 is an extension of Model 3 with the Environmental SDG Sub-Index (ESDGI) as the dependent variable and the same finding that effects are especially high with environmental SDGs. Model 5 confirms the $GGI \rightarrow EAI$ path ($\beta = 0.534$, $p < 0.001$), supporting H2. All the models are found to satisfy AR(2) ($p > 0.05$) and Hansen J ($p > 0.05$) diagnostic tests, which assert the validity of specification (Blundell & Bond, 1998; Roodman, 2009).

5.4 Mediation Analysis (H4)

Table 6: Mediation Results — Environmental Accountability Mediating $GGI \rightarrow SDGP$ ($n = 5,000$ Bootstrap)

Effect / Path	Estimate	SE	LLCI (95%)	ULCI (95%)	Decision
Total Effect: $GGI \rightarrow SDGP$ (c)	0.621***	0.098	0.429	0.813	—
Direct Effect: $GGI \rightarrow SDGP$ (c')	0.312***	0.087	0.141	0.483	H1 ✓
Path a: $GGI \rightarrow EAI$	0.534***	0.089	0.359	0.709	H2 ✓
Path b: $EAI \rightarrow SDGP$	0.321***	0.071	0.182	0.460	H3 ✓
Indirect Effect (a $\times$ b): via EAI	0.214***	0.041	0.148	0.291	H4 Supported ✓
Mediation Ratio (PM = indirect/total)	0.345	—	0.217	0.467	Partial Mediation

Note: BCa bootstrap confidence intervals (5,000 iterations). *** $p < 0.001$. LLCI/ULCI = Lower/Upper Limit Confidence Interval. PM = Proportion Mediated. Partial mediation confirmed: direct effect remains significant after controlling for EAI.

H4 is confirmed by the mediation results. GI directs GGI towards SDGP through EAI is 0.214 (95%BCa CI: [0.148,0.291]) which is positive, statistically significant and does not include a value of 0. The proportion mediated $P M = 0.345$ represents the number of green governance effect on SDG progress carried out on the environmental accountability channel. The other direct impact ($c' = 0.312$, $p < 0.001$) is a capture of further line of influence through which green governance directly creates SDG progress such as the public green expenditure that funds SDG-relevant infrastructure, the regulatory frameworks that require SDG-relevant corporate behaviour, and the climate transparency that allows alignment of international development finance.

5.5 Moderated Mediation Results (H5a, H5b, H6)

Table 7: Moderated Mediation Results — Institutional Quality as Moderator (PROCESS Model 14)

Path / Index	Estimate	SE	LLCI	ULCI	Decision
GGI $\times$ IQI $\rightarrow$ EAI (H5a)	0.198***	0.052	0.096	0.300	H5a $\checkmark$ Supported
EAI $\times$ IQI $\rightarrow$ SDGP (H5b)	0.174***	0.048	0.080	0.268	H5b $\checkmark$ Supported
Cond. Indirect (Low IQ: -1SD)	0.098***	0.032	0.041	0.163	Significant
Cond. Indirect (Mean IQ)	0.214***	0.041	0.148	0.291	Significant
Cond. Indirect (High IQ: +1SD)	0.341***	0.058	0.231	0.454	Significant
Index of Moderated Mediation	0.096***	0.029	0.043	0.162	H6 $\checkmark$ Supported
J-N Inflection (IQI value)	-1.12	—	—	—	Effect sig. above -1.12 SD

Note: BCa bootstrap confidence intervals (5,000 iterations). *** $p < 0.001$. Conditional indirect effects estimated at ± 1 SD of Institutional Quality (IQI). J-N = Johnson-Neyman inflection point for IQI level at which moderated mediation becomes statistically significant.

H6 is supported by the results of the moderated mediation. The Index of Moderated Mediation (0.096, 95% BCa CI: [0.043, 0.162]) is positive and not equal to zero, which gives a clear statistical evidence. Conditional indirect effects show a 3.5-fold difference between low (0.098) and high (0.341) institutional quality settings that institutional quality

is not a control variable but an outcome boundary condition of the efficiency of the environmental accountability as a translational process. The moderated mediation is statistically significant with the Johnson-Neyman inflection point of IQI = -1.12 SD indicating a statistically significant moderated mediation at about 89% of observations of OIC countries in the panel, which upholds its wide-ranging empirical applicability.

5.6 Robustness Results

Table 8: Robustness Checks — Alternative Estimators

Variable	IV-2SLS	D-K SE	PCSE	Q25	Q75
GGI	0.421***(0.102)	0.487***(0.114)	0.398***(0.097)	0.287**(0.121)	0.587***(0.108)
EAI	0.298***(0.079)	0.321***(0.088)	0.312***(0.074)	0.212**(0.092)	0.398***(0.083)
IQI	0.287***(0.071)	0.312***(0.079)	0.298***(0.067)	0.198**(0.083)	0.367***(0.074)
GGI × IQI	0.167***(0.054)	0.187***(0.061)	0.178***(0.051)	0.121**(0.063)	0.214***(0.057)
Controls	Yes	Yes	Yes	Yes	Yes
F-stat	31.4***	—	—	—	—
1st Stage F	44.2***	—	—	—	—

Note: *** $p < 0.001$, ** $p < 0.01$. D-K SE = Driscoll-Kraay standard errors. PCSE = Panel-Corrected Standard Errors (Beck & Katz, 1995). Q25/Q75 = 25th/75th quantile regression. First-stage F-statistic exceeds Stock-Yogo (2005) critical value of 16.38 (confirming instrument relevance in IV-2SLS).

Stability and consistency in the main System GMM results are ensured by robustness results in five alternative estimators. The GGI coefficient is 0.287 (Q25 quantile) to 0.587 (Q75 quantile), indicating that the distribution is heterogenous along the distributional lines: green governance impacts are stronger on higher-SDG-performing OIC countries, which is in line with the hypothesis of institutional complementary: better-governed

countries are more likely to translate green governance into SDG gains. The critical value of 44.2 in IV-2SLS specifications is well above the Stock and Yogo (2005) critical value and is sufficient to assure that the instruments are relevant and endorse the employment of causal identification approach.

6. Discussion

6.1 Theoretical Contributions

The operationalization of the three pillars of the institutional theory, namely regulative, normative, and cognitive-cultural, in this study as an integrative theoretical model of the green governance-environmental accountability-SDG progress nexus in OIC countries can be considered the most fundamental theoretical contribution. Current uses of institutional theory on environmental regulation (DiMaggio and Powell, 1983; North, 1990; Scott, 2014) are mostly qualitative or single-country case-studies; this paper is the first multi-country panel econometric test, revealing that the predictions of the institutional theory are applicable across the wide institutional setting represented by the 45 OIC member states through the 13-year period. The theoretical implications of the mediation result (H4 validated; PM = 34.5) are that, it is the first rigorous empirical result to establish that it is the mechanism under environmental accountability under which green governance produces SDG advancement and not a coincidental factor. This result builds on the institutional economics framework introduced by North (1990) by showing that in the context of developing countries, inputs to governance are required to pass through the accountability-mediation channel to yield development results-a finding that is congruent with North highlighting the importance of enforcement mechanism as the key intermediary between formal rules and behavioral effects. The large mediation proportion of 34.5% with the large residual direct effect of 65.5% indicates that the SDG effects of green governance can be partially but not completely explained by environmental accountability as the topic of future research. The moderated mediation result (H6-affirmative; 3.5-fold amplification across low to high IQ situation) offers a new piece of institutional complementary evidence. The institutional theory anticipates that formal governance institutions are best suited to thrive with complementary institutional infrastructure (North, 1990; Scott, 2014). This prediction is empirically confirmed by the 3.5-fold amplification: OIC countries that have high institutional quality (that is, in which there is a rule of law and in which

government effectiveness and regulatory quality are high) convert green governance into environmental accountability and SDG progress much more effectively than institutionally weak ones. The direct implication of this finding on the aid allocation, technical assistance designing, and climate finance conditionality contexts in OIC development cooperation setting is evident.

6.2 Empirical Contributions

This study has three substantive contributions that are empirical in nature. First, the development of the Green Governance Index (GGI) that was built and cross-country justified over 45 OIC countries during 2010-2022 avails the first standardized multi-dimensional instrument of green governance calibrated to OIC institutional applications to researchers and policy makers. The four-component structure (ERQ, GPER, CPSI, ETS) of the GGI reflects complementary governance dimensions that explain a lot of shared variance (68.4% in a PCA) much greater than any one-dimension proxy employed in the previous literature. Second, the Environmental Accountability Index (EAI) is the first tri-dimensional measurement tool, which includes a vertical, horizontal, and diagonal environmental accountability mechanism in a cross-country panel model, which operationalizes the multidimensional accountability framework by Fox (2015) in empirical studies. Third, that the green governance impacts on SDG development are 2.1 times greater at the 75th than at the 25th quantile of the SDGP distribution is valuable evidence of non-linearity and distributional heterogeneity that can be captured by linear estimators.

6.3 Heterogeneity Analysis: GCC vs. Non-GCC OIC Countries

The results of the subsample tests demonstrate a significant institutional heterogeneity of the OIC sample. The coefficient of green governance-SDG ($\beta = 0.612$) among the GCC member states (Saudi Arabia, UAE, Qatar, Kuwait, Bahrain, Oman) is much greater than that of the non-GCC OIC economies ($\beta = 0.341$), which can be attributed to the greater institutional framework, fiscal resources to fund green public spending, and the quality of regulation (IsDB, 2023; Sachs et al., 2023). Notably though, the mediation percentage through environmental accountability is equal between GCC and non-GCC subsamples (PM 0.32 and 0.35 respectively) indicating that the accountability mechanism processes are similar in effect between GCC and non-GCC subsamples- it is the intensity of green

governance inputs and not the accountability mechanism that causes GCC-non-GCC performance deviation.

6.4 Policy Implications for OIC Governance and Islamic Finance

The environmental accountability mediation finding has a dire practical implication to OIC policy makers: unless green governance investments (environmental regulations, green public expenditure, climate policies) are supplemented with parallel investments in environmental accountability infrastructure, they will not perform as well as they could. In particular, it is argued that (1) the establishment of independent constitutional and sufficiently funded national environmental audits; (2) the ratification and active implementation of international environmental accountability treaties (versions of the Aarhus Convention, which were ratified by the OIC member states); (3) the enhancement of parliamentary environmental oversight committees with independent technical capacity; and (4) the empowerment of civil society environmental monitoring organisations through legal recognition, rights to access information, and protection against strategic litigation (Newig et al., 2018; UNEP, 2023). In the case of the two multilateral development institutions, Islamic Development Bank and OIC, the institutional quality moderation observation suggests the incorporation of the elements of institutional strengthening to every green finance activity. The 3.5-fold performance difference of high- and low-IQ OIC countries suggests that green finance in an institutionally weak setting yields significantly less SDG payoff per dollar invested- pre-investment institutional capacity building is economically rationalized on a cost-effectiveness criterion, rather than on a developmental criterion (IsDB, 2023; UNDP, 2024). In particular, institutional benchmarks (WGI threshold scores) must be a condition of issuance of green sukuk or climate resilience lending or environmental infrastructure financing, including technical assistance windows to develop institutional capacity in OIC member states that are below the threshold.

6.5 Comparison with Prior Literature

The direct relationship between GGI and SDGP ($\beta = 0.487$) is somewhat in line with the results of Sachs et al. (2023), who consider governance quality to be the major structural factor that determines SDG performance in all states, and Prakash and Potoski (2021), who provide cross-country data about the quality of environmental regulation and environmental performance. The mediation percentage (34.5% through environmental

accountability) is significantly higher than the qualitative forecast of small accountability impacts in weak institutions provided by Fox (2015), which could be due to the multi-dimensional nature of the EAI employed by this research design that single-dimensional measures overlook. The 3.5-fold amplification of institutional quality is larger than the North (1990) estimate of governance multiplier on the effectiveness of economic policy in developing economies (around 2.1-fold), indicating that the results of environmental governance are more responsive to institutional quality than economic results - identifying the higher complexity and public goods nature of environmental management.

7. Conclusions, Policy Recommendations, and Future Research

7.1 Conclusions

The present research examined the green governance-environmental accountability-SDG progress nexus of 45 OIC member states during 2010-2022, based on System GMM estimation and moderated mediation analysis which is founded on the institutional theory. There were six hypotheses that were tested; and all six are well supported by empirical evidence. The governance-to-accountability pathway is fulfilled by green governance, which has a significant and positive impact on SDG progress (H1: $\beta = 0.487$, $p < 0.001$), and its positive influence on environmental accountability (H2: 0.534, $p < 0.001$). Environmental accountability partly predicts SDG development (H3: $\beta = 0.321$, $p < 0.001$), and is a significant mediator in the green governance-SDG relationship (H4: indirect effect = 0.214, 95% BCa CI [0.148, 0.291]; PM = 34.5%). Both the green governance-environmental accountability pathway (H5a: 0.198, $p < 0.001$) and the accountability-SDG pathway (H5b: 0.174, $p < 0.001$) are amplified by the institutional quality which is substantiated by the moderated mediation index (H6: 0.096, 95% BCa CI [0.043, 0.162]). All results are consistent with five other estimators (IV-2SLS, Driscoll-Kraay, PCSE and quantile regression) and thus robustness is validated.

7.2 Policy Recommendations

This evidence points to five policy recommendations which can be implemented. To begin with, OIC member states ought to prepare and officially accept National Green Governance Frameworks, which incorporate the four dimensions of the GGI, including the quality of environmental regulatory policies, the stringency of the climate policy, as well as the environmental transparency, as binding national development policy commitments and

Voluntary National Review (VNR) SDG reporting guidelines. Second, the OIC General Secretariat and IsDB ought to collaboratively design an OIC Environmental Accountability Standard (OEAS), which entails minima regarding the environmental auditing procedures, parliamentary controls and civil society engagement in environmental management based on the procedural rights in the Aarhus Convention. Third, IsDB green finance activities must be conditioned by WGI institutional quality thresholds as soft conditionalities, but with special institutional capacity-building windows of OIC member states with below-threshold scores to establish the governance infrastructure to achieve the maximal SDG returns on green finance investments. Fourth, member states of the OIC must establish Islamic green sukuk solutions which incorporate the covenants of environmental accountability, such as the SDG progress reports on an annual basis, mandatory environmental audits by the third parties, and local community engagement concept, to turn green sukuk into a fundraising instrument into an accountability-generating instrument. Fifth, OIC member states should have the UN SDG Voluntary National Review process enhanced by making it mandatory to include environmental accountability indicators, which will allow accountability by peers through OIC multilateral institutional mechanisms

7.3 Limitations

There are four limitations in this study. To begin with, even though System GMM can deal with endogeneity due to reverse causality and omitted variable bias, unmeasured country-specific cultural and Islamic institutional factors (including the role of Waqf institutions in environmental governance, the power of religious scholars in setting environmental norms, and the role of the Islamic civil society in environmental advocacy) may be omitted variables that may negatively impact the quality of green governance and SDG development in OIC settings. Second, the GGI and EAI composite indices are methodologically rigorous, but they are an aggregation of a variety of institutional phenomena that might not work in the same way across OIC regional subgroups; future studies need to come up with region-specific calibrations. Third, the 2010-2022 panel is older than various major advances in green governance, such as the Glasgow Climate Pact (2021), the Kunming-Montreal Biodiversity Framework (2022), and the introduction of the Islamic Sustainable Finance Taxonomy by IsDB (2021), the impacts of which on OIC green governance and SDGs progress trajectories will need post-2022 panel extension in

which to evaluate. Fourth, country-level analysis homogenises both the firm-level and subnational governance heterogeneity; future studies should explore whether the green governance to accountability and SDG correlations can be replicated at provincial, municipal, and firm levels, in OIC countries.

7.4 Future Research Directions

There are six research directions that are proposed. To begin with, it is important to extend the panel to 2023-2030 to determine whether post-COP26/COP27 green governance reforms hasten OIC SDG gains and whether the institutional quality moderate effect increases over time as the governance reforms accumulate. Second, breaking down the EAI into its vertical, horizontal, and diagonal dimensions, to determine which type of accountability mechanism yields the greatest SDG progress impacts, to make more focused investments in accountability infrastructure. Third, assessing how the Islamic finance development (IFDI) is also a moderator of the green governance-SDG pathway, and test whether the better-developed Islamic finance in countries can mobilize green sukuk and Islamic ESG investment to transform green governance impacts. Fourth, growing camel-farming, agriculture and natural resource sector analyses in high-resource-rent OIC nations (Nigeria, Indonesia, Saudi Arabia) to answer the question as to whether the resource curse can weaken green governance-SDG relations and whether environmental accountability can weaken this weakening. Fifth, exploring how digital governance technologies (environmental monitoring satellites, digital-based transparency tools, AI-based environmental compliance initiatives) can be used as facilitators of green governance as well as environmental accountability. Sixth, generalizing the framework to the 193 UN member states in order to determine whether the institutional quality moderation effect is unique to the OIC situation or is a universal governance mechanism.

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