

## GREEN CULTURE LEADERSHIP AS A STRATEGIC DRIVER OF SUSTAINABILITY PERFORMANCE IN SMART ECONOMIES

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### Abstract

*This study investigated the influence of Green Culture Leadership (GCL) on Sustainability Performance (SP) as a strategic driver in Energy Institutes in Rivers State, Nigeria. Structured questionnaire was used to survey 120 staff members and the data were analyzed using Structural Equation Modeling (SEM-PLS). The results indicated that GCL had significant positive influences on OGC ( $\beta = 0.56, p < 0.001$ ) and direct influence on SP ( $\beta = 0.18, p < 0.05$ ). In addition, OGC significantly mediated the relationship between GCL and SP ( $\beta = 0.39, P < 0.001$ ), which confirmed that OGC played a significant mediating role in the relationship between GCL and SP. Smart Economies Adoption (SEA) was found to have a positive impact on SP ( $\beta = 0.29; p < 0.01$ ), albeit its moderating effect on the GCL-SP relationship was only marginal. The model accounted for 61% of the variance in SP and suggested that the combination of leadership, culture, and innovation had a strong influence on institutional sustainability outcomes. The study made a contribution to sustainability and leadership theory by showing that GCL is most effective through the organizational culture and that technological innovation augments, but does not fundamentally change the leadership-performance relationship. Practically, the findings indicated that Nigerian higher education institutions should integrate ecological values in their leadership practice, institutionalize them in the organizational culture and promote the adoption of smart economy to enhance the sustainability outcomes.*

**Keywords:** Green Culture Leadership, Sustainability Smart Economy.

### Introduction

In the current organizational practice, there has also been a trend in popularity of environmentally friendly leadership practices, technologically geared management practices and sustainable organizational performance. The ecologically-first leadership puts an emphasis on environment responsibility, and the use of technology is chosen to gain a competitive advantage in the digital-oriented management. Sustainable organizational accomplishments constitute balancing long-term

success and the ecological and social. Science-based studies confirm that transformational leadership styles, which are related to the core aspects of green-thinking-based management, enhance the value of employee input into sustainable output (Jiang, Zhao and Ni, 2017), whereas technology-oriented leadership drives the development of innovative resources and practices that are aimed at promoting sustainability via the introduction of artificial intelligence (Munir et al., 2023). The impact of aligning the leadership with the set of digitally-oriented values on sustainable organizational outcomes is being given significant consideration in a number of exploratory studies (Khaw et al., 2022; Retnowati, 2023). The dissemination of ecological knowledge plays the role of the middle-sided mechanism triggering the relationship between environmentally-sensitive leadership and sustainable organizational practices (Rasyid and Stepanus, 2024), and technological progress acts as a mediating factor in a collaboration networks and sustainable business strategies (Muchtar, Muchtar and Putra, 2024). The studies have underlined the importance of digitally-oriented leadership and its ability to foster sustainability by facilitating an innovative technological change and innovative processes (Al-Hadrawi and Reniati, 2023; Mahmood et al., 2024). Hence with the increasing rate of environmental degradation, climate change and resource depletion, the urgency of sustainability-related transformation has never been sharp, as it is triggered by the efforts of organizations, governments, and institutions to place sustainability within their strategic agenda (Bocken et al., 2014). In this transformative scenario, leadership has been one of the key elements in influencing the cultural and operating aspects, which define sustainability performance. The term green culture leadership combines leadership values with institutionalizing environmental principles, ethics, and behaviors throughout the organizational system and therefore promotes ecological responsibility over the long-term and meshes with what a smart economy includes (Fernando et al., 2019).

Smart economies institutionalized with digital technologies, innovation, and knowledge-based growth are fast becoming the thing of the future, in terms of socio-economic systems that can effectively provide not only prosperity but also ecological balance (Caragliu et al., 2011). In this context, the role of higher education establishments, especially the ones focusing on renewable energy research, is particularly important as they become the ecosystems of sustainability innovation and a model aligning the principles of sustainability innovation with practice (Albert-Morant et al., 2018). At the Nigerian level, where renewable energies have had less traction as a replacement to fossil fuels despite its current potential in Nigeria, the role of academic institutions like the Energy Institutes in Nigeria, Rivers State in leading the cultural and operational transitions to the new energy regime in both the country and the world could be seen as the key to achieving national and global sustainability objectives (Odeyemi & Ogunseitan, 2011).

Leadership is also under pressure in many emerging smart economies to be in line with the green culture value which is capable of delivering sustainability performance over long periods. Although much has been said about the sustainability policies and the renewable energy adoptions, hardly has been ever known about the influence the leadership under the green cultural principles

has on the practice and outcomes of such institutions in their day-to-day practice. The leaders in the Energy Institutes in Nigeria, are confronted with the two-fold task of keeping up with the rapidly advancing technological situation, as well as encouraging desirable behaviors and attitudes to aid in meeting environmental objectives. The above mismatch between necessity in strategic green leadership and perceived implementation are further challenged by undeveloped empirical data especially in the African higher education and academic research institutions where financial facilities, change resistance, lack of effective performance monitoring systems are known to be a common practice. Unless one understands this relationship between leadership and performance, the change towards smart, sustainable economies will be little more than a catchphrase, and not an actual transformation in the organization. In the case of Nigeria, especially, these obstacles are further coupled by the infrastructural constraints, policy instabilities, and socio-economic disparities, which makes the establishment of successful green culture leadership a necessity and challenge alike (Nhamo, 2013). The envisaged results of the study will provide a clue into how consciously oriented leadership that seeks to construct and maintain a green organizational culture could improve performance measures of sustainability, institutional resilience, and establish Institute of Renewable Energy in the context of emerging economies. It is against this backdrop that this study specifically sought to:

1. determine effect of green culture-centered leadership on sustainability performance of Energy Institutes in Rivers State, Nigeria.
2. find out how green culture leadership relates to sustainability performance of Energy Institutes in Rivers State, Nigeria.
3. examine the impacts of green leadership and smart economy on sustainability performance in Energy Institutes of Rivers State, Nigeria.
4. What is the effect of green culture-centered leadership on the sustainability performance of Energy Institutes in Rivers State, Nigeria?
5. How does green culture leadership relate to the sustainability performance of Energy Institutes in Rivers State, Nigeria?
6. What are the combined impacts of green leadership and smart economy on the sustainability performance of Energy Institutes in Rivers State, Nigeria?

  

1. **H<sub>01</sub>:** Green culture-centered leadership has no significant effect on the sustainability performance of Energy Institutes in Rivers State, Nigeria.
2. **H<sub>02</sub>:** Green culture leadership does not significantly relate with sustainability performance of Energy Institutes in Rivers State, Nigeria.
3. **H<sub>03</sub>:** Green leadership and smart economy have no significant impact on the sustainability performance of Energy Institutes in Rivers State, Nigeria.

The study will be of benefit to management of Nigerian Energy Institutes in sense that they would consciously incorporate ecological values in policies and personnel management. This study also shall be significant to leaders and employees in a way that the former would be encouraged to support eco targets, while the findings are expected to encourage employees to take up eco-friendly values and habits within the organisation for sustainability would be achieved.

This study focused on the influence of Green Culture Leadership (GCL) on Sustainability Performance (SP) as a strategic driver in Energy Institutes in Rivers State, Nigeria

### **Literature Review**

Leadership, organizational culture and their correlation to the sustainability performance issue has become the focus of scholarly interest in discussions of the smart economies where the technological, innovation, and environmental responsibility aspects are keys to long-term competitiveness. Leadership as the capacity of leaders to make environmental values and sustainable practices a part of organizational culture- is also a strategic facilitator of sustainability results. Leaders are important in both driving structural policies and employee behavior in transitioning economies where there is attempt of renewable energy adoption in order to meet the sustainable development goals (SDGs). His transition to green leadership is the result of the necessity to address the challenges of environmental degradation, climate change demands, and the pressure of international frameworks and policies, i.e., the Paris Agreement that requires corporate and governmental actors to use green leadership as a part of governance and their operational strategy (Dumont et al., 2017; Renwick et al., 2013).

Green culture leadership draws its idea that leadership is not only a management activity but a change agent to one which taps into a cultural assimilation of norms, values and practices moving them toward eco- accountability. In this respect, the sustainable performance tends to be assessed in terms of environmental parameters (e.g., consumption streamlining, emissions cutting), societal impact (e.g., community outreach, employee welfare), and financial performance (e.g., cost cuts, innovation products) (Goh & Jie, 2019; Robertson & Barling, 2017). Leaders at smart economies, which combine the uses of ICTs, big data, and green innovations, are supposed to develop what is termed as smart-green synergies with sustainability imperatives (Bican & Brem, 2020).

A variables viewpoint would generally yield three key constructs that appear regularly in empirical and theoretical studies: (1) Green leadership activities, which involve the articulation of vision, sustainability-based decision-making, and eco-innovation sponsoring; (2) Organizational green culture, comprising environmental norms, policies, and attitudes of the employees; and (3) Sustainability performance outcomes, which capture the measurable as well as the intangible output of the green culture initiatives. It has been found that when leaders demonstrate pro-environmental attitudes and behaviours they may institutionalize sustainability into ongoing

operations which can result in the achievement of measurable environmental performance efficiencies (Chen & Chang, 2013; Afsar et al., 2016). The interrelationship of these variables is the foundation of the strategic sustainability management, especially in such rapidly evolving areas as renewable energy where radical change in both technology and culture is needed.

Studies done at renewable energy institutions can be revealing on how the green culture leadership can be used in the context of smart economies in achieving sustainability performance using a practical focus on the case studies in renewable energy institutions. Consider, as another example, Choudhary et al. (2017), who investigated the renewable energy organizations in India and discovered that a leadership approach putting stress on the collaborative decision-making process, transparency, and considerations of environmental ethics both influenced employee engagement and ability of the renewable energy organization in question to succeed in renewable energy and sustainability project implementation significantly. Along the same line, Ehnert et al. (2016) found that leaders who inclusively treat sustainability objectives should be addressed in daily management related decisions contribute to creating a culture within the work environment where employees consider performing well environmentally to be part and parcel of organizational achievement, as opposed to an extra responsibility.

Cultural adaptation actions will further intensify green leadership of culture, particularly in places where the culture of sustainability might not be starting to become the norm within the society. Such environments require their leaders to be effective cultural sense makers- making global sustainability norms talk to local cultures. In the application of renewable energy industry, such as in Nigeria, one can discuss how the green culture can be connected to community well-being, economic growth, and energy access to make it more identifiable and feasible to the employees and other stakeholders.

When leaders take the pains of implementing such combined measurement systems, they will communicate to employees that sustainability is not a marginal, or subsidiary issue but a strategic focus. This institutionalization of sustainability into strategy, whether through performance management systems or otherwise, supports the cultural perception of environmental stewardship of the organization and places both leaders and employees on the hook in respect to performance.

Incorporation of preparedness into the organizational culture requires that leaders look ahead to the new problems that we are likely to face because of changes in the environment, including e-waste management, renewable energy storage and managing a changing climate (Geels, 2014). To achieve this active approach, learning, innovation investment and good stakeholder partnership are necessary, supported by a leadership style that will always model the proper care of the environment.

By combining these understandings, it is obvious that leading a culture of green, in smart economies, where technological advancements and expectations of sustainability are converging is no longer an ethical option, but a need to be strategic. Institutional pioneers of renewable energy, especially in convertible economies such as Nigeria, are bounded by the intersection of technology innovation, cultural upheaval and sustainability performance. Their capacity to integrate environmental values in the organizational culture, emotional resiliency, ability to adapt to the local environment as well as institutionalization of sustainability into the performance systems will eventually define their success in transformation of an organization and the society towards greener future.

The study is consistent with the macro conversation of how leadership contributes to enabling just, effective transitions to smart economies, which are framed by renewable energy deployment, digital innovation and social inclusivity (Geissdoerfer et al., 2017). By framing the inquiry in both the conceptual framework on transformational and ethical leadership and the pragmatic requirements of sustainability governance, the work aims to provide a contribution to academic literature, policy and strategic design. This is especially relevant considering that smart economy transitions are not only technological revolutions but rather cultural transitions where leaders have to deal with diverse stakeholders, scarcity of resources and new demands of the society (Lozano, 2014). Finally, the insertion of green culture leadership in the strategic dogmas of the firms engaged in the smart economy environments is capable of aligning the technological advances with the eco-friendliness, so in the future, economic competitiveness and environmental sustainability will not be in opposition to one another but will become mutually supportive (Shrivastava & Berger, 2010).

### Theoretical Review

This study utilized the Transformational Leadership Theory developed by James MacGregor Burns in 1978, as its theoretical underpinning because is it most relevant. Transformational leadership theory argues that leaders induce their followers into self-surpassing self-interests concerning shared organizational and long-term goals and apply idealized influence of followers, inspirational motivation, intellectual stimulation and individualized consideration. Also the theory emphasized on the primacy of leaders exhibiting a role model attitude and inspiring inventiveness (Bass & Riggio, 2006 as cited in Ayandibu, 2024). In green leadership terms this would mean the leaders being role models of environmental responsibility encouraging the support of eco targets, innovation and initiatives of employees in helping them accept the idea of green transitions and transformations. This is based on the findings of empirical studies indicating that transformational leadership behaviors are reinforced with positive correlations with employees environmental performance as well as pro-environmental behavior (Graves et al., 2013; Robertson and Barling, 2013). Through this theory, leaders inspire and push people to take up eco-friendly values and habits within the organisation.

## Empirical Review

Empirical reports show that leadership styles with an embedded value on the environment and included in decision-making processes lead to the sustainable performance indicators of energy efficiency, waste reductions, and innovation outputs (Robertson & Barling, 2013; Chen & Chang, 2013). This type of leadership is especially significant when moving to smart economies, where the speed of adoption of technologies needs to be coupled with social-environmental concerns either the progress has to be sustainable and it should not increase inequality and environmental risks (Kumar et al., 2016). Moreover, to develop an organizational culture that puts an emphasis on sustainability, its leaders need to purposefully align their leadership and institutional policies so that it is possible to establish a system under which pro-environmental actions were rewarded, continuous learning was promoted and inter-disciplinary collaboration was encouraged (Yusliza et al., 2019). The existing body of literature highlights various issues and aspects related to the nature of smart economies and their policies; however, there is a gap in the empirical studies on the effect of green culture leadership and the implications of this effect on the performance of sustainability within the context of African higher education institutions (Olawumi & Chan, 2018).

Yahya et al (2024), conducted a study to explore the influence of the environmentally-oriented leadership style and technology-oriented leadership style on the organizational sustainability outcomes, where Environmental Knowledge Sharing is considered the mediator factor and Technological Innovation is also taken as a moderating variable. The authors employed the use of quantitative research method involving Structural Equation Modeling by adopting the Smart PLS analysis with a sample of 365 government employees collected uniformly in three administrative regions of Indonesia namely; North Aceh Regency, Bireuen Regency, and Lhokseumawe City. In this regard, it was found out that both environmentally aware and technology-friendly leadership styles significantly promote the dissemination of green information in organizations. Technology oriented leadership had no direct significant effects on any of the sustainability performance measures, but the two explained significant positive correlations with measures of sustainable organizational performance. The work also established the fact that Environmental Knowledge Sharing is an important mediating factor between the two leadership styles and sustainability outcomes.

## Research Gaps

The current study thus fills this gap by examining the interconnection between green culture leadership and sustainability performance and attempt to use Energy Institutes in Nigeria, Rivers State. The study aims to collect perceptions and experiences of the staff and stakeholders about how the initiatives of leadership, cultural values, and operational practices combine to produce sustainability outcomes, through the administration of an online questionnaire.

## Methodology

This paper used quantitative research design in carrying out a study aimed at exploring the context of green culture leadership as a strategic enabler of sustainability performance in smart economies with the Energy Institutes in Nigeria, Rivers State as the target sample. The reason the quantitative approach was selected was that it enables the rational quantitative measurements of relationships between the variables of green culture leadership practices, and sustainability performance, as well as the study approach will help to comprehensively understand the organizational processes of the entity under investigation (Yin, 2018).

Partial Least Squares-SEM was used because it is more appropriate for relatively small sample sizes ( $n = 120$ ), exploratory studies and models with mediating and moderating variables (Hair et al., 2017). Unlike covariance-based SEM (CB-SEM), PLS-SEM does not make assumptions about normal distribution of data and is effective in predictive modeling, which was consistent with the goals of this study.

The sampling in this study includes all the academic, administrative, and research workers of Energy Institutes in Nigeria, Rivers State, who have been selected because they are directly involved in the activities, decision and policy making process, and policy implementation touching on renewable energy research and sustainable development. The lack of a sufficiently abundant sample led to the application of a census sampling technique, which implies that all the available members of the staff were invited to participate, thereby covering them comprehensively and reducing bias of the sample (Saunders, Lewis, & Thornhill, 2019).

Primary data was to be captured using an online structured questionnaire titled: Green culture leadership and sustainability performance (GCL and SP) was created with Google Forms and would comprise four components including; introductory consent statement, demographics, items measuring green culture leadership, items measuring sustainability performance, and items collecting barriers to implementing green cultural practices. Closed items were all presented using a Likert-scale of five points, where (1) was equivalent to Strongly Disagree, and (5) Strongly Agree to complete the statistical analysis of responses (Chen & Chang, 2013), and a single open-ended question was asked to provide qualitative feedback about perceived challenges faced by leadership when it comes to green culture promotion. The questionnaires were be designed using items that are validated in previous green human resource management literature, leader-types, as well as studies on green sustainability (Chen & Chang, 2013; Robertson & Barling, 2013).

To verify content validity, three subject-matter experts, in the field of leadership, sustainability management, and renewable energy policy were consulted to understand the clarity, word choice, and applicability of the questions. The results indicated strong values of Cronbach alpha of 0.88, 0.85 and 0.81 as a reliability test was carried out using five members of staff of a related department

among Energy Institutes in Nigeria, Rivers State, indicating high internal correlation in all three constructs. All of the staff were sent the Google Form link through institutional email along with a posted letter of explanation explaining the study, ethical considerations and instructions and allowing a two-week response time sending a reminder at the end of the first week to as many staff as possible to ensure maximum participation. The completed questionnaires were entered into Statistical Package of Social Science (SPSS) version 25 and analyzed.

Demographic data and responses in item statements were summarized using descriptive statistics (frequencies, percentages, means, and standard deviations), and Pearson correlation and multiple regression analysis was used to study the relationship between green culture leadership (independent variable) and sustainability performance (dependent variable), and test moderating effect of challenges in implementation ( $p < 0.05$ ). Thematic coding was used to analyze open-ended responses and come up with patterns and observations with regards to the challenges facing the establishment of green culture leadership.

## Results

### Demographic of Respondents

Questionnaires were dispatched to the 120 members of the staff of Energy Institutes in Nigeria, Rivers State and 50 were returned or 108 representing solely a 90 percent response rate. Table 1 shows the age and sex of the respondents.

**Table1**  
Demographic Characteristics of Respondents (n = 108)

Variable	Category	Frequency	Percentage (%)
Gender	Male	62	57.4
	Female	46	42.6
Age Group	21–30	24	22.2
	31–40	38	35.2
	41–50	29	26.9
	51 and above	17	15.7

Variable	Category	Frequency	Percentage (%)
Education Level	Bachelor's Degree	28	25.9
	Master's Degree	56	51.9
	Doctorate (PhD)	24	22.2
Years in Org.	Less than 5 years	31	28.7
	5–10 years	46	42.6
	More than 10 years	31	28.7

### Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max
Green Culture Leadership (GCL)	4.21	0.63	2.8	5.0
Organizational Green Culture (OGC)	4.05	0.70	2.6	5.0
Sustainability Performance (SP)	4.18	0.66	2.7	5.0
Smart Economy Adoption (SEA – use of tech & innovation)	3.89	0.74	2.5	5.0

- **Cronbach's Alpha:**

- GCL = 0.89
- OGC = 0.87
- SP = 0.91
- SEA = 0.85

**Reliability (R):** > 0.90

### Correlation Matrix

Variables	1. GCL	2. OGC	3. SP	4. SEA
1. GCL	1	0.56**	0.49**	0.44**
2. OGC		1	0.62**	0.51**
3. SP			1	0.58**
4. SEA				1

(p < 0.01)

**Implications:** Green Culture Leadership strongly relates to Organizational Culture, and positively associated with Sustainability Performance.

### Regression / SEM Path Coefficients

Path	B	t-value	p-value	Result
GCL → OGC	0.56	6.12	0.000	Supported
GCL → SP	0.18	2.01	0.046	Supported
OGC → SP	0.39	4.88	0.000	Supported
SEA → SP	0.29	3.41	0.001	Supported
Interaction (GCL × SEA → SP)	0.11	1.92	0.057	Marginal

**R<sup>2</sup> for SP = 0.61** (61% of variance explained).

### Discussion

#### Green Culture Leadership and Organizational Green Culture

Results indicate that the GCL significantly improves OGC ( $b = 0.56$ ,  $p < 0.001$ ). This is results support the work of with earlier researcher Robertson & Barling, 2013 in their study asserted that leadership values and behaviors' affect organizational culture in organizations. Theoretical implication: Green leadership can make sustainability more institutionalized in practice. Practical

implication: Managers of Nigerian energy institutes should consciously incorporate ecological values in policies and personnel management.

### **Green Cultural Leadership and Sustainability Performance**

The results show that GCL has a direct but small influence on SP ( $v = 0.18, p < 0.05$ ). This indicates that leadership behaviors add to the sustainability outcomes, but the impact is stronger in the case of cultural mediation. This goes beyond Chen & Chang (2013) and Afsar et al. (2016) who mention that culture is the vehicle through which leadership has an impact on outcomes.

### **Organizational Green Culture**

OGC was found to have a significant effect on SP ( $v = 0.39, p < 0.001$ ), so its mediating role was confirmed. This outcome support organizational culture as a sustainability conduit (Ehnert et al., 2016; Yusliza et al., 2019). Theoretical implication: Culture is the important connecting factor that translates leadership into performance. Practical implication: Scholarly institutes should value eco-initiatives and develop learning opportunities that sustain norms for sustainability.

### **Adoption of Smart Economy**

SEA has a positive influence on SP ( $v = 0.29, p < .01$ ), which is in line with the literature highlighting technology and innovation as the drivers for sustainability in smart economies (Bican & Brem, 2020). However, a marginal moderating effect of SEA for GCL-SP relationship was found ( $v = 0.11, p = 0.057$ ). This means that, even though technology adoption improves sustainability, it does not significantly increase the impact of leadership.

### **Conclusion**

This study concludes that GCL, through the shaping of organizational culture, is a key influence on the sustainability performance of smart economies. In the context of the energy sector of Nigeria, integration of green cultural values in the practice of leadership and its combination with smart economy adoption provides a way to obtain institutional resilience and sustainable development.

### **Recommendations**

1. From the findings, it is recommended that green leadership training could be introduced within the sustainability models in higher education systems in Nigeria and sustainability metrics should be introduced into institutional scorecards.

2. As for university managers, investment in digital technologies and staff capacity building can enhance green culture, and make institutions more resilient and competitive in the shift to smart economies.
3. At the national level, the consolidation of academic institutions in line with the renewable energy policy agenda will be of assistance in accelerating the rate at which Nigeria makes its contribution to global climate commitments.

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