



Research Article



Dynamic Capabilities and Climate Resilience in Nigeria's Energy and Extractive Industries: Testing Sensing, Seizing, and Transforming Capabilities

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Abstract: Firms in Nigeria's energy and extractive industries face intensifying climate-related transition and physical risk, yet management research has rarely tested how the microfoundations of dynamic capabilities, sensing, seizing, and transforming, translate into climate-resilient organizational performance in this setting. Building on Teece's dynamic capabilities framework, this paper develops and specifies an empirically testable model in which sensing capability (the identification and interpretation of climate-related threats and opportunities), seizing capability (the mobilization of resources and business-model responses to those threats and opportunities), and transforming capability (the reconfiguration of organizational assets, routines, and structures) are hypothesized as sequential yet interacting drivers of climate resilience, with institutional and regulatory pressure specified as a boundary condition. The paper situates this model within the empirical tradition established by dynamic-capabilities studies of oil and gas, coal, and shipping incumbents confronting decarbonization and climate transition pressure, and extends that tradition to a Nigerian context marked by a distinctive combination of climate exposure, regulatory volatility, and community-level accountability contestation. A mixed-methods research design is specified, combining a firm-level quantitative survey of Nigerian oil, gas, and solid-minerals companies, analyzed using partial least squares structural equation modeling, with semi-structured interviews to validate and contextualize the quantitative findings. Four hypotheses and a moderation proposition are advanced for empirical testing. The paper is positioned as a research design contribution consistent with Business Strategy and the Environment's focus on firm-level strategic responses to environmental and climate pressure, and it lays the empirical groundwork for the data-collection phase of this research program.

Keywords: dynamic capabilities, sensing, seizing, transforming, climate resilience, energy sector, extractive industries, Nigeria, PLS-SEM



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INTRODUCTION

Firms operating in Nigeria's oil, gas, and solid-minerals sectors face a combination of physical climate risk, transition risk, and regulatory volatility that few other national contexts combine so acutely. Physical risk arises from flooding, coastal erosion, and infrastructure disruption affecting upstream and midstream operations in the Niger Delta and beyond; transition risk arises from Nigeria's own Energy Transition Plan and Climate Change Act alongside international decarbonization pressure on hydrocarbon assets; and regulatory volatility arises from a fragmented, multi-agency governance environment in which environmental accountability outcomes frequently lag formal policy commitments [1]. How firms in this environment build the organizational capability to anticipate, respond to, and recover from climate-related disruption remains empirically underexamined.

Dynamic capabilities theory offers a well-established but, in this specific context, largely untested lens for this question. Teece decomposed dynamic capability into three microfoundational processes, sensing opportunities and threats, seizing them through resource mobilization and business-model response, and transforming the organization's asset base and routines to sustain competitiveness under changing conditions. A growing empirical literature has applied this triad to incumbent firms in carbon-intensive industries confronting decarbonization pressure, including Norwegian oil and gas companies transitioning toward renewable energy, Baltic Sea shipping firms reorienting toward decarbonization, and Indonesian coal companies responding to transition risk with markedly heterogeneous degrees of sensing, seizing, and reconfiguring capability [2]. None of this empirical tradition, to date, has been extended to Nigeria's energy and extractive industries, despite the sector's combination of high climate exposure and high strategic significance to the national economy.

This paper responds to that gap by specifying, rather than merely proposing, an empirically testable model of how sensing, seizing, and transforming capabilities relate to climate-resilient organizational performance among Nigerian energy and extractive firms, and by detailing the mixed-methods research design through which that model will be tested [3]. The paper's contribution is to convert the sensing-seizing-transforming triad from a general theoretical vocabulary into a set of falsifiable hypotheses, operationalized measures, and a sampling and analysis plan suited to the Nigerian institutional context, thereby providing both a theoretical extension of dynamic capabilities theory to a climate-vulnerable emerging-economy extractive setting and a practical diagnostic tool for firms and regulators in that setting [4].

Theoretical Background and Hypothesis Development

1. Dynamic Capabilities: Sensing, Seizing, Transforming

Dynamic capabilities were originally defined as a firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments. Teece subsequently decomposed this ability into three interdependent clusters of activity. Sensing capability concerns the identification and assessment of threats, opportunities, and changing stakeholder expectations, achieved through environmental monitoring, scenario analysis, and organizational learning. Seizing capability concerns the mobilization of resources, capital, and business-model innovation to capture value from opportunities identified through sensing, including new product or service development and strategic partnership formation [5]. Transforming capability, sometimes labeled reconfiguring, concerns the ongoing renewal of organizational assets, routines, and structures, including divestment, restructuring, and the redeployment of resources toward new strategic priorities. These three clusters need not occur in strict sequence and are frequently observed operating in parallel, but

each has been shown empirically to contribute a distinct and separable effect on firms' capacity to respond to environmental and climate-related disruption.

2. Dynamic Capabilities and Climate-Related Transition Risk in Carbon-Intensive Industries

Empirical application of this triad to carbon-intensive incumbents shows substantial variation in the strength and completeness of sensing, seizing, and transforming capability across firms and contexts. Among Norwegian oil and gas companies, firms with more developed sensing and seizing capability were more likely to identify and pursue renewable-energy diversification pathways aligned with the energy transition [6]. Among Baltic Sea shipping incumbents, dynamic capabilities enabled a documented shift from reactive compliance toward more proactive decarbonization strategy over time. Among Indonesian coal companies, most firms demonstrated only basic, compliance-oriented sensing capability, while genuine seizing and transforming capability, evidenced by green business development, structural reconfiguration, and asset divestment, was confined to a smaller set of leading firms with greater financial and organizational resources [7]. This pattern suggests that sensing capability may be a necessary but insufficient condition for climate resilience, and that the presence of seizing and transforming capability differentiates firms capable of substantive adaptation from those capable only of symbolic or compliance-level response, a distinction with direct relevance to Nigerian energy and extractive firms operating under similarly uneven resource and institutional conditions.

3. Hypotheses

- H1: Sensing capability is positively associated with climate-resilient organizational performance among Nigerian energy and extractive firms.
- H2: Seizing capability is positively associated with climate-resilient organizational performance among Nigerian energy and extractive firms, and this relationship is stronger than that of sensing capability alone.
- H3: Transforming capability is positively associated with climate-resilient organizational performance among Nigerian energy and extractive firms, and mediates part of the relationship between seizing capability and performance.
- H4: Sensing capability is positively associated with seizing capability, and seizing capability is positively associated with transforming capability, consistent with the sequential logic of the dynamic capabilities triad.
- H5 (moderation): Institutional and regulatory pressure strengthens the relationship between sensing capability and seizing capability, such that firms facing more acute regulatory and stakeholder pressure convert sensing into seizing activity more readily than firms facing weaker pressure.

Figure 1 (to be developed following data collection) will depict sensing, seizing, and transforming as sequential but correlated first-order constructs feeding into a second-order climate-resilient performance construct, with institutional and regulatory pressure specified as a moderator of the sensing-to-seizing path, consistent with the institutional-pressure and dynamic-capability interaction identified in adjacent climate-strategy research [8], [9].

RESEARCH DESIGN AND METHODOLOGY

1. Overall Design

A sequential explanatory mixed-methods design is proposed. The quantitative phase will test Hypotheses 1 through 5 using firm-level survey data analyzed through partial least squares structural equation modeling (PLS-SEM), an approach well suited to dynamic-capabilities research given its ability to handle formative and reflective higher-order constructs with moderate sample sizes. The qualitative phase will follow,

using semi-structured interviews with a purposively selected subsample of survey respondents to validate, contextualize, and explain the quantitative results, following the case-based logic used in comparable dynamic-capabilities studies of carbon-intensive incumbents.

2. Sample and Population

The target population is management-level respondents (sustainability, HSE, strategy, or operations leadership) in Nigerian-registered oil and gas, gas infrastructure, and solid-minerals firms, encompassing international oil companies, indigenous exploration and production companies, and mid- and downstream operators. A stratified sampling frame will be constructed to ensure representation across firm size, ownership structure (indigenous, joint venture, international), and subsector, reflecting the ownership-structure distinctions shown to moderate sustainability performance in prior Nigerian extractive-sector research.

3. Measures

Sensing, seizing, and transforming capability will be operationalized using multi-item reflective scales adapted from the established dynamic-capabilities measurement literature, following the guidance on construct conceptualization and measurement set out in the most comprehensive systematic review of dynamic-capabilities-for-sustainability scales to date, and adapted to the climate-transition context using item wording consistent with the oil-and-gas and coal-sector applications of the triad. Climate-resilient organizational performance will be measured as a multidimensional construct capturing operational continuity through climate-related disruption, environmental and safety incident trends, and stakeholder-validated ESG performance. Institutional and regulatory pressure will be measured using items capturing perceived regulatory stringency, stakeholder scrutiny, and community accountability pressure, informed by the accountability-gap literature on Nigerian oil and gas governance.

RESULT AND DISCUSSION

1. Analytical Strategy

The measurement model will first be assessed for reliability and convergent and discriminant validity before the structural model is estimated. Hypotheses 1 through 4 will be tested through path coefficients and their significance, assessed via bootstrapping. Hypothesis 5 will be tested through a moderation analysis of the interaction between institutional and regulatory pressure and the sensing-to-seizing path [10], [11], [12]. Common method bias will be assessed given the single-respondent-per-firm design, and where feasible a second respondent per firm will be sought to allow partial multi-informant validation.

2. Qualitative Validation

Following the quantitative phase, twelve to fifteen semi-structured interviews will be conducted with survey respondents purposively selected to represent the range of capability profiles identified in the PLS-SEM results, following the qualitative content-analysis approach used to interpret sensing, seizing, and reconfiguring activity among Indonesian coal incumbents. Interviews will probe how sensing signals are interpreted, how seizing decisions are resourced and authorized, and what internal or external factors enable or constrain transforming activity, providing explanatory depth that the quantitative model alone cannot supply.

3. Expected Contributions

This paper is expected to make three contributions once the specified data collection is completed. Theoretically, it will extend the empirical application of the sensing-seizing-transforming triad to a climate-vulnerable, institutionally distinctive emerging-economy extractive setting that has not previously been tested against this

framework, complementing existing applications in Norwegian oil and gas, Baltic shipping, and Indonesian coal [13]. Empirically, it will provide the first firm-level quantitative evidence on how the three capability clusters differentially predict climate-resilient performance among Nigerian energy and extractive firms, testing whether the pattern of uneven seizing and transforming capability observed among Indonesian coal incumbents also characterizes this setting [14]. Practically, the validated measurement instrument and capability diagnostic arising from this study are intended to give firm managers and Nigerian regulators an evidence-based tool for identifying where capability gaps between sensing and seizing, or between seizing and transforming, are constraining climate resilience in practice.

4. Limitations and Scope

As a research design and hypothesis-specification paper, this contribution does not yet report primary data; the survey instrument, sampling execution, and PLS-SEM results constitute the next phase of this research program. The cross-sectional design proposed here, common in dynamic-capabilities survey research, limits causal inference regarding the sequential logic of sensing, seizing, and transforming, a limitation partially addressed through the qualitative validation phase but not fully resolved absent longitudinal data [15]. Findings from the Nigerian energy and extractive sector should also be interpreted as context-specific in the first instance, given the sector's distinctive combination of ownership structures, regulatory volatility, and community accountability dynamics, pending subsequent comparative testing against other resource-dependent emerging economies.

CONCLUSION

This paper specifies an empirically testable dynamic-capabilities model of climate resilience for Nigeria's energy and extractive industries, extending the sensing-seizing-transforming triad established in the oil and gas, shipping, and coal literatures to a setting that combines acute climate exposure with a distinctive institutional and regulatory environment. Five hypotheses and a detailed mixed-methods research design are advanced, positioning the next phase of this research program to generate the first firm-level quantitative and qualitative evidence on how dynamic capabilities translate into climate-resilient performance among Nigerian energy and extractive firms, and offering both a theoretical extension relevant to Business Strategy and the Environment's readership and a practical diagnostic for firms and policymakers navigating the sector's climate transition.

Declarations

Author Contributions

Oludolapo Oriyomi Akinola is the sole author and is responsible for the conceptualization, theoretical development, research design, and writing of this manuscript.

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Data Availability Statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current, research-design stage of this study. The survey and interview data described in Section 3 will be made available from the corresponding author upon reasonable request following data collection, subject to participant confidentiality requirements.

Ethics Statement

The survey and interview protocols described in Section 3 will be submitted for

institutional or independent ethics review prior to data collection; no human-subjects data have been collected at the current stage of this study.

Author Biography

Oludolapo Oriyomi Akinola is Head of Operations at the Oladiran Olusegun Adebute Foundation, Lagos, Nigeria, where she leads a multidisciplinary team delivering community development, health, education, and rural sustainability programmes across multiple Nigerian communities. She holds an MBA in Sustainability (Distinction) from Nexford University and is a certified ISO 45001:2018 Lead Auditor, with internal auditor credentials across ISO 45001, ISO 14001, and ISO 9001 management systems. She is a Doctoral Research Fellow of the Chartered Institute of Public Administration and Governance and a member of the Sustainability Professionals Institute of Nigeria (MSPIN). Her research and practice interests span sustainable development, energy policy, climate governance, ESG strategy, and community resilience in emerging economies, and she is working toward a career as a practitioner-scholar contributing to sustainable development policy, energy governance, and applied research.

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