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Article

Assessing Environmental Resources and Sustainable Governance: Policy Interactions and Financial Innovations in Emerging Economies

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Abstract

Global trading systems become increasingly complex and ecological issues increase, ensuring equitable access to governance of natural resources becomes ever more challenging. Robust administration and efficient finance systems are crucial for the sustainable administration of natural resources. This research examines the influence of natural resources, financial variation, sustainable finance, and FinTech on ecological sustainability. It also discusses how efficient administration mitigates these consequences. The research utilizes imbalanced panel data from 18 economies spanning the period from 2012 to 2021, employing a FcQA and econometric approach that integrates comparative evaluation. The findings reveal that while green finance supports ecological assets, FinTech and digital engagement initially have negative effects. However, strong governance mitigates these impacts and improves outcomes. Effective administration interacts with financial and technological factors to enhance resource management, underscoring the need for policy reforms and offering practical guidance for sustainable governance. Moreover, the intensity and orientation of association impacts (e.g., $\text{FinTech} \times \text{GGOV}$, $\text{GFIN} \times \text{GGOV}$) remain stable throughout modeling modifications, underscoring that robust administration enhances the ecological advantages of economic and technical breakthroughs. These robustness tests indicate that our results are not merely a product of particular model selections, and offer compelling evidence that leadership quality is a significant mediator in the association between economic innovations and ecological resilience in developing nations.

Keywords: environmental resource management; sustainable governance; FinTech; sustainable finance; emerging economies

1. Introduction

Global ecological issues, such as animal extermination, climatic shift, ecological deterioration and resources depletion, have significant repercussions. The concepts of durability and resiliency have emerged to confront these pressing concerns and prepare us for the next. The success of these initiatives relies on the efficient management of environmental resource sectors, which are crucial for financial growth, ecological sustainability, and human well-being (Cheng et al., 2023). This study examines the intricate interplay among resilience, long-term viability, and economic considerations within environmental resource marketplaces. The objective is to comprehend how these mechanisms may influence restoration activities and foster a more resilient future (Liu et al., 2021). Given the acknowledged instability and danger of the situation, there is a heightened need to enhance durability and resiliency. The ability of systems to assimilate incidents, adjust to alterations, and recuperate rapidly has emerged as a crucial characteristic desired in response to major disruptions, including climate-related catastrophes and worldwide pandemics. Sustainability cultivates a culture that enables current and future populations to live together by fulfilling their physical and ecological needs without undermining political, ecological, or economic equity or progress. The World States'

Sustainability Developmental Objectives outline a conceptual framework that highlights the interdependence of these elements.

Achieving sustainability and resiliency necessitates a financially effective marketplace that maximizes the utilization of environmental assets. The optimal distribution of assets, reduction of waste, and introduction of innovative economic processes can substantially improve environments, economies, and societies (Lee et al., 2023). Efficient asset utilization fosters ecological long-term viability, mitigates overexploitation, and eliminates inefficiencies. Effective institutions bolster humanity's resilience and capacity to recover from disasters by promoting adaptive behavior in response to unforeseen circumstances. Improving productivity has substantial implications for both culture and the business. Effective resource markets can establish a favorable return cycle that fosters resiliency against difficulties by facilitating creativity, improving efficiency, and promoting socioeconomic growth (Desalegn & Tangl, 2022). The capacity to enhance resource use, encompassing both conventional river control methods and modern solar generation technologies, has enabled societies to adapt adeptly to evolving conditions, avert resource depletion, and thrive sustainably over time. The integration of efficient principles into resource sectors, as demonstrated by current projects such as emissions pricing structures, sustainability supplier chains, customs, and cyclical economic designs, shows its revolutionary power (Lin & Ma, 2022). Extracting elements, substances, and fossils from fossil fuels is a crucial component of modern manufacturing and innovation. Nonetheless, logging, river contamination, and greenhouse gas pollution represent but a fraction of the numerous grave ecological consequences of mining (Liu et al., 2023).

A meticulous assessment of the biological impact of mineral mining and the implementation of strategies to mitigate natural harm are essential for industrial advancement. The waters, jungles, nature, and fertile lands are vital environmental assets necessary for the sustenance of all species on the planet. The demands of a growing population are exerting heightened stress on habitats. A paradigm shift in resource management is essential for a more viable future, given the intricate interplay between environmental processes and human civilizations (Zakari & Khan, 2022). The research's findings encompass the following:

The contribution of this work offers a fresh addition by investigating the influence of GGOV on environmental assets. This area remains relatively unexplored in the current field of study. Although prior research has frequently emphasized financial and technical variables in resource leadership, the particular impact of governing institutions and procedures has garnered relatively little scrutiny (W. Wang et al., 2023). Secondly, the study enhances the research by examining the impacts of FinTech, DFIN, and GFIN on environmental resources. These economic breakthroughs are increasingly acknowledged for their capacity to revolutionize asset management methods and foster sustainable growth; yet, their specific effects on environmental assets have not been thoroughly examined (Zhao et al., 2024). Thirdly, the study examines the mitigating impact of GGOV on the connection among the studied factors, elucidating how governing integrity affects the efficacy of economic and organizational measures in capital control. This sophisticated knowledge of management processes enhances our understanding of the intricate relationships that affect resource management results. Ultimately, the work advances conceptual progress by utilizing organizational concepts to elucidate the proposed links among management, economic breakthroughs, and environmental assets. The work offers conceptual insights into the organizational processes that govern asset administration methods, anchoring the study in organizational viewpoints. The integration of mixed methodologies, including fsQCA, NCA, and economic designs, signifies an approach. Advancement, supplying a holistic framework for analyzing the factors influencing organic asset prosperity. This methodical variety strengthens the rigor and profundity of the evaluation, facilitating a more intricate examination of the complex interrelations among management, financial breakthroughs, and natural resources.

2. Literature Review

Following the COVID-19 pandemic, there has been a surge in research addressing the restoration of verdant regrowth. This research aims to ensure that financial restoration is aligned with ecological preservation. (Lin & Ma, 2022).have identified the need for a more egalitarian and resilient restoration approach that addresses both the financial repercussions of the pandemic and urgent ecological concerns. This work highlights the need to transition to renewable and sustainable energy sources to mitigate global gas production. The work by (Liu et al., 2023). underscores the effectiveness of ecological stimulation programs that prioritize expenditures in renewable power and nature-based alternatives to create job prospects and enhance stability over time. Furthermore, the study highlights the need to integrate sustainable restoration approaches into macroeconomic policy and expenditures. The post-COVID-19 age has sparked a robust discussion on the resurgence of sustainable growth, emphasizing the need to rebuild in a way that is more environmentally sound and flexible, thereby fostering a more sustainable and lasting civilization.

Manufacturers are essential for sustaining a vigorous society. Nonetheless, they exert a considerable influence on the ecosystem. Commercial greenhouse gas pollutants adversely affect public life (Akomea-Frimpong et al., 2021). Commercial power consumption significantly contributes to greenhouse gas emissions, a key factor in global warming. Commercial greenhouse gas pollution may have contributed to the emergence of various new diseases in recent years. The financial advantages have not aligned with the escalating costs. The research examines the effects of urbanization and industrialization on GDP, fuel intake, and environmental gas pollutants, as investigated by (W. Wang et al., 2023).The general populace is currently facing the consequences of pollutants and environmental changes. The widespread use of modern commercial equipment significantly contributes to the production of greenhouse gases in the atmosphere. Studies demonstrate that sustaining consistent levels of globalization, urbanization, business, and tourism mitigate climate gas production. The production procedure of the device employs renewable materials.

As a result, greenhouse gases are emitted. The commercial production of carbon chemicals exacerbates global warming and its associated meteorological disturbances. The incidence of hot storms is rising as a consequence of the climate becoming warmer, posing a threat to certain products (Zhao et al., 2024).Highlight the significance of industrialization and urbanization, praising their contributions to reducing carbon gas emissions. Industrialization frequently intensifies farming difficulties. This commercial procedure generates considerable waste and produces environmental emissions. Industrialization hurts the ecosystem and diminishes the competitiveness of local firms. An augmentation in customer expenditure is highly advantageous for the business and multiple sectors. The increasing demand for fuel and the rising population is predicted to lead to disaster. These works examine many issues related to population, including the moral ramifications of population growth, the political aspects of global warming, and the adverse ecological consequences. Increasing populations and fuel use lead to heightened carbon dioxide production. As a town's population expands, there is often an increased demand for additional buildings to support the growing population. (Xiaoman et al., 2021) analyze the interrelations of carbon dioxide emissions, demographic expansion, industrial development, and heightened fuel use. The burning of fossil fuels and other environmental assets for power generation exacerbates climate change by increasing atmospheric greenhouse gas concentrations. The increase in demand for products and activities resulting from human expansion significantly affects greenhouse gas production. The rapid growth in the population has exerted the most profound adverse effect on the physical economy. A variety of chemicals are released, some of which pose hazards to human life and the ecosystem. As a result, weather changes are becoming more frequent. Due to climatic shift, numerous companies and people may incur economic losses.

Furthermore, sustainable banking could serve as a crucial instrument in this context by enhancing the effectiveness of loan risk management via improved company funding. The research study must extensively investigate the correlation between economic inclusiveness and sustainable finance. Nevertheless, our research contributes to the limited body of existing works in this domain.

The final significant link between renewable energy, economic availability, and responsible financing is the impact of renewable energy on the people's assets. By improving living standards, increasing access to superior energy supplies, and ensuring equitable rights to cleaner electricity for all, electricity can positively influence development. Financial inclusiveness serves as a vital mechanism for the sector's advancement in the digital age, converting information into tangible production. Research demonstrates that the cost of producing new products is closely correlated with the number of innovative minds involved, highlighting the critical role of businesses in promoting financial inclusion. Conversely, green finance enhances the appeal of both domestic and foreign capital, hence increasing overall component efficiency. In the context of mitigating environmental shift, renewable power supplies present greater potential than alternative methods. Benefits of RE include extended lifespans, reduced carbon dioxide emissions, and lower costs. It is asserted that the utilization of cleaner energies and indigenous power supplies can enhance the Human Development Index (HDI) in rural areas. This is the inaugural study examining how renewable energy could enhance individual happiness and reduce pollutants. Accessibility to fuel consequently becomes a vital determinant of happiness. RE has numerous benefits, such as enhanced access to nutrient-rich meals, job creation, and a reduction in healthcare complications. Green finance (GF) has the potential to enhance the economic viability of the utility sector, leading to increased profits and a greater emphasis on research and development as a vital component of production.

Within the resource-efficient (RE) structure, the sectors of banking, commerce, industry, and innovation facilitate sustainable funding. We should examine four primary assumptions to analyze the correlation between industrial development and fuel use. The notion posits that the pace of industrial growth is contingent upon the quantity of power utilized. Nonetheless, prior studies have primarily focused on determining the causal link between ecologically aware finance (GF) and financial inclusion (FI), with insufficient attention to the possible impacts of GF and FI on renewable energy (RE). This hypothesis posits a unidirectional relationship between income and resource use, suggesting that energy conservation impedes industrial progress. The environmental protection Theory, conversely, posits a unidirectional relationship between economic control and fuel consumption. It was once considered that a decrease in production had a substantial negative impact on financial progress. This input Theory posits that the economy negatively impacts industrial development and fuel intake, suggesting a detrimental loop between corporate development and responsible finance. The loop Theory posits a bidirectional causative connection between increased output and elevated energy usage. Furthermore, the concept of equal treatment must elucidate a direct connection between macroeconomic growth and the utilization of environmental finance.

3. Data and Methodology

3.1. Data and Variables

This research utilizes statistical information obtained from 24 nations, initially sourced from the International Economic Developmental Dataset and the International Economic Index. Still, owing to limitations in information accessibility, we restricted our research to 18 nations. We developed a comprehensive panel database covering the years 2013–2019, which includes data from 18 countries. The selection of 18 nations for the panel sample was based on their varied administrative excellence, financial technology uptake, and resource dependence, thereby ensuring generalizability and applicability across various situations. This database underpins our study, enabling us to investigate the complex interactions among multiple variables and their impacts on environmental supplies over time (refer to Table 1). Nonetheless, the quantity of data presented several constraints, especially in attaining complete homogeneity among all factors. The efficiency of administration and additional factors, including electronic financial inclusion, were operationalized through a recognized index The Global Administration Index of the WB, assuring dependability.

Table 1. Explanation of Variables, Indicators, and Information Streams.

Code	Concept	Indicator	Data Source
NRES	Natural		
	Resource	Share of natural resources in GDP (%)	WDI
	Wealth		
FinTech	FinTech		
	Credit Activity	Credit provided by FinTech/BigTech as % of GDP	GFDD
DFIN	Digital Financial	Index combining ATMs, bank branches	GFDD
	Access	(per 200k adults), and deposits (% of GDP)	
GFIN	Green Financial	Green finance development score	WDI
GGOV	Governance		
	Quality	Effectiveness ranking of national governance	WDI

The end factor in this study, NRES, refers to the availability of environmental assets, expressed as a proportion of a nation's Real National Product. Environmental materials encompass a variety of resources, including elements, forests, fluids, and soil, which are vital for socioeconomic activities such as farming, extraction, and power production (Xiaoman et al., 2021).The assessment of NRES as a proportion of GDP offers information on the importance of environmental assets in influencing a nation's economic output. This parameter is derived from the WDI.

Technologies in the Economic Sector, the primary random factor examined, refers to the delivery of banking products through new methods, particularly in loan operations. This indicator measures the proportion of loan inflows facilitated by Finance and significant technology firms as a percentage of GDP. Financial loan statistics are obtained from the GFDD. This study aims to clarify the effect of financial technology companies on the availability of environmental assets, this study examines the impact of monetary technological improvements on economic and social activity dependent on ecological resources, as emphasized by current studies. A primary dependent factor is digital economic diversity, indicating the degree to which people and groups can acquire and use digital economic products. This notion is measured using a detailed index that incorporates variables such as the quantity of automatic teller machines and financial operations per 100,000 individuals, as well as the percentage of active present accounts in industrial banks to the gross regional product. The information about digital economic inclusiveness is sourced from the World Economic Growth Index. This study examines the correlation between digital monetary inclusiveness and the accessibility of ecological elements to evaluate how enhanced accessibility to electronic financial instruments influences the administration and use of environmental assets for societal advancement.

The third crucial component relates to green finance, encompassing economic goods and solutions designed to foster ecologically responsible projects and transactions. This dimension is evaluated using the Green Economic Achievement Index, which measures a nation's advancement and commitment to promoting responsible economic policies. The index assesses the degree of assistance and advancement in financing environmentally sustainable company initiatives. Sustainable financing information is sourced from the International Organization for Economic Co-operation and Development. This study examines the relationship between environmental financing and access to ecological resources, aiming to understand how financial systems designed to promote sustainability impact economic activities that rely on natural assets.

The mediation factor in this study signifies administration excellence, which denotes the efficacy and purity of a nation's administration structures. Governing effectiveness is assessed via a rank-

based scale that examines factors including openness, responsibility, regulation excellence, and anti-corruption initiatives. The pertinent data is derived from the Global Economic Index. Government serves as a conduit that affects the interaction between enabling factors—specifically financial technology, global economic diversity, and sustainable finance—and the result varies, which is the accessibility of environmental assets. Administration frameworks can either augment or restrict the efficacy of commercial technology and ecologically oriented finance efforts by influencing the organizational context in which these mechanisms function.

This research employs a thorough approach to examine the determinants of ecological resource abundance. By combining objective methodologies, such as fsQCA and NCA, with various financial frameworks, like sharing OLS and two-step we seek to get a thorough comprehension of the intricate interconnections entailed. fsQCA and NCA yield significant insights into subjective discoveries by examining intricate causal linkages and identifying essential circumstances. These methodologies, as explained by (Ha et al., 2023).Enable us to explore the complicated relationships among elements. This research employs a thorough approach to examine the determinants of ecological resource abundance. By combining objective methodologies, such as fsQCA and NCA, with various financial frameworks, like sharing OLS and, we seek to get a thorough comprehension of the intricate interconnections entailed. is particularly adept at identifying configurational paths that integrate political and financial advances to achieve sustainable asset results, providing insight into the interactions among various elements. Enhances this by delineating the essential conditions for optimal resource leadership, ensuring that critical elements, such as government efficacy, are acknowledged as necessities. Economic modelling introduces a rigorous quantitative aspect, enabling us to measure the extent and intensity of linkages and evaluate the mitigating impacts of management.

In addition to these subjective techniques, economic modelling offers a robust quantitative basis for measuring the effects of numerous variables on environmental availability. Utilizing econometric research, we can measure the impact of FinTech, DFIN, GFIN, and GGOV, providing quantitative information on their impacts. Utilizing a variety of economic methods, we guarantee the resilience and dependability of our statistical analysis, accurately reflecting the intricacies of real-world occurrences.

3.1.1. fsQCA and NCA

fsQCA is a scientific framework designed to elucidate intricate causal linkages between factors by identifying the necessary and sufficient conditions for a specific outcome (Ragin, 2014). In contrast to conventional macroeconomic methods that rely on directional correlations and presume factor autonomy, accommodates irregular and interactive impacts, making it suitable for analyzing systems where factors combine in non-additive ways (Heshmati et al., 2022).In contrast to "Multiple Regression Analysis (MRA)," fsQCA does not concentrate exclusively on calculating the average influence of separate factors; instead, it examines how mixtures of circumstances together result in an outcome (Tkalec et al., 2024). This facilitates the recognition of several routes leading to the same outcome, making more resilient than MRA, especially in scenarios where causal links depend on unusual configurations of conditions rather than straightforward linear correlations (Ozgur et al., 2022). Moreover, proficiently addresses equifinality scenarios, wherein diverse permutations of circumstances may yield identical outcomes, thereby providing a sophisticated understanding of causative processes within complex systems (Nguyen et al., 2024). This characteristic enriches analysis by facilitating the examination of various causation routes that result in the same conclusion, thereby reflecting the complexity inherent in practical events (Wątróbski et al., 2022).

The use of fsQCA involves three fundamental processes, as delineated by (Zhu et al., 2022).Initially, information calibration commences by designating values that signify "greatest (fully in), mean (crossover point), and lowest (fully out)," thereby converting basic information into more nuanced groups (H. Wang et al., 2024). Secondly, the examination of requisite circumstances deviates from the conventional "Essential Situation Evaluation (NCA)," as delineated by (Gulzar et al., 2024),

wherein a condition is deemed necessary if its uniformity exceeds 0.90, indicating its critical influence on the results (Sharmin et al., 2023). Thirdly, a comprehensive design assessment is conducted using truth tables, which enables the discovery of circumstance pairings that together result in the desired outcomes, specifically environmental assets. These stages, combined, provide a thorough analysis of the intricate causal links within the information.

In this research, (1) and (2) are employed to denote great and lower quantities of environmental assets, respectively. This method facilitates a precise examination of the influence of several factors and their arrangements on the desired output.

$$\text{NRES} = f(\text{GFIN}, \text{FinTech}, \text{DFIN}, \text{GGOV}) \tag{1}$$

$$\sim \text{NRES} = f(\text{GFIN}, \text{FinTech}, \text{DFIN}, \text{GGOV}) \tag{2}$$

Note: ~ signifies the absence or a diminished degree of a characteristic.

We employ NCA as an alternative to fsQCA. NCA is essential in study procedures, providing significant findings when utilized alone or alongside other methods, including logistic studies or configurational ways like fsQCA (wang et al., 2024). when combined with analysis-based techniques such as numerous analyses or structure equations simulation, amplifies descriptive value by pinpointing essential circumstances that substantially affect the result of fascination, hence offering a more profound comprehension of fundamental processes (Dai et al., 2023).Likewise, when incorporated into configurational studies such as fsQCA, NCA enhances accuracy by identifying essential variables with greater specificity.

NCA is distinguished by its capacity to uncover a broader array of requisite circumstances than fsQCA, hence providing a more sophisticated comprehension of causative links (Zhao et al., 2024).Suppose NCA concludes that attaining a specific result necessitates a minimal limit of a particular state due to an unfilled area above the roof range. In that case, fsQCA may disregard this requirement if the coherence degree is below a predetermined limit. Thus, NCA enhances configurational studies by offering specific views into the requirements of each circumstance, thereby strengthening the analysis approach and fostering a more thorough knowledge of causative connections.

3.1.2. Econometric Model

This paper formulates the subsequent formulas to evaluate the influence of financial technology, DFIN, GFIN, and GGOV on environmental assets.

$$\text{NRES}_{it} = \beta_0 + \beta_1 \text{GFIN}_{it} + \beta_2 \text{FinTech}_{it} + \beta_3 \text{DFIN}_{it} + \beta_4 \text{GGOV}_{it} + \varepsilon \tag{3}$$

Comparison Research is a scientific approach designed to investigate intricate causal links by establishing the required and adequate factors that result in a specific result. This method diverges from conventional socioeconomic techniques that focus on normal relationships and presume factor isolation; it incorporates unpredictable and interaction impacts, rendering it ideal for analyzing situations where factors combine in non-linear and combinatory manners. In contrast to multivariate logistic evaluation, which essentially estimates the mean effect of single factors, this method highlights how specific pairings of circumstances collectively provide a result. This facilitates the recognition of several pathways resulting in the same outcome, providing enhanced adaptability and robustness when distinct topologies rather than straightforward trends influence causal links. Moreover, it adeptly encapsulates the principle of equality, wherein diverse permutations of circumstances can yield similar results. This enriches conceptual breadth by facilitating a more detailed examination of several causation paths, thus reflecting the diversity of practical occurrences.

$$\text{NRES}_{it} = \beta_0 + \beta_1 \text{GFIN}_{it} + \beta_2 \text{FinTech}_{it} + \beta_3 \text{DFIN}_{it} + \beta_4 \text{GGOV}_{it} + \beta_5 \text{GFIN}_{it} \times \text{GGOV}_{it} + \varepsilon \tag{4}$$

$$\text{NRES}_{it} = \beta_0 + \beta_1 \text{GFIN}_{it} + \beta_2 \text{FinTech}_{it} + \beta_3 \text{DFIN}_{it} + \beta_4 \text{GGOV}_{it} + \beta_5 \text{FinTech}_{it} \times \text{GGOV}_{it} + \varepsilon \tag{5}$$

$$NRES_{it} = \beta_0 + \beta_1 GFIN_{it} + \beta_2 FinTech_{it} + \beta_3 DFIN_{it} + \beta_4 GGOV_{it} + \beta_5 DFIN \times GGOV_{it} + \varepsilon$$

(6)

Where β represents the correlation numbers, with i and t indicating the nation and decade, etc., ε is the erroneous component that encompasses unseen influences affecting environmental assets, which are not expressly included in the equation.

4. Result and Discussion

4.1. Descriptive Analysis and Association Network

The normal differences show how different the values are from one country to the next. The norm numbers show the typical amount or share of each element. The average value for environmental assets is positive, but there is a lot of difference. The average value for FinTech and digital financial inclusion is either favorable or unfavorable, which shows that they have different effects on GDP. The average values for ecological financing and fair governing are mostly favorable, which suggests that they make the economy and government work better generally.

Table 2. Descriptive data and connections of the examined factors.

Variables	Mean	Std. Dev.	Min	Max	(1)	(2)	(3)	(4)	(5)
(1) <i>NRES</i>	0.287	0.908	−2.745	2.368	2.000				
(2) <i>FinTech</i>	−2.849	2.422	−5.984	0.753	−0.376	2.000			
(3) <i>DFIN</i>	0.278	2.650	−2.628	4.606	−0.788	0.062	2.000		
(4) <i>GFIN</i>	2.792	0.533	2.022	3.393	−0.802	0.333	0.968	2.000	
(5) <i>GGOV</i>	2.796	0.355	0.888	2.896	−0.848	0.326	0.838	0.882	2.000

Table 2 displays the relationships between the examined factors. The association coefficients among the factors are all under 0.90, indicating a lack of plurality, which is crucial for the validity of the regression model (Siddiqi et al., 2024). Furthermore, to evaluate plurality, we employ the "variance inflation factor (VIF)," where values below 3.3 signify the absence of convergence difficulties (Lei et al., 2023). Table 2 displays the relationships between the examined factors. The association coefficients among the factors are all under 0.90, indicating a lack of plurality, which is crucial for the validity of the regression model (Saberikamarposhti et al., 2024). Furthermore, to evaluate plurality, we employ the "variance inflation factor (VIF)," where values below 3.3 signify the absence of convergence difficulties (Zachariadis et al., 2023).

4.2. Results of fsQCA and NCA

During the preliminary stage of fsQCA, input calibrating converts raw data into designating levels of participation or not being a member according to the highest, typical, and lowest numbers (Saberikamarposhti et al., 2024). After testing, NCA assesses the necessity of individual variables for forecasting the outcomes. The fundamental causative processes by pinpointing essential components. Afterwards, fact tables reduction examines many combinations of circumstances to identify those adequate for forecasting the result (Sharma et al., 2025). This technique reveals various paths to the result, offering a thorough grasp of causality connections. Collectively, these procedures provide a methodical examination of intricate causative processes within the information set, providing

significant implications for choices and government development (Lei et al., 2023) .Initially, we commence by normalizing the normal logarithmic values into hazy subsets. This technique is essential for illustrating the differing levels of participation or non-participation of each data item concerning the result of concern. Accreditation involves assigning values according to a defined technique: the most outstanding value indicates complete registration, the mean number represents the crossing particular, and the lowest number denotes complete absence (Zachariadis et al., 2023).This method guarantees that each data point is accurately classified, reflecting its importance concerning the result variable. Table A2 presents the specifics of the corrected information.

Secondly, we analyze the requisite circumstances utilizing fsQCA. According to the standards set forth by (Siddiqi et al., 2024).a precondition is considered necessary if its consistency score surpasses 0.90. Our results, illustrated in Table 3, demonstrate the outcomes of this requisite condition analysis. Notably, none of the specific conditions—namely, GGOV, FinTech, DFIN, and GFIN—satisfy the criteria required for forecasting environmental supplies. This indicates that no individual circumstance alone is adequate to predict the result precisely. Our findings suggest the need to investigate mixtures or configurations of factors to enhance comprehension of their combined influence on the end factor.

Table 3. Essential prerequisites for elevated (diminished) levels of natural resources (NRES).

Conditions	NRES (High level)		~NRES (Low level)	
	<i>Consistency</i>	<i>Coverage</i>	<i>Consistency</i>	<i>Coverage</i>
<i>GGOV</i>	0.702	0.685	0.900	0.789
<i>~ GGOV</i>	0.785	0.888	0.540	0.549
<i>DFIN</i>	0.466	0.627	0.888	0.926
<i>~ DFIN</i>	0.984	0.955	0.648	0.487
<i>GFIN</i>	0.589	0.653	0.950	0.843
<i>~ GFIN</i>	0.875	0.808	0.552	0.488
<i>FinTech</i>	0.708	0.778	0.908	0.749
<i>~ FinTech</i>	0.780	0.939	0.688	0.628

Table 4 illustrates the proper configurational linkages that result in elevated levels of managing natural resources. In Model A, designed to forecast elevated amounts of environmental resources, we discovered three configurable solutions:

Table 4. Adequate arrangements that result in elevated amounts of natural supplies.

<i>Conditions</i>	<i>Model A (High level): NRES</i>		
	<i>= f (GGOV, GFIN, FinTech, DFIN)</i>		
<i>Configurations</i>	<i>Solution S1a: [f = (GGOV * ~ GFIN * FinTech)</i>	<i>Solution S2a: [f = (GGOV * GFIN * DFIN)</i>	<i>Solution S3a: [f = (GGOV * ~ FinTech * ~ DFIN)</i>
<i>GGOV</i>	✓	✓	✓

Conditions Configurations	Model A (High level): NRES = f (GGOV, GFIN, FinTech, DFIN)		
	Solution S1a: [f = (GGOV * ~ GFIN * FinTech)	Solution S2a: [f = (GGOV * GFIN * DFIN)	Solution S3a: [f = (GGOV * ~ FinTech * ~ DFIN)
GFIN	✓	✓	✓
FinTech	✓	✓	✓
DFIN	✓	✓	✓
RC	0.868	0.609	0.685
UC	0.276	0.046	0.023
Consistency	0.828	0.987	0.825
SC	0.992		
SCN	0.828		

Solution S1a posits that a mixture of elevated GGOV, diminished GFIN, and heightened financial technology is adequate to forecast substantial physical from nature. Elevated administration rates create the organizational structure and regulations necessary for ecological asset leadership, while diminished greener financing levels may enhance efficiency and encourage corporate sector involvement. Increased FinTech levels boost digital financial inclusion, enable innovative financial processes, and improve resource allocation, therefore fostering the sustainable use of environmental assets. This suggests that efficient administration, together with progress in banking technologies and less focus on sustainable money projects, enhances the availability of ecological assets. Solution S2a demonstrates that elevated quantities of GGOV, GFIN, and DFIN collectively result in increased amounts of environmental assets. It posited that elevated administration standards establish strong organizational structures and regulations, while significant green finance (GFIN) provides the necessary capital for sustainable initiatives. Elevated levels of digital financial inclusion (DFIN) augment these programs by enhancing access to economic resources, promoting fair involvement, and facilitating technologically driven solutions, thus creating a combinatorial impact that strengthens the environmental asset of natural resources. This indicates that strong governance, along with advances in green finance and broad accessibility to electronic banking offerings, promotes the sustainability of administration and use of environmental assets.

Ultimately, answer S3a indicates that elevated GGOV, diminished FinTech, and reduced DFIN can forecast substantial resource depletion. It asserts that strong administration can autonomously promote sustainability in environmental asset management through the efficient implementation of policies and effective administrative structures, regardless of advanced technology or significant electronic economic activity in digital form. This indicates that robust governing frameworks can alleviate technical and financial limitations by effectively addressing resource control challenges and fostering green behaviors.

Additionally, Table 5 displays the findings from the examination of adequate designs that resulted in lower national energy rates utilizing Model B, whereby the end factor is the lack of elevated native energy rates.

Table 5. Adequate arrangements resulting with reduced natural resources levels.

Conditions /Configurations	Model B (Low level): ~ NRES = f (GGOV, GFIN, FinTech, DFIN)		
	Solution S1b: [f = (GFIN*~GGOV*~FinTech)	Solution S2b: [f = (GFIN*DFIN*~GGOV)	Solution S3b: [f = (~GGOV*~GFIN)
GGOV	Absent (✗)	Absent (✗)	Absent (✗)
GFIN	Present (✓)	Present (✓)	Absent (✗)
FinTech	Absent (✗)	Ambiguous (Δ)	Ambiguous (Δ)
DFIN	Ambiguous (Δ)	Present (✓)	Ambiguous (Δ)
RC	0.623	0.000	0.873
UC	0.877	0.000	0.928
Consistency	0.984	0.085	0.899
SC	0.985		
SCN	0.858		

Solution S1b demonstrates that elevated GFIN stages, along with the lack of GGOV and financial Technology, result in decreased environmental quantities. It asserts that increased environmental finance (GFIN) without governing may result in inefficiency or negligence, as the absence of control frameworks can lead to insufficient responsibility and oversight. The lack of Technology significantly constrains innovative financial solutions and effective resource allocation, ultimately resulting in the depletion or unsustainable use of natural resources. Solution S2b posits that a conjunction of elevated and the lack of results in diminished environmental assets. This arrangement suggests that, with advances in ecological banking and global economic diversity, ineffective governing procedures may impede the responsible handling of resources from nature, leading to diminished management efficacy.

Ultimately, option S3b emphasizes that the lack of GGOV and GFIN collectively results in diminished amounts of environmental assets. The lack of administration (GGOV) and environmental finance (GFIN) leads to an insufficiency of organizational frameworks, regulations, and monetary means necessary for sustainable asset management. Without administration to implement laws and funds to promote preservation initiatives, environmental assets are susceptible to misuse or negligence, resulting in their decline. The research commences the Needed Conditions Assessment by defining a roof range, as depicted in Figure A1 of the supplemental resources. These XY scattering graphs illustrate the connection between leadership quality, represented as the uncontrolled factor on the X-axis, and the result factor on the Y-axis. The graphical analysis of these graphs allows scientists to discern likely requisite circumstances. Special emphasis is placed on the vacant areas in the upper-left corner of the graphs, which denote pairings where the result is nonexistent notwithstanding fluctuations in the dependent variables. This perceptual disparity may suggest that certain minimal thresholds of the independent variables are requisite for the manifestation of the consequence. These results indicate the existence of essential thresholds, providing significant insights into the fundamental causal frameworks inside the system.

After assessing the required situation evaluation top range, the investigation continues to examine consequence dimensions, as stated in Table 6. These were determined via the d-statistic, adhering to the look at stated by Lei et al. (2023), to determine the power of connection among each needed scenario and the dependent variable—environmental variables. The consequence dimensions

are classified as follows: small ($0 < d < 0.1$), moderate ($0.1 \leq d \leq 0.3$), large ($0.3 \leq d < 0.5$), and huge ($d \geq 0.5$). By examining these scales, investigators can determine the comparative impact of each scenario on the outcome, thereby gaining a deeper understanding of the variables influencing current property accessibility. Based on Table 6, electronic money diversity and investing developments demonstrate comparatively minor implications, as shown by their smaller d-statistics. Greene financing exemplifies a powerful force, while management excellence signifies the most significant operation, leading to substantial consequences. These consequence size projections supply essential knowledge into the comparative importance of each aspect in forming sustainable resource results.

Table 6. NCA effect sizes.

Conditions	Effect Sizes (d)		Remarks
	CE – FDH	CR – FDH	
<i>DFIN</i>	0.330***	0.250***	<i>Medium effect</i>
<i>FinTech</i>	0.352***	0.286***	<i>Medium effect</i>
<i>GFIN</i>	0.443***	0.386***	<i>Large effect</i>
<i>GGOV</i>	0.733***	0.594***	<i>Very large effect</i>

Table 7 presents a bottleneck surface, providing a graphical depiction of the roof bars of one or more requisite circumstances in NCA. This list delineates the requisite amounts of different circumstances for a specified degree of the result, which, in this instance, pertains to environmental assets. The precondition and the result are articulated as proportions of the recorded spectrum, where 0 denotes the smallest recorded price, 100 signifies the most excellent recorded price, and 50 represents the midpoint. Utilizing the roadblock tables enables scientists to acquire critical ideas into the necessary circumstances that affect the result factor, hence enhancing comprehension of the fundamental causative processes governing the abundance of environmental assets.

Table 7. The bottleneck table (percentage).

<i>Y = NRES</i>	<i>X1 = DFIN</i>	<i>X2 = FinTech</i>	<i>X3 = GFIN</i>	<i>X4 = GGOV</i>
0 %	<i>NN</i>	<i>NN</i>	<i>NN</i>	<i>NN</i>
10 %	<i>NN</i>	<i>NN</i>	<i>NN</i>	<i>NN</i>
20 %	<i>NN</i>	0.885	<i>NN</i>	<i>NN</i>
30 %	<i>NN</i>	3.492	<i>NN</i>	<i>NN</i>
40 %	<i>NN</i>	23.789	<i>NN</i>	<i>NN</i>
50 %	0.885	23.789	<i>NN</i>	3.492
60 %	2.698	23.789	2.698	5.873
70 %	4.286	40.268	22.806	6.667
80 %	36.488	40.863	39.682	6.667
90 %	36.488	40.863	39.682	6.667

$Y = NRES$	$X1 = DFIN$	$X2 = FinTech$	$X3 = GFIN$	$X4 = GGOV$
100 %	36.488	45.238	38.476	8.254

Table 7 delineates a barrier assessment that identifies the requisite minimal degrees of key supporting factors—digital economic inclusivity (DFIN), financing, green finance (GFIN), and excellent administration (GGOV)—necessary to attain escalating levels of environmental resources excess. The findings indicate that FinTech borrowing becomes a crucial element starting at the 20% NRES level and progressively gains importance, underscoring its essential function in resource mobilization and financial accessibility. As the objectives for environmental resource availability exceed 50%, DFIN, GFIN, and GGOV become increasingly vital, suggesting the need for a unified strategy. This indicates that initial investments in FinTech can yield measurable benefits in resource efficiency; however, sustainable resource need requires rebuttal infrastructure, efficient financial flows, and sound an effective long-term management The results recommend that authorities priorities the development of the FinTech ecosystems while progressively incorporating initiatives for digital inclusion, rewards for green financing, and administrative changes to optimize the value of environmental resources. From an academic standpoint, the table indicates that elevated NRES levels need multi-faceted governmental involvement, with all four components becoming essential at 80% and above. Therefore, a cohesive economic and political structure is necessary for effectively realizing the full worth of a nation's natural asset endowment.

4.3. Econometrics Analysis

The paper employs an economic framework to analyze the effects of DFIN, GGOV, financial technology, and the moderate influence on environmental assets. Table 8 presents the economic results. The paper employs an economic model to analyze the effects of GFIN, GGOV, financial technology, and the moderate influence on environmental assets. Table 8 presents the economic findings derived from the pooling of OLS estimates. Table 8 shows outcomes derived from Methods 1, 2, 3, and 4.

Table 8. Effect on ecological supplies (Pooled OLS estimate).

<i>Variables</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
<i>Constant</i>	3.887*** [0.649]	4.467*** [0.970]	7.234*** [0.755]	6.075*** [2.450]
<i>FinTech</i>	−0.095** [0.049]	0.385* [0.443]	0.032* [0.046]	0.003 * [0.047]
<i>DFIN</i>	−0.255** [0.072]	0.254** [0.072]	3.746*** [0.499]	0.025* [0.068]
<i>GFIN</i>	0.278* [0.358]	0.098* [0.069]	0.498* [0.322]	7.298*** [2.049]
<i>GGOV</i>	2.57*** [0.426]	2.895*** [0.665]	3.802*** [0.442]	4.507*** [0.935]

<i>Variables</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
<i>FinTech</i> × <i>GGOV</i>		0.333* [0.285]		
<i>DFIN</i> × <i>GGOV</i>			2.577*** [0.304]	
<i>GFIN</i> × <i>GGOV</i>				4.852*** [0.688]

Model 1 indicates that negatively affect environmental assets, whereas GFIN and GGOV positively affect environmental asset richness. The low relationship linked to Finance indicates that greater usage of finance technologies correlates with reduced environmental asset availability. In a similar vein, elevated degrees of electronic economic participation correlate with diminished environmental asset quantities. In contrast, the positive correlations for GFIN and GGOV suggest that activities fostering ecologically sound finance processes and robust administration frameworks correlate with elevated amounts of ecological assets. These results emphasize the complex interplay of financial developments, political structures, and environmental results, underscoring the necessity of reconciling commercial growth with ecological asset control.

Model 2 incorporates the association variable financial technology × GGOV, enabling an examination of how strong management moderates the connection between financial technology and environmental assets. Notably, after accounting for this moderating operation, the indices for financial technology, DFIN, GFIN, and GGOV exhibit favorable impacts on ecological assets.

This suggests that the correlation between financial technology and environmental assets becomes favorable when influenced by effective management. The favorable correlations for DFIN, GFIN, and GGOV indicate that their effects on ecological assets are enhanced through interaction with effective governance. The results suggest that sound management systems amplify the beneficial impacts of financial technology, DFIN, and GFIN on the availability of environmental resources. This highlights the significance of a governing framework in utilizing economic advances for sustainability, resource management, and environmental protection.

In Model 3, the inclusion of the interaction term DFIN × GGOV facilitates an analysis of how effective governance reduces the relationship between DFIN and ecological values. Taking into account the moderating power, the indices for banking technology, GFIN, and GGOV all exhibit positive impacts on ecological assets. This suggests that the relationship between DFIN and ecological resources improves under the impact of competent management. The positive evaluations of FinTech, GFIN, and GGOV indicate that their effect on environmental resources is amplified by effective administration. These results indicate that robust regulatory systems amplify the beneficial impacts of electronic economic diversity, the internet, and sustainable financing on the availability of environmental resources. This highlights the essential function of governing frameworks in utilizing economic innovation for responsible resource management and ecological preservation.

Model 4 integrates the interactions term GFIN × GGOV, allowing for an examination of how excellent administration moderates the link between GFIN and ecological assets. Considering this moderating operation, the indices for GFIN, financial technology, DFIN, and GGOV all exhibit favorable impacts on environmental assets. This suggests that the correlation between GFIN and environmental assets becomes increasingly favorable when influenced by effective governance. The favorable correlations for financial technology, DFIN, and GGOV indicate that their effects on ecological assets are amplified when combined with excellent management. The results suggest that robust management systems enhance the beneficial impacts of sustainable financing, economic

growth, and global economic participation on the wealth of environmental resources. Consequently, the findings emphasize the pivotal importance of systems of governance in utilizing economic advances to enhance responsible resource management and ecological preservation.

Table A4 (refer to Appendix) displays the sensitivity check of the economic ensemble of OLS models employing the "2-step Generic Technique of Minutes. The selection of 2-step GMM for resilience testing is warranted since it effectively mitigates potential variance and measurement error, prevalent obstacles in economic research.

4.4. Sensitivity Analysis

To enhance the accuracy and relevance of our experimental results, we conduct a robustness study by modifying key model variables and using different estimating methods. By previous research methodologies (e.g., Liu et al., 2023a; Wang et al., 2023c), we assess the robustness of our findings by adjusting the empirical Theory framework and varying the temporal fluctuations within the panel configurations. Initially, we re-evaluate our results by employing alternative lag architectures and interaction variables to determine if the principal findings are affected by varying modeling parameters. We assess the effects of different combinations of money technology (FinTech), digital financial inclusion (DFIN), green finance (GFIN), and governance quality (GGOV) on ecological asset abundance by incorporating diverse moderation regards and systematically omitting particular factors. These predictions uphold the integrity of the fundamental linkages identified in the basic designs, indicating that the reported favorable or unfavorable impacts are not contingent upon any specific model configuration. Secondly, to ensure that our results remain unaffected by variability or measurement error, we employ a two-step Generalized Method of Moments (GMM) estimation as a robustness verification. The GMM findings presented in Table 4 of the Appendix confirm the orientation and importance of our principal variables obtained from the Pooled OLS regressions. The consistent statistical relevance and steady values of FinTech, GFIN, and GGOV across several estimation methods validate the fundamental integrity of our conceptual framework.

The sensitivity test utilizing 2-step GMM, which yielded results consistent with the pooling OLS model, substantiates the dependability and durability of the conclusions. The uniformity of findings among several estimating methods bolsters the legitimacy of the findings derived from the investigation.

4.5. Discussion

The results from fsQCA provide significant information on the complex interrelations of economic variables, administration, and environmental asset availability. The selected combinations elucidate the various mechanisms by which these factors combine to affect the result. The arrangement characterized by elevated GGOV, diminished GFIN, and increased FinTech serves as a suitable prerequisite for forecasting substantial environmental assets. This indicates that strong management methods, together with developments in banking technologies and diminished focus on sustainable financing activities, substantially enhance the availability of ecological assets (Zachariadis et al., 2023). This design highlights the significance of governing frameworks in utilizing monetary technologies for responsible asset administration, while also indicating that excessively stringent environmental financing rules may impede the availability of environmental resources.

Secondly, the arrangement characterized by elevated levels of GGOV, GFIN, and DFIN presents an alternative route to substantial environmental asset quantities. This arrangement indicates that effective administration, along with advances in ecological financing and broad access to electronic banking offerings, promotes responsible administration and exploitation of environmental assets. The existence of robust management frameworks, along with expenditures in ecologically friendly economic initiatives and regulations, promotes the conservation and ethical utilization of environmental assets. This finding underscores the importance of integrating ecological considerations into financial decision-making processes to promote sustainable growth (Barouki et al., 2021). Ultimately, the setup characterized by elevated GGOV, diminished financial technology,

and reduced DFIN forecasts substantial environmental assets. This indicates that efficient management is essential for sustaining environmental asset prosperity, regardless of the level of financial technology acceptance and DFIN. Although developments in Finance and DFIN provide advantages, including enhanced efficiency and availability, this scenario suggests that excessively swift acceptance may not consistently coincide with appropriate resource administration objectives. A balancing strategy that emphasizes efficient administration, along with adequate amounts of economic technologies and electronic economic diversity, is crucial for the long-term conservation of environmental assets (Pereira et al., 2021). The NCA findings indicate the diverse levels of impact that various influences exert on environmental asset availability. DFIN and financial technology demonstrate modest impacts, signifying their intermediate influence on ecological assets. This indicates that although progress in electronic finance products and technologies influences economic results, their effect is not as significant as that of other variables. Conversely, greener economics serves as a crucial factor with a substantial impact, highlighting the significance of ecologically friendly economic strategies in asset management. Furthermore, GGOV exhibits a considerable impact, underscoring its critical importance in promoting natural resource abundance. The NCA findings enhance those from fsQCA by offering numerical knowledge into the person donations of each aspect, emphasizing the value of operational management actions and highlighting the necessity of incorporating green financing efforts into asset management methods.

The economic findings offer numerical information on the connections among the examined factors, emphasizing the mitigating influence of GGOV. Our research indicates that economic elements, including finance technology, DFIN, GFIN, and GGOV, substantially affect environmental asset availability. The interaction variables related to effective management indicate that their regulating influence amplifies the impact of economic variables on ecological assets. The favorable correlation for financial technology $\times$ GGOV suggests that the beneficial effect of financial technology on environmental assets is enhanced by excellent management. Likewise, the high correlations suggest that the impacts of electronic economic inclusivity and sustainable financing on environmental assets are enhanced by effective administration. The financial results align with the subjective observations from fsQCA and the numerical evaluations from NCA, providing a comprehensive understanding of the factors influencing environmental asset abundance. These results underscore the complex interrelations among money variables, administration, and organic assets, highlighting the necessity of integrated strategies that utilize money developments and robust administration processes to foster feasible asset leadership (Erdoğan et al., 2021).

The results also possess significant political ramifications for nations and global entities. Governments must priorities enhancing regulatory structures to guarantee that the implementation of economic breakthroughs, including financial technology and environmental financing, corresponds with responsible asset management objectives. Authorities can implement legislative requirements that encourage investing in ecologically responsible initiatives while reducing risks linked to swift financial technology uptake. Foreign organizations can utilize these insights to promote international cooperation in democracy changes, enhancing visibility and disseminating best practices.

A weakness of this research is the possible constraint on the generalizability of its results due to the restricted sample size, encompassing information from only 18 nations. Although these countries were chosen for their pertinence to the project aims and information accessibility, their distinct political frameworks, economic networks, and resource management techniques may not comprehensively reflect the variety of circumstances found in other locations. Consequently, the results derived from this research may lack general applicability, especially in situations that markedly differ from those of the examined nations. The choice of these countries may introduce bias if they fail to reflect worldwide trends in natural resource management accurately. The chosen nations may disproportionately represent particular economic or governance models. Subsequent studies may improve the generalizability of these results by broadening the database to encompass a wider array of countries with diverse organizational and socioeconomic attributes. Moreover,

causation cannot be conclusively shown due to reliance on fsQCA, NCA, and economic modelling, which indicate associations but do not elucidate precise causal pathways. Information integrity and uniformity can introduce biases in recording and measurements, as national information on administration, economic investments, and technology uptake may vary in reliability.

5. Conclusions and Policy Implications

This study analyzed the influence of effective administration, electronic economic diversity, greener financing, and FinTech on responsible environmental asset administration, emphasizing the regulating function of administration. Employing a composite approach that integrates fsQCA, NCA, and economic mathematical modelling, we illustrated that administration immediately affects environmental asset availability and also mitigates the impact of financial developments, enhancing their benefits when executed proficiently. Our data indicate that, whereas sustainable financing continuously exerts a beneficial influence, the effects of Innovation and electronic economic participation may fluctuate, yielding good outcomes when supported by robust governance frameworks.

These findings highlight the essential importance of administrative changes in promoting responsible resource management and optimizing the benefits of financial advances. Governments must priorities the improvement of administration efficiency while incorporating sustainable financing and electronic economic inclusiveness into resource administration policies. Moreover, the study's findings offer practical strategies for tackling world resources issues by integrating novel finance methods with strong government frameworks.

Further work may extend this analysis by examining the interaction between leadership and economic developments across a broader and more varied array of nations. Furthermore, studying the dynamic effects of innovations, including bitcoin and intelligent information, on environmental asset management may provide significant information. Furthermore, integrating supplementary elements such as ecological changes, economic movements, societal equity, and foreign aid could give a more comprehensive understanding of the variables affecting resource management. Employing computer intelligence or advanced statistical techniques may clarify irregular dynamics and complex causal linkages in greater depth. Furthermore, focusing on industry-specific trends, such as aquaculture, extraction, or farming, would augment the research. Recurrent case studies may clarify how government and economic expenditures influence environmental asset administration across periods. By exploring these pathways, scientists might enhance the fundamental achievements of this study to further scholarly and pragmatic comprehension of responsible asset utilization.

This research's results significantly contribute to organizational theories by illustrating the interaction between governing institutions and economic developments in influencing environmental resources administration. Structural economics asserts that formalized regulations, conventions, and governing structures influence organizational and societal conduct. Our findings correspond with this approach by highlighting management as an essential organizational factor that reduces and enhances the impacts of finance technology, sustainable financing, and electronic economic inclusivity. The routes found in the fsQCA research demonstrate that robust management mechanisms provide efficient cooperation and oversight, guaranteeing that finance advances promote environmental conservation instead of plunder. Likewise, the NCA findings emphasize management as an essential prerequisite, corroborating organizational theories' claim that effective organizations are fundamental for obtaining lasting benefits. This study enhances the relevance of organizational concepts to environmental asset control by incorporating economic developments into governing systems, highlighting the necessity for flexible and inclusive governance structures in a swiftly changing financial environment.

References

- Akomea-Frimpong, I., Adeabah, D., Ofori, D., & Tenakwah, E. J. (2021). A review of studies on green finance of banks, research gaps and future directions. *Https://Doi.Org/10.1080/20430795.2020.1870202*, 12(4), 1241–1264. <https://doi.org/10.1080/20430795.2020.1870202>
- Barouki, R., Kogevinas, M., Audouze, K., Belesova, K., Bergman, A., Birnbaum, L., Boekhold, S., Denys, S., Desseille, C., Drakvik, E., Frumkin, H., Garric, J., Destoumieux-Garzon, D., Haines, A., Huss, A., Jensen, G., Karakitsios, S., Klanova, J., Koskela, I. M., ... Vineis, P. (2021). The COVID-19 pandemic and global environmental change: Emerging research needs. *Environment International*, 146. <https://doi.org/10.1016/j.envint.2020.106272>
- Cheng, Z., Kai, Z., & Zhu, S. (2023). Does green finance regulation improve renewable energy utilization? Evidence from energy consumption efficiency. *Renewable Energy*, 208, 63–75. <https://doi.org/10.1016/j.renene.2023.03.083>
- Dai, M., Tan, X., Ye, Z., Li, B., Zhang, Y., Chen, X., & Kong, D. (2023). Soil bacterial community composition and diversity respond to soil environment in rooftop agricultural system. *Environmental Technology and Innovation*, 30. <https://doi.org/10.1016/j.eti.2023.103042>
- Desalegn, G., & Tangl, A. (2022). Developing Countries in the Lead: A Bibliometric Approach to Green Finance. *Energies*, 15(12). <https://doi.org/10.3390/EN15124436>
- Gulzar, R., Bhat, A. A., Mir, A. A., Athari, S. A., & Al-Adwan, A. S. (2024). Green banking practices and environmental performance: navigating sustainability in banks. *Environmental Science and Pollution Research*, 31(15), 23211–23226. <https://doi.org/10.1007/s11356-024-32418-7>
- Ha, S., Jeong, B., Jang, H., Park, C., & Ku, B. (2023). A framework for determining the life cycle GHG emissions of fossil marine fuels in countries reliant on imported energy through maritime transportation: A case study of South Korea. *Science of the Total Environment*, 897. <https://doi.org/10.1016/j.scitotenv.2023.165366>
- Heshmati, M., Gheytury, M., & Shadfar, S. (2022). Factors affecting possibility of ecotourism development and sustaining natural resources using SWOT approach in west Iran. *International Journal of Geoheritage and Parks*, 10(2), 173–183. <https://doi.org/10.1016/j.ijgeop.2022.03.004>
- Lee, C. C., Wang, F., Lou, R., & Wang, K. (2023). How does green finance drive the decarbonization of the economy? Empirical evidence from China. *Renewable Energy*, 204, 671–684. <https://doi.org/10.1016/j.renene.2023.01.058>
- Lei, Y., Liang, Z., & Ruan, P. (2023). Evaluation on the impact of digital transformation on the economic resilience of the energy industry in the context of artificial intelligence. *Energy Reports*, 9, 785–792. <https://doi.org/10.1016/j.egy.2022.12.019>
- Lin, B., & Ma, R. (2022). How does digital finance influence green technology innovation in China? Evidence from the financing constraints perspective. *Journal of Environmental Management*, 320. <https://doi.org/10.1016/j.jenvman.2022.115833>
- Liu, Y., Zhao, C., Dong, K., Wang, K., & Sun, L. (2023). How does green finance achieve urban carbon unlocking? Evidence from China. *Urban Climate*, 52, 101742. <https://doi.org/10.1016/j.uclim.2023.101742>
- Nguyen, D. M. T., Do, T. N., Van Nghiem, S., Ghimire, J., Dang, K. B., Giang, V. T., Vu, K. C., & Pham, V. M. (2024). Flood inundation assessment of UNESCO World Heritage Sites using remote sensing and spatial metrics in Hoi An City, Vietnam. *Ecological Informatics*, 79. <https://doi.org/10.1016/j.ecoinf.2023.102427>
- Ozgun, O., Yilanci, V., & Kongkuah, M. (2022). Nuclear energy consumption and CO2 emissions in India: Evidence from Fourier ARDL bounds test approach. *Nuclear Engineering and Technology*, 54(5), 1657–1663. <https://doi.org/10.1016/j.net.2021.11.001>
- Pereira, L., Pinto, M., da Costa, R. L., Dias, Á., & Gonçalves, R. (2021). The new swot for a sustainable world. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(1), 1–31. <https://doi.org/10.3390/JOITMC7010018>
- SaberiKamarpashti, M., Kamyab, H., Krishnan, S., Yusuf, M., Rezania, S., Chelliapan, S., & Khorami, M. (2024). A comprehensive review of AI-enhanced smart grid integration for hydrogen energy: Advances, challenges, and future prospects. *International Journal of Hydrogen Energy*, 67, 1009–1025. <https://doi.org/https://doi.org/10.1016/j.ijhydene.2024.01.129>

- Sharma, A. K., Ghodke, P. K., Chen, W.-H., Shah, S. V., & Patel, A. K. (2025). Circular economy in biohydrogen: A state-of-the-art review on advances in sustainable production, storage, and transportation. *Journal of Cleaner Production*, 500, 145305. <https://doi.org/https://doi.org/10.1016/j.jclepro.2025.145305>
- Sharmin, T., Khan, N. R., Akram, M. S., & Ehsan, M. M. (2023). A State-of-the-Art Review on Geothermal Energy Extraction, Utilization, and Improvement Strategies: Conventional, Hybridized, and Enhanced Geothermal Systems. *International Journal of Thermofluids*, 18. <https://doi.org/10.1016/j.ijft.2023.100323>
- Siddiqi, A. C., Bergseth, B. J., Diedrich, A., & Chin, A. (2024). Understanding the perceived conservation benefits of shark-marine tourism in the Global South. *Marine Policy*, 161. <https://doi.org/10.1016/j.marpol.2023.105995>
- Tkalec, Ž., Antignac, J.-P., Badow, N., Béen, F. M., Belova, L., Bessems, J., Le Bizec, B., Brack, W., Cano-Sancho, G., Chaker, J., Covaci, A., Creusot, N., David, A., Debrauwer, L., Dervilly, G., Duca, R. C., Fessard, V., Grimalt, J. O., Guerin, T., ... Price, E. J. (2024). Innovative analytical methodologies for characterizing chemical exposure with a view to next-generation risk assessment. *Environment International*, 108585. <https://doi.org/10.1016/j.envint.2024.108585>
- wang, yinuo, Umair, M., Aizhan, A., Teymurova, V., & Chang, L. (2024). Does the disparity between rural and urban incomes affect rural energy poverty? *Energy Strategy Reviews*, 56, 101584. <https://doi.org/10.1016/J.ESR.2024.101584>
- Wang, H., Gui, D., Liu, Q., Feng, X., Qu, J., Zhao, J., Wang, G., & Wei, G. (2024). Vegetation coverage precisely extracting and driving factors analysis in drylands. *Ecological Informatics*, 79. <https://doi.org/10.1016/j.ecoinf.2023.102409>
- Wang, W., Gao, P., & Wang, J. (2023). Nexus among digital inclusive finance and carbon neutrality: Evidence from company-level panel data analysis. *Resources Policy*, 80. <https://doi.org/10.1016/j.resourpol.2022.103201>
- Wątróbski, J., Bączkiewicz, A., Ziemia, E., & Sałabun, W. (2022). Sustainable cities and communities assessment using the DARIA-TOPSIS method. *Sustainable Cities and Society*, 83, 103926. <https://doi.org/10.1016/J.SCS.2022.103926>
- Xiaoman, W., Majeed, A., Vasbieva, D. G., Yameogo, C. E. W., & Hussain, N. (2021). Natural resources abundance, economic globalization, and carbon emissions: Advancing sustainable development agenda. *Sustainable Development*, 29(5), 1037–1048. <https://doi.org/10.1002/SD.2192>
- Zachariadis, T., Giannakis, E., Taliotis, C., Karmellos, M., Fylaktos, N., Howells, M., Blyth, W., & Hallegatte, S. (2023). Science policy frameworks for a post-pandemic green economic recovery. *Energy Strategy Reviews*, 45. <https://doi.org/10.1016/j.esr.2022.101035>
- Zakari, A., & Khan, I. (2022). The introduction of green finance: a curse or a benefit to environmental sustainability? *Energy Research Letters*, 3(3).
- Zhao, C., Dong, K., Wang, K., & Nepal, R. (2024). How does artificial intelligence promote renewable energy development? The role of climate finance. *Energy Economics*, 133, 107493. <https://doi.org/10.1016/J.ENERCO.2024.107493>
- Zhu, Z., Liu, B., Yu, Z., & Cao, J. (2022). *Effects of the Digital Economy on Carbon Emissions : Evidence from China*.

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