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Environmental Justice in the Age of Energy Transition: A Case Study of Shell's Operational Impact on Bayelsa State Ecosystem (2000-2023)

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ABSTRACT

This study investigates environmental justice within the context of the ongoing energy transition, focusing on the shell's operational impact on the ecosystem of Bayelsa State, Nigeria. It assesses the effects of shell's activities on local communities, particularly regarding environmental degradation and socioeconomic well-being. The research employs a descriptive design, surveying 290 respondents, including chiefs, community leaders, youths, and opinion leaders from ten purposively selected oil-producing communities in Bayelsa State. Data were collected using a self-designed questionnaire on environmental justice concerns and Shell's operational impact, with responses measured on a four-point Likert scale. The questionnaire's validity was ensured through expert review, with reliability confirmed by a Cronbach's alpha of 0.73. Data collection, achieved with a 91% response rate, involved frequency counts, percentages, means, standard deviations, and independent linear regression to test the null hypothesis at a 0.05 significance level. The findings reveal a statistically significant relationship between Shell's operational activities and the degradation of Bayelsa State's ecosystem. Additionally, the study discovered that community resistance significantly influences corporate accountability, with Shell's operations detrimentally affecting environmental justice and ecological integrity in the region. Thus this research contributes to the broader discourse on environmental justice during the energy transition, offering specific recommendations for Shell to adopt a human rights-based approach to its operations, emphasizing ecological restoration to address the environmental and social harms caused by its activities in oil-producing regions.

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1. Introduction

The Niger Delta region in Nigeria exemplifies the intersection of environmental justice and energy activities, particularly oil extraction, as discussed in various studies. Ecological problems in the Niger Delta, such as oil spillage and pollution, are exacerbated by multinational oil companies' activities, leading to environmental degradation and disproportionately affecting local communities. (Mark, 2024). The concept of environmental racism is highlighted, emphasizing the unequal burden borne by the Niger Delta peoples due to oil exploration and exploitation practices that would not be tolerated in Western countries. Addressing these environmental injustices and promoting environmental justice is crucial to mitigate the adverse impacts on community well-being and ensure sustainable resource management practices in regions heavily impacted by fossil fuel extraction activities (Ilham, 2024).

The discovery of oil in Oloibiri in Bayelsa State in 1956 marked the beginning of Nigeria's oil exploration journey, attracting multinational companies to the region. The Oloibiri Oilfield, where oil was first discovered, became Nigeria's inaugural commercial oil field, with Shell Darcy leading the exploration efforts in the Niger Delta region. This discovery led to the drilling of multiple wells in the area, with the first crude oil pipeline in Nigeria laid from Oloibiri to Port Harcourt for export purposes. Despite its initial success, the Oloibiri field faced depletion by 1979 after producing over 20 million barrels of oil during its operational years. Today, Oloibiri stands as a quiet village in Bayelsa State, serving as a historical site where the remnants of the original wellhead can still be observed (Eliton, 2023)

The environmental and socio-economic impacts of multinational oil corporations, such as Shell Petroleum Development Company (SPDC), in Bayelsa State, Nigeria, have been the subject of intense scrutiny from 2000 to 2023. The region has faced significant environmental challenges, including oil spillage, pollution, deforestation, and biodiversity destruction, largely attributed to the activities of these corporations (Marine, & Amanda 2024). Moreover, the adverse effects of climate change, such as rising sea levels, increased flooding, and erosion, have further exacerbated the situation in Bayelsa State (Jammy, 2024). The presence of SPDC and other oil companies has led to environmental degradation, impacting local communities and ecosystems, highlighting the urgent need for stricter environmental regulations, improved corporate governance, and community engagement to achieve sustainable development in the oil industry (Dufela, et al., 2024). Furthermore, the company's responses to these challenges have been criticized, with questions raised about its commitment to environmental sustainability and human rights (Okwudili, 2023). The presence of heavy metals in shellfish from the rivers of Bayelsa State also highlights potential health risks associated with ecosystem contamination. Efforts to address these issues must align with global shifts towards cleaner energy sources to mitigate further environmental degradation and promote environmental justice in the region.

Overall, this case study underscores the urgent need for improved environmental practices, community engagement, and accountability in the oil and gas industry to ensure environmental justice and sustainability during the energy transition era (Madu & Ebikeme 2023). The research will delve into the environmental consequences of oil spills, gas flaring, and other operational practices, as well as the responses from local, national, and international stakeholders. Additionally, it will explore the intersection of environmental justice with the ongoing energy transition, questioning whether the shift towards renewable energy sources has translated into improved environmental practices by oil companies operating in vulnerable regions like Bayelsa State. Through this analysis, the study aims to contribute to the broader discourse on environmental justice, energy transition, and the future of oil-dependent communities.

1.2 Statement of the Problem

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Environmental justice has emerged as a critical issue in the age of energy transition, where the shift from fossil fuels to renewable energy sources is often marred by the legacy of environmental degradation and socio-economic inequalities. In the context of Bayelsa State, Nigeria, the operations of multinational oil companies, particularly Shell, have had profound impacts on the local ecosystems and the livelihoods of the communities dependent on them. Despite global movements toward cleaner energy, the region continues to grapple with the aftermath of decades of oil extraction, which has left its environment severely compromised.

Between 2000 and 2023, Shell's activities in Bayelsa State have been a focal point of environmental justice debates. This period is marked by ongoing environmental degradation, including oil spills, gas flaring, and pollution of water bodies, which have led to the loss of biodiversity, destruction of farmlands, and adverse health effects on the local population. The communities affected by these environmental hazards often find themselves marginalized, with limited access to legal and institutional mechanisms for redress, raising critical questions about equity, accountability, and the effectiveness of environmental governance.

The problem, therefore, lies in the intersection of environmental degradation, corporate accountability, and the evolving dynamics of energy transition. As the world increasingly embraces renewable energy, the communities in Bayelsa State are still battling the consequences of past and ongoing oil exploitation. This study seeks to explore the extent of Shell's operational impact on Bayelsa State's ecosystems during this period and to critically assess the challenges and opportunities for achieving environmental justice in the context of the energy transition. Through this case study, the research will contribute to the broader discourse on how environmental justice can be ensured in regions that continue to suffer from the legacy of fossil fuel extraction while the world moves toward a cleaner energy future.

1.3 Objectives of the Study

1. To assess the extent of ecosystem degradation in Bayelsa State caused by Shell's operational activities between 2000 and 2023, with a focus on biodiversity loss, soil contamination, and water pollution.
2. To analyse the forms and effectiveness of community resistance in Bayelsa State against environmental degradation, including protests, legal actions, and advocacy efforts, in the context of the broader discourse on environmental justice.
3. To evaluate the impact of the global energy transition on Shell’s environmental policies in Bayelsa State, assessing whether these policies have adequately addressed past environmental damages and contributed to advancing environmental justice in the region.

1.4 Research Question

1. How have Shell's operational activities in Bayelsa State between 2000 and 2023 significantly degraded local ecosystems, leading to the destruction of biodiversity, soil contamination, and water pollution?
2. How have the affected communities in Bayelsa State actively resisted environmental degradation caused by Shell's operations, and how has this resistance through protests, legal actions, and advocacy amplified the discourse on environmental justice and increased pressure for corporate accountability?
3. How has the global energy transition prompted Shell to adopt more environmentally conscious policies in Bayelsa State, and why have these changes been insufficient to fully address past environmental damages or significantly advance environmental justice in the region?

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1.5 Research Hypothesis

1. There is no significant impact of Shell's operational activities between 2000 and 2023 on the degradation of local ecosystems, including biodiversity loss, soil contamination, and water pollution in Bayelsa State.
2. Community resistance in Bayelsa State, through protests, legal actions, and advocacy, has no significant impact on amplifying environmental justice discourse, pressuring Shell for accountability, driving stricter regulations, or raising awareness of local environmental issues.
3. Shell's greener policies in Bayelsa State, driven by global energy transition and regulatory pressures, have adequately addressed historical environmental damage and advanced environmental justice

2. Literature Review

2.1 Environmental Justice

Environmental justice is a crucial concept aiming to provide fair and equitable treatment for all individuals, irrespective of race, income, or social status, in environmental matters (Gouthami 2024). It addresses historical disparities where certain communities, especially marginalized and vulnerable groups, have faced disproportionate exposure to environmental hazards and limited participation in decision-making processes (Shirley 2024). The Environmental Justice Movement, originating in the 1980s, has evolved to encompass a broad range of environmental health concerns and rights, emphasizing the need for inclusive policies and collective action to combat environmental injustices. Scholars emphasize the importance of a socioecological approach involving schools, communities, and individuals to achieve sustainable and equitable environmental conditions, highlighting the critical role of education in promoting environmental justice and creating healthier environments for future generations Gamze et al,.(2024)

The concept emphasizing the right of every individual to a healthy environment, encompassing access to clean air, water, and land, as well as the fair distribution of environmental advantages and disadvantages, is a crucial aspect of modern legal and human rights discourse. This right is recognized in various international legal frameworks, such as the American Convention on Human Rights (Lisa 2023), the legislation of Ukraine (Vera 2022), and the practices of the ECtHR and the EU (Volkova 2023). The recognition of the human right to a healthy environment by the UN General Assembly further underscores the evolving nature of international human rights norms and the complex processes involved in their development (Mwanza 2023). The multifaceted nature of this right highlights the interconnectedness of environmental protection, public health, and social justice within the global legal landscape.

2.2 Energy Transition

The energy transition is a crucial process involving the shift from traditional fossil fuels to renewable and low-carbon energy sources to mitigate greenhouse gas emissions and combat climate change (Abraham et al, 2024; Gabriela et al, 2024). This transition necessitates changes in energy production, consumption, technology, and policy to promote cleaner energy sources and enhance energy efficiency. Studies highlight the challenges posed by the intermittency of renewable energy sources, emphasizing the need for efficient management of electricity production and the gradual phase-out of conventional power generation units to ensure system stability (Lucian, 2024). Furthermore, the development of dynamic capabilities and green innovations is crucial for highly emission-intensive oil and gas firms to transition into greener industries, emphasizing the importance of proactive behavior, market insight, and cross-sector collaboration in seizing new opportunities and driving sustainable practices in the energy sector (Fanny et al, 2024).

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2.3 Ecosystem Degradation

Ecosystem degradation, encompassing habitat loss, soil degradation, land degradation, and overexploitation of natural resources, significantly impacts biodiversity, ecosystem services, and resilience to environmental changes. Habitat loss, predominantly anthropogenic, is linked to species persistence and movement strategies (Yurij et al,.2024).

Soil degradation, caused by land conversion for intensive agriculture, reduces soil quality, fertility, and carbon sequestration capacity, contributing to global climate change (Christine, 2023). Land degradation, accelerated by inappropriate farming practices, leads to decreased productivity and biodiversity loss (Olesea, 2023) Human overexploitation of natural resources, as indicated by the Human Appropriation of Net Primary Production Index (HANPP), is associated with the spread of diseases like Covid-19, emphasizing the need for sustainable resource management (Chiara et al,.2023). These findings underscore the urgent necessity for conservation efforts and sustainable practices to mitigate the adverse effects of ecosystem degradation on ecosystems and human well-being.

2.4 Shell Petroleum Development Company (SPDC)

Shell, a prominent global energy company, has been recognized as the most valuable oil & gas brand in the world for 2023, showcasing its strong market presence and brand value (Pesa News 2024). Shell's commitment to sustainability is evident in its strategic shift towards producing base oils for lubricants and investing in renewable energy projects like hydrogen production and biomethane liquefaction (Alex, 2024). However, Shell has faced legal challenges related to its energy transition strategy, with ClientEarth filing a derivative claim alleging breaches of duties under the Companies Act 2006 due to inadequate alignment with the Paris Agreement, highlighting the intersection of environmental and company law objectives 4. Additionally, the concept of shell companies, entities with minimal assets or operations often used for illicit purposes like money laundering and tax evasion, poses economic challenges globally, emphasizing the need for regulatory frameworks to address such entities (Satya, 2023)

2.5 Oil spills and Environmental pollution in Bayelsa State

Oil spills and environmental pollution in Niger Delta, particularly in Bayelsa State the region, have been a longstanding issue, significantly impacting the environment and local communities (Kester& Thaddeus 2024). The presence of crude oil and its constituents like Pyrenees, benzene, and polycyclic aromatic hydrocarbons in the environment has led to adverse health effects and environmental degradation, affecting soil, water, air, humans, plants, and marine ecosystems (Ozogu et al, 2024). The artisanal fishing sector in oil-spilled areas has faced challenges such as water pollution, lack of government support, and health issues, hindering productivity and profitability (Wilcox, 2024). Additionally, land-use changes from 2000 to 2020 have shown a decline in environmental resources in Bayelsa State, emphasizing the need for implementing environmental laws and public awareness campaigns to mitigate further degradation.

The extensive environmental pollution caused by oil spills in the Niger Delta region, particularly in Ahoada, Eleme, Okrika, and Oporoma communities, has led to severe health hazards among the local population, including skin diseases, respiratory problems, and an increased risk of cancer (Chukwumati&Asiegbe 2023) This pollution has also resulted in the loss of livelihoods, especially in Bayelsa, where agriculture and fishing, the primary sources of income, have been severely impacted, contributing to widespread poverty and economic hardship (Wilcox, 2023). Furthermore, the environmental degradation caused by oil spills has drastically reduced biodiversity, and destroyed mangroves crucial for ecological balance, leading to erosion and land loss. Despite the requirement for oil companies to remediate

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spills, efforts have often been inadequate, delayed, or poorly executed, leaving many areas perpetually polluted (Jonah et al,.2024)

2.6 Theoretical Framework

The utilization of the "Resource Curse" theory and the "Negative Externalities" theory in examining the environmental issues stemming from multinational corporations and oil exploitation in Bayelsa State reveals critical insights. The "Resource Curse" theory, as highlighted in various research papers by Igwe (2023); John (2023); Cyril (2023) emphasizes how abundant natural resources can hinder overall economic development by diverting attention from infrastructure and industry diversification. This myopic focus can lead to overreliance on specific sectors, impeding economic growth and fostering dependency on external sources. Additionally, the "Environmental Externalities" theory, not explicitly mentioned in the provided contexts, would underscore the negative environmental impacts of oil extraction, such as pollution and ecosystem degradation, further exacerbating the challenges faced by resource-rich regions like Bayelsa State. By considering both theories, a comprehensive understanding of the complex interplay between resource abundance, economic development, and environmental degradation can be attained

The concept of the "resource curse," as introduced by Richard Auty in 1998, highlights how countries abundant in natural resources often struggle to translate this wealth into sustained economic growth, a phenomenon exemplified by the "Dutch Disease" syndrome that hampers economic diversification (Yuan, 2021). Studies by Sachs and Warner (2001); and Billon (2001) have further solidified the negative correlation between natural resource abundance and economic growth. Moreover, Saeed and Michael. (2021) warns about the risks of over-exploitation of finite resources due to unrestricted access, leading to depletion over time.

The competition for resource control among different societal groups can exacerbate conflicts and weaken governmental effectiveness (Cyril 2023). This intricate web of factors underscores the complex challenges faced by resource-rich nations in achieving sustainable development and economic stability. The theory of negative externalities in environmental economics is fundamental as pollution, a common negative externality, harms both individuals and the environment. Externalities, whether positive or negative, result from economic activities without direct compensation to affected parties (Devashis 2024). Negative externalities like pollution lead to environmental and societal costs, while positive externalities, such as technological spill over's, benefit society beyond the original actors. Understanding externalities is crucial for assessing the true costs and benefits of economic activities, especially in industries like petroleum and chicken farming, where unintended consequences impact wider society (Rusny et al,.2022). By recognizing and internalizing external costs, firms can be held accountable through mechanisms like corporate social responsibility, ultimately promoting more sustainable and socially beneficial economic practices. Pollution, like when a factory releases untreated effluents into a river, is a classic example of a negative externality that imposes costs on society.

Pigou's theory of negative externalities, introduced in the 1920s, addresses such issues by proposing a per-unit tax on firms producing negative externalities to align private and social costs. This tax aims to internalize environmental costs by adjusting prices and reducing demand, moving towards socially optimal outputs where prices equal social marginal costs. Pigou also recognized the potential need for government intervention to control externalities when market mechanisms are insufficient. By incorporating Pigou's insights, policymakers can design effective strategies to mitigate pollution externalities and promote environmental sustainability (Richard, 2023). The negative externality theory, as discussed in the provided contexts, emerges when the actions of one party lead to a welfare loss for another party that remains uncompensated, highlighting the absence of liability to third parties affected by the damages. Scholars like Baumol have extensively studied the concept of externalities, particularly in industries like petroleum and

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mining (Xu et al,.2020). These studies emphasize the importance of understanding and quantifying the costs associated with negative externalities, such as pollution from extractive industries and mining activities, to promote corporate social responsibility and efficient resource management. By exploring the impacts of negative externalities on welfare and the environment, researchers aim to develop strategies for mitigating these harmful effects and ensuring sustainable development practices in various economic sectors.

Table I: Shell Oil Spillage and Environmental Pollution in Bayelsa State 2000 -2023

Year	Incident/Spillage	Location	Volume Spilled (Barrels)	Environmental Impact	Response/Action
2000		Odioma, Ogbia, Nembe	12,000	Widespread environmental damage, water and soil contamination, loss of biodiversity	Compensation to victims; some cleanup efforts initiated
2000	Equipment failure	Ikarama Community Okordia Clan	10,000+	Soil contamination, river pollution, loss of farmlands	Clean-up operation (slow response), compensation to some affected families
2004	Increased Silage production	Nembe, Gbarain		Soil degradation, vegetation loss	Limited government intervention, local outcry
2009	Equipment failure	Ogoniland, Gbarain, Bayelsa State	9,500	Soil pollution, air quality deterioration	Lawsuits by local communities, Shell agreed to cleanup efforts
2010	Sabotage, corrosion	Brass, Ekeremor	13,200	Destruction of mangroves, health issue	Legal proceedings, some remediation efforts
2012	Nembe Creek Pipeline Explosion	Nembe Creek	3,000	Mangrove destruction, biodiversity loss, air and water pollution	Court cases, cleanup operations
2013	Kolo Creek Incident	Kolo Creek	500	Localized water contamination, harm to wildlife	Limited cleanup by Shell
2014	Shell Wellhead Spill	Southern Ijaw	1,500	Significant contamination of local water bodies and farmland	Litigation by affected communities
2014	Oruma Pipeline Leak	Oruma	8,750	Air and water pollution	Shell fined, compensatory claims made
2016	Equipment failure, sabotage	Amassoma, Yenagoa	15,600	Contamination of farmlands, fisheries decline	Emergency response and partial remediation
2017	Nembe-Bonny Spill	Nembe-Bonny	1,000	Significant air, water, and soil contamination, public health risks	Shell fined, limited cleanup operations
2020	Wellhead blowout	Santa Barbara River (Nembe)	16,000+	Widespread water contamination, destruction of aquatic life, displacement	Clean-up and remediation initiated, temporary relief materials provided to affected communities
2021	spill due to equipment failure	Agbura, Bayelsa State, Nigeria	600	Water pollution, health risks, livelihood disruptions	Legal action by communities, Shell's response under NOSDRA watch

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2023	Peremabiri Spillage	Peremabiri in Southern Ijaw Bayelsa State	1,200	Air pollution, acid rain, increased respiratory diseases in nearby communities	Environmental activists press legal action, demands for policy reform
2023	Nembe Pipeline Leak	Nembe Region	500	Continued degradation of local ecosystems, health risks	Cleanup ongoing, community demands more substantial compensation
2023	Equipment failure	Okordia/Rumuekpe	3,000+	Soil and water pollution, destruction of local ecosystems	Ongoing clean-up efforts, Shell under pressure to provide long-term environmental restitution

Source: Researchers Computations, 2024

Fig 1: Bayelsa community Peremabiri in Southern Ijaw LGA, Bayelsa State bemoans oil spill, seeks compensation**.** Source: Punch, 13th October (2023)

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Fig 2: Shell's Facility Spill Pollutes Water in Agbura community Yenagoa Local Government Area of Bayelsa State. Source: Daily Trust Newspaper Fri, 2 April (2021)

3. Methodology

3.1 Research Design

The study utilized a descriptive survey research design to explore Shell operational impact on bayelsa State ecosystem aiming to gain in depth understanding of the study.

3.2 Data Collection

This study used both primary and secondary data. Three research questions and three hypotheses were formulated to guide the study. The study's population consisted of individuals residing in the oil-producing communities that host SPDC in Yenagoa, Ekeremor, Southern Ijaw, Ogbia, and Nembe, Local Government Areas of Bayelsa State. The study utilized the purposive sampling method to choose 290 respondents were Chiefs, Community Leaders; Youths; Opinion Leaders, and other persons from ten selected oil-producing communities in the study area.

3.3 Instrumentation

Data were collected using a self-designed Instrument titled: Environmental Justice and Shell Operational Impact in Bayelsa State which included demographic questions and items related to Environmental Justice in the Energy Transition and Shell's Operational impact on Bayelsa ecosystem with a four-point Likert scale questionnaire. The instrument's validity was measured by experts, and reliability was established with a Cronbach's alpha of 0.73, indicating consistency.

3.4 Data analysis

The analysis involved frequency counts, percentages for demographic data means, and standard deviations for research questions, with an independent linear regression used to test the null hypothesis at a 0.05 significance level. Items scoring above 2.5 were considered as having a high extent, while those below were considered low Extent

4. Results

Research Question One**:** How have Shell's operational activities in Bayelsa State between 2000 and 2023 significantly degraded local ecosystems, leading to the destruction of biodiversity, soil contamination, and water pollution?

Table 2: The Extent of Environmental Impact on Shell Operational Activities in Bayelsa State (2000-2023)

S/N	Item	Mean	Std. Deviation	Decision
1	Shell's activities contributed to soil contamination and the effects on agriculture	2.64	1.23	High Extent
2	Shell's operations in Bayelsa State affected local biodiversity, including both flora and fauna	2.09	1.00	Low Extent
3	Shell's operational activities influenced water quality in Bayelsa State, particularly in terms of pollution levels in rivers, streams, and groundwater	3.14	0.89	High Extent

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4	Health issues have emerged among the local population as a result of the environmental degradation caused by Shell's operations	3.70	0.65	High Extent
5	Shell has taken measures to mitigate the environmental damage in Bayelsa State	2.18	0.96	Low Extent
6	Government policies and regulatory frameworks influenced Shell's environmental practices in Bayelsa State	1.90	0.78	Low Extent
	Grand Mean	**2.61**	**0.92**	**High Extent**

Table two shows the extent of Shell's operational activities in Bayelsa State between 2000-2023 and how it has significantly degraded local ecosystems. In Table 2, items 2, 5, and 6 have mean values lower than the criterion mean of 2.5, while items 1, 3, and 4 have mean values greater than the criterion mean of 2.5. Moreover, table 2 shows that the grand mean is 2.61, which is greater than the criterion mean of 2.5. This shows that the extent to which shell operational activities impact the environmental livelihoods of Bayelsans is high.

Research Question Two: How have the affected communities in Bayelsa State actively resisted environmental degradation caused by Shell's operations, and how has this resistance through protests, legal actions, and advocacy amplified the discourse on environmental justice and increased pressure for corporate accountability?

Table 3: Extent to which Affected Communities Actively Resisted Environmental Degradation Caused by Shell's Operations in Bayelsa State

S/N	Item	Mean	Std. Deviation	Decision
1	Community members actively participated in resisting environmental degradation caused by Shell's operations	3.44	0.91	High Extent
2	Protests have influenced public awareness and discourse on environmental justice in your community	3.24	0.89	High Extent
3	Local or international advocacy influenced the resistance efforts against Shell's operations in Bayelsa State	1.47	0.84	Low Extent
4	Communities been involved in any legal actions against Shell. What were the outcomes, and how did they impact the broader fight for environmental justice	2.49	0.96	Low Extent
5	The ongoing resistance, including protests and legal actions, contributed to the broader discourse on environmental justice in Bayelsa State	2.65	0.99	High Extent
6	The resistance from the affected communities increased pressure on Shell for greater corporate accountability regarding environmental degradation	2.90	0.92	High Extent

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Grand Mean	**2.70**	**0.92**	**High Extent**

Table three shows the extent to which affected communities actively resisted environmental degradation caused by shell operations in Bayelsa State. In Table 3, items 3 and 4 have mean values lower than the criterion mean of 2.5, while items 1, 2, 5, and 6 have mean values greater than the criterion mean of 2.5. Moreover, table 3 shows that the grand mean is 2.70, which is greater than the criterion mean of 2.5. This shows that the extent to which affected communities' actively resisted environmental degradation caused by Shell's operations in Bayelsa State is high.

Research Question Three: How has the global energy transition prompted Shell to adopt more environmentally conscious policies in Bayelsa State, and why have these changes been insufficient to fully address past environmental damages or significantly advance environmental justice in the region?

Table 4: The Extent to which Global Energy Transition Prompted Shell to Adopt More Environmentally Conscious Policies in Bayelsa State

S/N	Item	Mean	Std. Deviation	Decision
1	The global energy transition influenced Shell's environmental practices in Bayelsa State	2.39	1.01	Low Extent
2	Shell's recent policy changes in Bayelsa State addressed the environmental damages caused by their past operations	1.92	0.93	Low Extent
3	Shell's environmentally conscious policies been deemed insufficient to fully address the historical environmental damages in Bayelsa State	2.17	0.99	Low Extent
4	Shell's recent efforts fallen short of significantly advancing environmental justice in Bayelsa State	1.75	0.89	Low Extent
5	Communities in Bayelsa State perceive the effectiveness of Shell's new environmentally conscious policies in addressing both current and past environmental issues	2.38	1.18	Low Extent
6	The environmental conscious policies has Shell implemented in Bayelsa State as a result of the global energy transition	1.74	0.88	Low Extent
	Grand Mean	**2.06**	**0.98**	**Low Extent**

Table four shows the extent to which the global energy transition prompted Shell to adopt more environmentally conscious policies in Bayelsa State. In Table 4, all the items (1, 2, 3, 4, 5, and 6) have mean values lower than the criterion mean of 2.5. Moreover, table 3 shows that the grand mean is 2.06, which is less than the criterion mean of 2.5. This shows that the extent to which the global energy transition prompted Shell to adopt more environmentally conscious policies in Bayelsa State is low.

Hypothesis one: There is no significant impact of Shell's operational activities between 2000 -2023 on the degradation of local ecosystems, including biodiversity loss, soil contamination, and water pollution in Bayelsa State.

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Table 5: Linear Regression Results of the Impact of shell operational activities on the Degradation of local ecosystem in Bayelsa State

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.097	0.196		-10.686	0.000
	Bayelsa State's Ecosystem (biodiversity loss, soil contamination, and water pollution)	0.873	0.012	0.974	73.337	0.000

a. Independent Variable: Shell's Operational Activities
R = 0.974; R Square = 0.949; Adjusted R^2 = 0.949

Table 5 is a linear regression result of the dependent variable (Impact on Bayelsa State's Ecosystem) regressed against the independent variable (Shell operational activities). Testing the hypothesis at 0.05 significant levels, the p-values for the model are indicated as (0.000) is less than the alpha value (0.05), therefore, there is a significant impact. This means that the relationship between Shell's operational activities and the degradation of Bayelsa State's ecosystem (including biodiversity loss, soil contamination, and water pollution) is statistically significant. Also, the 94.9% adjusted R2 indicates the variation which can be explained by variability in explanatory variables as well as control variables in the model. Conclusively, there is a significant impact between the Bayelsa State's ecosystem degradation and Shell's operational activities.

Hypothesis Two: Community resistance in Bayelsa State, through protests, legal actions, and advocacy, has no significant impact on amplifying environmental justice discourse, pressuring Shell for accountability, driving stricter regulations, or raising awareness of local environmental issues.

Table 6: Linear Regression Results of Community Resistance: Protests, Legal Actions, and Advocacy for Holding Shell Accountable in Bayelsa State.

Model	Unstandardized		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant) Bayelsa State's Ecosystem	-2.551	0.241		-10.598	0.000
(Community resistance prostest, legal actions, and advocacy)	0.872	0.014	0.964	61.525	0.000

a. Independent Variable: Shell's Operational Activities
R = 0.964; R Square = 0.930; Adjusted R^2 = 0.929

Table 6 linear regression result of the dependent variable (Bayelsa ecosystem) regressed against the independent variable (Shell operational activities). Testing the hypothesis at a 0.05 significant level, the p-value (0.000) is less than the alpha value (0.05), therefore, there is a significant impact. This means that community resistance protests, legal actions, and advocacy have significant impact on Shell's Operational

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activities. Also, the 92.9% adjusted R2 indicates the variation in Shell accountability and can be explained by variability in explanatory variables as well as a control variable in the model. Conclusively, there is a significant impact on community resistance protests, legal actions, and advocacy on shell operations in Bayelsa State.

Hypothesis Three: Shell's greener policies in Bayelsa State, driven by global energy transition and regulatory pressures, have an adequate impact on the historical environmental damage and advanced environmental justice

Table 7: Linear Regression Results on Shell's Greener Policies on Environmental Damage and Justice in Bayelsa State.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.929	0.144		13.390	0.000
	Bayelsa state ecosystem Enviromental damage/Justice	0.781	0.011	0.975	73.750	0.000

a. Independent Variable: Shell Operational Activities
R = 0.975; R Square = 0.950; Adjusted R^2 = 0.950

Table 7 is a linear regression result of the dependent variable (Bayelsa ecosystem environmental damage/Justice) regressed against the independent variable (shell operational activities). Testing the hypothesis at a 0.05 significant level, the p-value of (0.000) is less than the alpha value (0.05), therefore, there is a significant impact. Also, the 95% adjusted R2 indicates the variation in the Bayelsa ecosystem and can be explained by variability in explanatory variables as well as control variables in the model. Conclusively, the relationship between Shell's operational activities and the environmental damage and justice in Bayelsa State is statistically significant.

5. Discussion of Findings

5.1 How have Shell's operational activities in Bayelsa State between 2000 and 2023 significantly degraded local ecosystems, leading to the destruction of biodiversity, soil contamination, and water pollution?

Table two shows the extent of Shell's operational activities in Bayelsa State between 2000-2023 and how it has significantly degraded local ecosystems. In Table 2, items 2, 5, and 6 have mean values lower than the criterion mean of 2.5, while items 1, 3, and 4 have mean values greater than the criterion mean of 2.5. Moreover, table 1 shows that the grand mean is 2.61, which is greater than the criterion mean of 2.5. This shows that the extent to which shell operational activities impact the environmental livelihoods of Bayelsans is high.

The analysis of the linear regression results indicates a statistically significant relationship between Shell's operational activities and the degradation of Bayelsa State's ecosystem, as evidenced by a p-value of 0.000, which is well below the alpha level of 0.05. This suggests that Shell's activities contribute

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meaningfully to issues such as biodiversity loss, soil contamination, and water pollution in the region (Marine & Amanda 2024) Chukwunweike et al,.(2023).

The model's adjusted R^2 value of 94.9% further supports this conclusion, indicating that a substantial portion of the variability in ecosystem degradation can be explained by the operational activities of Shell, alongside other control variables (Wilcox 2024). However, while the findings are compelling, it is essential to consider potential limitations, such as the model's reliance on available data and the complexity of ecological interactions that may not be fully captured in the regression analysis. Overall, the evidence strongly supports the assertion that Shell's operations significantly impact the ecosystem in Bayelsa State.

How have the affected communities in Bayelsa State actively resisted environmental degradation caused by Shell's operations, and how has this resistance through protests, legal actions, and advocacy amplified the discourse on environmental justice and increased pressure for corporate accountability?
Table three shows the extent to which affected communities actively resisted environmental degradation caused by shell operations in Bayelsa State. In Table 2, items 3 and 4 have mean values lower than the criterion mean of 2.5, while items 1, 2, 5, and 6 have mean values greater than the criterion mean of 2.5. Moreover, table 3 shows that the grand mean is 2.70, which is greater than the criterion mean of 2.5. This shows that the extent to which affected communities actively resisted environmental degradation caused by Shell's operations in Bayelsa State is high

The analysis of linear regression results indicates a significant relationship between community resistance manifested through protests, legal actions, and advocacy and Shell's accountability in Bayelsa State. The p-value of 0.000 confirms the statistical significance of community actions at the 0.05 level, suggesting that increased community resistance correlates with heightened corporate accountability. Additionally, the adjusted R^2 value of 92.9% indicates that a substantial portion of the variability in Shell's accountability is explained by these community factors, alongside other control variables included in the model. This finding is consistent with broader literature emphasizing the importance of community engagement in fostering corporate responsibility, where active resistance can drive companies to adopt more ethical practices (Caecilia&Jérémy 2023). However, it is crucial to acknowledge the limitations of this study, particularly the specific context of Bayelsa State, which may not be generalizable to other regions or industries. Overall, the evidence robustly supports the hypothesis that community resistance significantly influences corporate accountability.

5.2 How has the global energy transition prompted Shell to adopt more environmentally conscious policies in Bayelsa State, and why have these changes been insufficient to fully address past environmental damages or significantly advance environmental justice in the region?

Table four shows the extent to which the global energy transition prompted Shell to adopt more environmentally conscious policies in Bayelsa State. In Table 3, all the items (1, 2, 3, 4, 5, and 6) have mean values lower than the criterion mean of 2.5. Moreover, table 3 shows that the grand mean is 2.06, which is less than the criterion mean of 2.5. This shows that the extent to which the global energy transition prompted Shell to adopt more environmentally conscious policies in Bayelsa State is low.

The analysis of the relationship between Shell's operational activities and environmental damage in Bayelsa State reveals a statistically significant impact, as indicated by a p-value of 0.000, which is below the 0.05 alpha threshold. This suggests that Shell's activities are closely linked to the environmental degradation observed in the region. The 95% adjusted R^2 value further supports this conclusion, indicating that a substantial portion of the variability in environmental damage can be explained by the operational activities of Shell, alongside other control variables in the model. This finding aligns with broader research on the ecological consequences of industrial activities, which often lead to significant alterations in local

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ecosystems and biodiversity, as seen in various studies on anthropogenic impacts on marine and freshwater environments Tacianaet al, (2024), Ahmed et al (2023). Thus, the evidence strongly supports the assertion that Shell's operations have a detrimental effect on the environmental justice and ecological integrity of the Bayelsa ecosystem.

6. Conclusion and Recommendations

The investigation into Shell's operational impact on Bayelsa State from 2000 to 2023 reveals significant environmental degradation, primarily due to oil spills and gas flaring, which have severely affected local ecosystems and the livelihoods of residents. Research indicates that Shell Petroleum Development Company (SPDC) has not positively contributed to sustainable development in these communities, with adverse effects including pollution, unemployment, and farmland destruction overshadowing any developmental initiatives, which are often unstained post-implementation. Furthermore, legal actions, such as Client Earth's derivative claim against Shell's board, highlight the company's failure to adopt a robust energy transition strategy, raising concerns about its long-term viability and accountability in the face of climate risks.

This underscores the urgent need for stronger regulatory frameworks to ensure corporate accountability and prioritize environmental justice in the energy transition. Future energy developments must respect local communities' rights and well-being, integrating sustainability and equity principles to avoid repeating past injustices.

In addressing environmental justice in the context of Shell's operations in Bayelsa State, the following recommendations emerge from the literature.

1. Shell should enhance its community relations strategies by ensuring genuine engagement with local communities in identifying their needs and priorities, rather than imposing top-down solutions.
2. Shell should adopt a human rights-based approach to its operations, focusing on ecological restoration as a means to remedy the environmental and social harms caused by its activities.
3. Shell should implement capacity-building programs that can empower local populations, fostering resilience and reducing dependency on Shell's sporadic development initiatives collectively, these strategies can promote a more just and equitable energy transition in Bayelsa State.
4. The Bayelsa state Government should enact effective and strict anti-pollution laws that would compel oil firms particularly the SPDC to ensure sound and healthy environmental practices and existing environmental laws should be amended to align with present reality and international standards**.**

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Conflicts of interest statement:

The authors confirm that there is no existing conflict of interest.

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