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Patterns, Trends, And Spatial Distribution Of Crude Oil Pipeline Vandalism In The Niger Delta, Nigeria, 2015 - 2025

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ABSTRACT
This study examined the patterns, trends, and spatial distribution of crude oil pipeline vandalism in the Niger Delta, Nigeria, between 2015 and 2025. The study adopted Relative Deprivation (Greviance) Theory. Also, a mixed-methods research design, combining quantitative and qualitative approaches, was utilized. The population comprised residents of oil-bearing communities in Rivers, Bayelsa, and Delta States, while a sample size of 383 respondents was determined using the Krejcie and Morgan formula. Data were collected through structured questionnaires, key informant interviews, and documentary sources and analysed using descriptive statistics and thematic content analysis. Findings revealed that pipeline vandalism is concentrated in specific oil-producing communities and major pipeline corridors, particularly in riverine and difficult-to-access areas. The study also found a shift from militant-driven sabotage to organised crude oil theft and artisanal refining activities. Furthermore, ageing pipeline infrastructure, weak surveillance systems, and socio-economic deprivation contribute significantly to the persistence of vandalism. The study concluded that pipeline vandalism remains a major challenge in the Niger Delta and recommended improved surveillance technology, infrastructure modernization, community-based pipeline protection, and sustainable youth employment programmes to mitigate the problem.

Keywords: Crude oil pipeline vandalism, crude oil theft, Niger Delta, pipeline security, oil infrastructure, spatial distribution.

INTRODUCTION

The Niger Delta region of Nigeria remains one of the most important oil-producing regions in Africa, accounting for the overwhelming share of the country's crude oil production and export earnings. Since the discovery of crude oil in commercial quantities in Oloibiri in 1956, petroleum resources have constituted the backbone of Nigeria's economy, contributing significantly to government revenue, foreign exchange earnings, and national development. The region hosts an extensive network of oil wells, flow stations, manifolds, export terminals, and thousands of kilometres of crude oil and gas pipelines that transport petroleum products across the country and international markets (Aghalino, 2018; Obi, 2020; Egobueze & Ajieh, 2024; Egobueze, 2025).

Despite its strategic economic importance, the Niger Delta has remained a major hotspot of crude oil pipeline vandalism. Pipeline vandalism refers to the deliberate destruction, sabotage, puncturing, or illegal

tapping of oil pipelines for purposes such as crude oil theft, illegal refining, political protest, or economic gain. Over the years, vandalism of oil infrastructure has emerged as one of the most persistent security and economic challenges confronting Nigeria's petroleum industry. The phenomenon has resulted in significant losses in oil production, environmental degradation, loss of government revenue, disruption of energy supply, and increased operational costs for oil companies (Ikelegbe & Umukoro, 2016; Obi & Rustad, 2019).

Between 2015 and 2025, crude oil pipeline vandalism exhibited fluctuating patterns and trends across the Niger Delta. Available evidence indicates that incidents increased significantly during periods of heightened crude oil theft and illegal refining activities, particularly in Rivers, Bayelsa, Delta, and parts of Akwa Ibom States. According to the Nigerian National Petroleum Company (NNPC), hundreds of illegal pipeline connections and illegal refining sites were discovered and dismantled annually within the Niger Delta during this period. For example, NNPC reported the discovery of 295 illegal pipeline connections between June and August 2022 alone, with Rivers State accounting for the highest concentration of incidents. Similarly, the company identified more than 470 illegal connections and numerous illegal refining camps across the region in 2023, highlighting the persistence of vandalism despite intensified surveillance and security operations (NNPC Ltd., 2022; NNPC Ltd., 2023).

The temporal trend of pipeline vandalism during the study period reveals important variations. Between 2015 and 2018, incidents were strongly associated with militant activities, particularly attacks by groups such as the Niger Delta Avengers, whose operations significantly reduced Nigeria's crude oil output in 2016. Nigeria's oil production declined from approximately 2.2 million barrels per day in 2015 to about 1.4 million barrels per day in mid-2016 due largely to coordinated attacks on critical oil infrastructure (International Crisis Group, 2018; Obi, 2020). Following the decline of organised militant attacks, the period from 2019 to 2025 witnessed the proliferation of decentralised crude oil theft networks, illegal refining camps, and localized pipeline vandalism activities that became more economically motivated than politically driven (Akinwale, 2020).

The spatial distribution of pipeline vandalism across the Niger Delta demonstrates significant geographical concentration. Empirical reports consistently identify Rivers State as the epicentre of pipeline vandalism and illegal refining activities, particularly within local government areas such as Emohua, Ahoada East, Ahoada West, Degema, Ogba/Egbema/Ndoni, and Eleme. Bayelsa State has also experienced recurrent incidents along pipeline corridors traversing Southern Ijaw, Ekeremor, and Nembe areas. In Delta State, vandalism activities have been concentrated around Warri South-West, Burutu, and Ughelli South, while parts of Akwa Ibom and Ondo States have recorded comparatively lower but notable incidents. These spatial variations suggest that pipeline vandalism is not uniformly distributed across the Niger Delta but is concentrated along major transportation corridors, creeks, and areas with extensive illegal refining activities (Nigeria Extractive Industries Transparency Initiative [NEITI], 2022; International Crisis Group, 2021).

A notable trend during the study period was the expansion of artisanal refining activities. The proliferation of illegal refineries created a strong demand for stolen crude oil, thereby increasing attacks on pipelines and wellheads (Chibor, Daniel & Egobueze, 2026; Daniel & Egobueze, 2026). In 2022, Nigerian authorities reportedly discovered over 1,000 illegal refining sites across the Niger Delta, many of which were linked to organised crude oil theft syndicates. The growth of these informal petroleum economies transformed pipeline vandalism from isolated acts of sabotage into a complex and organised criminal enterprise involving local actors, security collaborators, transport networks, and transnational criminal interests (UNDP, 2022; Obi & Rustad, 2019).

The geographical pattern of vandalism also reflects the influence of environmental and infrastructural factors. Pipelines located in remote creeks, mangrove forests, and difficult-to-access terrains tend to experience higher rates of vandalism due to weak surveillance and limited state presence. Conversely, pipelines located closer to urban centres and heavily monitored facilities often record fewer incidents. This uneven spatial distribution underscores the importance of geographic and environmental conditions in shaping the occurrence of pipeline vandalism within the region (Aghalino, 2019; Ikelegbe, 2021).

Government responses during the period under review included military deployments, pipeline surveillance contracts, technological monitoring systems, and regulatory reforms. The enactment of the Petroleum Industry Act in 2021 introduced provisions intended to improve host community participation and reduce conflicts around oil infrastructure. Similarly, surveillance contracts awarded to private security operators and community stakeholders contributed to temporary reductions in some pipeline attacks. Nevertheless, recurring discoveries of illegal connections and refining camps indicate that vandalism remained widespread throughout the study period (NEITI, 2022; NNPC Ltd., 2023).

The persistence of pipeline vandalism has generated significant economic and environmental consequences. NEITI estimated that Nigeria lost billions of dollars annually through crude oil theft and pipeline sabotage. In addition to economic losses, pipeline vandalism has contributed to extensive oil spills, destruction of farmlands, contamination of rivers and fishing grounds, and ecological degradation across many Niger Delta communities (UNEP, 2011; Amnesty International, 2018). These consequences have further complicated efforts to achieve sustainable development and environmental restoration within the region.

Understanding the patterns, trends, and spatial distribution of crude oil pipeline vandalism is therefore essential for explaining the changing dynamics of insecurity in the Niger Delta. Examining where incidents occur, how they evolve over time, and the factors influencing their geographical concentration provides critical insights into the nature of oil-related conflicts and criminal activities in the region. Such understanding is necessary for designing targeted interventions aimed at protecting critical infrastructure, reducing crude oil theft, and promoting sustainable peace and development in the Niger Delta.

Based on the foregoing, this study seeks to answer the following research question: What are the patterns, trends, and spatial distribution of crude oil pipeline vandalism in the Niger Delta between 2015 and 2025?

Theoretical Framework: Relative Deprivation (Grievance) Theory

This study is anchored on the Relative Deprivation Theory, popularly known in contemporary conflict literature as Grievance Theory. The theory is principally associated with the work of Ted Robert Gurr, whose seminal book *Why Men Rebel* (1970) remains one of the most influential explanations of political violence, collective action, and conflict. Relative Deprivation Theory argues that conflict emerges when there is a perceived gap between what individuals or groups believe they are entitled to (value expectations) and what they are actually able to obtain (value capabilities) (Gurr, 1970).

The intellectual roots of the theory can be traced to the pioneering work of Stouffer et al. (1949), who demonstrated that dissatisfaction often arises from comparative expectations rather than objective conditions. Runciman (1966) subsequently expanded the concept by distinguishing between egoistic deprivation, which relates to individual perceptions of disadvantage, and fraternalistic deprivation, which concerns group-based perceptions of injustice and is more likely to generate collective action. Building on these foundations, Gurr (1970) argued that persistent discrepancies between expectations and capabilities generate frustration, which may ultimately manifest in aggression, protest, sabotage, rebellion, or other forms of conflict behaviour.

According to Gurr (1970), relative deprivation occurs when people perceive that they are denied benefits, opportunities, or conditions of life that they believe they deserve. The greater the gap between expectations and realities, the stronger the grievances and the greater the likelihood of conflict. Thus, violence does not necessarily arise from absolute poverty but from perceptions of injustice, exclusion, and unequal access to resources and opportunities.

The relevance of Relative Deprivation Theory to the study of crude oil pipeline vandalism in the Niger Delta lies in its ability to explain why oil-producing communities frequently become hotspots of attacks on petroleum infrastructure despite hosting the resource that generates much of Nigeria's wealth. The Niger Delta accounts for over 90 percent of Nigeria's crude oil production and export earnings, yet many communities continue to experience poor infrastructure, environmental degradation, unemployment, poverty, and inadequate social services (Obi, 2010; Watts, 2008). This contradiction between the enormous wealth generated from crude oil and the persistent underdevelopment of host communities creates conditions of relative deprivation.

The theory provides an important explanation for the spatial distribution of pipeline vandalism across the Niger Delta. Pipeline vandalism is not randomly distributed throughout the region. Rather, incidents tend to cluster in areas where grievances associated with environmental degradation, perceived marginalisation, and economic exclusion are most pronounced. Empirical evidence shows that Rivers, Bayelsa, and Delta States consistently record the highest incidence of pipeline vandalism and crude oil theft in Nigeria. According to reports by the Nigerian National Petroleum Company Limited (NNPCL), Rivers State accounted for the largest proportion of illegal pipeline connections discovered between 2022 and 2024, followed by Bayelsa and Delta States (NNPCL, 2023; NNPCL, 2024). These states also host some of the most environmentally impacted oil-producing communities in the country.

Relative Deprivation Theory also helps explain the temporal trends observed in pipeline vandalism between 2015 and 2025. During the early years of the study period, particularly between 2015 and 2018, pipeline attacks were largely associated with militant groups such as the Niger Delta Avengers, which justified their actions on grounds of resource control, environmental justice, and perceived neglect of the region. The group's attacks on major oil installations in 2016 significantly reduced Nigeria's crude oil production from approximately 2.2 million barrels per day to about 1.4 million barrels per day (International Crisis Group, 2018; Obi, 2020). The grievances articulated by these groups reflected the core assumptions of Relative Deprivation Theory: communities believed that they bore the environmental costs of oil production without receiving commensurate developmental benefits.

The theory equally explains the changing pattern of pipeline vandalism observed after the decline of organised militancy. From 2019 onwards, pipeline vandalism increasingly became associated with crude oil theft syndicates, artisanal refining operators, and local criminal networks. Although economic motivations became more pronounced, grievances remained an important underlying factor. Many participants in illegal refining and pipeline vandalism activities continued to justify their actions as responses to unemployment, exclusion from oil-sector opportunities, and dissatisfaction with government development initiatives (Ikelegbe & Umukoro, 2016; Obi & Rustad, 2019). Thus, the shift from militant sabotage to economically driven vandalism does not invalidate the theory; rather, it demonstrates how unresolved grievances can evolve into alternative forms of illegal economic activity.

Environmental degradation further reinforces relative deprivation within the Niger Delta. Decades of oil spills, gas flaring, and ecosystem destruction have undermined traditional livelihoods such as fishing and farming. The landmark assessment conducted by the United Nations Environment Programme in Ogoniland documented extensive environmental contamination and highlighted the severe impact of oil pollution on local livelihoods (UNEP, 2011). Communities affected by such environmental damage often perceive that while multinational oil companies and the Nigerian state benefit from oil extraction, local populations bear the costs. This perception of injustice contributes to recurring attacks on oil infrastructure and helps explain why certain pipeline corridors remain persistent hotspots of vandalism.

The theory is particularly useful in explaining the geographical concentration of pipeline vandalism. Pipeline corridors located in areas such as Ogba/Egbema/Ndoni, Emohua, Ahoada West, Degema, Southern Ijaw, Ekeremor, Nembe, Burutu, and Warri South-West have repeatedly recorded incidents of vandalism and illegal refining activities. Relative Deprivation Theory suggests that these patterns are linked to local perceptions of exclusion, environmental neglect, and unequal distribution of oil benefits. Consequently, areas experiencing greater levels of perceived deprivation are more likely to become centres of pipeline sabotage and crude oil theft.

A major strength of the theory is its ability to explain why vandalism persists despite numerous government interventions. Programmes such as the Presidential Amnesty Programme, the Host Community Development provisions of the Petroleum Industry Act (2021), and various corporate social responsibility initiatives were intended to reduce tensions in the Niger Delta. However, where such interventions are perceived as inadequate, unevenly distributed, or captured by local elites, feelings of deprivation may persist or even intensify (Stewart, Brown, & Mancini, 2005). This helps explain why pipeline vandalism has continued in many communities despite substantial investments in security and development programmes.

Despite its explanatory value, Relative Deprivation Theory has attracted criticism. Scholars such as Collier and Hoeffler (2004) argue that grievances alone cannot fully explain resource conflicts because economic incentives and opportunities often influence participation in violence. In the context of pipeline vandalism, substantial profits generated from crude oil theft and artisanal refining suggest that economic motivations also play a role. Similarly, critics contend that the theory does not adequately explain why some deprived communities remain peaceful while others engage in violence. Factors such as leadership, access to illegal markets, state capacity, and criminal networks may influence whether grievances translate into vandalism (Collier et al., 2009).

Notwithstanding these criticisms, Relative Deprivation Theory remains highly relevant to the present study. The theory provides a useful framework for understanding why crude oil pipeline vandalism occurs repeatedly in particular locations, why incidents fluctuate over time, and why some communities become persistent hotspots of vandalism. By focusing on perceptions of exclusion, environmental injustice, and unequal access to the benefits of oil wealth, the theory offers important insights into the patterns, trends, and spatial distribution of crude oil pipeline vandalism in the Niger Delta between 2015 and 2025. It therefore serves as an appropriate analytical lens for examining the underlying grievances that shape the geography and persistence of pipeline vandalism across the region.

METHODOLOGY

This study adopted a mixed-methods research design, integrating quantitative and qualitative approaches to examine the patterns, trends, and spatial distribution of crude oil pipeline vandalism in the Niger Delta, Nigeria, between 2015 and 2025. The mixed-methods approach was considered appropriate because it combined statistical evidence on the occurrence and geographical concentration of pipeline vandalism with qualitative insights from affected communities and key stakeholders.

The population of the study comprised residents of oil-bearing communities in Rivers, Bayelsa, and Delta States, which host extensive crude oil pipeline networks and have consistently recorded high incidences of pipeline vandalism, crude oil theft, and illegal refining activities. To ensure adequate representation, the study focused on nine Local Government Areas (LGAs), comprising three LGAs from each state. In Rivers State, the selected LGAs were Ogba/Egbema/Ndoni, Ahoada West, and Eleme. In Bayelsa State, Southern Ijaw, Brass, and Nembe LGAs were selected, while Warri South-West, Ughelli North, and Ndokwa East LGAs were selected from Delta State. These areas host major pipeline corridors operated by companies such as TotalEnergies EP Nigeria, Chevron Nigeria Limited, Oando PLC, NNPC Limited, and Renaissance Africa Energy Company Limited.

The sample size was determined using the Krejcie and Morgan (1970) formula. A sample size of 383 respondents was considered adequate at a 95% confidence level and 5% margin of error. However, 400 questionnaires were administered to accommodate possible non-response and incomplete returns.

A multi-stage sampling technique was adopted. Purposive sampling was used to select the three states and nine LGAs due to their history of recurrent pipeline vandalism. Stratified sampling was then employed to ensure representation of key stakeholder groups, including community residents, youths, farmers, fishermen, community leaders, security personnel, local government officials, and oil company representatives. Simple random sampling was subsequently used to select respondents within each stratum.

Primary data were collected through structured questionnaires and key informant interviews, while secondary data were obtained from reports of the Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA), NNPC Limited, Nigeria Extractive Industries Transparency Initiative (NEITI), academic publications, and security reports. Quantitative data were analysed using descriptive statistics, while qualitative data were analysed through thematic content analysis.

DATA PRESENTATION

Table 1: Gender Distribution of Respondents

Gender	Frequency	Percentage (%)
Male	221	59.7
Female	149	40.3
Total	370	100.0

Source: Field Survey, 2026

Table 1 shows that 59.7% of the respondents were male, while 40.3% were female. The dominance of male respondents reflects the demographic composition of many oil-producing communities where men are more actively engaged in occupations and community activities associated with oil infrastructure and pipeline surveillance. The inclusion of both male and female respondents provided diverse perspectives on the occurrence and distribution of pipeline vandalism across the study area.

Table 2: Age Distribution of Respondents

Age Range (Years)	Frequency	Percentage (%)
18–25	56	15.1
26–35	112	30.3
36–45	95	25.7
46–55	71	19.2
56 and above	36	9.7
Total	**370**	**100.0**

Source: Field Survey, 2026

The results indicate that the largest proportion of respondents (30.3%) were aged 26–35 years. Combined with those aged 36–45 years (25.7%), over half of the respondents were within the economically active population. This category is particularly important because they are more familiar with oil-related activities and the changing patterns of pipeline vandalism within their communities between 2015 and 2025.

Table 3: Educational Qualification of Respondents

Educational Level	Frequency	Percentage (%)
No Formal Education	21	5.7
Primary Education	48	13.0
Secondary Education	136	36.8
Tertiary Education	165	44.6
Total	**370**	**100.0**

Source: Field Survey, 2026

The table reveals that 44.6% of respondents possessed tertiary education, while 36.8% had secondary education. This indicates that the majority of respondents had sufficient educational background to understand and provide informed responses regarding the occurrence, trends, and geographical spread of pipeline vandalism in the Niger Delta.

Table 4: Occupation of Respondents

Occupation	Frequency	Percentage (%)
Civil Servant	68	18.4
Fisherman/Farmer	97	26.2
Trader/Business	82	22.2
Artisan	64	17.3
Unemployed/Student	59	15.9
Total	**370**	**100.0**

Source: Field Survey, 2026

The results show that fishermen/farmers constituted the largest occupational group (26.2%), followed by traders (22.2%). These categories are strategically important because they reside close to pipeline routes and are often among the first to observe incidents of pipeline vandalism, oil theft, and illegal refining activities within their localities.

Table 5: Duration of Residence in the Community

Years of Residence	Frequency	Percentage (%)
Below 5 Years	44	11.9
6–10 Years	89	24.1
11–15 Years	121	32.7
16 Years and Above	116	31.4
Total	**370**	**100.0**

Source: Field Survey, 2026

The findings indicate that 64.1% of respondents had lived in their communities for more than ten years. Their long-term residence provides valuable knowledge of recurring pipeline vandalism incidents, changing trends, emerging hotspots, and the geographical distribution of vandalism activities within the study area between 2015 and 2025.

Summary of Respondents' Demographic Characteristics

Overall, the demographic profile shows that respondents were predominantly male, economically active, relatively educated, and long-term residents of oil-producing communities. These characteristics enhance the reliability of the data because the respondents possess adequate knowledge and experience regarding the patterns, trends, and spatial distribution of crude oil pipeline vandalism across the Niger Delta.

Evidence of Interview and Presentation of Interview Data

Field interviews were conducted to obtain qualitative information on the occurrence, trends, hotspots, and geographical distribution of crude oil pipeline vandalism in the Niger Delta between 2015 and 2025. Participants were purposively selected from stakeholder groups with direct knowledge of pipeline infrastructure and vandalism activities.

Table 6: Categories of Interview Respondents

Respondent Code	Category of Respondent	Location	Date
CL1	Community Leader	Rivers State	November 2025
YL1	Youth Leader	Rivers State	November 2025
SO1	Security Officer	Rivers State	November 2025
OC1	Oil Company Official	Port Harcourt	November 2025
EA1	Environmental Activist	Bayelsa State	October 2025
CL2	Community Leader	Delta State	September 2025
YL2	Youth Representative	Bayelsa State	October 2025
SO2	Security Personnel	Rivers State	November 2025
OC2	Oil Company Official	Delta State	September 2025
EA2	Environmental Advocate	Bayelsa State	October 2025

The interviews generated qualitative evidence on major pipeline vandalism hotspots, temporal variations in incidents, emerging trends in crude oil theft and illegal refining, and factors influencing the concentration of vandalism activities in specific communities and pipeline corridors across Rivers, Bayelsa, and Delta States. The responses were subsequently analysed thematically in line with the research questions of the study.

4.2 DATA ANALYSIS

Data collected from the field were analyzed using percentages and Weighted Mean Scores (WMS) based on a 4-point modified Likert scale. Responses were weighted as follows: Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1.

Decision Rule

2.50 – 4.00 = Accepted

1.00 – 2.49 = Rejected

A total of 400 questionnaires were administered across selected oil-bearing communities in Rivers, Bayelsa, and Delta States. Of this number, 383 questionnaires were properly completed and returned, representing a response rate of 95.8%. The responses were analyzed in line with the research question.

Research Question One

What are the patterns, trends, and spatial distribution of crude oil pipeline vandalism in the Niger Delta between 2015 and 2025?

Table 7: Patterns, Trends, and Spatial Distribution of Crude Oil Pipeline Vandalism in the Niger Delta (2015–2025)

Item	SA	A	D	SD	Σfx	WMS	Decision
Certain pipeline corridors experience recurrent vandalism incidents	171	140	45	27	1,221	3.19	Accepted
Incidents of pipeline vandalism increased in several communities between 2015 and 2025	175	138	44	26	1,228	3.21	Accepted
Pipeline vandalism is concentrated in specific LGAs and oil-producing communities	169	142	48	24	1,222	3.19	Accepted
Illegal refining activities have contributed to the expansion of vandalism hotspots	180	136	41	26	1,236	3.23	Accepted
Riverine and difficult-to-access locations record higher incidences of vandalism	186	132	40	25	1,251	3.27	Accepted
Rivers State records more pipeline vandalism incidents than most Niger Delta states	174	144	42	23	1,235	3.22	Accepted

Source: Fieldwork Survey and Interviews, 2026 (N = 383)

Grand Mean = 3.22 (Accepted)

Interpretation of Findings

Table 7 reveals a strong consensus among respondents that crude oil pipeline vandalism in the Niger Delta follows identifiable patterns, trends, and geographical concentrations. The grand mean score of 3.22 exceeds the benchmark of 2.50, indicating general agreement with all the statements presented.

The highest mean score (3.27) was recorded for the statement that riverine and difficult-to-access locations experience higher incidences of vandalism. This suggests that geographical characteristics significantly influence the spatial distribution of pipeline vandalism. Respondents from Southern Ijaw, Nembe, Brass, Ogba/Egbema/Ndoni, and Warri South-West identified creeks, swamps, and remote pipeline routes as major hotspots for illegal tapping and crude oil theft.

The finding that illegal refining activities have contributed to the expansion of vandalism hotspots (mean = 3.23) indicates that artisanal refining has become a major driver of pipeline breaches during the study period. Interview participants observed that the proliferation of illegal refining camps has increased demand for stolen crude oil, thereby expanding vandalism activities across several communities.

Respondents also agreed that Rivers State records more pipeline vandalism incidents than most states in the region (mean = 3.22). This perception corresponds with reports from petroleum regulatory agencies and industry operators, which frequently identify Rivers State as a major hotspot of crude oil theft and pipeline breaches.

The mean scores for recurrent attacks on specific pipeline corridors (3.19) and concentration of incidents in particular LGAs and communities (3.19) further indicate that pipeline vandalism is not randomly

distributed. Rather, incidents tend to cluster around established oil-producing areas and major trunk pipeline routes in Rivers, Bayelsa, and Delta States.

Overall, the findings demonstrate that crude oil pipeline vandalism in the Niger Delta between 2015 and 2025 exhibits clear temporal trends and spatial patterns characterized by recurring hotspots, concentration along major pipeline corridors, increasing involvement of illegal refining networks, and greater incidence in riverine and difficult-to-monitor locations.

DISCUSSION OF FINDINGS

Patterns, Trends, and Spatial Distribution of Crude Oil Pipeline Vandalism in the Niger Delta (2015–2025)

The findings of this study revealed that crude oil pipeline vandalism remains a persistent, organised, and spatially concentrated phenomenon across the Niger Delta. Analysis of questionnaire responses, interview data, and documentary evidence indicates that incidents of pipeline vandalism are not randomly distributed but are concentrated along major oil-producing corridors in Rivers, Bayelsa, and Delta States. The study found that riverine communities, remote creeks, and areas traversed by major trunk pipelines experience the highest incidence of vandalism. The grand mean score of 3.22 confirms respondents' strong agreement that pipeline vandalism follows identifiable patterns and trends within the region.

The finding that riverine and difficult-to-access locations record higher incidences of vandalism supports existing empirical evidence. Reports by the Nigerian National Petroleum Company Limited (NNPCL) and the Nigeria Extractive Industries Transparency Initiative (NEITI) consistently identify Rivers, Bayelsa, and Delta States as major hotspots of crude oil theft and pipeline sabotage (NEITI, 2022; NNPCL, 2023). Communities such as Ogba/Egbema/Ndoni, Ahoada West, Southern Ijaw, Nembe, Brass, Warri South-West, and Ndokwa East were repeatedly identified by respondents as locations where pipeline breaches occur frequently due to extensive pipeline networks, swampy terrain, and limited surveillance capacity.

This finding was corroborated by a community leader who stated:

> "Most pipeline vandalism incidents occur in areas where pipelines pass through isolated creeks and forests. These locations make it easier for vandals to operate without being easily detected" (Chima, Personal Interview, November 2025).

The respondent's observation supports studies by Obi and Rustad (2019) and Watts (2008), which argue that the physical geography of the Niger Delta provides favourable conditions for illegal oil activities. The extensive mangrove forests, creeks, and waterways often limit access by security personnel and facilitate the concealment of illegal refining camps and crude oil transportation routes.

The study further revealed a significant shift in the trend of pipeline vandalism during the period under review. While pipeline attacks before and around 2015 were largely associated with militant agitation and resource-control struggles, recent incidents increasingly reflect economically motivated crude oil theft and artisanal refining activities. This finding aligns with the observations of Obi (2020), who noted that the post-amnesty era witnessed a transition from politically motivated militancy to criminalised oil theft networks driven by economic incentives.

An oil company official interviewed during the study observed:

> "Between 2018 and now, we have seen more frequent cases of pipeline sabotage compared to earlier years. The operations are becoming more organized" (A. Mboh, Personal Interview, November 2025).

The increasing organisation of pipeline vandalism suggests the emergence of sophisticated criminal networks possessing technical knowledge of oil infrastructure. This finding supports the position of the International Crisis Group (2021), which reported that crude oil theft in the Niger Delta has evolved into a highly organised illicit economy involving local actors, criminal syndicates, and transnational networks. The proliferation of illegal refining camps across Rivers, Bayelsa, and Delta States further demonstrates the growing complexity of pipeline vandalism activities.

The study also found that pipeline vandalism exhibits clear spatial clustering. Respondents agreed that incidents are concentrated in specific local government areas and communities rather than being evenly

distributed across the Niger Delta. Areas hosting major export pipelines, flow stations, and oil facilities recorded higher levels of vandalism. This finding corresponds with NNPCL reports documenting repeated discoveries of illegal pipeline connections in Rivers, Bayelsa, and Delta States between 2022 and 2024 (NNPCL, 2023).

A youth leader interviewed during the study remarked:

> "Most of the places where pipeline vandalism occurs are communities where young people have no jobs or economic opportunities" (R. Andrew, Personal Interview, November 2025).

This observation reinforces the assumptions of Relative Deprivation Theory, which posits that conflict emerges when there is a perceived gap between societal expectations and actual opportunities (Gurr, 1970). In many oil-producing communities, the coexistence of immense oil wealth and widespread poverty generates feelings of exclusion and marginalisation. Such conditions create an enabling environment for participation in crude oil theft and pipeline vandalism (Ikelegbe & Umukoro, 2016).

Another important finding concerns the vulnerability of ageing pipeline infrastructure. A security officer interviewed during the fieldwork noted:

> "Many sabotage incidents occur along older pipelines because they are easier to tamper with and sometimes poorly monitored" (Zee, Personal Interview, November 2025).

This finding suggests that infrastructural factors contribute significantly to the spatial distribution of vandalism. Older pipelines often lack modern monitoring technologies and are more susceptible to illegal tapping. Similar observations have been made by Akinwale (2020), who identified weak surveillance systems and ageing oil infrastructure as major contributors to pipeline breaches in the Niger Delta.

Overall, the findings demonstrate that crude oil pipeline vandalism in the Niger Delta between 2015 and 2025 is characterised by identifiable spatial concentrations, recurring hotspots, increasing operational sophistication, and a transition from militant-driven sabotage to economically motivated crude oil theft. The results support the propositions of Relative Deprivation Theory by showing that geographical vulnerability, economic incentives, infrastructural weaknesses, and perceived marginalisation collectively shape the patterns and trends of pipeline vandalism across the region.

CONCLUSION

This study examined the patterns, trends, and spatial distribution of crude oil pipeline vandalism in the Niger Delta, Nigeria, between 2015 and 2025. The findings revealed that pipeline vandalism remains a persistent security and economic challenge across the region, with incidents concentrated in specific oil-producing communities and major pipeline corridors in Rivers, Bayelsa, and Delta States. The study established that pipeline vandalism is not randomly distributed but exhibits identifiable spatial patterns, particularly in riverine and difficult-to-access locations where surveillance and enforcement are constrained.

The study further found that the nature of pipeline vandalism has evolved over time. While earlier incidents were largely associated with militant agitation and resource-control struggles, recent trends indicate increasing involvement of organised crude oil theft networks and artisanal refining operators. This transformation has contributed to the emergence of recurring vandalism hotspots and a more sophisticated pattern of illegal activities targeting oil infrastructure.

The findings also showed that geographical terrain, ageing pipeline infrastructure, weak monitoring systems, and socio-economic conditions within host communities contribute significantly to the concentration and persistence of pipeline vandalism. In addition, the study confirmed that communities experiencing high levels of unemployment and limited economic opportunities tend to record higher incidences of vandalism, lending support to the assumptions of Relative Deprivation Theory.

Overall, the study concludes that crude oil pipeline vandalism in the Niger Delta is a multidimensional problem shaped by spatial, infrastructural, economic, and governance factors. Addressing the challenge therefore requires a combination of technological, institutional, and community-based interventions capable of reducing vulnerabilities along pipeline corridors while simultaneously addressing the conditions that sustain illegal oil-related activities.

RECOMMENDATIONS

Deployment of Advanced Pipeline Surveillance Technologies: Government agencies and oil companies should deploy modern surveillance technologies such as drones, satellite monitoring systems, fibre-optic sensors, and real-time leak detection systems along major pipeline corridors. Priority should be given to riverine and remote locations identified as recurring vandalism hotspots.

Replacement and Rehabilitation of Ageing Pipeline Infrastructure: Oil companies should undertake systematic replacement, rehabilitation, and modernization of ageing pipelines that are highly vulnerable to sabotage. Upgrading pipeline infrastructure with automated monitoring systems will reduce opportunities for illegal tapping and improve rapid detection of breaches.

Strengthening Community-Based Pipeline Protection Mechanisms: Security agencies, oil companies, and host communities should establish collaborative pipeline protection frameworks involving community surveillance teams, traditional institutions, and local stakeholders. Such partnerships would improve intelligence gathering and increase local participation in safeguarding critical oil infrastructure.

Expansion of Sustainable Livelihood and Youth Employment Programmes: Federal and state governments should implement targeted employment, vocational training, entrepreneurship, and skills acquisition programmes in oil-producing communities. Providing alternative sources of income for youths will reduce dependence on illegal oil activities and diminish the recruitment base for pipeline vandalism networks.

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