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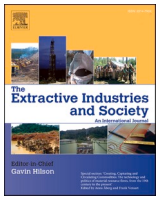

Original article

Geo—narratives: Mapping local perspectives on the socio-ecological realities of extractivism in the Niger Delta

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ABSTRACT

This article examines the socio-ecological impacts of oil and gas activities in four communities in the Niger Delta using a political ecology lens and environmental justice perspective. Drawing on participatory mapping, focus group discussions, and key informant interviews, the study reveals that community exposure to extractive infrastructure is both spatial and structural—defined not just by proximity to pipelines and facilities but also by systemic neglect, weak governance, and infrastructural deficits. The concept of "structural exposure" is introduced to explain how absence of services (e.g., roads, hospitals, potable water) amplifies harm in affected communities, while the idea of "exposure displacement" captures how ecological pressure migrates when resource users are pushed into contested or degraded areas. These dynamics deepen environmental and livelihood vulnerabilities and are often mediated by institutional inaction.

Findings highlight a range of community impacts—environmental degradation, cultural erosion, psychological stress, and socio-political disempowerment—as well as coping strategies such as artisanal refining, self-medication, and overexploitation of non-oil resources. These responses, while pragmatic, are often maladaptive, reinforcing cycles of vulnerability in the absence of state or corporate support. The analysis shows that harm is not evenly distributed but shaped by differentiated access to institutional protection, reinforcing patterns of environmental injustice. By linking these lived experiences to broader policy and governance failures, this article offers a grounded empirical base for subsequent governance and actor-network analysis and contributes to global debates on extractivism, vulnerability, and environmental justice.

1. Introduction

Environmental degradation and social inequity in Nigeria's Niger Delta are not new concerns, but most explanations remain framed through institutional or policy lenses rather than the lived realities of affected people. This study turns to community voices to reveal how residents interpret, experience, and respond to the socio-ecological disruptions of oil extraction. The Niger Delta's exceptional ecological richness, cultural diversity, and deeply entrenched extractive economy create the structural context within which these experiences unfold.

Extractivism, understood as the large-scale removal of natural resources for export that privileges external markets over local well-being, often generates severe environmental and social costs (Acosta, 2013; UNDP, 2011; Bednik, 2019). In the Niger Delta, both international oil companies and the Nigerian state sustain this dynamic, producing what scholars describe as ecologically unequal exchange—a concentration of environmental burdens at sites of production alongside the outward flow of benefits to political and economic centres of power (Hornborg and Martinez-Alier, 2016; Infante-Amate et al., 2022). The region's biodiversity hotspot status also exemplifies how extractivism disproportionately harms ecologically sensitive and politically marginalised communities, intensifying environmental injustice (Schlosberg, 2007; Bullard, 1993).

Globally, oil and gas development has reshaped landscapes and societies while driving economic growth, frequently producing environmental degradation, social unrest, and deepening inequality (Smith, 2015; Martínez-Alier et al., 2010). These global contradictions are mirrored in the Niger Delta, where the dense infrastructural footprint of

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extraction cuts through settlements and ecosystems, creating persistent socio-ecological risk. Regulatory and institutional responses have been inconsistent or weakly enforced (Frynas, 2000; UNEP, 2011), exemplified by protracted delays in implementing the UNEP Ogoniland recommendations and limited enforcement capacity within agencies such as National Oil Spill Detection and Response Agency (NOSDRA).

Although substantial research documents the environmental, social, and livelihood impacts of extractivism in the Niger Delta, relatively few studies explore how these domains intersect or are experienced differently across communities and social groups. Notable contributions—such as Pegg and Zabbey (2013) on livelihood loss following the Bodo oil spills, (Nwozor, 2020) on depoliticised remediation, Nwaichi and Osuoha (2022) on weak enforcement of pollution-control policy, Babatunde (2020) on food-security impacts, and (Adedayo et al., 2020) on the links between ecological degradation, communal conflict, and vandalism—have deepened understanding of the region's governance failures. Yet a nuanced appreciation of how governance shapes community perceptions of impact and influences collective responses remains limited (Bebbington and Bury, 2013). Building on and extending these works, this article integrates political-ecology and environmental-justice perspectives with participatory geo-narratives to reveal how governance structures mediate everyday exposure and community response in oil-affected communities.

This paper forms part of a broader research programme that operationalises a re-imagined version of (Blaikie and Brookfield, 1987) Chain of Explanation as a multi-scalar analytical framework for environmental governance in extractive regions. While the wider study extends across policy and institutional analysis, this paper focuses on the first component of the chain (Boxes A–D), examining community-level processes of exposure, impact, and response as foundational to understanding higher-order governance and regulatory dynamics. The subsequent papers in this series apply the remaining stages of the re-imagined chain to analyse policy coherence and actor-network governance in the Niger Delta.

The article pursues two objectives:

1. to understand the extent and nature of community exposure to oil-and-gas activities in four Niger Delta communities; and
2. to examine the socio-environmental impacts and community responses, highlighting how oil-industry presence shapes human–environment interactions.

The analysis combines participatory geo-narratives (focus groups and key-informant interviews) with exposure mapping in ArcGIS Pro to connect lived experience with spatial risk. Conceptually, it is grounded in the complementary frameworks of political ecology (Blaikie and Brookfield, 1987) and environmental justice (Schlosberg, 2007; Walker, 2012), which together illuminate how power, governance, and inequality shape ecological outcomes and community responses.

1.1. Political ecology and environmental justice

A political-ecology perspective is invaluable for understanding both how economic and political processes drive the exploitation of natural resources and how this exploitation, in turn, shapes political, social, and economic dynamics (Swyngedouw and Heynen, 2003). Emerging in the 1980s as an interdisciplinary field, political ecology applies the concepts and methods of political economy to analyse environmental issues. A core principle is that ecological change cannot be fully understood without considering the political and economic structures and institutions in which it is embedded (Neumann, 2009).

Environmental justice, as a theoretical concept, originated in the United States to highlight how polluting industries and activities were systematically located in African-American and low-income communities (Bullard, 2018). Over the decades, the concept has expanded to incorporate decolonial and intersectional perspectives that foreground non-Western experiences of environmental injustice (Álvarez et al., 2020). Building on Kimberlé Crenshaw's intersectional framework (Crenshaw et al., 2017), David Pellow (2016) proposed a *critical environmental-justice* perspective that broadens the analysis beyond race to include gender, ethnicity, and other intersecting identities that shape exposure and vulnerability.

To sustain and increase energy flows into the global economy, extraction frontiers inevitably expand, extending the negative consequences of extractive practices. Environmental-distribution conflicts frequently emerge wherever these frontiers advance and extraction intensifies (Temper et al., 2015). Globally, this condition is often described as extractivism—a term originating in Latin America that referred to the plundering of the continent's natural resources and, by extension, those of other formerly colonised regions in the Global South. It captures the notion that these resources, exploited by foreign powers and corporations, rarely benefit the countries that bear the environmental and human costs of extraction (Bednik, 2019). Extractivism is thus both a product and a prerequisite for the continuation of colonial power dynamics between peripheral and core societies (Chagnon et al., 2022).

In biophysical terms, such asymmetric relationships have been theorised as ecologically unequal exchange (Hornborg et al., 2016; Infante-Amate, 2022), which describes the unequal net flow of biophysical resources from poorer to richer countries. Fossil fuels remain central to the industrial economy that extracts energy from peripheral regions to concentrate it in economic cores. Between 1990 and 2015, Hickel et al. (2022) estimated that the Global North drained 650 EJ of energy from the Global South—about 11 percent of the North's total consumption. Oil and gas therefore facilitate these asymmetric ecological relationships, intersecting with colonial and socio-economic injustices. Through the unequal distribution of environmental burdens in extraction, transport, and processing zones—and the concentration of energy use in consumption zones—oil and gas both embody and perpetuate colonial relationships and deepen global inequalities. In this sense, fossil-fuel extractivism is intrinsically linked to environmental-justice and decolonial debates.

1.2. The case of the Niger Delta

The Niger Delta (Fig. 1) is recognised as a critical biodiversity hotspot, encompassing coastal inland, freshwater, lowland rainforest, and the largest contiguous mangrove forest in Africa (Uwadiae et al., 2023). The region's ecological richness also exemplifies how extractivism disproportionately impacts ecologically sensitive and socio-politically marginalised areas, reinforcing the environmental-justice concerns outlined in Section 1.1. Culturally, the Delta is home to an estimated 31 million people (Twumasi and Merem, 2006) from more than 40 ethnic groups, most of whom depend directly on natural resources for their livelihoods.

Nigeria—currently the world's 15th-largest producer of hydrocarbons and sixth-largest exporter of liquefied natural gas (LNG)—is economically dependent on oil and gas production. The petroleum industry, concentrated mainly in the Niger Delta, contributes approximately 95 percent of export earnings and 62 percent of government revenue (Federal Government of Nigeria, 2017). The International Trade Administration ITA (2022) reported that in early 2022, Nigeria's average daily oil production of 1.49 million barrels per day accounted for 6.63 percent of total GDP. This economic dependence reflects the logic of ecologically unequal exchange introduced earlier—national prosperity is maintained through intensive extraction that externalises ecological costs to local communities who experience the greatest environmental burden.

However, this dependence has fostered a governance landscape in which regulatory oversight and environmental protection remain inadequate, compromising the well-being of oil-producing communities. The infrastructural footprint of extraction has produced significant risks to land and water systems. Frequent oil spills and gas flaring have caused

Fig. 1. Location of the four study local government areas within the nine Niger Delta states, Nigeria.

widespread contamination of waterways, mangroves, and farmlands—resources essential for local livelihoods (UNEP, 2011). According to the Nigerian Oil Spill Monitor, an average of about 1000 oil spills per year has occurred since 2006, releasing an estimated 801,000 barrels of crude oil into the environment (NOSDRA, 2023)—comparable in volume to the 1989 Exxon Valdez spill (≈ 780,000 barrels) and occurring on an annual basis, underscoring the Niger Delta's status as one of the world's most persistently contaminated oil frontiers.

Governance failures have repeatedly undermined remediation efforts. For example, the UNEP Ogoniland clean-up has faced long delays and limited implementation, while weak enforcement capacity within NOSDRA and overlapping mandates among agencies have hindered effective monitoring and accountability (Frynas, 2000; UNEP, 2011). These systemic weaknesses exacerbate socio-ecological vulnerabilities and entrench mistrust between communities, companies, and the state.

2. Methods

2.1. Case study selection

ArcGIS Pro was used to identify oil spill hotspots across the Niger Delta. Hotspots served as surrogate indicators of industry presence and impact intensity. The Getis–Ord Gi* tool (Getis and Ord, 1992), commonly applied in environmental-spatial studies (e.g., Wang et al., 2022), was used to determine statistically significant clusters of high values, indicating spill concentration.

$$G_i^*(d) = \sum_{j=1}^{n} W_{ij}(d)X_j \Big/ \sum_{j=1}^{n} X_j \quad (1)$$

In Eq. (1) Wij(d) represents as the impact of individual i on individual j in a specific area (the spatial weight between features i and j), with Xj being the attribute value at point j. The continued standardisation of Gi* leads to the subsequent formulation:

$$Z(G_i^*) = \left[G_i^* - E(G_i^*)\right] \Big/ \sqrt{Var(G_i^*)} \quad (2)$$

In Eq. (2), E(Gi*) and Var(Gi*) denote the expected value and variance matrices, respectively. Hotspot analysis evaluates relationships between each element and its neighbours. Positive Z-scores identify statistically significant "hot" clusters (high spill frequency and intensity), while negative values indicate "cold" areas (Guo and Liu, 2021).

This method directly addressed the study's core research gaps—by identifying where exposure to extraction activities spatially concentrates, it linked community-level experiences of harm to patterns of governance failure and uneven environmental management.

Hotspot results revealed four clusters of high spill frequency and volume, which corresponded to Bodo (Rivers State), Odidi (Delta State), Nembe (Bayelsa State), and Mkpanak/Ibeno (Akwa Ibom State). These were selected as representative case study communities (Fig. 1). Following previous studies (Elliott et al., 2018; Tran et al., 2020), a distance-based exposure model was applied using buffer zones of 0.5–1.0 km around oil infrastructure.

While no universal global standard exists for onshore oil-facility buffers, 500–1000 m thresholds are widely used as hazard-exposure proxies in energy-infrastructure studies (e.g., UK HSE ON54, India OISD-STD-118, Alberta Energy, 2023). These ranges approximate realistic daily exposure gradients for communities in close proximity to oil pipelines and flow stations. To reduce spatial bias, buffers were generated from verified infrastructure shapefiles, cross-checked against satellite imagery and participatory-mapping validation (see below).

2.2. Data collection

Participatory mapping was used to elicit community knowledge and perception of oil-related impacts. This cooperative approach engages stakeholders to produce spatially explicit information in data-poor regions (Makailipessy, Abrahamsz and Tubalawony, 2023). The method was particularly relevant to the Niger Delta, where official datasets are fragmented, and communities possess the most detailed knowledge of ecological change.

Fieldwork was conducted in May 2023. Two community representatives were initially consulted to identify potential participants. Recruitment prioritised residents with direct experience of oil-industry impacts and involvement in community responses, ensuring demographic diversity (age, gender, occupation). The final sample was theoretically justified by qualitative saturation principles—each focus group was conducted until no new codes or perspectives emerged across the four sites.

Four focus groups were conducted per community (elders, women, fishers, youth) and complemented by 2–3 key-informant interviews ($n = 10$ total). Snowball and purposive sampling yielded an initial pool of 160 candidates; purposeful screening based on experience and representativeness produced a final participant group of 72. Attendance varied (3–6 per group; median ≈ 5) due to work and weather constraints, but a quorum of ≥ 3 was maintained to ensure validity without participant fatigue.

Each session followed a structured discussion guide (see Supplementary material S1) designed to capture narratives of exposure, socio-environmental change, and community coping. High-resolution Google Maps basemaps (2023) were printed in A3 format for participatory mapping, where participants marked spill sites, livelihood assets, and community response areas. These maps were digitised in ArcGIS Pro (Esri, 2022) and verified through field walks, ensuring triangulation between local knowledge, spatial data, and direct observation.

Community landmarks (schools, markets, water bodies, religious centres) were overlaid with pipeline and well shapefiles. ArcGIS buffer tools delineated exposure zones (0–500 m; 500–1000 m) based on the precedents noted above. Thematic symbology categorised asset types and highlighted zones of cumulative exposure.

Qualitative and spatial data were triangulated to enhance credibility. Thematic analysis followed a hybrid inductive–deductive approach, using cross-coder review within the research team to enhance reliability. Codes and definitions are summarised in Supplementary Codebook S2. Integration of participatory mapping with coded narratives allowed the study to visualise how lived experiences of extractivism intersect with spatial risk.

Ethical approval was obtained from James Cook University, Australia (H8959). As a Nigerian environmental scientist with long-standing professional experience in the region, the principal researcher possessed contextual familiarity that supported rapport and accurate interpretation of field realities. Shared use of Pidgin English facilitated communication, while translators assisted for local dialects to ensure inclusivity and cultural respect.

Recognising that gendered and cultural power relations could shape participation, women-only focus groups were convened and supported by female note-takers. Reflexive practice was applied throughout to prevent institutional bias from the researcher's prior regulatory role. Participants provided informed consent, and anonymity was assured—particularly for those discussing sensitive or illicit activities. This integrated approach ensured both ethical rigour and methodological transparency.

3. Thematic findings and discussion

This study had two main objectives:

1. To understand the extent and nature of exposure to the oil and gas industry in select communities within the Niger Delta; and
2. To explore the socio-environmental impacts and community responses, with attention to how oil industry presence mediates human–environment interactions.

The subsections that follow are organised to answer RQ1 (extent and nature of exposure) through a comparative spatial description of the four communities, and RQ2 (socio-environmental impacts and community responses) through a structured synthesis of impacts and response strategies, explicitly linking the findings to governance conditions identified earlier. The findings revealed the multi-layered exposure profile of communities to oil and gas facilities, complex socio-ecological impacts and, often, maladaptive responses to these impacts. The following section discusses these findings in more detail and is structured in line with these objectives. We begin with a comparative description of the livelihood systems of case study communities.

3.1. Description of case study communities

The GIS mapping and hotspot analysis identified four case study communities significantly impacted by the oil and gas industry – Bodo, Nembe, Odidi, and Ibeno communities (Fig. 1). The data, derived from a combination of spatial data, focus groups and key informant interviews, reveals the comparative livelihoods and socio-ecological context of each community. Table 1 presents a comparative analysis of livelihood activities across Bodo, Nembe, Odidi, and Ibeno communities, highlighting prevalent economic activities and socio-cultural dimensions. Communities are described as significantly impacted where (i) spill hotspot clusters are statistically significant (Gi* $Z > 1.96$, $p < 0.05$), (ii) clusters intersect populated areas within 0–1000 m of oil infrastructure, and (iii) there is documented spill frequency and/or volume over the 2006–2023 period.

Fishing emerges as a universally high activity, underscoring the communities' reliance on local water bodies. While farming is notably less frequent across the board, trading activities show variability, being highly prevalent in Bodo and Ibeno, particularly among women. Public service and hospitality roles vary, with Nembe and Ibeno showing higher engagement than Bodo and Odidi. Hunting and wood gathering reflect local environmental interactions, especially in Nembe. Employment in the oil industry is generally low, except for a moderate presence in Ibeno, which, like the others, faces challenges such as high youth unemployment rates. These livelihood profiles situate RQ2 by indicating where environmental change is most likely to disrupt income and food security (e.g., fishing-dependent Bodo, Odidi, and Nembe; diversified but oil-exposed Ibeno). A more community-specific description is as

Table 1
Comparative description of livelihood systems in Bodo, Nembe, Odidi, and Mkpanak.

Livelihood Type	Description	Prevalence			
		Bodo	Nembe	Odidi	Ibeno
Fishing	Engaging in fishing activities in local water bodies	High	High	High	High
Farming	Subsistence crop cultivation and/or rearing livestock	High	Low	Low	Low
Trading	Selling goods or services, often in local markets but also fronts of houses, roadsides, local schools, and churches	High	High	Low	High
Hospitality and customer service	Running or working in local food stands and shops	Low	Low	Low	High
Public service	Working in government or public sector roles (mostly in local government office and state-owned schools)	Low	High	Low	High
Hunting	Hunting local wildlife for food or trade	Low	High	High	Low
Wood Gathering	Collecting wood for fuel or construction	Medium to low	High	High	Low
Employment in Oil Industry	Working in any capacity within the oil industry (usually as artisans, security personnel, and drivers)	Low	Low	Low	Medium
Others	Other miscellaneous livelihood activities	Low	Low	Low	High

Note. High/Medium/Low" reflect focus-group consensus within each community using group-level counts (4 groups per site: elders, women, fishers, youth): High = 3–4 groups reported, Medium = 2 groups, Low = 1 group. This qualitative scale avoids overstating precision while making the aggregation transparent. See Supplementary Codebook S2 for code definitions and prompts.

Table 2
Comparative spill incidence in the case-study communities (Nov 2006–Nov 2023)[1].

Community	Number of spills	Total spill volume (Barrels)	Average volume per spill (Barrels)
Bodo	121	10,321.0	85.2
Nembe	108	14,193.5	131.4
Odidi	46	6204.0	134.9
Ibeno	466	43,514.0	93.4

follows.

3.1.1. Bodo community

Bodo, located in Rivers State's Gokana area, comprises 39 villages with a population heavily reliant on fishing and farming for their subsistence (Table 1). Home to approximately 70,000 people, this community is characterised by its extensive mangrove forests and waterways, vital for fisheries and mangrove wood production. Bodo's cultural vibrancy is showcased through traditional festivals like Beko and Milgia, pivotal for maintaining local culture and social unity.

3.1.2. Nembe community

Nembe, located in Bayelsa State is a community with a significant population of approximately 195,000 people, primarily belonging to the Ijaw ethnic group. This local government area, comprising thirty-seven villages is marked by an extensive coastline and a network of rivers that significantly contribute to the local economy. With the majority of the populace engaged in fishing, farming, and hunting, Nembe has a deeply rooted connection with its natural environment. Sandwiched between two national forest reserves, Nembe's economic activities, particularly fishing and hunting, are not only a source of livelihood but also form a part of the cultural identity, with practices like boat making being a traditional craft in the area. The youth unemployment rate was reported to be high in focus group sessions, reflecting the socio-economic challenges faced by the younger population.

3.1.3. Odidi community

Odidi, one of a network of fishing settlements situated in the Warri Southwest Local Government Area of Delta State, is home to approximately 1700 people, predominantly from the Itsekiri ethnic group. The community, like Nembe, is also reported to be characterized by a high youth unemployment rate and faces significant socio-economic challenges. The economy of Odidi is primarily based on fishing, with the local water bodies rich in seafood. Participants in focus groups repeatedly mentioned sacred trees and shrines, indicating that Odidi has deep-rooted cultural and religious practices. Housing predominantly consists of stilt structures that are adapted to the riverine environment. Odidi's socio-ecological profile is further complicated by environmental challenges like flooding and erosion, adversely affecting farming and other land-based activities.

3.1.4. Mkpanak (Ibeno) community

Mkpanak, located in the Ibeno Local Government Area of Akwa Ibom State, is a vibrant community with a population of approximately 95,000, predominantly comprising the Efik-Ibibio-Andoni linguistic groups. This coastal community is situated just about 1 km from the Mobil Qua Iboe (export) Terminal, indicating its proximity to major oil activities. Like other communities, Mkpanak grapples with a reported high youth unemployment rate. Mkpanak's economy is significantly influenced by the presence of the oil industry, alongside traditional livelihood activities such as fishing, farming, and trade. The local economy benefits from the rich natural resources, including seafood from the rivers and tributaries and agricultural products like oil palm, cashew, and rubber.

3.2. Extent and nature of exposure to oil and gas activities

From November 2006 to November 2023, the Nigerian Oil Spill Monitor recorded 15,611 incidents totalling approximately 801,389 barrels of crude oil spilled. Notably, 3803 spills were not assessed by Joint Investigation Teams (JITs)—multi-stakeholder bodies typically comprising representatives of the oil company, government regulators, and affected communities tasked with investigating spill incidents. In addition, 5517 incidents had no officially recorded spill volumes, indicating substantial underreporting. Within this broader context, Table 2 presents a comparative profile of spill incidence in the case study communities:

The data reveal significant variation in both frequency and severity. While Ibeno recorded the highest number of spills (466), Nembe and Odidi exhibited the highest average spill volumes per incident—a critical indicator of long-term exposure intensity.

To move beyond abstract national statistics, exposure mapping, informed by qualitative data from local focus groups and key participant interviews, was conducted in ArcGIS Pro, integrating both physical proximity and socio-spatial risk. A key innovation in this study is the triangulation of three exposure domains: (1) spatial proximity to oil infrastructure, (2) community-nominated vulnerability zones, and (3)

structural exposure[2] linked to governance and service deficits. This three-pronged framing helps operationalize political ecology critiques of spatially embedded and institutionally reinforced harm.

Key social infrastructure along Bodo Road—schools, markets, and clinics—lies largely within the 0–1000 m pipeline buffers. Because these are daily-use spaces, proximity translates into routine exposure rather than rare incidents, shifting 'risk' from hypothetical to structural. The map shows the Trans-Niger pipeline running adjacent to Bodo Road, the town's main economic and social artery, with a gradient of risk extending from within 500 m of the pipeline outward. Youth and market women's focus groups identified this corridor as vital for trade and interaction yet highly vulnerable, citing recurrent contamination of markets, water bodies, and farms. Participants also emphasised that rivers and streams intersecting Bodo—particularly the Tene Oil River—are central to livelihoods and cultural practices, and that oil spills here ripple beyond environmental harm to destabilise economic activity and social cohesion.

The participatory map in Fig. 3 delineates Nembe Town and highlights key infrastructure, including sampled locations, the road network, and the crude oil pipeline. The responses from focus groups and interviews suggest that Nembe is a community largely dependent on its renewable natural resources for livelihoods, with fishing, farming, and small-scale trading identified as primary economic activities.

As shown in Fig. 3, religious and livelihood sites cluster within the 500–1000 m zone near pipeline crossings and flow stations. Repeated spills in these corridors have displaced fishers into adjacent creeks and offshore grounds, intensifying ecological pressure and sparking resource-access tensions with neighbouring settlements (see 'exposure displacement[3]' below). Participants described how such relocations led to overexploitation of shared water resources, fueling inter-community conflict. This spatial spillover underscores Nembe's direct vulnerability to extractive infrastructure and shows how environmental degradation here produces immediate, compounding socio-economic effects.

Fig. 4 indicates Industrial clustering—including the QIT terminal, pipelines, and processing facilities—lies within 1 km of community services and Ibeno Beach, a major livelihood and recreational space. Participants linked offshore spills driven ashore to creek contamination, noting short-term bans on swimming and fishing, and clinic surges during flaring episodes. Youth focus groups described being unable to use the beach or nearby creeks during these periods, with health facilities overwhelmed. Mkpanak is further encircled by a network of creeks that serve as transport corridors, fishing grounds, and domestic water sources. Offshore spills from multiple deepwater platforms routinely reach these waterways, contaminating household water, damaging riverbank farms, and reducing fish stocks. This dual exposure—emanating from both inland infrastructure and offshore operations—shows how hydrological connectivity compounds spatial vulnerability, making Mkpanak particularly susceptible to cumulative socio-environmental disruption.

Fig. 5 shows how a dense pipeline network intersects a hydrologically connected creek system in Odidi, a community that lacks basic infrastructure such as roads, clinics, potable water, and reliable transport, and where movement is further constrained by militarised checkpoints. Here, the absence of welfare-oriented or protective governance compounds exposure: people face hazards without parallel systems that safeguard health, livelihoods, and basic services. The interconnected waterways feed into the Forcados, Warri, and Escravos Rivers, forming the backbone of local fishing livelihoods and daily activities. Notable facilities include the 50 km Rapele–Forcados oil pipeline and the 87 km segment of the Trans Forcados pipeline, which carry crude oil from Warri's oilfields to the Forcados Terminal through Odidi's creeks, embedding substantial hydrocarbon infrastructure in the socio-ecological landscape. Although the number of spills is relatively low, their average volume is the highest recorded across the study sites. Participants described persistent oil seepage into artisanal wells and gas flaring near homes. Women reported digging their own wells in the absence of state services, only to have them contaminated by seepage. The community is only accessible by river, has no functioning hospital, power, or paved roads—creating a state of *structural exposure*,[4] where vulnerability is driven as much by governance neglect and infrastructural absence as by geographic proximity to hazards.

While each community has a distinctive spatial layout and exposure history, analysis of Figures (2–5) reveals four cross-cutting patterns that illuminate shared vulnerabilities and deeper structural dynamics. First, the proximity of social infrastructure—schools, markets, health centres, and places of worship—to oil facilities is both striking and consequential. Spatial analysis revealed that a significant proportion of these assets fall within 500 to 1000 m of pipelines, wellheads, and flow stations (Figs. 2–5). While regulatory assessments often acknowledge proximity as a technical risk factor, they frequently fail to consider the socio-functional implications of such proximity (UNEP, 2011). In practice, these infrastructures are not only close to harm, but deeply reliant on the ecological systems now compromised by extractive operations. For example, in Nembe and Bodo, drinking water sources and fishery zones overlap with areas of high oil infrastructure density. These overlaps transform spatial proximity into functional dependence under threat, heightening vulnerability through daily exposure to pollution and disruption. This challenges simplistic risk zoning models and underscores that exposure in extractive contexts must be understood through both spatial and relational lenses.

A second insight is that exposure is not static but redistributive—ecological and social pressures shift in response to damage. In Nembe and Odidi, participants explained that recurring oil spills forced them to abandon traditional fishing grounds, pushing them into already overused or contested territories. In Nembe, this has led to tensions with neighbouring communities, while in Odidi, it has compounded existing strain on the interconnected creek systems (Fig. 5). This pattern—where degraded zones displace resource use—creates ripple effects that amplify environmental stress and conflict beyond the immediate spill area. This demonstrates that the impacts of oil infrastructure extend not only through terrain but also through livelihood redistribution and spatial tension, making the consequences of extractivism more diffuse and socially entangled than often reported.

Third, exposure is not solely biophysical; it is structured by

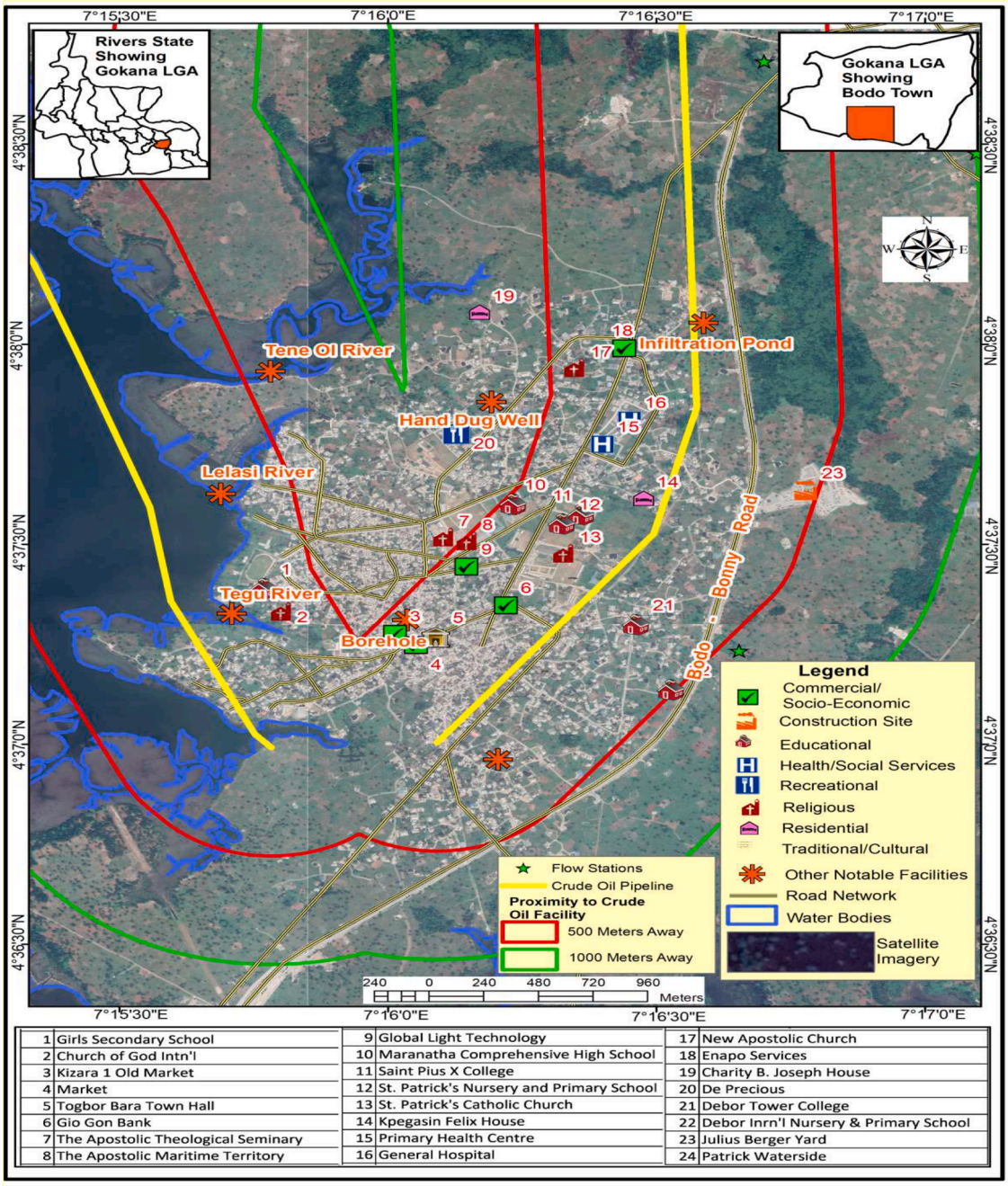
[1] Data sourced from the Nigerian National Oil Spill Monitor. Table 2-2 shows spill incidence data for the case study communities, with Ibeno facing a notably higher frequency but Odidi and Nembe facing lower frequencies but higher average spill volumes (in barrels) per incident. A barrel of oil is approximately 159 liters.

[2] Structural exposure refers to exposure that is manufactured and sustained by infrastructural deficits, jurisdictional gaps, and weak protection/recourse mechanisms, not only by physical closeness to hazards.

[3] Exposure displacement is the re-spatialisation of risk whereby avoidance of a polluted site forces users into new spaces where ecological pressure and social conflict intensify.

[4] Structural exposure refers to the ways in which vulnerability to environmental harm is compounded by systemic inequalities, infrastructural neglect, and institutional absence. In this context, communities like Odidi are not only physically proximate to extractive hazards but are also denied access to the protective infrastructures—such as healthcare, clean water, legal recourse, and roads—that would mitigate harm. This concept draws from critical development and political ecology literature that frames exposure as socially differentiated and institutionally mediated, rather than merely geographic or environmental (Watts, 2001; Ribot, 2017; Schlosberg, 2007).

[5] *"Case Study Communities" = the number of communities where each impact was recognized as significant by a simple majority of participants from at least one focus group. 'X' = a simple majority of participants within that particular focus group, in the respective community, identified the impact as considerable.*



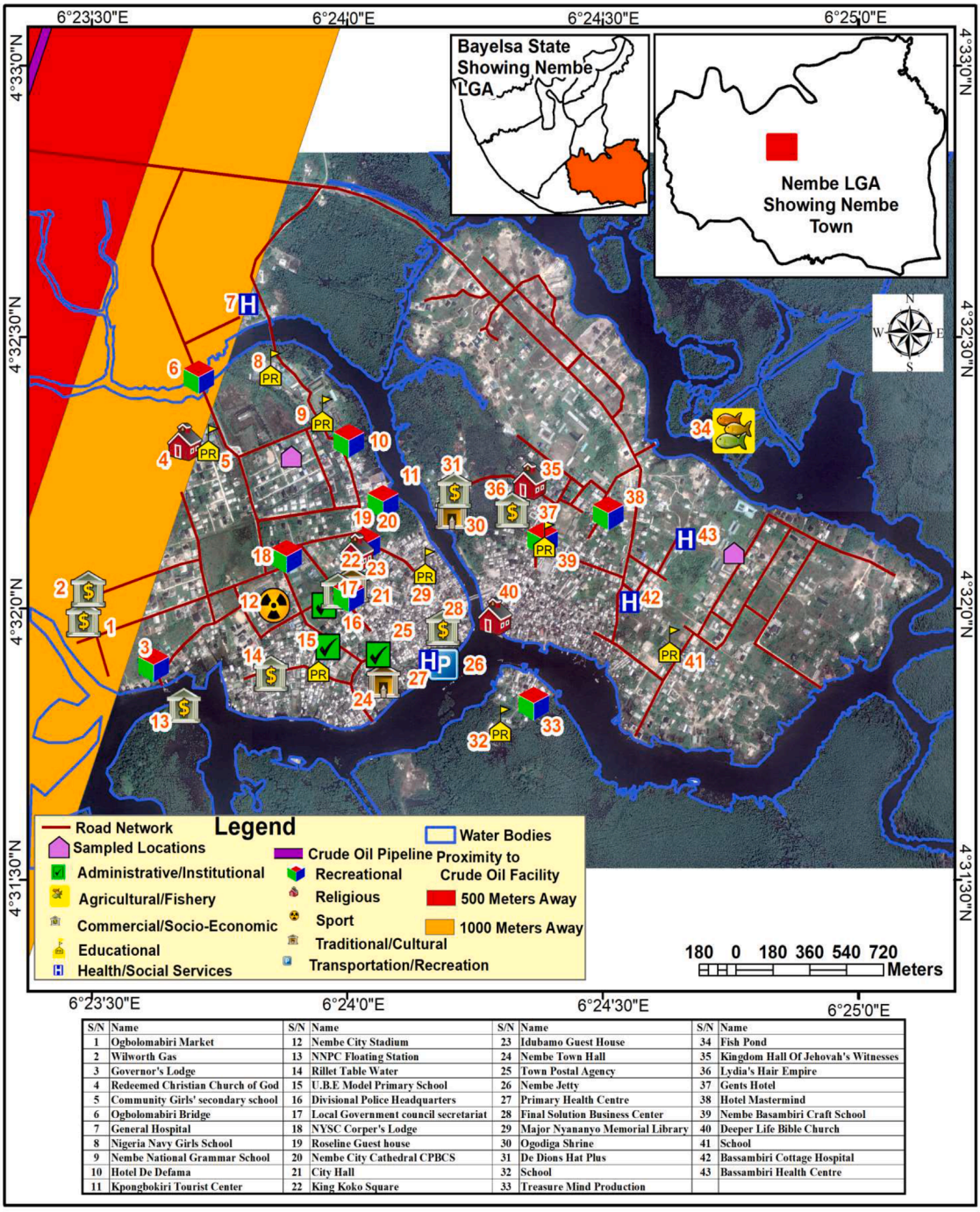
1	Girls Secondary School	9	Global Light Technology	17	New Apostolic Church
2	Church of God Intn'l	10	Maranatha Comprehensive High School	18	Enapo Services
3	Kizara 1 Old Market	11	Saint Pius X College	19	Charity B. Joseph House
4	Market	12	St. Patrick's Nursery and Primary School	20	De Precious
5	Togbor Bara Town Hall	13	St. Patrick's Catholic Church	21	Debor Tower College
6	Gio Gon Bank	14	Kpegasin Felix House	22	Debor Inrn'l Nursery & Primary School
7	The Apostolic Theological Seminary	15	Primary Health Centre	23	Julius Berger Yard
8	The Apostolic Maritime Territory	16	General Hospital	24	Patrick Waterside

Fig. 2. Exposure map of Bodo community (0–500 m and 500–1000 m buffers).
Note. Buffers drawn around key oil infrastructure/features to illustrate potential exposure zones; see Methods for rationale. CRS: WGS 84 (EPSG:4326). Data: company shapefiles/NOSDRA points.

infrastructural absence and institutional failure. Odidi community, in particular, illustrates this clearly: geographically isolated and lacking roads, hospitals, schools, or reliable water supply, residents face environmental risks without parallel systems of support. Participants described digging their own wells after oil seepage contaminated surface water and avoiding medical facilities due to distance or non-existence. Despite being ringed by major pipelines like the Rapele-Forcados and Trans-Forcados lines, Odidi receives none of the protective or compensatory mechanisms that might be expected in a regulated environment. This reaffirms a key critique that not only do regulatory systems fail to function in affected areas, but broader state presence in the form of welfare, infrastructure, and basic services is also largely absent. Drawing on political ecology's emphasis on power-laden environmental inequalities (Robbins, 2019; Peet and Watts, 2004, this study positions Odidi as an emblem of structural exposure—where governance absence is as hazardous as pollution presence.

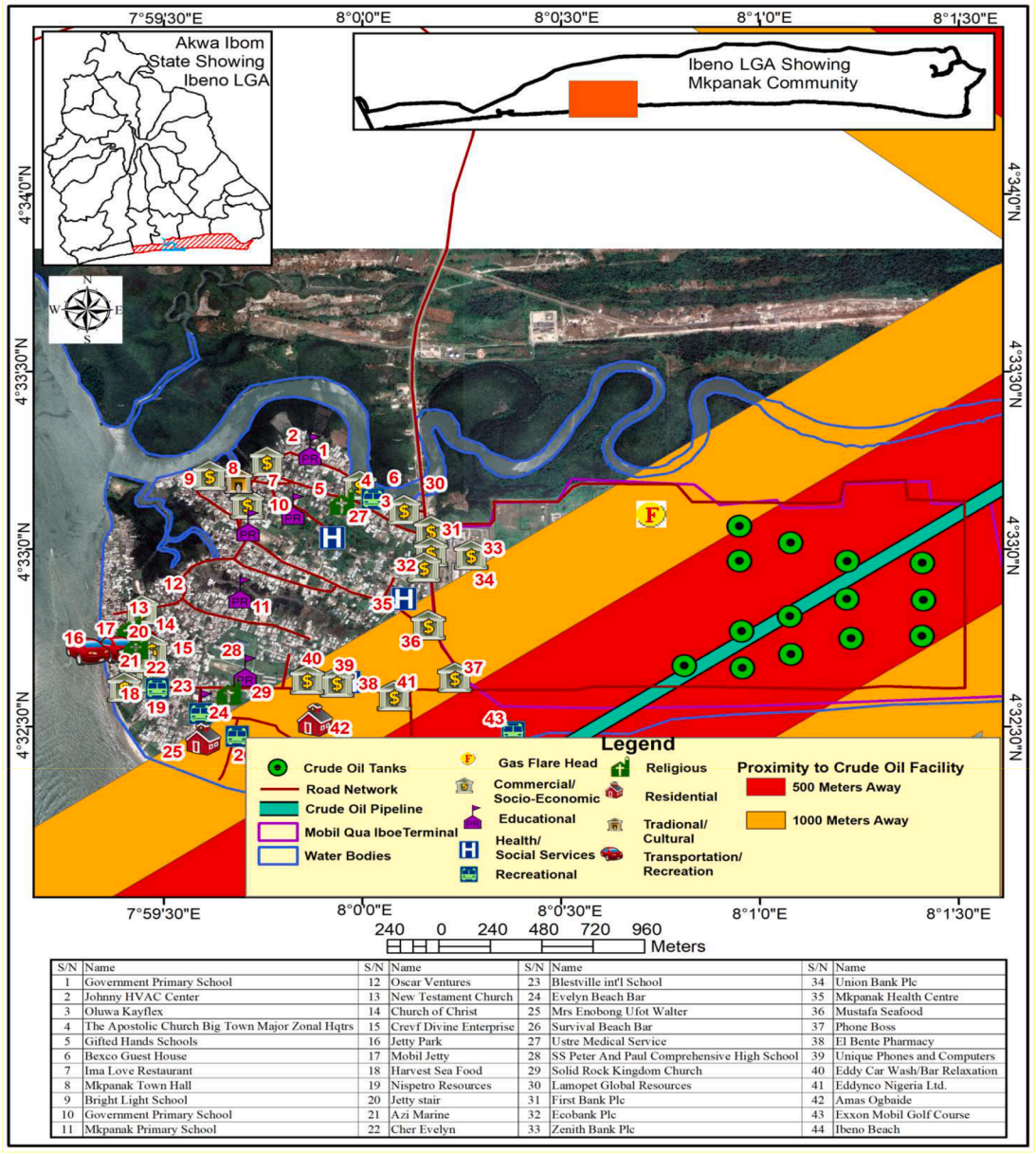
3.3. *Impacts and responses*

The following themes address RQ2 by linking reported impacts to measurable indicators (share of focus-groups reporting; participant-mention frequencies) and to governance conditions (JIT assessment, compensation access, service provision). Focus group and interview data suggests that the presence of oil infrastructure and the potential exposure of all four communities to oil spills has resulted in a large number of perceived and realised socio-economic and environmental impacts



S/N	Name	S/N	Name	S/N	Name	S/N	Name
1	Ogbolomabiri Market	12	Nembe City Stadium	23	Idubamo Guest House	34	Fish Pond
2	Wilworth Gas	13	NNPC Floating Station	24	Nembe Town Hall	35	Kingdom Hall Of Jehovah's Witnesses
3	Governor's Lodge	14	Rillet Table Water	25	Town Postal Agency	36	Lydia's Hair Empire
4	Redeemed Christian Church of God	15	U.B.E Model Primary School	26	Nembe Jetty	37	Gents Hotel
5	Community Girls' secondary school	16	Divisional Police Headquarters	27	Primary Health Centre	38	Hotel Mastermind
6	Ogbolomabiri Bridge	17	Local Government council secretariat	28	Final Solution Business Center	39	Nembe Basambiri Craft School
7	General Hospital	18	NYSC Corper's Lodge	29	Major Nyananyo Memorial Library	40	Deeper Life Bible Church
8	Nigeria Navy Girls School	19	Roseline Guest house	30	Ogodiga Shrine	41	School
9	Nembe National Grammar School	20	Nembe City Cathedral CPBCS	31	De Dions Hat Plus	42	Bassambiri Cottage Hospital
10	Hotel De Defama	21	City Hall	32	School	43	Bassambiri Health Centre
11	Kpongbokiri Tourist Center	22	King Koko Square	33	Treasure Mind Production		

Fig. 3. Exposure map of nembe community.
Note. As in Figure 3–2. CRS: WGS 84 (EPSG:4326).



S/N	Name	S/N	Name	S/N	Name	S/N	Name
1	Government Primary School	12	Oscar Ventures	23	Blestville int'l School	34	Union Bank Plc
2	Johnny HVAC Center	13	New Testament Church	24	Evelyn Beach Bar	35	Mkpanak Health Centre
3	Oluwa Kayflex	14	Church of Christ	25	Mrs Enobong Ufot Walter	36	Mustafa Seafood
4	The Apostolic Church Big Town Major Zonal Hqtrs	15	Crevf Divine Enterprise	26	Survival Beach Bar	37	Phone Boss
5	Gifted Hands Schools	16	Jetty Park	27	Ustre Medical Service	38	El Bente Pharmacy
6	Bexco Guest House	17	Mobil Jetty	28	SS Peter And Paul Comprehensive High School	39	Unique Phones and Computers
7	Ima Love Restaurant	18	Harvest Sea Food	29	Solid Rock Kingdom Church	40	Eddy Car Wash/Bar Relaxation
8	Mkpanak Town Hall	19	Nispetro Resources	30	Lamopet Global Resources	41	Eddynco Nigeria Ltd.
9	Bright Light School	20	Jetty stair	31	First Bank Plc	42	Amas Ogbaide
10	Government Primary School	21	Azi Marine	32	Ecobank Plc	43	Exxon Mobil Golf Course
11	Mkpanak Primary School	22	Cher Evelyn	33	Zenith Bank Plc	44	Ibeno Beach

Fig. 4. Exposure Map of Mkpanak (Ibeno) Community.

(Table 3). It was not only the immediate impacts of the spills that the communities highlighted as affecting them, but also the cascading effects on their livelihoods and local economy. The focus group and interview data reveal a diverse, interwoven set of community-level experiences and coping responses to oil and gas activities across the four case study communities.

Table 3 illustrates the spread and overlap of these impacts across domains—environmental, economic, political, legal, cultural, and health. Every community reported misinformation about the impacts of oil activities by joint investigation teams (JITs) of stakeholders, marginalisation in decision-making processes, corruption and inefficiency in the legal system in relation to compensation claims and limited legal resource for addressing oil-related grievances. The disjuncture between lived impacts and institutional responses is not coincidental—it appears to be systemic, embedded in the very design and operation of extractive governance in Nigeria.

While there were differences in intensity and emphasis across the communities, common threads emerged: environmental degradation, health concerns, livelihood erosion, cultural dislocation, and a pervasive sense of abandonment by both state and corporate actors. The lived realities reported by participants reflect a deep and entangled set of socio-environmental disruptions.

Fig. 6 and Table 3, anchored in direct community narratives, offer a textured understanding of these dynamics, moving beyond abstract categorisation into grounded, situated experience. To complement narrative excerpts, we report frequency-of-mention counts at the participant level and group-level consensus across communities where feasible (see Fig. 6 and Table 3 notes). For example, pollution affecting fisheries, and the subsequent impacts on traditional farming practices, are recurrent stressors that these communities navigate:

> *" Mkpanak is surrounded by water, it has been our life, but the oil nearby is big trouble. When oil spills, it doesn't just spoil our water, it ruins everything - our fish, our farms, all gone. It's not just the oil we see, it's our life turning bad. We can't fish, can't farm like before, and it's eating up our pockets. We're just trying to live, but this oil is making everything hard, real hard for all of us."*(Focus group participant IE4).

Fig. 6, which captures the distribution of community responses,

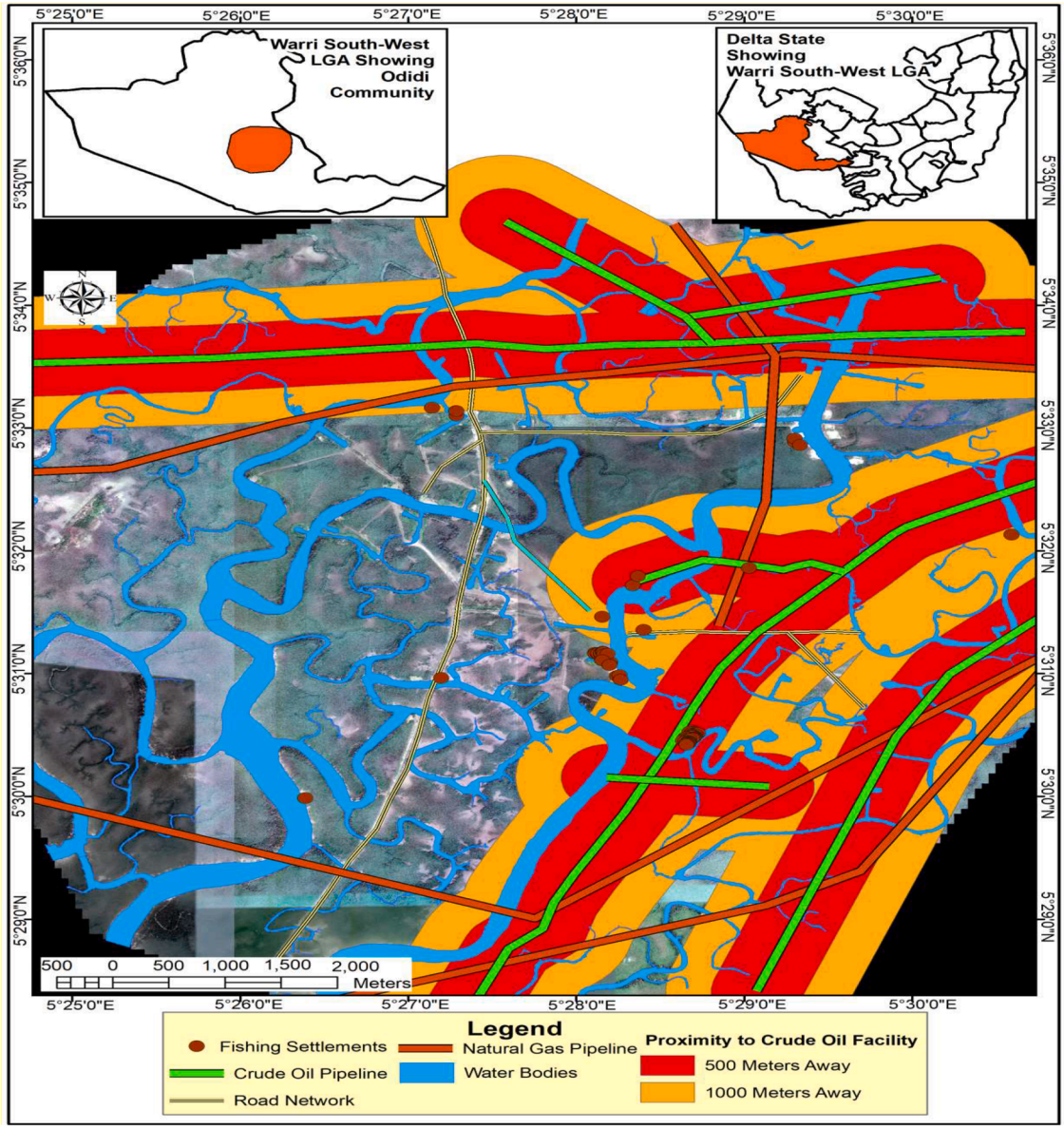


Fig. 5. Exposure map of Odidi community.

provides an entry point into these adaptive dynamics. Overexploitation of non-oil resources, such as intensified logging and mangrove harvesting, emerged as the most prevalent coping strategy across communities.

This aligns with participant narratives from Nembe and Odidi, where repeated oil spills in traditional fishing zones displaced fishing activity into already strained or contested areas, reinforcing social conflict and ecosystem strain—a dynamic this study refers to as exposure displacement.[6] Communities also reported shifts in dietary practices, school withdrawal, and heightened intra-community conflict, underscoring the deeply interconnected nature of environmental and social systems in the Niger Delta.

Fig. 6 illustrates the range of coping responses identified by respondents across all focus groups, with each bar representing the number of individuals who highlighted specific responses during discussions. The responses were not prompted by the researchers; instead, they emerged spontaneously during the conversations. The responses from all participants were then categorized into the corresponding 11 themes. To support comparability across groups, the same facilitation guide and two-person team (facilitator + note-taker) were used at all sites; coders cross-checked theme assignments to enhance reliability.

A notable insight—previously raised but worth expanding here—is the concept of structural exposure**.** While we earlier highlighted how Odidi's physical proximity to oil infrastructure is compounded by an absence of protective infrastructure and services, the present findings further underscore the lived consequences of this compound vulnerability. Though Odidi experienced fewer spill events than Bodo or Ibeno (see Table 2), participants described more persistent and acute socio-environmental harms**.** These are not simply the result of oil presence,

[6] Exposure displacement describes the process by which communities, in response to environmental degradation (e.g., oil spills, flaring), are forced to relocate key livelihood activities (e.g., fishing, farming) into other territories. This displacement can exacerbate pressure on nearby ecosystems, escalate land or resource conflicts, and trigger feedback loops of ecological degradation. While similar spatial redistribution processes have been discussed in contexts such as climate-induced migration (Adger et al., 2015; Black et al., 2011) and conservation-related displacement (Dowie, 2009), its articulation in oil extractivist landscapes remains limited—particularly in political ecology studies of the Niger Delta.

Table 3
Impacts reported by focus groups (by theme and participant group)[5].

Theme	Oil infrastructure and spill impacts reported by focus groups	Case Study Communities	Focus Groups			
			Fishers	Elders	Youth	Women
Infrastructure	Contamination affecting drinking water sources and land	**4**	X	X	X	X
Livelihoods and Local Economy	Fluctuations in global oil market prices intensifying local oil production	**2**		X	X	
	Pollution affecting fisheries, leading to reduced catch and income	**4**	X	X	X	X
	Disruption of traditional farming	2		X	X	
	Reduced access to cultural/ traditional sites	**3**		X	X	
	Decreased tourism and local business opportunities	2		X	X	X
	Lack of alternative employment opportunities	3	X	X	X	X
	Stagnation of non-oil sectors	4	X	X	X	
Health and Wellbeing	Nutritional changes due to shifts in local ecosystems affecting food sources	**2**	X	X		X
	Increased disease vectors due to pollution and disrupted drainage	2		X		X
	Psychological stress from constant environmental degradation and fear of accidents	3	X	X	X	X
	Respiratory and skin diseases from constant exposure to pollutants and toxins	4	X	X	X	X
Environment	Degradation of critical ecosystems	4	X	X	X	X
	Reduction in the quality of air, soil, and water	4	X	X	X	X
Cultural Heritage and Practices	Disruption to traditional ceremonies and practices	3	X	X	X	
	Loss of heritage sites due to oil infrastructure and spills	3	X	X		
	Erosion of cultural identity	4	X	X		X
Political Engagement	Marginalization in decision-making processes	4	X	X	X	X
	Lack of effective representation	3		X	X	X
	Suppression of dissent and community voices	2		X	X	
Community Cohesion and Social Capital	Erosion of trust within and between communities	2		X	X	X
	Weakening of traditional support systems	2	X	X		X
	Rise in conflict over resources	2	X	X	X	
	"Divide and rule" tactic by oil industry	4	X	X	X	
Legal justice	Limited legal recourse for addressing oil-related grievances	4	X	X	X	X
	Corruption and inefficiency in the legal system	4	X	X	X	X
Migration Patterns	Influx of workers leading to social tension	1		X	X	
	Migration of local populations due to resource shortages	4	X	X	X	X
	Changes in demographic composition	1		X	X	X
Gendered Social Outcomes	Increased prostitution and domestic violence	2		X	X	X
	Societal shifts and changing social roles and responsibilities	3	X	X		X
Illegal Economic Activities	Artisanal refining and environmental consequences	2	X	X		
	Illegal pipeline bunkering	3	X	X	X	

Note. "X" indicates the theme was reported by a simple majority (>50 %) of participants in that specific group; blank = not majority. Across all sites, the median theme was reported in 12–14 of 16 focus-groups (range by theme), underscoring cross-community consistency.

but of what might be called a void of governance presence. Oil seepage into self-dug wells, lack of nearby health facilities, militarised waterways that impede movement, and the total absence of formal compensation pathways intensify day-to-day hardship. As one elder noted:

> "Even our sickness, we treat ourselves. Government doesn't reach here."[Focus group participant OE3).

Importantly, many of the community responses were not institutionally supported.

While positive benefits such as scholarships or contracts—typically channelled through governance models such as Corporate Social Responsibility initiatives and Global Memoranda of Understanding (GMOUs) between oil companies and host communities—were acknowledged, they were often described as elite-captured or selective. By participants' estimates, benefits reached a minority of households and were perceived as selectively distributed. Participants did not describe engaging formal grievance mechanisms, early warning systems, or post-spill remediation efforts. Instead, community responses largely occurred at the individual or household level, with some—including retaliatory sabotage and intra-community tensions—indicating a breakdown of trust and the growing precarity of local governance arrangements. From drinking contaminated water to withdrawing children from school, these practices illustrate strategies of coping in contexts of institutional abandonment.

This pattern reinforces a central political ecology critique that marginalised geographies like Odidi do not only suffer biophysical degradation but are also governed through unequal power relations, in which interventions are shaped more by corporate and state interests than by community needs (Idemudia, 2009; Watts, 2001). The infrastructure of extraction is present; the infrastructure of protection is not. These insights show how spatial abandonment and regulatory neglect produce forms of exposure that are structurally embedded, not incidental. Odidi, in this sense, becomes a powerful case of how extraction without equitable governance produces a socially differentiated burden of harm. These claims are grounded in participant testimony (e.g., OE3 on self-medication due to absent clinics; IW2 on the loss of women's periwinkle livelihoods) and mapped evidence showing the co-location of social infrastructure within 0–1000 m of pipelines (Figs. 2–5) and the frequency/volume profile of spills (Table 2).

Another emergent pattern involves the rise of maladaptive responses—particularly artisanal refining and pipeline bunkering. These practices, especially prominent in Nembe, and Odidi area, function simultaneously as economic necessity in contexts of exclusion and, at times, as resistance to perceived institutional bad faith, even as they exacerbate ecological harm and invite militarised crackdowns. While participants acknowledged the risks, they described these activities as among the few remaining livelihood options. *"There's nothing else,"* one youth in Nembe stated, "*if you don't do oil the rough way* [oil bunkering and artisanal refining], *you go* [will be] *hungry."* [Focus group participant NY2]. Such actions, while providing short-term income, exacerbate environmental degradation, increase community health risks, and invite militarised crackdowns—deepening a cycle of harm. These responses mirror a "governance vacuum," where weak state presence and limited livelihood alternatives create conditions for maladaptive coping (Hilson, 2002; see also Watts, 2001; Idemudia, 2009). They also reflect a breakdown in the legitimacy of state and corporate actors, where

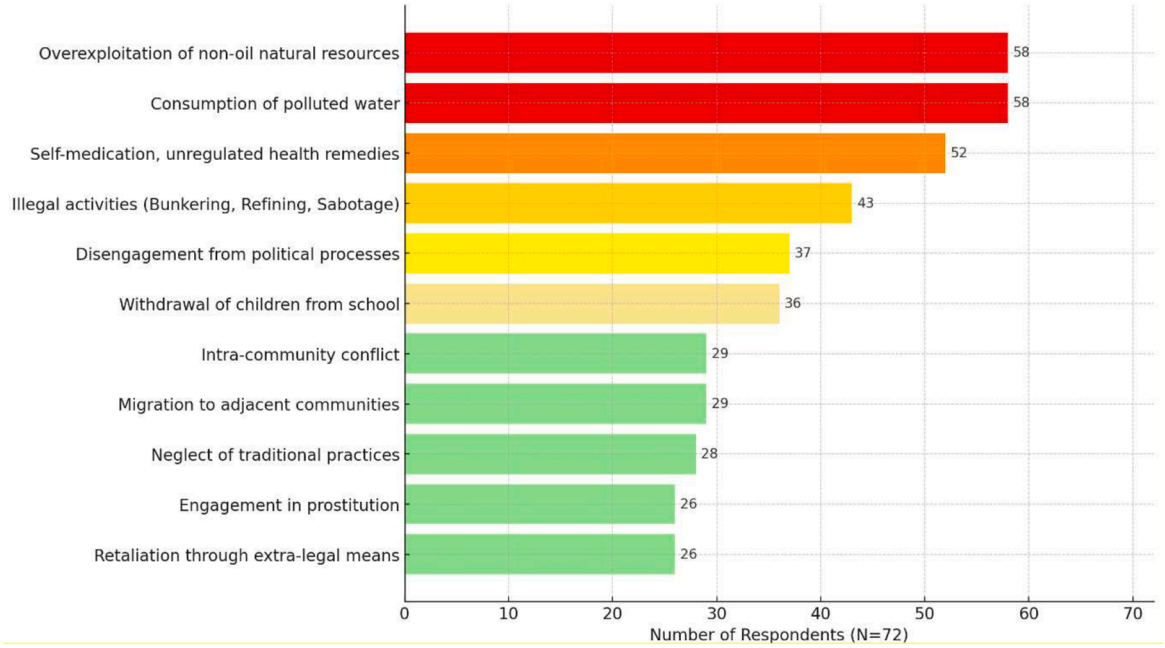


Fig. 6. Distribution of community responses to oil-industry impacts (all focus groups).
Note. Bars represent distinct participants who mentioned each response theme across all discussions ($N = 72$). Responses were not prompted; they emerged during open conversation and were probed neutrally for clarification following a common facilitation guide. Categories were participant-driven and then consolidated into 11 themes using a hybrid inductive–deductive codebook (Supplementary Codebook S2). The chart indicates salience (mentions), not population prevalence; no severity weighting is implied. Data: author's fieldwork (coded FGD transcripts).

community survival strategies become entangled with illegality.

In addition to economic and institutional vulnerabilities, health impacts featured prominently across all sites. Participants reported a range of symptoms linked to chronic exposure—skin irritations, respiratory problems, and persistent fatigue—often attributed to gas flaring, polluted water, and toxic sediments. Psychological stress was a recurring theme: the fear of explosions, disease outbreaks, or further displacement created a background anxiety that shaped daily life. *"Even when we sleep,"* said a participant in Mkpanak, *"we think about if the oil will come again."* [Focus group participant IF2]. Several participants in Bodo and Nembe described increased disease vectors due to drainage blockages from sludge and construction debris, often left unmanaged by authorities. Stagnant water in these blocked channels was linked to higher prevalence of mosquitoes (malaria) and cholera outbreaks, underscoring the public health risks of poor environmental management.

These vulnerabilities intersect with social and cultural dimensions. In Odidi, Bodo, and Mkpanak, community members spoke of disrupted rites, declining engagement in traditional practices, and the erosion of cultural identity. Gendered impacts were also evident: in Ibeno, the disappearance of periwinkle harvesting—a critical livelihood for women—led to increased domestic violence and, in some cases, sex work. Focus group participant (IW2) in Ibeno noted thus:

> *"Since the oil spills, our waters are polluted, and the periwinkles are gone. Our women, who used to collect them to sell, are jobless now and it's tearing our families apart. We can't support our children and homes anymore, leading to more fights and violence at home. Some of our sisters are forced into prostitution because there's no other way. It's a serious trouble we are facing."* [Focus group participant IW2]

A final and instructive contrast emerges in the Ibeno case. While Ibeno had the highest volume of reported spills, the perceived impacts were lowest among the four communities. This is attributed to a comparatively diversified economy, higher access to oil-related employment, and greater infrastructure investments such as schools, roads, and free electricity. Community members linked this to Mobil's presence in Ibeno and its relative embeddedness. While these gains are not unproblematic—and do not offset environmental harm—they show how differentiated institutional engagement can shape vulnerability trajectories

Taken together, these findings show how spatial proximity interacts with institutional absence to produce structural exposure (Odidi) and how repeated disturbances displace livelihoods, generating exposure displacement (Nembe, Bodo). In political-ecology terms, these are power-mediated vulnerabilities: communities closest to infrastructure bear chronic, everyday risk while lacking protective governance (e.g., delayed JITs, limited compensation). In environmental-justice terms, burdens are concentrated while benefits (jobs, CSR) are selective and thin, reproducing inequity.

There are notable parallels between the Niger Delta and other areas affected by extractive industries globally in terms of the types of community impacts and coping mechanisms adopted. In the Arctic and Amazon Basin, widespread deforestation and pollution from mining and oil exploitation have endangered the ecosystem and impacted indigenous tribes (Sawyer, 2004; Larsen and Fondahl, 2015). Communities in these extractive frontiers have likewise adapted to the loss of traditional livelihoods and rising health risks, often resorting to short-term coping strategies—such as shifting from agriculture to small-scale gold mining or relying more on non-traditional foods when traditional sources are contaminated (Hecht, 2013; Nuttall, 2005). These marginalised populations, lacking political influence, typically bear a disproportionate share of environmental costs while receiving minimal benefits from extraction (Peluso and Watts, 2001). Though similar, the Niger Delta is distinctive in three respects. First, unlike Alberta or much of the Arctic—where infrastructure is sparse and spill events are episodic—the Delta's dense on-shore network and chronic spill frequency create everyday exposure (Table 2; Figs. 2–5). Second, the rural population directly dependent on aquatic ecosystems is unusually large, so a given spill translates immediately into livelihood loss (fish protein, periwinkles, riverbank farms). Third, remediation and compensation regimes have faced long delays and low trust (e.g., UNEP Ogoniland; JIT gaps), meaning impacts persist and accumulate. The Delta therefore mirrors global patterns of extractive injustice while also diverging in severity

and context, making it a critical case for comparative analysis.

These patterns are not merely the outcome of discrete spill events; they are co-produced through governance failures, institutional absence, and spatially uneven benefits. Communities are not passive victims but pragmatic agents navigating harm—sometimes in ways that become maladaptive under chronic exposure. Conceptually, we show how structural exposure and exposure displacement link proximity, service deficits, and livelihood redistribution; practically, the findings imply value **in** routine exposure mapping, transparent JIT reporting, and buffer-aware siting of schools and clinics, alongside support for viable livelihood alternatives. The Niger Delta therefore reflects global extractive patterns yet diverges in severity and context, making it an acute, distinctive case for comparative analysis rather than a universal stand-in.

4. Conclusion

This study has explored the extent and differentiated nature of exposure to oil and gas activities, alongside the socio-environmental impacts and community responses in four oil-impacted communities in the Niger Delta. The findings demonstrate that exposure is not merely a function of physical proximity but is structurally embedded, compounded by infrastructural neglect, militarised geographies, and institutional absences. Communities described a wide range of socio-ecological impacts—ranging from ecological degradation, health risks, and livelihood disruption to cultural dislocation and psychological stress—met with coping responses such as artisanal refining, resource overexploitation, and self-medication. Many of these responses represent maladaptive resilience shaped by institutional abandonment. A particularly salient insight is the dynamic of *exposure displacement*, where contamination forces livelihood activities to relocate, intensifying resource conflict and ecological pressure elsewhere. By applying a political ecology and environmental justice lens, these findings show how environmental harms are socially patterned and politically mediated, with the Niger Delta emerging not only as a site of environmental risk but of institutional failure and contested governance. These insights reaffirm critiques regarding governance vacuums (e.g., Akpan, 2006; Obi, 2010) while offering granular, place-based evidence of how *structural exposure* operates on the ground. They also have broader relevance for other extractive regions, where infrastructural absence and governance neglect convert environmental hazards into everyday conditions of vulnerability.

Ethical approval and consent to participate

Human research ethics approval was obtained from James Cook University (H8959). All participants provided informed consent. Identifying details were removed and sensitive disclosures anonymised to protect confidentiality.

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Data availability

De-identified qualitative excerpts, aggregated coding tables, and mapping outputs are available from the corresponding author on reasonable request. Full transcripts are not publicly shared to protect participant privacy.

CRediT authorship contribution statement

Oluwatosin Olayioye: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Amy Diedrich:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Maxine Newlands:** Writing – original draft, Validation, Resources, Methodology, Investigation, Data curation, Conceptualization. **Jane Addison:** Writing – review & editing, Visualization, Validation, Resources, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Moreover, this study would have been impossible without the participation of the communities of Bodo, Ibeno, Odidi, and Nembe. We are deeply grateful to the focus group and interview participants in these communities for their openness, cooperation, and willingness to share their experiences and perspectives with us. Their contributions have not only enriched our study but have also shed light on the nuanced impacts of oil and gas extractivism in the Niger Delta. Their voices and stories are at the heart of our research, and we hope the findings contribute to a broader understanding and appreciation of the socio-ecological challenges they face.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.exis.2025.101847.

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