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Integrating ISO 45001 and ISO 14001 Management Systems with Community-Based Disaster Risk Reduction in Niger Delta Oil Operations

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Abstract

Oil operations in the Niger Delta sit inside the same floodplains, creeks and villages that host millions of residents. Hazards such as spills, fires, floods and pipeline failures rarely stop at the fence line, yet the management systems that govern them usually do. This paper argues that ISO 45001 (occupational health and safety) and ISO 14001 (environment), both built on the same high-level structure, can be deliberately extended to include community-based disaster risk reduction (CBDRR). Using a structured document-based synthesis of international standards, the UNEP Ogoniland assessment, Sendai Framework guidance

and CBDRR scholarship, we develop a five-component integration framework, map it to clauses of both standards, propose indicators, and outline a three-phase implementation roadmap for operators. The paper is conceptual: it presents no new field data, though it specifies a Delphi and household-survey design for validation, and its figures are explicitly labelled as either sourced or illustrative. We conclude that clauses on context, interested parties, worker participation, emergency preparedness and improvement already provide the entry points; what is missing is a community seat at the table.

Keywords: ISO 45001, ISO 14001, Community-Based Disaster Risk Reduction, Niger Delta, Oil and Gas, Emergency Preparedness, Integrated Management Systems

1. Introduction

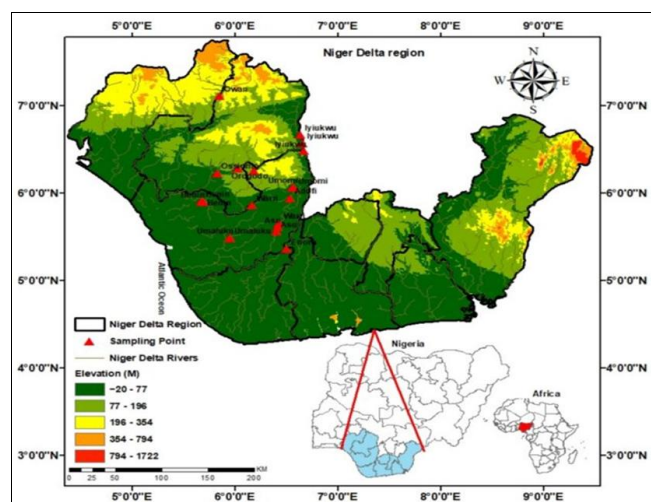
An operator's HSE manager and a village chief in the Niger Delta often manage the same risk from opposite sides of a fence. A pipeline leak is a process-safety event to one and a lost fishing season, a drinking-water threat or a fire hazard to the other. Management systems certified to ISO 45001:2018 and ISO 14001:2015 are normally scoped to the organisation's workers and site footprint (ISO, 2015, 2018) [6, 7]. Disaster risk reduction, by contrast, has moved decisively towards local ownership and shared responsibility (UNISDR, 2015; Shaw, 2012) [14, 12].

This paper asks one practical question: *how can an oil operator use the management systems it already maintains to reduce disaster risk with, and not merely around, host communities?* We contribute (i) a clause-level alignment of both standards with CBDRR, (ii) an integration framework, (iii) a performance-indicator set, and (iv) a phased roadmap suited to Niger Delta conditions.

2. Context: hazard, exposure and the legacy problem

The Niger Delta spans nine Nigerian states, and oil operations there date from the late 1950s. The most systematic scientific record of what decades of contamination can look like is the UNEP assessment of Ogoniland, which examined more than 200 locations, surveyed 122 km of pipeline rights of way, reviewed over 5,000 medical records and engaged more than 23,000 people at community meetings (United Nations Environment Programme [UNEP], 2011) [13]. It found hydrocarbon contamination of drinking water in at least 10 communities and estimated that recovery could take 25–30 years (International Institute for Sustainable Development, 2011) [5]. Broader reviews describe the region as heavily affected by spills, flaring and

water contamination, with reported cumulative spill volumes of at least 9–13 million barrels over five decades (Kadafa, 2012) [8].



Map of the Niger Delta region of Nigeria showing region elevations (maps of Africa and Nigeria insert).

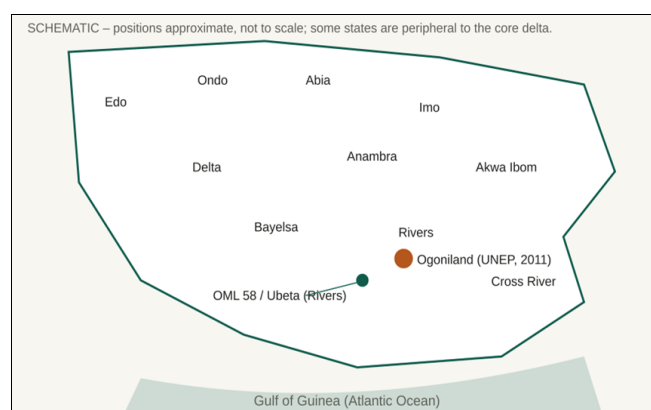


Fig 1: Schematic locator of the Niger Delta area and two reference sites. Redraw with GIS boundary data (e.g., NOSDRA or NDDC layers) before journal submission

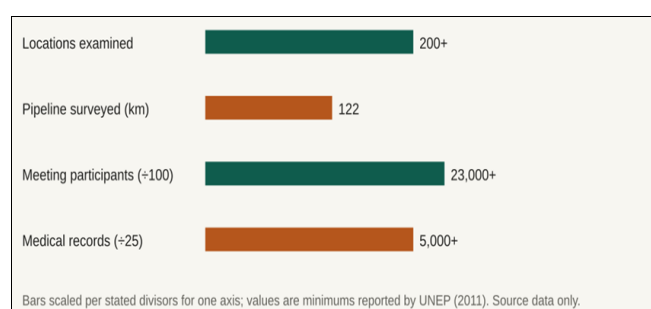


Fig 2: Scale of the UNEP (2011) [13] Ogoniland assessment, showing why community-generated evidence mattered to the technical findings

3. Conceptual background and literature review

3.1 The two standards

Both standards follow the harmonised Plan–Do–Check–Act structure, with the same clause spine: context, leadership, planning, support, operation, performance evaluation and improvement. ISO 45001 adds worker consultation and participation; ISO 14001 requires attention to interested parties, environmental aspects and potential emergency

situations (ISO, 2015, 2018) [6, 7]. That shared architecture is what makes integration feasible.

3.2 Community-based disaster risk reduction

CBDRR treats residents as active analysts and implementers of risk reduction, not recipients of aid, and stresses the roles of government, NGOs, universities and the private sector in partnership (Shaw, 2012) [12]. Vulnerability is understood as produced by social and economic processes, not by hazards alone (Wisner *et al.*, 2004) [15]. The Sendai Framework for 2015–2030 reinforces this by calling for whole-of-society engagement and better understanding of risk (UNISDR, 2015) [14].

3.3 A practical precedent

Chevron Nigeria Limited introduced its Global Memorandum of Understanding (GMOU) in 2005, a tripartite model under which community clusters, state government and the company work through elected Regional Development Committees (Channels Television, 2014) [3]. By 2014, community leaders reported about 600,000 beneficiaries in roughly 400 communities. Although designed for development and not for disaster risk, the GMOU shows that community-governed structures around oil assets can be built and sustained; those reports are self-reported and have not been independently evaluated here.

3.4 Integrating management-system standards

Research on combining ISO 14001 and ISO 45001 has focused mainly on internal efficiency. Pauliková *et al.* (2022) [11] analysed the requirements and documented information of both standards using content analysis and clustering, and reported that integration can reduce bureaucracy and management cost, simplify certification, improve internal management and ease continual improvement. Their analysis is a useful base for the clause mapping in Section 5, but it treats the organisation as the unit of analysis; host communities do not appear as co-managers of risk.

3.5 Promise and limits of community-based approaches

Allen (2006) [2] argued that community-based disaster preparedness values local knowledge and social capital and can help local coping and adaptation, but warned that it can both empower and disempower and should not be treated as a panacea. A later review of Philippine resilience research described a broad range of community-based activities and drew on a search of largely peer-reviewed studies (Alcayna *et al.*, 2016) [1]. For oil operators the lesson is practical: community participation must be structured, resourced and independently monitored, otherwise it risks becoming symbolic.

3.6 Flood exposure in the Niger Delta

Flooding compounds industrial hazards. A remote-sensing and GIS study of the western Niger Delta reported that about 27% and 63% of the land lie below 1 m and 5 m above mean sea level respectively, and documented local adaptive strategies (Fasona *et al.*, 2002 [4]; this is a peer-reviewed conference proceeding, so journal evidence should be added). Where floodwater can mobilise spilled hydrocarbons or disable facilities, natural and technological

hazards interact, which is a case for joint community and operator planning.

3.7 Synthesis and research gap

Table 1: Synthesis of reviewed literature

Source	Contribution	Gap for this paper
Pauliková <i>et al.</i> (2022) ^[11]	Requirement-level mapping of ISO 14001 and ISO 45001	No community or disaster-risk dimension
Allen (2006) ^[2]	Critical appraisal of community-based preparedness	Not set in industrial or oil contexts
Alcayna <i>et al.</i> (2016) ^[1]	Review of community resilience research and practice (Philippines)	Different hazard and governance setting
Fasona <i>et al.</i> (2002) ^[4]	Flood exposure and local adaptation, western Niger Delta	No management-system link
UNEP (2011) ^[13]	Evidence on contamination and institutional failures, Ogoniland	Assessment, not a management model

In the sources we reviewed, we did not find a study that links ISO 45001 and ISO 14001 to community-based disaster risk reduction in Niger Delta oil operations. This is a statement about our search, not proof of absence; a systematic search (Scopus, Web of Science) should confirm it before submission.

4. Methodology

4.1 Design overview

The study uses a three-phase sequential mixed-methods design: (A) document synthesis, (B) a modified Delphi study with experts, and (C) a cross-sectional household survey in host communities. Phase A produced the framework in Section 5. Phases B and C validate and test it and are **proposed, not yet completed**.

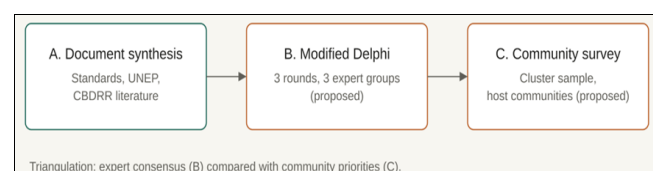


Fig 3: Three-phase research design

4.2 Delphi study (Phase B)

The Delphi design follows the staged logic in Okoli and Pawlowski (2004) ^[10]: purposeful expert selection, then idea generation, narrowing, and ranking, with anonymous controlled feedback between rounds (see also Linstone & Turoff, 1975) ^[9]. Three groups would be recruited: HSE and environment professionals from operators and contractors, community and civil-society representatives, and regulators and academics in disaster risk management. A target of 8–10 per group (24–30 total) is proposed, to allow for attrition.

- **Round 1:** Open questions on barriers, enablers and clause-level integration actions; responses coded into a candidate list.
- **Round 2:** Panellists rate each item on a 5-point importance scale and see group medians.

- **Round 3:** Panellists re-rate and rank the retained items. Consensus is defined a priori (author-set thresholds): median ≥ 4 with interquartile range ≤ 1 and at least 75% of ratings at 4–5. Ranking concordance across rounds is assessed with Kendall's W. Items failing thresholds after Round 3 are reported as non-consensus, not dropped silently.

4.3 Household survey (Phase C)

Table 2: Proposed survey and Delphi design parameters

Element	Specification
Population	Adult residents of host communities around one onshore field
Sampling	Two-stage cluster: communities first, then households by systematic selection
Sample size	385 (95% confidence, $\pm 5\%$, $p = 0.5$); $\times 1.5$ design effect = 578; $\div 0.85$ for 15% non-response = about 680
Instrument	Structured questionnaire, 5-point Likert items on hazard awareness, warning access, trust, participation, past drills
Quality	Pilot in a non-sampled community; translation and back-translation; Cronbach's alpha ≥ 0.70 as a conventional target
Delphi consensus	Median ≥ 4 , IQR ≤ 1 , $\geq 75\%$ agreement (author-defined)
Analysis	Descriptives; ordinal logistic regression of preparedness on trust and participation; Kendall's W for Delphi rankings

4.4 Ethics, positionality and bias control

Institutional ethics approval and informed consent are required. Entry to communities should go through traditional and community leaders, and enumerators should be independent of the operator to reduce social-desirability bias. Data must be anonymised and handled in line with Nigerian data-protection law. Because the lead author may be an HSE practitioner, a conflict-of-interest and positionality statement should be included and Delphi ratings analysed by group as well as pooled.

Alignment strength in Fig 5 reflects the authors' analytical judgement and is illustrative; Phase B is designed to test it.

5. Integration Framework

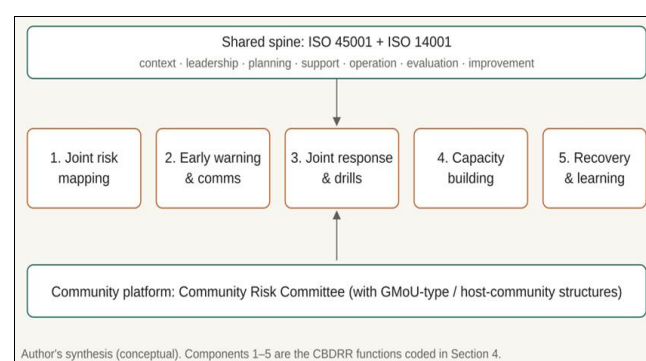
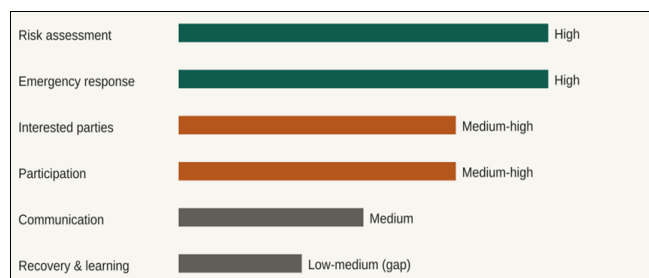


Fig 4: Proposed integration framework linking the management-system spine to community-based risk reduction

Table 3: Clause entry points for CBDRR integration

Theme	ISO 45001:2018	ISO 14001:2015	CBDRR integration
Context and stakeholders	Cl. 4 (needs of workers and other interested parties)	Cl. 4 (interested parties)	Formally list host communities and their risk priorities
Leadership and participation	Cl. 5 (consultation and participation)	Cl. 5	Seat community representatives on risk review forums
Risk assessment	Cl. 6 (hazards, risks, opportunities)	Cl. 6 (aspects, risks, emergency potential)	Joint hazard/vulnerability mapping with residents
Support	Cl. 7 (competence, communication)	Cl. 7	Local-language warning protocols; volunteer training
Emergency response	Cl. 8 (preparedness and response)	Cl. 8 (emergency preparedness)	Joint drills, shared response roles, spill and fire scenarios
Evaluation and improvement	Cl. 9–10	Cl. 9–10	Community-reported near-misses and post-event reviews

**Fig 5:** ILLUSTRATIVE, judgement-based alignment of clause themes with CBDRR functions; not empirical data. Validation is recommended

The pattern is intuitive: standards are strongest where they already require hazard identification and emergency planning, and weakest where they are silent on post-event recovery and community learning. Those gaps are where operators must add procedures deliberately.

6. Indicators and roadmap

Table 4: Candidate performance indicators (to be baselined per site)

Function	Indicator	Type
Risk mapping	% host communities with a jointly validated hazard map reviewed in the last 12 months	Leading
Early warning	Median time from leak detection to community notification	Leading
Joint response	Joint drills per year; % of drill actions closed within target	Leading
Capacity	Trained community responders per 1,000 residents	Leading
Outcomes	Community-reported incidents; recovery time to restore water/livelihoods	Lagging

Table 5: Three-phase implementation roadmap

Phase	Focus	Typical outputs
1. Foundation (0–6 months)	Stakeholder analysis; extend EMS/OHSMS scope; agree governance with community leaders	Updated context register; MoU-type agreement
2. Co-design (6–18 months)	Joint risk mapping, warning channels, drill design	Hazard maps; joint emergency plan
3. Embed (18+ months)	Audit, indicator review, recovery protocols	Integrated audit checklist; annual community report

7. Discussion

Three implications stand out. First, integration is an extension of existing certification, not a new system, which lowers cost and resistance. Second, trust is the binding

constraint: legacy contamination documented by UNEP (2011) ^[13] means communities may doubt operator-led processes, so independent facilitation (NGOs, universities) matters (Shaw, 2012) ^[12]. Third, security and access limits in some areas can restrict joint activities, and plans should include remote and low-tech warning options.

8. Limitations and future research

This is a conceptual paper. Fig 5 reflects judgement, and no site data were collected. Future work should (i) execute the Delphi study and household survey specified in Section 4, (ii) pilot the framework at one onshore field with pre/post indicators, and (iii) test whether integrated audits detect community-facing gaps that separate audits miss.

9. Conclusion

ISO 45001 and ISO 14001 already contain the clauses needed to open a management system to the people living beside it. Adding a standing community risk platform, jointly owned emergency arrangements and a learning loop would turn compliance systems into shared disaster risk reduction, which is what the Niger Delta's history calls for.

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