

ENVIRONMENTAL MANAGEMENT OF PHYSICAL AND CHEMICAL HAZARDS IN THE OIL AND GAS INDUSTRY: A LITERATURE STUDY

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Abstract

Oil and gas operations involve interconnected physical and chemical hazards affecting workers, the environment, and nearby communities. Effective risk management combines source control, equipment integrity, environmental and occupational monitoring, worker protection, emergency preparedness, contractor oversight, verified corrective action, and organizational learning. Chemical risks occur through air, water, soil, vegetation, and produced-water pathways, while physical risks include fire, explosion, pressure, confined spaces, heat, noise, vibration, and infrastructure failure. Monitoring alone is insufficient without management commitment, training, reporting, and controls for both routine exposures and major accidents. Evidence is stronger for emissions and process safety than for occupational noise, vibration, heat, long-term biomonitoring, multimedia exposures, interventions, and community health. Future systems should integrate industrial hygiene, environmental science, process safety, digital monitoring, and environmental-equity analysis.

Keywords: oil and gas industry; environmental management; physical hazards; chemical hazards; occupational health

INTRODUCTION

Oil and gas operations generate interconnected physical and chemical hazards across exploration, drilling, production, transportation, storage, refining, and decommissioning. Physical hazards include high pressure, temperature extremes, noise, vibration, radiation, confined spaces, mechanical energy, fire, explosion, and ergonomic demands. Chemical hazards include hydrocarbons, volatile organic compounds (VOCs), benzene and other BTEX compounds, hydrogen sulfide, drilling and fracturing chemicals, combustion products, metals, and contaminated waste streams. These hazards can affect workers, nearby populations, ecosystems, and the integrity of air, water, soil, and vegetation.

The environmental-management problem is therefore broader than compliance with emission limits or provision of personal protective equipment. A failed well barrier can create a chemical release and a fire or explosion; poor produced-water management can affect water quality and agricultural receptors; fugitive emissions can expose workers and communities while also contributing to climate forcing. Reviews of shale and tight-gas development identify air and water pathways associated with production, wastewater transport and disposal, and impaired well integrity, while also emphasizing persistent gaps in epidemiological evidence (SB et al., 2014). A review of hydraulic-fracturing risks similarly reports that produced water may contain BTEX, arsenic, barium, mercury, strontium, radioactive isotopes, and other organic compounds, and that risk assessment should combine hazard characterization with exposure assessment (Klaus-Michael Wollin, 2020).

This study synthesizes the literature around four questions: which physical and chemical hazards are most consequential; how exposure and environmental effects are measured; which controls and management systems appear most useful; and where the evidence is insufficient for confident decision-making. Primary empirical studies are prioritized for measured outcomes, while reviews and conceptual studies are used to interpret management approaches, governance, and research gaps. The six thematic sections below constitute the literature review.

LITERATURE REVIEW

Hazard pathways and exposure evidence

Physical hazards arise from the interaction of energy, equipment, work practices, and organizational conditions. A study of 21 fatal confined-space accidents, supplemented by 33 interviews, attributed 77% of identified causal factors to organizational and supervisory levels. Contract management and emergency management were needed as additional categories in the accident model (Zahra Naghavi K., 2019). The implication is direct: permit-to-work systems, isolation, atmospheric testing, rescue planning, supervision, and contractor control are as important as individual behavior.

Subsea production demonstrates the need for barrier-based analysis when conventional safeguards do not map neatly onto new technology. A layers-of-protection analysis assigned different safety-integrity requirements to subsea protection functions; well isolation for a satellite well required a higher level than less critical functions (Clarín, 2013). Such methods make protection assumptions explicit, but their conclusions remain sensitive to generic failure data and expert judgment.

Chemical hazards originate in crude oil, natural gas, drilling fluids, production chemicals, produced water, storage contents, and combustion emissions. At oil and gas sites on shortgrass steppe, volatile organic compound concentrations varied among production groups; benzene and acrolein were particularly relevant, and BTEX compounds were detected in nearby vegetation (Lupardus, 2017). Ambient air, vegetation, and soil measurements therefore need to be interpreted together. Lead and mercury findings, including persistent lead at sites abandoned for decades, show that decommissioning does not automatically remove environmental liabilities (Lupardus, 2017).

Flaring creates both local and regional exposure pathways. A Nigeria case study estimated that green completion could reduce host-community BTEX exposure by at least 80% and reported a positive modeled net impact over a six-year return period (Akinyemi, 2020). Because the analysis relied on archival information, exposure assessment, and modeling rather than a controlled intervention, it supports the plausibility of source reduction but does not establish a universal effect size. More broadly, the flaring literature identifies a lack of one globally consistent method, emission factor, or estimation procedure for flared-gas volume and emissions (Ismail & Umukoro, 2012).

Produced water and drilling waste can contain metals, salts, radioactive constituents, BTEX, and other organic compounds. Reviews identify wastewater transport and disposal, poor zonal isolation, and agricultural reuse as potential contamination pathways (Klaus-Michael Wollin, 2020; SB et al., 2014). Controls should extend across generation, storage, transport, treatment, reuse, and disposal. Tank and pipeline integrity, secondary containment, waste characterization, treatment validation, and post-closure monitoring are more defensible than reliance on a single end-of-pipe control.

Monitoring workers, communities, and ecosystems

Exposure monitoring should characterize source, route, intensity, duration, task, worker group, and environmental context. The strongest direct evidence in this review concerns VOCs, BTEX, flaring, and environmental deposition; evidence for occupational noise, vibration, and heat is thinner. That imbalance should not be interpreted as proof that physical exposures are negligible. It may reflect differences in research priorities, access, or monitoring capacity. Real-time VOC measurements near production sites found that concentrations generally increased during the six-hour daytime period and that production, rather than vehicle exhaust, was the predominant source (Lupardus, 2017). Time-resolved monitoring can identify operating conditions that warrant leak detection, maintenance, or work-scheduling changes. Ambient measurements, however, are not direct estimates of individual worker dose. Personal sampling and task-specific assessment are required before assigning occupational exposure levels.

Environmental monitoring is strongest when it links emissions to ambient concentrations, deposition, ecological response, and health-relevant exposure. The Athabasca forest-health program combined air-quality and atmospheric-deposition measurements with soil, needle, lichen, tree, and understory indicators across repeated monitoring locations and cycles (Foster et al., 2019). Multipollutant management similarly requires emissions characterization, ambient measurement, atmospheric modeling, and assessment of human and ecological responses (Hidy & Pennell, 2010). These approaches preserve baselines while allowing indicators to respond to new technologies, extreme events, and stakeholder concerns. Risk is also distributed unevenly across communities. An environmental-equity analysis of three Louisiana parishes found different exposure patterns around extraction, offshore-service infrastructure, refineries, pipelines, and transport systems. Some communities faced direct residential risks, while others faced indirect risks through hunting and fishing grounds (Hemmerling, 2007). Regional

averages can therefore conceal local burdens. Community monitoring, transparent reporting, complaint systems, baseline data, and participation in decisions about siting, flaring, transport, and waste disposal are necessary complements to facility-boundary compliance. Health surveillance should combine exposure records, task histories, employment duration, contractor status, medical outcomes, and relevant confounders. Reviews of unconventional gas development call for stronger epidemiology linking air and water pollution to health outcomes among nearby populations (SB et al., 2014; Klaus-Michael Wollin, 2020). Proximity alone is not exposure, and plausible pathways do not establish causation. Surveillance should distinguish hazard presence from dose and should combine personal sampling, validated biological monitoring where available, audiometry, heat-strain indicators, injuries, and near-miss information.

Hierarchy of controls and process-safety barriers

The hierarchy of controls favors elimination, substitution, and engineering measures over administrative controls and personal protective equipment. In oil and gas operations, source reduction can include reducing flaring and venting, selecting less hazardous additives, using closed transfer systems, and redesigning equipment or tasks. The hydraulic-fracturing literature describes movement toward fewer, less hazardous, and more biodegradable substances, while noting that hydrocarbons such as kerosene and diesel remain permitted in some contexts (Klaus-Michael Wollin, 2020).

Engineering controls include enclosure, containment, drainage, ventilation, guarding, interlocks, automatic isolation, remote operation, and intrinsically safe equipment. Confined-space evidence shows that atmospheric testing and rescue arrangements must be integrated with organizational controls rather than delegated solely to the entrant (Zahra Naghavi K., 2019). PPE remains necessary for residual risk, but its performance depends on selection, fit, maintenance, compatibility, training, and consistent use.

Well integrity and pressure control connect worker safety to environmental protection. A well-integrity case identified design deficiencies, unclear operating instructions, training and communication problems, alarm-management weaknesses, workload, poor procedure usability, and inadequate service-company risk understanding as relevant human and organizational factors (Hals, 2015). The subsea LOPA study and a Bayesian approach to external hazards both show how barrier models can prioritize safeguards and allocate resources (Clarín, 2013; Villa, 2017). Their outputs remain sensitive to data quality, expert assumptions, and the realism of assumed independence between barriers.

Maintenance is itself an environmental and safety control when it prevents leaks, loss of containment, and equipment failure. A five-year quasi-experimental study across eight gas-production facilities evaluated RCA–FMEA corrective actions using 864 assets, 3,412 verified failure events, and 51,840 asset-month observations. Intervention assets had a 32% lower adjusted failure rate, a 51% lower odds of repeated failure, and a 38% lower failure hazard than matched routine-maintenance assets (Ahmed & Pradhan, 2022). The findings support verified corrective action, but the quasi-experimental design does not eliminate all risk of residual confounding. Emergency preparedness should cover fire, explosion, toxic release, confined-space rescue, spill response, medical evacuation, community notification, and environmental containment. Exercises should be based on credible scenarios, clear command arrangements, independent rescue capability, and post-incident learning. Documentation alone is not evidence of readiness.

Organization, competence, and digital systems

Hazard controls succeed or fail within organizational systems. A systematic review of oil-and-gas safety culture identified safety rules, reporting, working environment, job satisfaction, accidents and incidents, and technology and equipment as influential factors (Razak & Ismail, 2026). A fitness-to-operate framework organizes safety capability around organizational, social, and human capital rather than relying only on injury rates (Griffin et al., 2013). Safety culture is therefore visible in maintenance decisions, stop-work authority, staffing, contractor oversight, investigation quality, and whether production pressure overrides controls.

Training cannot compensate for defective design, unavailable equipment, or weak supervision. Evidence from Ghana's mining and petroleum sectors found high awareness of OHS policies among petroleum respondents, but only 53.1% confirmed that policies were available in written form. Training frequency was associated with awareness, while communication, managerial support, and resourcing remained limitations (Parmaak et al., 2025). Contractors should receive the same exposure information, permit controls, emergency arrangements, and reporting expectations as direct employees. Prequalification should examine competence, equipment, supervision, corrective-action history, and environmental performance rather than paperwork alone (Zahra Naghavi K., 2019).

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Digital tools can improve hazard detection, especially for cumulative exposures and difficult-to-observe conditions. Proposed applications include real-time risk platforms, IoT monitoring, AI-assisted hazard identification, methane and VOC alerts, vibration diagnostics, and wearable heat indicators. A review of Nigeria's upstream offshore sector also identifies barriers including legacy infrastructure, cybersecurity, limited digital literacy, privacy concerns, and cost (Ekpo et al., 2026). Digital systems should trigger accountable actions such as work orders, exposure follow-up, alarm review, and management decisions. More data without corrective action does not reduce risk.

Environmental performance, climate, and cumulative effects

Environmental performance extends beyond emissions to land disturbance, reclamation, waste, biodiversity, and climate resilience. The shortgrass-steppe study found changes in vegetation composition, bare ground, introduced species, diversity, mineral content, and reclamation status across producing and abandoned sites. Older plugged-and-abandoned sites showed signs of recovery but also persistent contamination indicators (Lupardus, 2017). Vegetation recovery and chemical recovery should therefore be evaluated separately.

Waste and resource-recovery decisions can shift rather than eliminate harm. A resource-recovery review warns that assessments focused on one domain can obscure environmental, economic, social, and technical trade-offs (Iacovidou et al., 2017). Lifecycle assessment should track material flows, residuals, energy use, secondary emissions, worker exposure, and community risks. Performance indicators should include integrity-test completion, overdue maintenance, alarm availability, leak-detection response time, exposure exceedances, training competence, near misses, spills, injuries, ecological indicators, and community complaints (Lj & Vm, 2012).

Offshore oil development can affect marine habitats, fisheries, coastal livelihoods, infrastructure, and governance, with impacts varying by ecosystem and activity (Nathan Andrews, 2021). Conventional assessments can also omit distant and transboundary harms associated with extraction, processing, transport, and disposal (Healy et al., 2019). Climate change adds extreme temperatures, storms, flooding, lightning, high winds, and storm surges to the asset-integrity agenda (Katopodis & Sfetsos, 2019). Adaptation should therefore be integrated with process safety, spill prevention, emergency response, and asset integrity.

METHODS

This literature study used a focused narrative synthesis of hazards and health, environmental, and community impacts across the oil and gas lifecycle, from exploration and drilling to processing, transport, storage, flaring, hydraulic fracturing, produced water, and decommissioning. Searches addressed physical and chemical hazards, exposure pathways, environmental and ecological effects, HSE controls, and organizational, regulatory, and equity issues. Key terms covered hazards such as VOCs, BTEX, benzene, hydrogen sulfide, noise, heat, fire, explosions, and well-integrity failures, alongside process safety, monitoring, safety culture, contractor management, and digital tools. Searches prioritized Semantic Scholar and OpenAlex, combining a broad search with claim-focused follow-ups. Studies were selected for addressing occupational, environmental, process-safety, or community outcomes; empirical studies informed exposure and intervention findings, while reviews supported synthesis and identification of research gaps. Because studies varied widely in settings, populations, measures, outcomes, designs, and geography, findings were compared narratively rather than pooled.

RESULTS AND DISCUSSION

The evidence converges on four findings. First, chemical hazards are multi-media problems. VOCs and BTEX can be emitted to air, deposited onto vegetation, transported through water, and experienced by workers and communities through different routes (Lupardus, 2017). Produced water and hydraulic-fracturing activities create additional pathways involving organic compounds, metals, salts, and radioactive constituents (Klaus-Michael Wollin, 2020). Environmental management should therefore use source-to-receptor models instead of isolated stack, tank, or wastewater measurements.

Second, physical and chemical hazards share organizational causes. Confined-space fatalities were strongly associated with organizational and supervisory factors (Zahra Naghavi K., 2019), while well-integrity analysis identified design, workload, procedures, alarms, training, and contractor competence as relevant conditions (Hals, 2015). This makes management systems, permit-to-work, isolation, competence, and emergency preparedness direct controls rather than administrative accessories.

Third, evidence for interventions is strongest when control implementation is verified. Green completion was modeled as a high-potential BTEX control (Akinyemi, 2020), and RCA-FMEA interventions were associated with lower equipment failure and repeat-failure rates in gas facilities (Ahmed & Pradhan, 2022). However, many

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other sources are reviews, theses, conceptual models, or cross-sectional studies. Their findings can guide design but cannot establish causal effectiveness across the industry.

Fourth, environmental and occupational management should be integrated with equity and lifecycle analysis. Localized analysis shows that communities within the same petroleum region can experience different hazard profiles (Hemmerling, 2007), while lifecycle reviews warn that controls may shift burdens across environmental, social, economic, and technical domains (Iacovidou et al., 2017). A Sinta-oriented article should therefore avoid presenting HSE as a purely technical or company-internal matter; environmental receptors, workers, contractors, and affected communities belong in the same analytical frame.

RESEARCH GAPS

The comparison in table 1 shows that no single design answers the full environmental-management question. Field monitoring detects contamination but may not establish health effects. Accident investigations reveal causal structures but are vulnerable to reporting and classification limits. Surveys capture implementation perceptions but not necessarily exposure reduction. Quasi-experimental maintenance studies provide stronger intervention evidence but may not measure environmental or worker-health outcomes. Longitudinal, multi-site designs that combine exposure, control, health, integrity, and environmental indicators would provide more decision-relevant evidence.

Direct physical-hazard measurements

The sources reviewed provide limited directly comparable field evidence for occupational noise, vibration, heat stress, radiation, and ergonomic exposure in oil and gas settings. Future studies should use personal dosimetry, task-based sampling, repeated heat-strain measurements, vibration metrics, audiometry, and ergonomic assessment across drilling, maintenance, offshore, refinery, and transport work. These studies should report exposure distributions, control conditions, work organization, and health outcomes rather than only hazard presence.

Longitudinal chemical exposure and health studies

The literature identifies plausible chemical pathways but contains fewer longitudinal studies that combine personal exposure, biomonitoring, employment history, co-exposures, and clinically meaningful outcomes. Research should focus on benzene and BTEX mixtures, hydrogen sulfide, particulate and combustion products, drilling and fracturing chemicals, and produced-water constituents. Community studies should incorporate baseline sampling, cumulative exposure, socioeconomic context, and comparison populations.

Tabel 1. Methodological Comparison of Studies

Study	Design or method	Population, setting, or dataset	Main finding	Management implication
Lupardus, 2017	Field monitoring and ecological assessment.	Oil and natural-gas production sites on shortgrass steppe; ambient VOCs, plant BTEX, minerals, and vegetation.	VOCs varied by production group; benzene and acrolein were important contaminants; BTEX and mineral changes were detected in vegetation.	Combine air, vegetation, soil, distance, production age, and reclamation monitoring rather than relying on facility emissions alone.
Akinyemi, 2020	Exposure assessment, archival analysis, trend analysis, and cost model.	Gas-flaring context in Nigeria; host-community BTEX exposure.	Green completion was estimated to reduce BTEX exposure by at least 80% and produce a positive modeled net impact benefit over six years.	Prioritize source reduction and evaluate controls using exposure, feasibility, and economic consequences.
Naghavi et al., 2019	Accident-report analysis using HFACS plus 33 semistructured interviews.	21 fatal confined-space accidents in oil and gas operations	77% of causal factors were attributed to organizational and supervisory levels; contracting and emergency management	Strengthen permit systems, supervision, contractor control, atmospheric testing, and rescue preparedness.

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Study	Design or method	Population, setting, or dataset	Main finding	Management implication
			required additional categories.	
Ahmed and Pradhan, 2022	Retrospective longitudinal quasi-experiment with matched assets and multiple statistical analyses.	Eight gas-production facilities; 864 assets, 3,412 failure events, and 51,840 asset-month observations.	Verified RCA–FMEA actions were associated with lower failure rate, repeat failure, failure hazard, downtime, and maintenance expenditure.	Link risk assessment to verified corrective action and asset-integrity performance.
Foster et al., 2019	Long-term multi-stakeholder environmental monitoring.	Athabasca oil-sands region; air, deposition, soil, plant chemistry, trees, lichen, and understory	Repeated multi-media monitoring supported regulatory and stakeholder evaluation and adapted to new environmental needs.	Maintain baselines and integrate environmental media with ecological indicators over long time periods.
Parmaak et al., 2025	Cross-sectional survey with descriptive statistics and chi-square tests.	286 mining and petroleum workers in Ghana, including 143 petroleum workers.	Petroleum policy awareness was 79.7%, but only 53.1% confirmed written policy availability; communication, support, and resourcing remained weaknesses.	Convert policy awareness into implemented systems through training, communication, accountability, and resourcing.

Intervention effectiveness and counterfactual designs

Green completion, digital monitoring, maintenance programs, integrity barriers, and environmental-management systems are often described as promising, but causal evidence remains uneven. Before-and-after studies should define the intervention, comparator, implementation fidelity, exposure metric, outcome, and follow-up period. Where randomization is infeasible, matched controls, interrupted time series, difference-in-differences, and stepped-wedge implementation designs can improve inference.

Integrated and equitable performance metrics

Many systems still separate occupational safety, process safety, environmental compliance, climate emissions, and community impact. Research should develop validated leading indicators that connect barrier health and management actions to exposure reduction, release prevention, worker health, ecological recovery, and community outcomes. Spatially resolved cumulative-impact and environmental-equity metrics are also needed so that regional averages do not conceal concentrated burdens.

CONCLUSION

Environmental management of oil and gas hazards is most effective when it treats physical energy, chemical toxicity, environmental transport, worker exposure, process integrity, and community risk as one connected system. The literature supports a hierarchy that begins with source reduction and inherently safer design, continues through containment, integrity, monitoring, maintenance, and emergency preparedness, and is reinforced by training, contractor control, reporting, and accountable leadership. The strongest empirical signals favor multi-media monitoring, verified corrective action, source-reduction strategies, and long-term ecological baselines. The evidence is less complete for direct occupational measurements of noise, vibration, heat, and cumulative chemical exposure, and it remains difficult to infer health effects from proximity or modeled risk alone. A publication-quality HSE framework should therefore distinguish measured exposure from inferred risk, primary evidence from review-level interpretation, and association from causation. Sustainable performance requires more than compliance documentation. It requires demonstrable reduction of emissions, releases, exposure, injury, ecological damage, and unequal community burdens across the full lifecycle of oil and gas operations. Future research should connect

industrial hygiene, environmental monitoring, process safety, digital technologies, health surveillance, and environmental justice in longitudinal, multi-site designs.

REFERENCES

- Adekoya, O. O., Tula, O. A., Adefemi, A., & Abatan, A. (2023). Health, safety and environmental (HSE) practices in the LNG industry: A review. *World Journal of Advanced Research and Reviews*. <https://doi.org/10.30574/wjarr.2023.20.3.2689>
- Ahmed, S. F., & Pradhan, M. M. P. (2022). Root-cause analysis and FMEA-driven reliability improvement in gas production facilities: A multi-year empirical study. *12*(10), 01–53. <https://doi.org/10.63125/70msp878>
- Aini, N., Berliana, R., & Badriyah, L. (2025). An overview of hazard identification and risk assessment in industrial safety (2015–2025): A narrative review. *Svāsthya: Trends in General Medicine and Public Health*. <https://doi.org/10.70347/svsthya.v2i6.154>
- Akinyemi, A. S. (2020). Green completion as a mitigation for BTEX exposure in gas flaring: Nigeria case study (exposure assessment and cost model). <https://doi.org/10.33915/etd.7977>
- Calderon, J. L., Sorensen, C., Lemery, J., Workman, C. F., Linstadt, H., & Bazilian, M. (2022). Managing upstream oil and gas emissions: A public health oriented approach. *Journal of Environmental Management*, *310*, 114766. <https://doi.org/10.1016/j.jenvman.2022.114766>
- Clarín, C. (2013). Application of layers of protection analysis (LOPA) for subsea production systems - a risk based model for determination of integrity levels in a global perspective. *Lund University Publications Student Papers* (Lund University). <http://lup.lub.lu.se/student-papers/record/4195391>
- Down, A. (2014). Partitioning biological and anthropogenic methane sources. *DukeSpace* (Duke University). <http://hdl.handle.net/10161/9055>
- Ekpo, K. I., Esitkot, E. L., Ganranwei, S. T., Naworio, N. B., Nta, U. E., & Akpan, N. P. (2026). Digital technologies in occupational health and safety management in nigeria's upstream offshore oil and gas sector: A critical review of gap-bridging potential. *International Journal of Research and Innovation in Applied Science*, *11*(7), 705–718. <https://doi.org/10.51584/ijrias.2026.11070040>
- Foster, K. R., Davidson, C., Tanna, R. N., & Spink, D. C. (2019). Introduction to the virtual special issue monitoring ecological responses to air quality and atmospheric deposition in the athabasca oil sands region the wood buffalo environmental association's forest health monitoring program. *The Science of The Total Environment*, *686*, 345–359. <https://doi.org/10.1016/j.scitotenv.2019.05.353>
- Griffin, M., Hodkiewicz, M., Dunster, J., Kanse, L., Parkes, K. R., Finnerty, D., Cordery, J., & Unsworth, K. (2013). A conceptual framework and practical guide for assessing fitness-to-operate in the offshore oil and gas industry. *Accident Analysis & Prevention*. <https://doi.org/10.1016/j.aap.2013.12.005>
- Hals, A. (2015). Well integrity assessment: Challenges related to human and organizational factors - the case study of veslefrikk. *Duo Research Archive* (University of Oslo). <http://hdl.handle.net/11250/2351199>
- Healy, N., Stephens, J. C., & Malin, S. A. (2019). Embodied energy injustices: Unveiling and politicizing the transboundary harms of fossil fuel extractivism and fossil fuel supply chains. *Energy Research & Social Science*, *48*, 219–234. <https://doi.org/10.1016/j.erss.2018.09.016>
- Hemmerling, S. A. (2007). Environmental equity in southeast louisiana: Oil, people, policy, and the geography of industrial hazards. https://doi.org/10.31390/gradschool_dissertations.1304
- Hidy, G. M., & Pennell, W. T. (2010). Multipollutant air quality management. *Journal of the Air & Waste Management Association*, *60*(6), 645–674. <https://doi.org/10.3155/1047-3289.60.6.645>
- Iacovidou, E., Velis, C. A., Purnell, P., Zwirner, O., Brown, A., Hahladakis, J. N., Millward-Hopkins, J., & Williams, P. T. (2017). Metrics for optimising the multi-dimensional value of resources recovered from waste in a circular economy: A critical review. *Journal of Cleaner Production*. <https://doi.org/10.1016/j.jclepro.2017.07.100>
- Ismail, O. S., & Umukoro, G. E. (2012). Global impact of gas flaring. *Energy and Power Engineering*. <https://doi.org/10.4236/epe.2012.44039>
- Katopodis, T., & Sfetsos, A. (2019). A review of climate change impacts to oil sector critical services and suggested recommendations for industry uptake. *Infrastructures*. <https://doi.org/10.3390/infrastructures4040074>

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- Klaus-Michael Wollin, H. F., Georg Damm. (2020). Critical evaluation of human health risks due to hydraulic fracturing in natural gas and petroleum production. *Archives of Toxicology*. <https://doi.org/10.1007/s00204-020-02758-7>
- Lj, B., & Vm, S. (2012). A literature review on safety performance indicators supporting the control of major hazards. *Data Archiving and Networked Services (DANS)*. <http://hdl.handle.net/10029/256345>
- Lupardus, R. C. (2017). Potential environmental impacts of oil and natural gas production on a shortgrass steppe. *Scholarship & Creative Works - Digital UNC a Service of University Libraries (University of Northern Colorado)*. <https://digscholarship.unco.edu/dissertations/452>
- Mulla, M. A. (2007). Effect of ISO certification on the safety performance level of petrochemical industries in arabian gulf countires. *Figshare*. https://figshare.com/articles/thesis/Effect_of_ISO_certification_on_the_safety_performance_level_of_petrochemical_industries_in_Arabian_Gulf_countires/10175702
- Nathan Andrews, P. B., N. Bennett. (2021). Oil, fisheries and coastal communities: A review of impacts on the environment, livelihoods, space and governance. <https://doi.org/10.1016/J.ERSS.2021.102009>
- Parmaak, J. B., Joel, P., & Boadu, P. (2025). Evaluation of occupational health and safety implementation protocols of the mining and petroleum industries in ghana. *International Journal of Research and Scientific Innovation*. <https://doi.org/10.51244/ijrsi.2025.1215ph000172>
- Razak, A. A. A., & Ismail, S. N. (2026). Investigating the organisational safety culture factors in the oil and gas industry: A systematic review. *International Journal of Industrial Management*. <https://doi.org/10.15282/ijim.20.2.2026.12173>
- SB, S., J, H., & ML., F. (2014). Environmental public health dimensions of shale and tight gas development. *Environmental Health Perspectives*. <https://doi.org/10.1289/ehp.1307866>
- Stefana, E., Ustolin, F., & Paltrinieri, N. (2021). IMPROSafety: A risk-based framework to integrate occupational and process safety. *Journal of Loss Prevention in the Process Industries*. <https://doi.org/10.1016/j.jlp.2021.104698>
- Villa, V. (2017). Extension of quantitative risk assessment to the analysis of external hazard factors in the chemical and process industry. *AMS Dottorato Institutional Doctoral Theses Repository (University of Bologna)*. <https://doi.org/10.6092/unibo/amsdottorato/7945>
- Zahra Naghavi K., H. A. M., S. Mortazavi. (2019). Exploring the contributory factors of confined space accidents using accident investigation reports and semistructured interviews. *Safety and Health at Work*. <https://doi.org/10.1016/j.shaw.2019.06.007>