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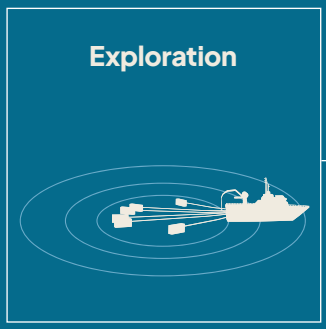
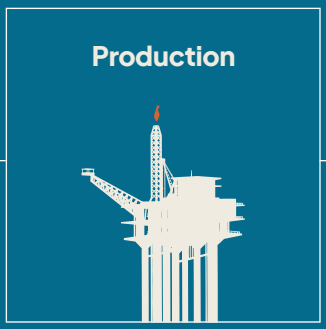
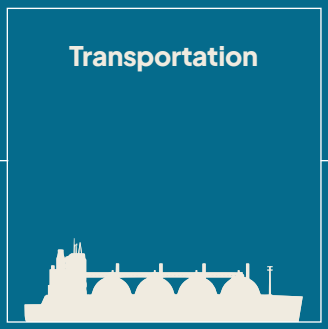
Offshore, Off-Limits

The Risks of Improper Decommissioning of Offshore Oil and Gas

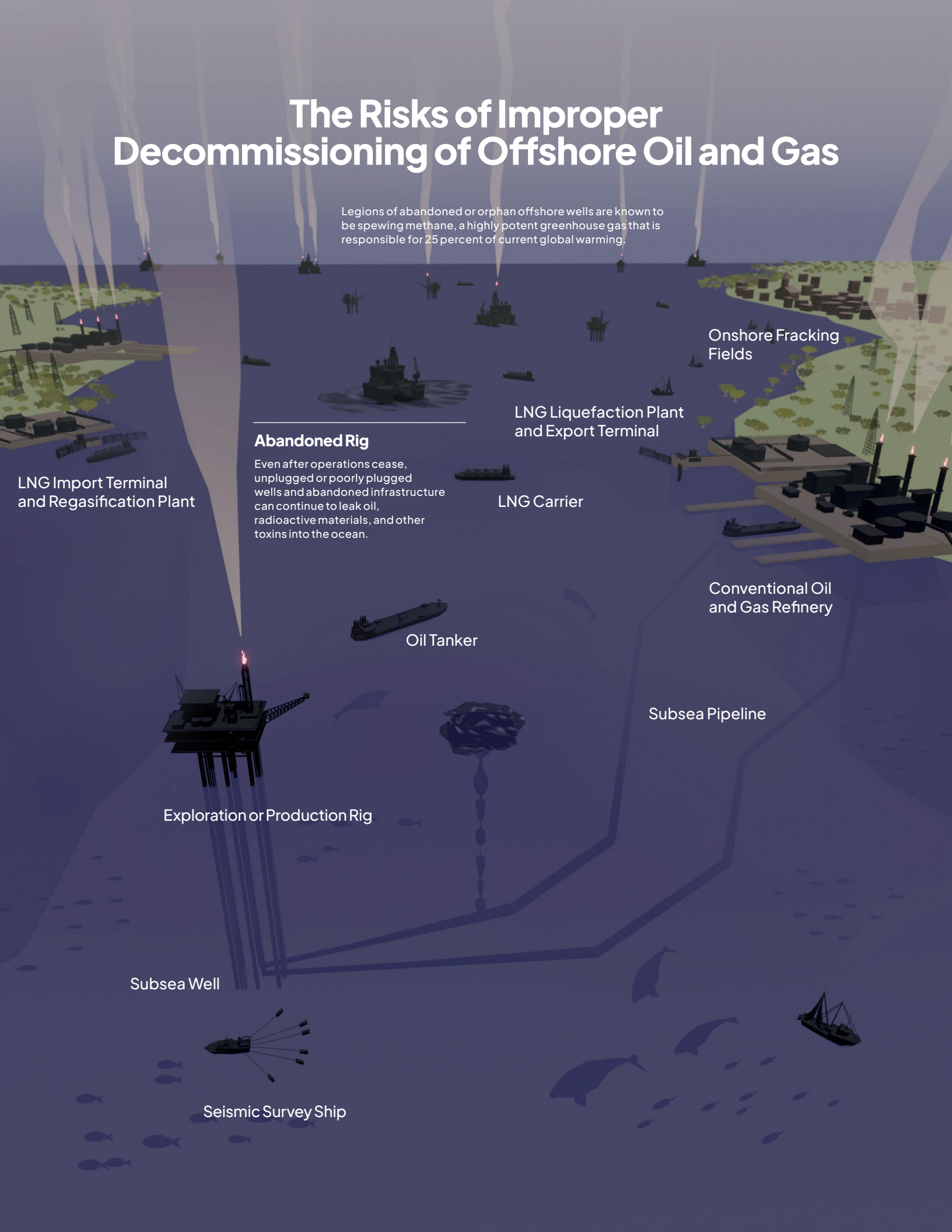






The Risks of Improper Decommissioning of Offshore Oil and Gas

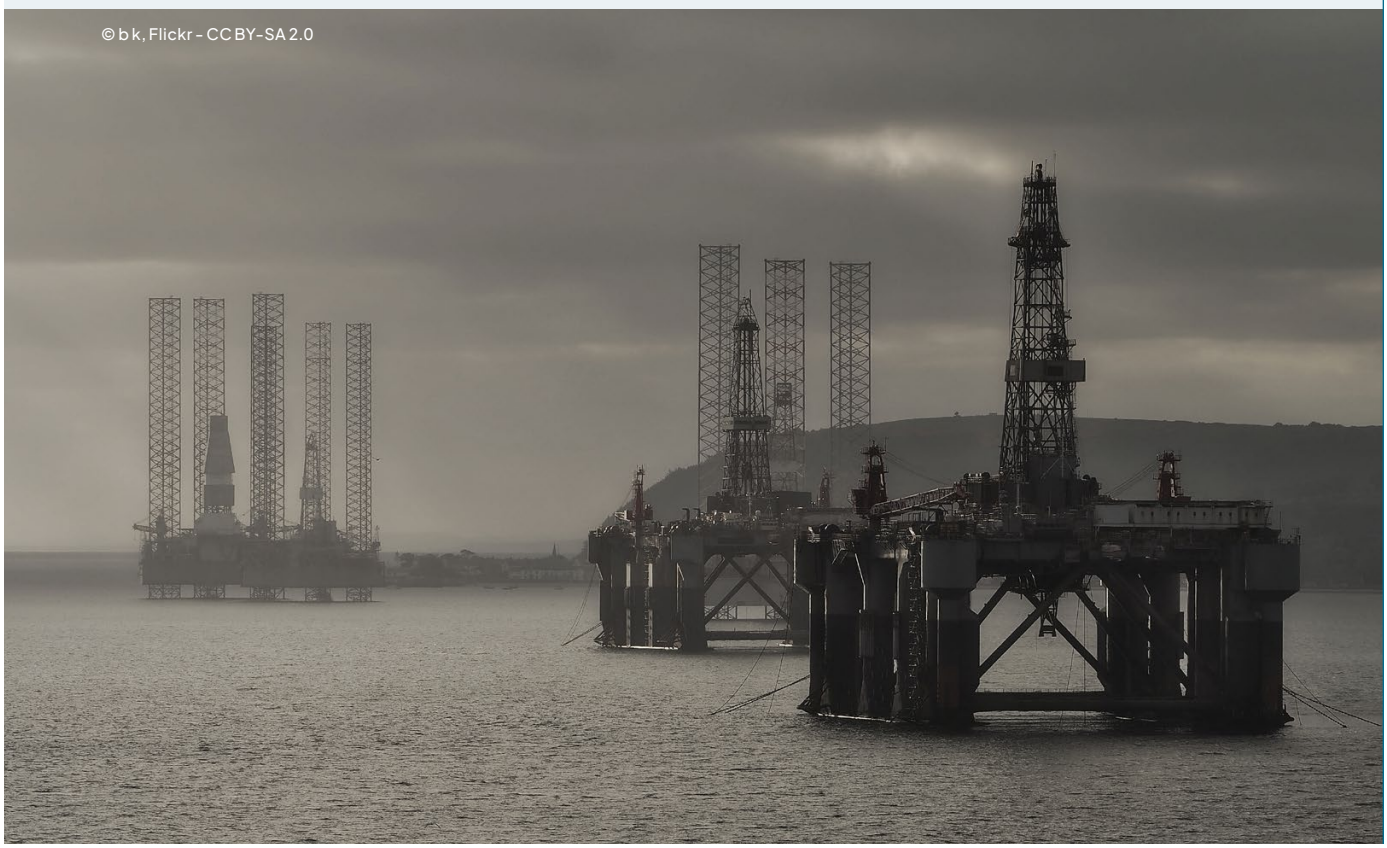
Legions of abandoned or orphan offshore wells are known to be spewing methane, a highly potent greenhouse gas that is responsible for 25 percent of current global warming.



Offshore oil and gas activity poses myriad threats to the environment and human rights across its life cycle, from exploration and production to transport and decommissioning. *Offshore, Off-Limits* examines many of the relevant risks and impacts at each of these phases. This brief in the series focuses on the risks and impacts associated with the decommissioning phase of offshore oil and gas projects, after operations have ceased when closure and cleanup should occur.

Key Takeaways

- Abandoned wells and improperly decommissioned offshore platforms are proliferating in the world's oceans, leaking enormous amounts of planet-warming gases into the atmosphere and toxic contaminants into the marine environment.
- From impacts on fisheries and tourism to contaminants in the food chain, offshore oil and gas facilities left in oceans can threaten the health, livelihoods, and cultures of nearby coastal populations long after operations cease.
- Oil and gas companies often avoid paying decommissioning costs through legal, tax, and contractual loopholes, shifting the burden to host governments and the public.
- There is a need for better accountability for both offshore operators and the government agencies tasked with their oversight to ensure that decommissioning liabilities are enforced.



What Is Offshore Decommissioning?

Decommissioning is the final stage of offshore oil and gas operations, which entails plugging and sealing the oil or gas well to permanently close it off and removing and disposing of associated equipment and infrastructure.[1] It should occur when an oil or gas well stops producing, which can be after several decades or much sooner, for instance, if a well is deemed commercially unviable during exploratory drilling. In principle, the process is complete when the host ecosystem and seafloor have been returned to their original, preexisting state. In practice, however, operators very often abandon wells without properly closing down and cleaning up production sites, leaving aesthetic eyesores, environmental hazards, and significant financial burdens in their wake.

How Are Offshore Oil and Gas Projects Decommissioned?

Proper decommissioning is a necessary, albeit costly and complex, process that requires years of planning. Closure of offshore oil and gas production sites typically involves the following steps:

Plugging Wells and Severing Well Casings

What the fossil fuel industry refers to as a "plug and abandonment" operation foremost involves cleaning out the well and installing a series of barriers to help keep potentially harmful fluids and gases from leaking into the environment.[2] This process often entails cutting and recovering the well casing — typically a steel pipe that lines the well — to prevent it from becoming a conduit for migrating fluids as it corrodes over time.[3] The well casing can be severed using chemicals, explosives, or cutters and is then recovered using cranes and other machinery.[4] The decommissioned well is ultimately capped with a surface plug to prevent leaks.[5] Operators carry out subsea plugging and casing recovery activities using semisubmersible rigs or floating vessels.[6]

Removing Platforms, Pipelines, and Other Offshore Structures

After the wells have been permanently plugged and sealed, operators should ideally remove all the infrastructure and equipment at the production site, including the rigs and platforms, wellheads, moorings, pipelines, artificial islands, and power cables.[7] Before the platform can be dismantled, workers must clean out any holding tanks, processing equipment, and piping, disposing of any residual oil or gas.[8] The platform must then be removed from its foundation, which may entail severing moorings that extend below the seafloor.[9]

Disposing of Platforms and Other Equipment

Complete rig or platform removal entails transporting all existing infrastructure and equipment from an offshore production site to onshore facilities where they can be recycled or disposed of, such as scrapyards.[10] However, some operators fail to decommission sites or only do so partially. Operators sometimes deliberately dump dismantled structures and other waste in deep waters, a practice that can harm the marine environment, as discussed below. In some jurisdictions, regulators may allow offshore platforms to remain in place or be relocated to the seafloor to serve as artificial reefs, the ecological benefits of which are dubious.[11]

Cleaning Up the Project Site

Following rig removal, proper site cleanup involves clearing the seafloor of all debris and obstructions, which may require the use of trawl nets and vessels as well as deep-sea divers.[12] Trash recovered from the seafloor should be towed to shore for proper disposal.[13]

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What Are the Risks Associated with the Decommissioning Phase?

Responsible closure and cleanup of offshore oil and gas operations is necessary to avert further harm from an already destructive industry and constitutes a critical step in a just and equitable transition away from fossil fuels. Failure to properly close down and clean up offshore operations leaves a lasting legacy of harm long after drilling ends. While the process of shutting down oil and gas production sites can be disruptive to the environment, it is far preferable to allowing the proliferation of aging, leaking wells and infrastructure in the world's oceans. The best way to avoid the impacts and costs associated with decommissioning offshore oil and gas operations — and the damage of failing to do so properly — is not to commence them in the first place.

Environmental and Biodiversity Risks

Equipment and wastes left at sea may release toxic or radioactive contaminants, whether over time or as a result of sudden accidents when oil and gas companies abandon offshore operations without decommissioning the project sites. Abandoned offshore infrastructure poses a host of risks. Over time, oil and gas pipelines left on the seafloor become more susceptible to damage from erosion, mudslides, corrosion, and fishing trawlers, and, when ruptured, may leak oil, gas, and other harmful compounds into the ocean.[14] Heavy currents during hurricanes and other extreme weather events, which are occurring with increasing frequency and severity due to climate change, are capable of moving pipelines over significant distances.[15] The displaced pipeline segments may, in turn, damage subsea habitats or the infrastructure at other oil and gas production sites, elevating the risk of noxious leaks.[16] Likewise, discarded drill cuttings have the potential to release heavy metals — including mercury[17] — and naturally occurring radioactive materials for years after operations have ceased.[18] Like old pipelines, ecotoxic cuttings can be dispersed by mudslides, ocean currents, and other physical disturbances.

Oil and gas leaks from abandoned wells can expose marine life to toxic substances. Beyond methane, unplugged or poorly plugged wells can also leak oil as well as other contaminants, such as benzene, nitrogen oxides, and carbon dioxide (CO_2). Benzene, a known carcinogen, has an acute toxic effect on marine life when dissolved in water, and in the long term, it can shorten lifespans, cause reproductive problems, lower fertility, and affect physiology and behavior.[19] Nitrogen pollution can cause algal blooms that clog the gills of fish and invertebrates, smother coral, and block sunlight from reaching underwater vegetation.[20] When it enters oceans, nitrogen can boost the growth of harmful phytoplankton species whose biotoxins accumulate in the tissues of the fish that eat them and can lead to death and illness among the marine mammals and birds that feed on the contaminated fish.[21] Finally, CO_2 emissions drive both ocean acidification and anthropogenic climate change.

Regulators and operators should take steps to address and minimize the adverse environmental impacts associated with certain cleanup practices. For instance, decommissioning activities can lead to increased noise levels and ship traffic due to the presence of large vessels on-site and the transport of materials to and from port.[22] Likewise, the use of explosives to break down moorings and other infrastructure creates shockwaves and acoustic energy, disturbances that can destroy coral reefs and kill or harm wildlife, including fish, sea turtles, and marine mammals.[23]

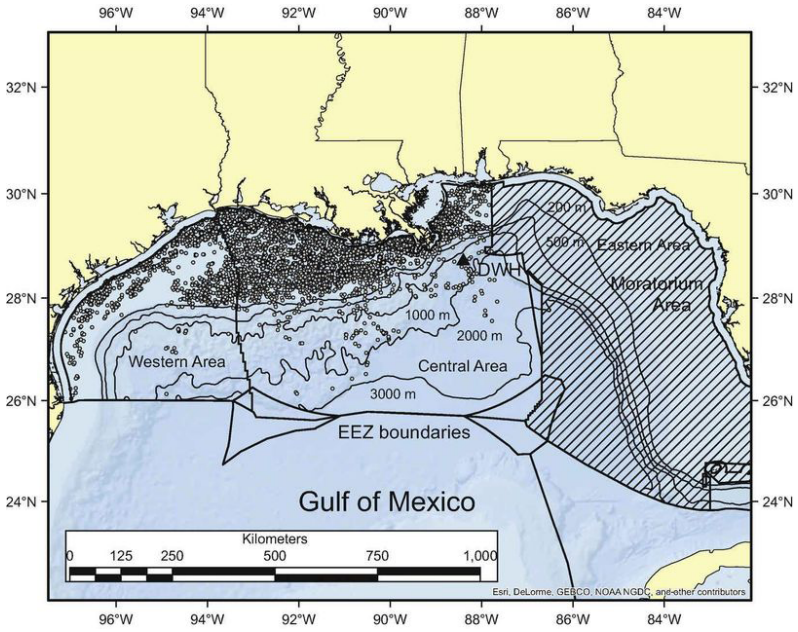
Poor site cleanup practices can pose risks to water quality, with far-reaching implications

for marine ecosystems. Sources of pollution include accidental spills or discharges from surface vessels as well as fluids released during the cleaning and disassembly of platforms, pipelines, and other machinery containing oil and harmful chemicals.[24] The process of dredging the seabed surrounding rigs to remove drill cuttings — which contain mineral deposits typically coated with hydrocarbons and toxic drilling mud and other waste — can stir up materials that may have been contaminated during drilling and subsequently buried through sedimentation.[25] These newly exposed toxins can then enter the water column and benthic environment, traveling via ocean currents over long distances and harming zooplankton, invertebrates, and fish.[26] Some industry practices around decommissioning, therefore, need significant improvement.

Climate Risks

The offshore oil and gas industry's most damaging environmental legacy is the legions of unplugged or poorly plugged wells littering the seafloor, a shocking percentage of which are largely unaccounted for. Unplugged or poorly plugged wells release planet-warming greenhouse gases and other toxins harmful to the marine environment. Even in jurisdictions that require operators to plug wells before their abandonment, the lack of capacity for sustained monitoring of decommissioned sites — as well an absence of strong laws mandating that operators assume that duty — almost guarantees that shoddy work and equipment failures will go unnoticed. This is only likely to get worse, with the number of improperly plugged or orphan wells and deserted facilities expected to increase drastically around the world.[27] Decades-old production sites offshore the Asia-Pacific, Latin America, and West Africa are nearing the end of their economic lives — including in jurisdictions where decommissioning is new and thus largely unregulated.[28]

In the Gulf of Mexico alone, more than 32,000 out of 55,000 permanently or temporarily abandoned wells have been ignored for decades and may be leaking, not to mention the more than 1,000 rigs and platforms that have long been sitting idle.[29] Yet, alarmingly, a 2021 research plan prepared by the Bureau of Ocean Energy Management (BOEM) indicates that the US federal agency specifically tasked with managing the development of offshore energy and mineral resources "in an environmentally and economically responsible way" was and may still be unaware of which abandoned oil and gas wells in the Gulf of Mexico are leaking.[30] Given the significant threat they pose to the climate, the lack of knowledge about leaking wells is particularly troubling.



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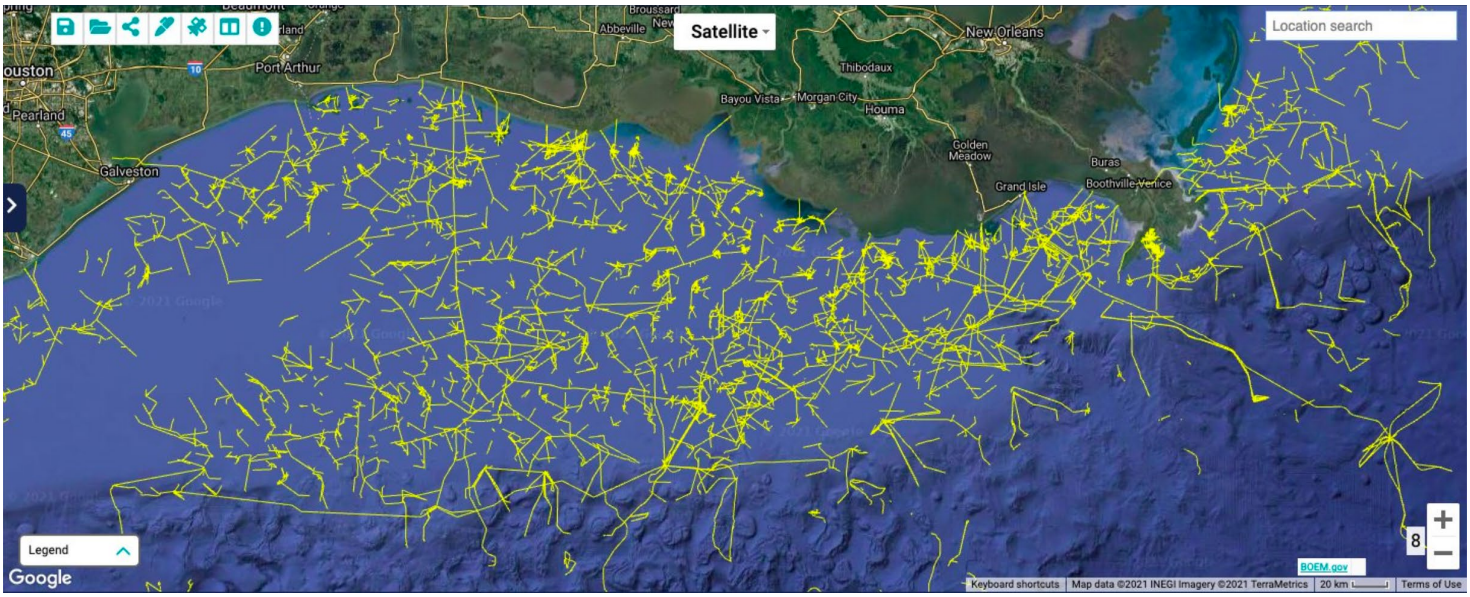
Deepwater Oil and Gas Production in the Gulf of Mexico and Related Global Trends

Leaks from post-production wells exacerbate climate change. Leaking offshore wells constitute a pernicious threat to marine ecosystems as well as to the global climate — one that persists long after production sites have been shut down. When oil and gas wells are left unplugged or when plugs fail — which becomes all the more likely over time as environmental factors contribute to declining well integrity[31] — they can release harmful gases into the ocean and atmosphere, including enormous quantities of methane.[32] A study in the North Sea, for instance, revealed that one-third of the region's abandoned offshore wells could be releasing between 3,000 and 17,000 tons of methane into the ocean every year,[33] roughly equivalent to the annual CO_2 emissions of 16,000 to 91,500 gas-powered cars.[34]

Methane leaks from offshore wells can be so massive that they can even be detected from space. In June 2022, scientists using satellite data discovered that an oil and gas platform offshore southern Mexico had spewed some 40,000 metric tons of methane over a 17-day period in December 2021.[35] Methane is a highly potent greenhouse gas, second only to CO_2 in driving climate change during the industrial era.[36] In fact, methane is 86 times more effective at trapping heat than CO_2 over a 20-year period and is responsible for 25 percent of current global warming.[37]

The vast network of offshore pipelines, many of which are aging, also risks leaks. In the US, lax federal regulators have permitted 97 percent of inactive offshore pipelines to remain in place since the 1960s. In spite of clear rules requiring cleanup, there are currently 18,000 miles (29,000 km) of abandoned pipelines on the Gulf of Mexico's seafloor.[38] Out of the 8,600 miles of active pipelines in the Gulf, over 44 percent were installed prior to 2000[39] and are already aging — which, according to documentation by the Bureau of Safety and Environmental Enforcement, can increase the risk of leakage incidents due to corrosion.[40]



Oil and gas pipelines in the Gulf of Mexico officially designated "Abandoned" or "Out of Service."
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Rigs-to-Reefs: Ecological Havens or Greenwashing Harbors?

Recent years have witnessed the growing popularity of "rigs-to-reefs" (RtR), an alternative to complete platform removal that involves converting decommissioned offshore oil and gas platforms into artificial reefs. In the US, the RtR program under the Bureau of Safety and Environmental Enforcement (BSEE) permits the operator to either:

1. "Top" the platform by severing it 85 feet below the surface while leaving the remaining structure in place
2. Detach the platform from the seabed and then topple it in place
3. Tow the platform to another location more ideal for reefing[41]

Outside of the US, artificial reefs have been created from inactive platforms offshore Brunei, Malaysia, Senegal, and Thailand, among other places.[42] Unsurprisingly, the fossil fuel industry is a big proponent of RtR programs, which can save oil and gas companies millions of dollars in decommissioning costs.

Among environmentalists, marine scientists, and ocean campaigners, however, the practice remains controversial. On the one hand, some groups have advocated that old platforms be left in the ocean, arguing that removing them could do more harm than good.[43] On the other hand, many remain skeptical that leaving gargantuan unnatural structures under the sea could be beneficial to the environment and point to "substantial unpredictability and uncertainty regarding the effectiveness of artificial reefs, considering the variability and complexity of global marine ecosystems."[44] Moreover, the practice could cause future harm. Studies show that artificial reefs have the potential to damage marine environments by harboring and facilitating the spread of invasive species, creating adverse changes in natural food-web dynamics and ecological community structure, and releasing contaminants as rigs corrode.[45]

Given the debate around the long-term efficacy and safety of artificial reefs, as well as the diversity of marine ecosystems, two things are clear. First, RtR programs cannot follow a "one-size-fits-all" approach across regions that ignores unique ecological conditions and corresponding risks specific to a particular site. Second, the fossil fuel industry must not use RtR programs to shirk responsibility for proper closure and cleanup while simultaneously greenwashing the environmental, climate, and health impacts of their offshore operations or minimizing the numerous impacts and risks they pose across their phases, as detailed in this series of briefs.

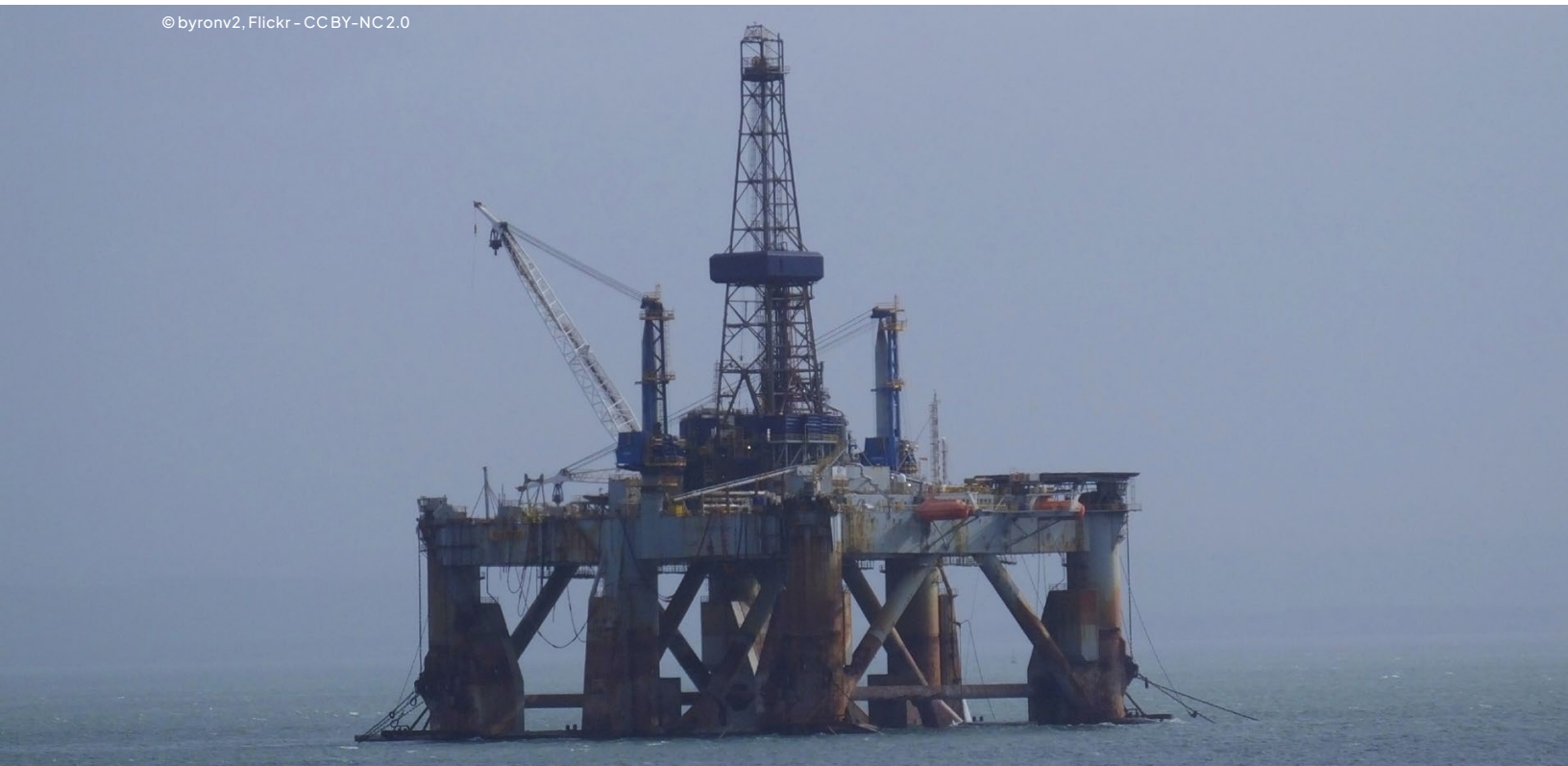
Health, Livelihood, and Cultural Risks

From impacts on fisheries and tourism to contaminants in the food chain, offshore oil and gas facilities can threaten the health and livelihoods of nearby coastal populations long after operation ceases. On the one hand, when offshore projects are simply abandoned without closure and cleanup, pipelines and other infrastructure and trash left on the seafloor present navigational and trawling hazards to commercial and subsistence fishermen alike.[46] On the other hand, poor industry practices around the dismantling and recovery of offshore infrastructure can cause substantial habitat destruction, fish die-off, and overall ecological imbalance. In either case, the impacts can jeopardize the physical and economic integrity of fishing communities dependent on those resources.

Communities adjacent to operations are also at heightened risk of consuming seafood that contains heavy metals, hydrocarbon particles, and the many other harmful compounds dispersed into the marine environment during the breakdown and cleanup of production sites and released by leaking wells. These toxins collect in the tissues of fish and other marine life and eventually make their way up the food chain in progressively larger quantities, meaning that humans are exposed to harmful doses. Especially dangerous particulates include chemical components of crude oil called polycyclic aromatic hydrocarbons (PAH), which can persist in the environment and animal tissues for months or even years and have been linked to cancers of the skin, lung, bladder, and gastrointestinal system.[47]

Abandoned offshore rigs and platforms also create huge eyesores that can negatively affect local tourism by making coastal towns less attractive to visitors. In fact, according to an analysis of communities on the Gulf of Mexico, counties in the region that did not house offshore infrastructure like pipelines and refineries brought in 50 percent more tourism dollars per capita compared to localities with such infrastructure.[48]

Leaks from abandoned or improperly plugged wells can damage coastal areas and the cultural, as well as livelihood, resources located there. Some Indigenous communities in the US, for example, have voiced concerns that abandoned wells have the potential to leak oil that will contaminate coastal areas, including archaeological sites.[49]



Financial Risks

The high costs of proper closure and cleanup pose significant burdens to governments and the public in affected areas when companies default on their decommissioning duties.

The Cost and Complexity of Decommissioning Obligations

Shutting down offshore oil and gas facilities is consistently and significantly more expensive than closing onshore ones — and the bill only increases the deeper the water. While the cost of plugging a conventional onshore well can range between $20,000 and $50,000,[50] plugging an offshore well can cost around $150,000 per shallow water well and at least $21 million for a subsea well in deep water, according to estimates by the BSEE.[51] The process of removing and disposing of equipment and infrastructure at offshore sites is likewise pricey. The BSEE projects that removing fixed platforms in shallow water could cost anywhere between $85,000 and $4.6 million, while extracting a floating rig and associated equipment in deep water could cost $30 million or more.[52] Thus, per lease, decommissioning can cost tens of millions of dollars in shallow water and hundreds of millions of dollars in deep water.[53] It also costs considerably more to decommission offshore infrastructure damaged by hurricanes — which are increasingly frequent and severe due to climate change — than intact facilities.[54]

Those bills may come due sooner than anticipated. The risk of decommissioning default may increase if wells underperform, prices drop, or mandated climate action accelerates, leading to earlier-than-expected production halts and abandoned wells. A 2021 forecast by the financial analysis firm IHS Markit estimated that, globally, offshore decommissioning could cost nearly $100 billion between 2021 and 2030,[55] what has been referred to as a "decade for decommissioning."[56] In the Gulf of Mexico's Outer Continental Shelf (OCS), production levels are declining, and decommissioning costs are rising due to more expensive deepwater development. As a consequence, the financial pressure on operators may intensify if revenues available for decommissioning drop.[57]

Decommissioning costs may be higher than anticipated if assets are decommissioned earlier than expected. Costs can change significantly over the lifespan of a project, and their unpredictability is compounded by the diverse funding structures employed by different jurisdictions to address these expenses. In Mexico, for example, companies are required to contribute to a designated fund for decommissioning active projects based on estimates of future production, remaining reserves, and initial decommissioning costs.[58] But because these contributions are made gradually, there's a chance that there won't be enough money in the fund to properly decommission a site if it happens before the planned end of its operating life. In other countries such as Australia and Norway, decommissioning is funded gradually as it becomes necessary.[59] However, this "pay-as-you-go" approach can be risky if the responsible party relies solely on income from the project, especially since decommissioning costs typically arise when the offshore asset is at the end of its life and not generating much profit.

Corporate Strategies to Avoid Decommissioning Costs

While most countries with significant offshore oil and gas resources require private companies to cover decommissioning costs, companies often avoid paying by transferring ownership of their oil and gas assets.[60] Bad-faith corporate tactics and opportunism have contributed to the rise in orphan wells, abandoned rigs, and disused platforms in the world's oceans. Corporations that sidestep decommissioning obligations leave the public in host countries to shoulder heavy financial burdens.

Larger companies can sell their aging assets to smaller firms, known as "wildcat" operators, with the aim of extracting maximum profit from depleted wells before they become non-productive.[61] Such has become common practice in Nigeria, where large multinationals like ExxonMobil and Shell reportedly routinely offload their oil and gas assets to inexperienced and under-resourced local companies, leaving them to inherit the decommissioning obligations and associated costs and liabilities, although they lack the means to cover them.[62]

Wildcat operators may declare bankruptcy and thereby shirk closure and cleanup costs, shifting them to the public rather than foot the bill when the time for decommissioning inevitably arrives.[63] In 2016, Australian energy giant Woodside transferred its aging assets in the Timor Sea to the newly incorporated group Northern Oil and Gas Australia, which subsequently collapsed into insolvency in 2019, passing the outstanding cleanup costs to Australian taxpayers.[64] Two decades after purchasing an offshore California rig from Mobil in 1997, Colorado-based oil company Venoco declared bankruptcy following a burst pipeline, leaving the state to deal with the mess.[65]

Regulatory, Tax, and Legal Loopholes

Tax credits or exemptions for decommissioning costs may enable oil and gas companies to transfer the heavy economic toll of oil and gas production to the public.[66] In the UK, for instance, dismantling the numerous inactive rigs in the North Sea is expected to cost around £40 billion,[67] only half of which will be borne by oil companies, the rest falling to the public purse through tax relief.[68] Such massive costs can be especially burdensome for lower-income countries already struggling with massive debt.

Contractual loopholes may also facilitate oil and gas operators' avoidance of decommissioning costs. For instance, in 2016, the local subsidiary of fossil fuel giant ExxonMobil, together with its joint operators Hess and China National Offshore Oil Corporation, entered into a production-sharing agreement with the Guyanese government concerning the consortium's deepwater drilling operations offshore Guyana.[69] Despite the significant looming expense of closing down these ultra-deep offshore operations, the agreement permits the consortium to deduct the estimated future costs of decommissioning as current operating expenses, thereby reducing the amount of "profit oil" it must share with Guyana. The agreement does not require ExxonMobil to demonstrate that it has reserved those decommissioning funds for future use, only to promise to pay when the time comes to close operations down, which in effect passes the decommissioning bill onto the government up-front.[70] An independent report by the Institute for Energy Economics and Financial Analysis (IEEFA) estimates that Guyana will ultimately pay Exxon and its partners GY$666.1 billion ($3.2 billion) out of its oil profits for decommissioning costs.[71]

Without adequate management and regulation of decommissioning, legal loopholes can be exploited by oil and gas companies, increasing default risk. Smaller subsidiary companies often receive financial assurances from their parent companies to cover the costs of decommissioning.[72] However, these parent companies are not always legally bound to fulfill these financial commitments for decommissioning, and it is not within their financial interests to do so.[73] As a result, when the time comes to decommission, if the subsidiary companies lack sufficient funds, they may default on their obligations, leaving the financial burden of decommissioning to the public.[74]

In the Gulf of Mexico's OCS, the ability of companies to obtain financial assurance waivers from BOEM has increased the risk that the government will have to pay the costs of decommissioning in the event of default. Typically, a company involved in offshore activity in the OCS that has potential future decommissioning costs is required to post a bond that serves as a financial guarantee that the company will fulfill its cleanup obligations.[75] However, as reported by Carbon Tracker, in 2022, only 10 percent of estimated decommissioning costs for the OCS were secured by bonds.[76] This is due in part to BOEM's financial assurance program, which allows companies that do not have investment-grade credit ratings to use third-party guarantees in lieu of posting a bond when obtaining leases for offshore development. Under this scenario, if these lessees became financially insolvent and filed for bankruptcy — as was the case between 2009 and 2020 for 30 companies whose unbonded offshore decommissioning liability totaled approximately $7.5 billion[77] — the public would be left to foot the massive bills. A new rule under the Biden administration requiring these less creditworthy companies to secure supplemental was expected to help ensure that some funds are available to cover decommissioning costs in the event these companies go bankrupt, lessening the burden borne by taxpayers.[78] However, the future of the rule under the new Trump administration is uncertain. In any case, because decommissioning deadlines routinely go unenforced — as a recent investigation into the US Government Accountability Office revealed[79] — there is a need for better accountability for both offshore operators and the government agencies tasked with their oversight.

Conclusion

Closing down and cleaning up offshore oil and gas operations is a complex, lengthy, and costly process that is all too often not done properly or not done at all. With the proliferation of orphaned and abandoned wells in the world's oceans, operators are leaving eyesores, environmental hazards, and financial burdens in their wake. Methane leaks from offshore wells constitute a significant and growing source of planet-warming emissions. Decommissioning, including plugging and sealing wells and disposing of associated infrastructure, is all the more difficult and costly in deeper waters and too often goes unmonitored. Legal, regulatory, and contractual loopholes facilitate industry avoidance of costs, leaving the public to foot the bill and suffer the consequences of the lasting harms that remain after an offshore oil or gas project is shuttered. The best way to avoid the pernicious impacts and significant costs of decommissioning offshore oil and gas operations is to not begin them in the first place. The risks posed by other phases of offshore oil and gas activity are explored further in the other briefs in the *Offshore, Off-Limits* series, which can be found on CIEL's website.

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