



PAPER • OPEN ACCESS

The long mid-transition: tracking decades of coastal oil well decommissioning in California

To cite this article: Tristan Partridge and Javiera Barandiaran 2024 *Environ. Res.: Energy* 1 045002

View the [article online](#) for updates and enhancements.

You may also like

- [Response of CO₂ and CH₄ emissions from Arctic tundra soils to a multifactorial manipulation of water table, temperature and thaw depth](#)
K Best, D Zona, E Briant et al.
- [Ensuring continuity and impact in Arctic monitoring: a solution-orientated model for community-based environmental research](#)
Louise Mercer, Dustin Whalen, Deva-Lynn Pokiak et al.
- [Energy transitions of declining energy industries: the effect of renewable portfolio standards on the U.S. coal industry](#)
Marcello Graziano, Nyakundi Michieka, Marta Musso et al.

ENVIRONMENTAL RESEARCH ENERGY



PAPER

OPEN ACCESS

RECEIVED

28 February 2024

REVISED

30 August 2024

ACCEPTED FOR PUBLICATION

17 September 2024

PUBLISHED

26 September 2024

Original content from this work may be used under the terms of the [Creative Commons Attribution 4.0 licence](#).

Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.



The long mid-transition: tracking decades of coastal oil well decommissioning in California

Tristan Partridge* and Javiera Barandiaran

Global Studies; University of California, Santa Barbara, CA, United States of America

* Author to whom any correspondence should be addressed.

E-mail: tristan.partridge@ucsb.edu

Keywords: energy transitions, decommissioning, environmental justice, corporate accountability, fossil fuel phase-out

Abstract

This article presents an account of four different experiences of oil well decommissioning and abandonment along the Santa Barbara coast in California, together forming an ongoing process that began over a century ago and which has, more recently, become a component of statewide transition plans. The cases include the re-abandonment of nineteenth century wells in Summerland; offshore oil platform removal in the 1990s; and two different areas of operational closures due to infrastructure failures and bankruptcies. Informed by this history, we suggest that decommissioning must be actively managed through coordinated, well-funded, multi-agency action, grounded in historical awareness of policy trajectories. Additionally, the scale of the need together with the economics and policies in place mean that oil well decommissioning will be happening for a very long time, even if no new wells are built.

1. Introduction: the long lifetimes of energy transitions

The ‘mid transition’ concept implies a relatively confined period of time during which the use of incumbent energy sources declines while the use of emergent energy sources increases, and both will operate sub-optimally, posing a range of challenges (Grubert and Hastings-Simon 2022). One such challenge is fossil fuel decommissioning, needed to ensure abandoned oil wells do not leak methane, oil, and other toxic elements which contaminate groundwater and the atmosphere and contribute to climate change. Decommissioning on the scale required during the mid-transition is unprecedented: globally, 29 million abandoned wells emit 2.5 million tons of methane (Partridge *et al* 2023). Never before have so many industrial sites been dismantled in a planned way and on a confined timeline. Historians of energy have had little to say about decommissioning on a large scale because past energy transitions were characterized by the opposite of substitution, that is, they were characterized by co-existence and energy *additions*: ‘in the nineteenth century when coal surpassed biomass in providing the largest share of the global energy supply and in the twentieth century when petroleum overtook coal... In both cases the use of the older energy source continued to grow, despite rapid growth in the new source’ (York and Bell 2019, 40, Acker *et al* 2023). The California coast, where decommissioning has a century-long history, illustrates some of the particular challenges involved in decommissioning, which are poised to become more common during the mid-transition.

Decommissioning requires significant expenditure to plug wells at the end of their life, yet generates no revenue, leading oil operators to prefer instead to postpone decommissioning ‘nearly indefinitely’ (Weber *et al* 2021, 1). The policies used to encourage closure—bonds, insurance, and minimum production thresholds—have been applied conservatively or not at all. For example, with natural gas wells in Pennsylvania, production thresholds are recommended but not required, despite regional findings that show one third of wells would close if a modest threshold were applied (Weber *et al* 2021). After Texas raised bonding and insurance requirements, small producers closed under-performing wells, leading to measurable improvements in environmental quality (Boomhower 2019). A similar dynamic occurred in North Dakota, confirming that higher bonds would accelerate decommissioning (Lange and Redlinger 2019). Still, finding

the optimal level of bonding is a hard political decision, because high bonds would effectively shut down the industry: by raising companies' liabilities, new companies would find it impossible to enter the market (Davis 2015). High bonds would thus accelerate the mid-transition and help limit climate change, yet no government or international agency has moved in this direction, and available studies are cautious about identifying such a high bond level (Davis 2015, Boomhower 2019, Lange and Redlinger 2019). Another challenge with bonds and policy in general is anticipating investors' reactions. In Germany's coal fields, investors largely ignored two policies aimed at closing down coal, and then came to expect compensation for doing so (Sen and von Schickfus 2020).

The question of who pays is the first of several justice and equity issues relevant to decommissioning. Although Germany's coal operators came to expect compensation, and some initiatives have tried to pay actors to leave oil in the ground, in the U.S. decommissioning policies assume that oil operators are responsible for paying for plugging wells and cleaning up former extractive sites (Davis 2015). In practice, however, across the country operators have not posted bonds large enough to cover even a fraction of the cost. Echoing the findings of studies in Texas, Pennsylvania and North Dakota cited above, a recent report on Colorado found that its landmark 2018 law on financial assurances for oil and gas cleanup has largely failed, leaving taxpayers on the hook (Purvis 2024). Relatedly, there is the matter of foregone wealth. In Pennsylvania, where more than half of all known drilled wells have been abandoned, these unplugged wells have depressed economic activity and property values around them (Max *et al* 2022). The costs of decommissioning are thus borne by citizens both directly through taxes used to pay for plugging, and in myriad indirect ways, including foregone wealth, environmental harm, and the rising costs associated with climate change.

Economics aside, decommissioning can alleviate environmental injustices and harms, or accentuate these if not done properly. Decommissioning involves ending production, dismantling extractive infrastructure, site remediation, and managing possible futures for that place. The first milestone is plugging a well by permanently sealing it, to prevent leaks. Too often, however, operators leave wells idle—that is, unproductive for at least two years and amenable to re-enter production—or wells are orphaned, with no known responsible operator. In California, there over 50 000 plugged wells, 36 000 idle wells, and over 5000 orphaned wells; if the mid-transition is to advance, then decommissioning all the idle and orphaned wells is urgent (Triozi 2022). Recent U.S. policy has helped reveal the scale of the challenge—in Ohio, for instance, the number of abandoned wells jumped from 891 to 20 429 the year federal funding was released (Partridge *et al* 2023). California's state regulator ranked orphaned wells by priority of decommissioning, with those in disadvantaged communities ranked as top priority in an effort to alleviate environmental injustices (Triozi 2022). But how to scale such an approach remains an open question. The intensive adoption of fossil fuels is a 20th century phenomenon, when 'whole landscapes dedicated purely to the extraction of fossil fuels were established,' causing intense environmental injustices (Acker *et al* 2023, 232). Now, during the mid-transition, these are 'whole landscapes' that need to be decommissioned, ideally following standards of effectiveness, equity, and justice.

The history of decommissioning on the California coast provides lessons which could inform the kinds of active management the mid-transition requires and point to criteria by which to assess how decommissioning is working. We present four processes of oil well decommissioning and abandonment along the relatively wealthy and technologically sophisticated Santa Barbara coast. This is a part of the world with 'dual investments' in nature and oil—places with very long, unfinished histories of oil extraction that also selectively maintain environmental valorization in contrast to nearby Los Angeles (LeMenager 2014). Our first case concerns hundreds of legacy coastal oil wells at Summerland, many drilled in the late 1800s, and which in recent years have become subject to 're-abandonment.' The second case dates to the 1990s when a number of offshore oil platforms built in the 1950s–60s were decommissioned in light of dwindling production and unfavorable economic conditions. The third and fourth cases, at Platform Holly and Rincon Island, are both connected to the volatility of the oil industry—specifically the constant risks of infrastructure failure (oil spill disasters) and economic failure (bankruptcies). While California continues to build-out renewable energy and work toward relatively ambitious emissions targets, these cases underline the unavoidable imperative for transition thinking and action to address the challenge of living with redundant fossil fuel infrastructure.

2. Legacy wells and re-abandonment in Summerland

The coastline of Santa Barbara County, California, is regularly described as the place where the world's first commercial offshore oil wells were drilled. In Summerland in 1896, rows of wooden piers resembling boardwalks were constructed out to sea from the shoreline—35 feet above the floor of the Pacific and extending up to 1350 feet in length—from which steel pipes were pounded up to 455 feet beneath the seabed

using techniques already in use in onshore operations (National Commission 2011). By 1902, 412 wells are recorded as having been drilled from these piers (Sollen 1998, 9). At that time, offshore activities were completely unregulated by the state and, in the rush to acquire coastal land or permission to build new piers, acts of vandalism and armed violence between rival prospectors were common (Wilder 1998, 31, Sollen 1998). This was an acutely ecologically destructive boom in industry, yet it produced only modest yields and the Summerland field was rapidly exhausted (Lima 1994). An oil well there (also including onshore wells) would 'begin with an output of five barrels each day but, within a year, it would be reduced by one-half and after two years to one-fourth of the initial output' (Myrick 1988, 100). Production at the Summerland field peaked after just 6 years of offshore extraction, in 1902 (National Commission 2011). Even though these early oil operations were relatively short-lived, their legacy still casts a shadow over energy debates today.

The various ecological impacts that persist were not only noticeable at the time, they were also met with widespread opposition. Writing in the *Santa Barbara News-Press* in 1974, Stella Haverland Rouse cites an 1899 piece in the *Santa Barbara Daily Press* that called for 'united resistance' against any possible expansion of Summerland's oil industry along the coast to Santa Barbara itself; Haverland Rouse also quotes Alfred Homan, the editor of *San Jose Mercury*, writing in 1901 on the impacts of local oil extraction: 'Summerland is a very different sort of place now, for in a day fatal to its peace somebody struck oil... [today] one sees streams of black, syrupy looking oil pouring out from the pumps' mouths... the general transformation is painful to look upon. The whole face of the townsite is aslme with oil leakages' (Sollen 1998, 11). Triumphant narratives of 'firsts' and 'fortunes' served not only to stimulate further speculative investments but also to obscure these ever-present forms of resistance, inequality, and objection—a pattern still seen in discourse around countless sites of resource extraction.

The pattern holds locally, though with some moments of disruption. Despite local opposition, on 14 September 1968 an oil rig known as Platform A was installed in 188 ft of water on the Dos Cuadras Field on Lease OCS-P 0241, 5.8 miles from the Summerland shore (BSEE 2017). Less than five months later, on the fateful day of 28 January 1969, a well blowout at that platform caused a major oil leak—the largest US oil disaster at the time—in what became an iconic event in U.S. environmental history (Spezio 2018). Less visible has been the role of racialized and prison labor in cleanup efforts ever since this 'iconic' event (LeMenager 2014, Dillon 2022). Another oil spill after a tanker collision near San Francisco in 1971 drew further public attention to oil disasters, ushering in new federal and state regulations in the 1970s seeking to reduce oil pollution (Dunbar-Hester 2023, 30). As Sollen notes, reflecting on events at Summerland and across the state since, people in California have been protesting against the destruction wrought by oil extraction for over a century—and the effects of those extractive operations are cumulative.

Once their wells were economically depleted, oil drillers in Summerland abandoned their operations in hasty, haphazard fashion—stuffing them with old telephone poles or rags and thus leaving behind wells that leaked profusely (Wilder 1998, 31–33, Sollen 1998). While timbers from the Summerland piers rotted away or were washed out to sea over time, state-funded clean-up efforts in the 1990s found much more debris than could be removed, including 'long lengths of pipe, concrete and steel caissons six to eight feet in diameter, cement coated pipe, wellheads, steel wire, steel rails, H-beams, well casing...' (Sollen 1998, 13)—all evidence of what Charlie Powell, a California State Lands Commission (CSLC) engineer, noted in 1991: 'Some companies made an attempt to clean up by cutting wells at the sandline... but the sandline varies several feet as sand comes and goes with the storms and seasons. In an attempt to plug the abandoned wells, some companies put rocks, wood, or metal down the hole, but this did not plug them. Some companies welded steel caps on the abandoned wells, but many wells were just filled with junk' (Sollen 1998, 13, interview). Contemporary decommissioning efforts in the area are in many respects finishing work that was begun but never completed (or, in many cases, never even initiated) at the start of the last century. The result is that, today, many abandoned oil wells along the California coast are the target of new projects of 're-abandonment.'

Re-abandoning oil wells seeks to permanently stop hydrocarbon leaks at their source and prevent further discharge (CSLC 2023a). The exact process is specific to individual well placement and condition but usually involves: placement of an environmental containment unit around the abandoned well; excavation at the seafloor to expose well outer casing; cutting casing closer to the mudline; pile-driving a 24-inch casing that surrounds the entire abandoned well to a depth where it meets rock or cannot be mechanically driven lower; pumping cement to fill both the abandoned well and the encasing pile with cement; cutting this approximately two feet above the 'natural bottom' seabed; then welding a cap on top (CSLC 2023a). The plugging of two Summerland wells in 2023 (Treadwell-1 and Treadwell-5) took 19 d, involved coordination across 10 state, county, and local agencies, was subject to delays due to inclement weather, and cost approximately \$2 million (Fausey 2023). The costs remain high, even as the process is continually being refined.

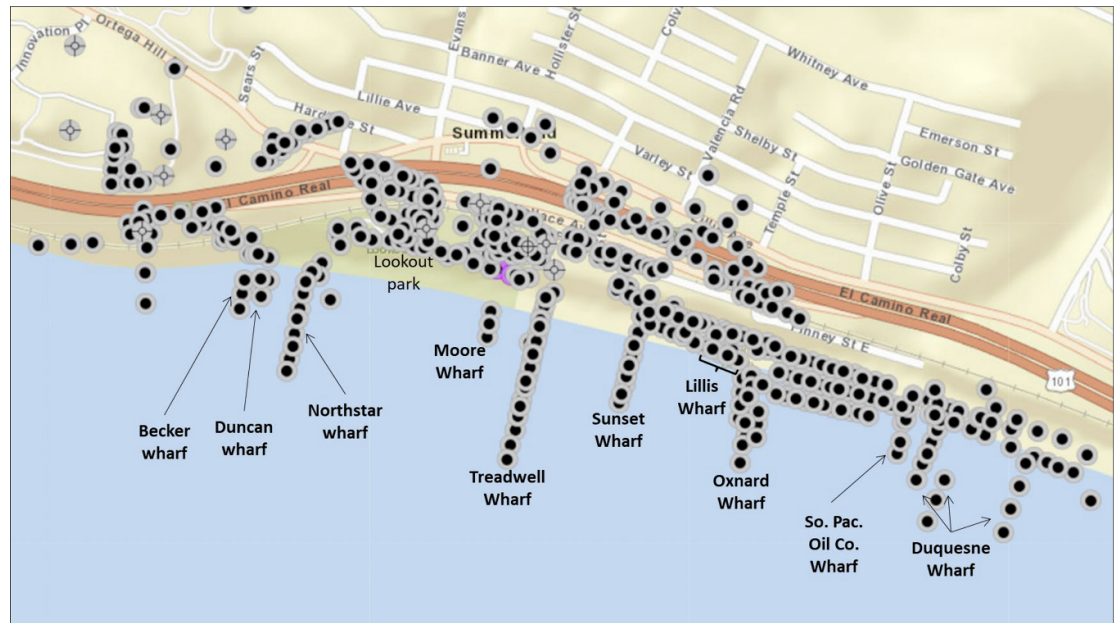


Figure 1. Showing legacy abandoned wells at Summerland, Santa Barbara County. CSLC research finds there are 192 ‘high priority’ legacy oil and gas wells, which pose an imminent or likely threat of leakage and pollution. To date, working between 2018 and 2023, six of these wells have been re-abandoned (source: CSLC 2023a).

Re-abandonment efforts at Summerland have been developed over decades. Efforts in the 1950s–60s were made to map abandoned wells and plug exposed casings; Treadwell-10 was re-abandoned in the 1970s; Treadwell-17 was plugged in the 1980s; three shoreside wells were re-abandoned through the Summerland Well Abandonment Project in 1993; and monitoring of seepage and pollution was stepped up through the 2000s in work completed by the University of California, Santa Barbara, the California Department of Fish and Wildlife (Office of Spill Prevention and Response) and the National Oceanic and Atmospheric Administration—a history published as the 2007 Nearshore and Onshore Summerland Final Report (CSLC 2011). In 2018, CSLC recapped and sealed the Becker Well, though this was many years after it had been identified as the source of noxious odors, sheen on the water, and oil on the beach—conditions that deteriorated to a point where, in August 2015, the beach at Summerland was closed to protect public health (SBCK 2023). In response, an alliance of environmental groups, concerned citizens, and elected officials played a critical role in highlighting this issue and in pushing for state-level action, such as California Senate Bill 44 (SB 44).

The funding and time required for re-abandonment work multiplies rapidly due to the number of abandoned wells, even just in this small area of California. SB 44 (Jackson; Chapter 645; Statutes of 2017) provides up to \$2 million per year to CSLC to administer a ‘State Lands: Coastal Hazard and Legacy Oil and Gas Well Removal and Remediation Program’ (CSLC 2023a). Through this program, between 2018 and 2023, a total of six legacy oil and gas wells have been re-abandoned in the Summerland area, including the two Treadwell cases mentioned above. Based on research completed by CSLC, this small number illustrates the sheer scale of the re-abandonment challenge: Summerland has 192 high-priority legacy oil and gas wells—so-called Category 1 wells which have been identified as those that could leak oil into the marine environment (Independent 2019, CSLC 2024a), see figure 1. That number is in addition to other wells categorized as medium (Category 2) to low priority (Category 3). Category 2/3 wells are those for which more information is available about their integrity and state of abandonment, or for which a responsible party has been identified to address any leak that may occur (CSLC 2023a). Most legacy wells at Summerland are Category 1 since ‘virtually no records’ exist concerning these wells and they were ‘abandoned in the early 1900s when oversight was nonexistent’ (CSLC 2024a, online). Over one hundred years later, the rapid shift away from oil extraction at Summerland is placing a significant economic and environmental strain on California’s energy transition efforts.

3. No longer worth it: Offshore oil platform removal in the 1990s

The ‘4-H Platforms’ were all located within California State waters (within 3 miles of the shoreline) and, at the time of their closure, were all operated by Chevron Corp. Two were located at the Summerland Offshore

Oil Field: Platform Hazel (constructed in 1958, it had 25 wells and stood in 96 ft of water) and Platform Hilda (1960; 29 wells at 106 ft.). Two were at the Carpinteria Offshore Oil Field: Platform Hope (1965; 46 wells at 137 ft.) and Platform Heidi (1965; 31 wells at 126 ft.). The 4-H Platforms were considered to be of advanced design at the time of installation: the Platform Hazel jacket (or stand) was a ‘gravity structure’ anchored under weight with large caisson bases filled with sand and cement. The Hope, Heidi and Hilda platforms were anchored to the sea floor by piles driven through the caisson supports (Basavalinganadoddi and Mount 2004, 468). No plans were made for their eventual, inevitable removal. The time-limited productive life of these installations did not match the permanence with which they were installed, and colossal up-front capital investments saw returns that quickly dwindled over time.

Production at the Carpinteria Field peaked in 1968—just a few years after the Platforms were constructed (Carone 2001). The subsequent steady decline meant that by the late 1980s and early 1990s, extraction ‘had reached its economic limit based on crude prices at that time’ (PACOPS 2009, n). In June 1992, the operator Chevron shut-in the wells at Platforms Hope and Heidi (ibid.). Soon after, in September 1992, production was ceased on Platforms Hazel and Hilda, similarly because continued operation had become uneconomical due to high operating costs and declining oil reserves (Basavalinganadoddi and Mount 2004, 468). Still, even after production at these sites had ceased, interest persisted in the potential extraction of remaining subsurface oil.

With the belief that sufficient reserves remained in place to justify the drilling of new commercial wells—several thousand feet below the ocean floor of the State leases and drilled from Platform Hogan, which stands in federal waters on the Outer Continental Shelf—in 2001 Carone Petroleum Corporation proposed drilling up to 25 new production or injection wells 12 000 feet eastward of the platform using ‘extended reach’ drilling (Carone 2001). However, studies went unfunded and applications were not appropriately filed. Meanwhile Carone fell behind on lease payments to the CSLC and eventually went into arrears to the sum of \$350 000, before finally being denied a renewal of those leases in 2019 (Welsh 2019). A report from the Office of the Inspector General found that ‘the company routinely used funds from its decommissioning account to pay what appeared to be various operating expenses’ (OIG 2020, n). Platform Hogan (and its immediate partner, Houchin) are now among eight platforms actively being decommissioned—among a total of 23 facilities off the Santa Barbara coast all scheduled for decommissioning. The Bureau of Safety and Environmental Enforcement (BSEE) estimates a deficit of approximately \$10 million in financial assurance to decommission wells from these two particular platforms (BSEE 2024). Such financial irregularities and shortfalls for the costs of decommissioning are common, unfortunately. Miyoko Sakashita, Oceans Director of the Center for Biological Diversity, has noted that ‘the thing that concerns us greatly [is] that operators will continue to pump out dribbles of oil to the last minute until they are bankrupt’ (Yamamura 2022, n). Decommissioning thus routinely becomes a public burden.

Back in state waters, all four of the 4-H Platforms were decommissioned and removed from the ocean floor through a single dismantling and removal contract during the Spring and Summer of 1996 (Basavalinganadoddi and Mount 2004). This decommissioning has become something of a landmark case. In their ‘Citizen’s Guide’ to offshore oil and gas decommissioning in federal waters off California, the Interagency Decommissioning Working Group—comprised of CSLC, BSEE, and the Bureau of Ocean Energy Management (BOEM)—detailed the steps involved in decommissioning an offshore platform, referencing these 1990s experiences: ‘plugging all wells supported by the platform and severing the well casings 15 feet below the mudline; cleaning and removing all production and pipeline risers supported by the platform; removing the platform from its foundation by severing all bottom-founded components at least 15 feet below the mudline; disposing the platform in a scrap yard or fabrication yard, or placing the platform at an artificial reef site; and performing site clearance verification at the platform location to ensure that no debris or potential obstructions to other [Outer Continental Shelf] users remain’ (IDWG 2019, 3). However, these remain largely untested protocols; unlike in the Gulf of Mexico where some platforms have been decommissioned, no platforms have yet been removed from the Outer Continental Shelf off California. As of January 2024, there are eight offshore platforms in various stages of decommissioning, though their ultimate fate or ‘scenario’ has yet to be decided (BSEE 2024).

There are three different ‘Decommissioning Scenarios,’ according to state agencies: [i] reuse/alternative use (this includes relocating for further extraction or repurposing *in situ* for other marine uses); [ii] rigs-to-reef (that is, with BSEE approval, leave the structures to become artificial reefs under the National Artificial Reef Plan); and [iii] complete removal (IDWG 2019, 7). The latter is defined as ‘transportation of all existing infrastructure and equipment from the project location to an area onshore where the material will be recycled or disposed of’ and is the only scenario where a prior example is, or can be, given: this is the scenario that ‘Chevron used when decommissioning its four platforms in 1996’ (ibid.). At the time, this abandonment project was somewhat experimental, testing the use of explosives to sever platform legs a few feet below the level of ocean floor—something that had not previously been done in California waters (and

which has not been done since) (Basavalinganadoddi and Mount 2004, 468). In December 2023, BSEE issued a Record of Decision (ROD) recommending *full removal* for all of the 23 offshore oil platforms in federal waters off California (Radziner 2024).

'Removal' remains not only a rare occurrence off California, it is also a process that arguably has never actually been completed: 'although the platforms were removed [in 1996], Chevron left behind large mounds of toxic debris containing chemicals including benzene and PCBs on the ocean floor, measuring up to 266 feet in diameter and 28 feet tall. These mounds remain... and consist of mollusk shells, drilling muds and cuttings, caissons, and pipeline components' (EDC 2020, n). On behalf of Citizens Planning Association, Get Oil Out, and Sierra Club Los Padres Chapter, the Environmental Defense Center has campaigned for the CSLC to ensure Chevron fulfills the requirements of the permits given to its Abandonment and Removal (by CSLC), in which the company is required 'to remove all toxic materials off the ocean floor and clean up and restore the surrounding marine environment' (ibid.). The EDC has also pressed for state agency studies of these 'mounds'—led by CSLC, CDFW, and others (CEQA 2002)—and core samples revealed that 'all four sites harbored very toxic chemicals [at risk of being] displaced by either human factors or natural factors such as earthquakes' (Callahan 2017, n). Local concerns about longer-term impacts—and questions about corporate responsibility for addressing these after platforms have been 'removed'—were not always given the attention they deserved, and the same questions still stand today concerning the many decommissioning efforts currently planned and in process.

4. Bankruptcies, ruptures, and other industrial ends: Platform Holly

On 19 May 2015, Line 901—an aging and corroded pipeline transporting crude oil from coastal operations in Santa Barbara County to refineries elsewhere in California—ruptured and spilled at least 140 000 gallons of oil before the blow-out was registered and shutdown measures implemented (Panzar and Barboza 2015). Final estimates of the size of the spill, known as the Refugio spill for the beach and State Park it soiled, are up to 630 000 gallons, which had devastating local effects and legal consequences for the Texas-based operator (Molina 2022). In 2019 a Santa Barbara Superior Court judge ordered Plains All American Pipeline (Plains) to pay a \$3.3 million criminal fine concerning failed maintenance and extensive pipeline corrosion; in May 2022, Plains settled a class-action lawsuit of \$230 million owed to those working in the fishing industry and to shoreline property residents who suffered damage (Molina 2022). During the former trial, the company's history of violations was exposed, including 194 spills between 2010 and 2019, 73 of which were caused by external corrosion, as was the case at Refugio (Magnoli 2019). Criminal negligence in the fossil fuel industry has clearly destructive environmental impacts (Partridge 2022). Such negligence also undermines both the oil industry's own ability to function and the ability of government agencies to implement regulatory and transition policies.

The Line 901 pipeline did not have an automatic shut-off valve installed, even though this is a requirement for all pipelines in Santa Barbara county—this exception was made due to a decades-old lawsuit in which the pipeline operator successfully challenged the county's oversight (Fastman 2015). Corporate responses to the 2015 blow-out then followed what is now an established pattern, worldwide: initially try to hide or deny a disaster; then, once the event has been publicly disclosed, under-report the scale of what has happened; and, as investigations continue, repeat general claims of being in 'adherence' with regulation to try and limit liability. In response to remotely detected flow anomalies, pipeline operators in Midland, Texas shut down the pipeline at 11:30 am, but Plains did not confirm the leak until 1:30 pm and did not notify the National Response Corporation (a federal body that coordinates emergency responses) until 2:56 pm (Panzar and Barboza 2015). That report was made first, around 12:30 pm, by the Santa Barbara County Fire Department who found the spill while responding to a report of a strong odor in the area (Kacik 2015b). Even after alerting federal regulators to the spill, company employees in Bakersfield initially announced that an estimated 21 000 gallons had leaked, later revising that figure to roughly five times the amount, approx. 101 000 gallons (Panzar 2015). Statements of corporate 'regret' have occasionally been cited in news coverage of the subsequent trials concerning negligence and compensation.

Built in 1987, the pipeline was rated to carry oil at a rate of up to 2 million gallons per day, and thus the longer that Line 901 remained closed, the harder it became for companies to continue production—rosy industry hopes for a swift return to business-as-usual now appear markedly misplaced (Kacik 2015a). After the blow-out, nearby oil industry operators and installations were immediately and significantly affected: three offshore platforms operated by Freeport-McMoRan (Hidalgo, Harvest, and Hermosa) were shuttered; three further platforms operated by Exxon (Heritage, Harmony, and Hondo) had to stop production; and the owner of Platform Holly in State waters, Venoco, went into bankruptcy (Curwen 2019, Partridge *et al* 2020). All seven platforms are now being decommissioned; while sustained environmental activism and

transition-related policies have been important in decisions to deny trucking permits and pipeline improvements, the platforms' closures were precipitated quite directly by the ruptured pipeline.

The aftermath of the Refugio blow-out also follows other patterns of corporate evasion and obfuscation, documented widely across global fossil fuel industries (Grubert and Hastings-Simon 2022). The 'mid-transition' era is both volatile and opaque (Partridge *et al* 2023). In October 2022, ExxonMobil purchased the Santa Barbara pipelines owned by Plains, including Line 901, also taking over the pending permit applications to install safety valves and build a replacement (Magnoli 2022). Then, only a few weeks later, ExxonMobil announced the sale of all the wells, pipelines (including Line 901), processing facilities and offshore oil platforms that make up its Santa Ynez Unit—all of which have been out of production or use since the Refugio blow-out. This deal is striking not least because it involves up to a \$2 billion loss for the company, but also because assets will be sold to a newly formed merger called Sable Offshore Corporation, in which ExxonMobil holds a 50% share, for a purchase price of \$643 million—most of it (\$623 million) financed by a loan from ExxonMobil (Magnoli 2022, Partridge *et al* 2023). The founder of Sable Offshore had a previous company—Sable Permian Resources—that filed for Chapter 11 bankruptcy in 2020 (McWilliams 2022). Meanwhile the Santa Ynez Unit deal contains a 'reassignment option' which will see ownership revert to ExxonMobil, without cost, if oil production is not successfully restarted by 1 January 2026 (Magnoli 2022, Partridge *et al* 2023). In July 2024, Sable sued the California Department of Fish and Wildlife and the Santa-Barbara based Environmental Defense Center in order to prevent their legally required 'integrated contingency plan' from being released following a Public Records Request—a request made after Sable claimed in a financial document that the 'reasonable worst-case spill volume' for the existing pipelines would be only 42 gallons (Lovely 2024, n.).

As the original lease holder, ExxonMobil is currently tasked with the decommissioning of Platform Holly, which was first installed in 1966 in 211 ft. of State waters and which has now become a critical site of closure after the most recent operator went bankrupt. As of February 2024, this project is in the final stages of well plug and abandonment; the next stage involves cutting and removing 30 well conductors that link the platform wellheads to the seabed (due to be completed by the end of 2024); then, once that work is completed, the platform will 'no longer be connected to the seabed, and there will be no possibility of producing oil or reactivating the platform again' (CSLC 2024b, n). The full cost to decommission Platform Holly (and connected onshore facilities) is estimated to be \$350 million, costs that are being borne by the state, ExxonMobil, and a bond of \$22 million that Venoco had placed (Yamamura 2021). A recent CSLC Report (October 2023) details the basis for this arrangement:

In April 2017, Venoco LLC (Venoco), the lessee of three State oil and gas leases offshore of Goleta [in Santa Barbara county] (Leases PRC 421, 3120 and 3242), quitclaimed its offshore leases to the Commission, filed for bankruptcy, and began the process of liquidating when it became apparent that Plains All American Pipeline Line 901 would not be repaired thereby eliminating Venoco's ability to produce from Platform Holly. Venoco deserted the onshore and offshore oil and gas infrastructure associated with the leases, which required the Commission to exercise the State's police powers to staff and maintain the facilities to ensure public health and safety and protection of the environment... The Commission approved Mobil's assignment to Venoco on 11 July 1997, on the condition that the assignment not release Mobil [now ExxonMobil] from lease obligations (CSLC 2023b, 1).

In a parallel move for three offshore platforms in federal waters (Hidalgo, Harvest, and Hermosa) that were also closed after the 2015 Refugio oil spill, the operator at the time—Freeport-McMoRan—allowed their leases to expire (on 27 November 2018) which led BSEE to call on the former lessee, Chevron, to carry out removal of all existing oil and gas infrastructure on those leases (BOEM 2021). Freeport-McMoRan's nearby Platform Irene was not immediately affected by the shutdown of Line 901. Chevron were also contacted by BSEE after the bankruptcy of Venoco, since the former were the prior lessee and were thus 'responsible for decommissioning all wells, pipelines, platforms, and other facilities for which you have accrued decommissioning obligations under 30 C.F.R. § 250.1702' (BSEE 2018, n). That section of the Code of Federal Regulations states seven conditions under which a company accrues decommissioning obligations, the first two of which are: (a) drilling a well; (b) installing a platform, pipeline, or other facility (CFR 2023). Thus, as a result of the Refugio pipeline rupture and subsequent bankruptcy of Venoco, Chevron has been called upon to decommission five platforms off the coast of Santa Barbara County, in addition to others located off the coast of neighboring counties: three that were run by Freeport-McMoRan (Hidalgo, Harvest, and Hermosa) and two that were run by Venoco (Grace and Gail, in federal waters). The final 'decommissioning scenario' for these platforms is yet to be agreed.

Debates about the decommissioned future of Platform Holly in State waters now occur in parallel with plans for the planned decommissioning of California's 23 offshore oil platforms in federal waters. As noted

above, BSEE issued a ROD in December 2023 recommending the ‘full removal’ of all 23 platforms, based on a Programmatic Environmental Impact Statement conducted to assess different decommissioning scenarios (Radziner 2024). The scale and novelty of these challenges in California contrasts with the Gulf of Mexico where over 6000 oil and gas structures have been installed since 1942, 3500 of which are still standing, 3200 of which remain active—numbers that vary over time as extraction activity responds to market fluctuations, costs, and bankruptcies (n.d.). It has been reported that 570 platforms there have been turned into artificial reefs managed by the states of Texas, Louisiana, Alabama, and Mississippi (Radziner 2024). To date, no platforms have been removed from the Outer Continental Shelf off California, and no platforms have yet been ‘reefed’ off California—but their steel structures (jackets) have become sites of abundant marine life and have been described as underwater oases home to countless creatures.

As confirmed by BOEM and others, reuse or repurposing of these aged platforms is not an option (Loxton 2023). The recent ROD therefore considered four alternatives: [1] full removal, where the remaining submerged platform jacket would be severed from the ocean floor and taken to shore for disposal or recycling; [2] & [3] partial removal, where the jacket is cut 85 feet below the ocean surface and the lower portion left in place or towed to an approved reefing site (to become a state-managed reef), for [2] the upper portion would be taken to shore for disposal, for [3] the upper portion would be placed alongside the rest of the structure to be reefed; [4] platforms left in place (Radziner 2024). The ROD recommended [1] for all 23 platforms being considered off California, even though full removal would require specialist heavy lift vessels and semi-submersible lift vessels currently only found in the Gulf of Mexico, Southeast Asia, or the North Sea, and all too large to pass through the Panama Canal (Radziner 2022).

Under state control, public participation has been given a central role in the decision-making process: debates about the future of Platform Holly have been the subject of eleven Town Hall Meetings, Public Hearings, and Public Scoping Meetings since June 2017 (CSLC 2024b). As Loxton (2023) details, these debates also consider that: full removal would involve disrupting thriving underwater ecosystems and killing countless marine animals alive in these artificial reefs; partial removal down to 85 feet is the depth that the coastguard deems acceptable for safe ship navigation but may still present some risks to vessels; and leaving platforms in place raises questions of responsibility and liability (since the structure would have to be stabilized and maintained and, given the marine environment, would continue to erode and would likely collapse within 50–100 years) (Loxton 2023). Pre-decommissioning maintenance is a critical issue and a significant cost. The improper abandonment of Platform Holly (due to Venoco’s bankruptcy) meant that the state—which until then, 2017, had never actively participated in decommissioning an offshore oil platform—had to step in, recruiting a contractor to operate and maintain the platform (and the connected Ellwood Onshore Facility), to monitor subsurface pressure in and around the unused subsurface wells, and to maintain site safety (Curwen 2019, Loxton 2023). As the debates continue, the overall goal of this process remains clear, as stated in CSLC documents:

the final decommissioning ‘project’ will be determined by the Commission after considering the environmental impacts of various decommissioning alternatives in an EIR, anticipated to be completed in 2025... [this] Agreement is an exchange whereby ExxonMobil plans and undertakes platform decommissioning, the vast majority of which shall be at its expense, and receives a contractual release of liability under the leases subject to Commission approval that all decommissioning activities have been completed to the Commission’s satisfaction... The goal of the Agreement is [to] thereby achieve final disposition of the last major visible remnant of offshore oil production in the state waters off Santa Barbara County’ (CSLC 2023b, 4).

5. Rincon Island

In February 2021, the CSLC announced it had plugged and abandoned all 74 oil wells associated with Rincon Island—a 2.3 acre artificial island built in the late 1950s by a company called Atlantic Richfield, just off the coast of Ventura County and connected to the mainland by a 2,700 foot causeway (Hart 2021, Olalde 2021). This completed Phase 1 of the Rincon decommissioning; Phase 2 initiated a process of feasibility and environmental impacts studies as well as public consultation to explore three potential alternatives: [1] reuse, where the island and causeway remain unchanged, existing biological diversity is allowed to stay in place, and hydrocarbon-contaminated soils are remediated (all expected to take 2 years and cost c.\$15 million); [2] reefing, which would leave the island as is but remove the causeway (3 years, c.\$25 million); [3] removal, where Rincon Island would be removed down to the seafloor, and decommissioned well conductors and causeway pilings removed to a minimum of 5 feet below the seafloor (3.5 years, c.\$28 million) (CSLC 2022, Rivers 2022). As with Platform Holly, the so-called final disposition of oil infrastructure is a phrase that also appears in these official documents. In public comments, it has frequently been pointed out how the island

influences wave patterns with the beneficial effect of preventing beach erosion. For many, this is a strong argument against complete removal.

The case of Rincon Island (in Ventura County but within a few miles of the Santa Barbara County line) also reflects how ongoing histories of volatility in the oil industry continue to affect (and often undermine) the achievement of energy transition goals. Bankruptcies have played a significant role in the history and current decommissioning of Rincon Island:

‘Over the years, production on Rincon Island waxed and waned... A 2002 bankruptcy sale ultimately handed it off to Greka Energy Corp., which restarted production through a subsidiary called Rincon Island Limited Partnership (RILP)... Poor management, severe corrosion and a winter storm rendered the island’s 3,000-foot pier and the attached oil pipeline unusable, and Greka pumped the final molecules of hydrocarbons off the island in 2008. Tensions grew as state officials cited RILP for myriad violations on issues ranging from fire hazards to worker safety. ‘They were just not conducting basic maintenance out there,’ said Joe Fabel, a senior attorney with the California State Lands Commission. Finally, the commission told RILP it had 90 days to comply, or the state would consider terminating the company’s leases on 9 August 2016, forever removing the possibility of restarting production on the island. One day before that deadline, RILP filed for bankruptcy in Texas with less than \$28 000 in its bank account’ (Olalde 2021, n).

Due to the RILP bankruptcy, in combination with subsequent corporate maneuvers by other entities within the Greka group of companies, California taxpayers have paid \$27 million of the \$45 million cleanup cost to date: ‘The first phase of decommissioning—making Rincon Island and the onshore leases safe, plugging the oil wells and tearing down infrastructure—cost \$45 million. The state had \$10 million in cleanup bonds from RILP and recovered \$8 million from ARCO, the current iteration of original operator Atlantic Richfield’ (Olalde 2021, n). Again we encounter a scenario where decommissioning has become a public burden—further highlighting the need for more effective, anticipatory, and fully enforced policy responses to the growing challenges of fossil fuel infrastructure decommissioning. While some steps in this direction are being taken—for example California bill AB1866 (Hart) which mandates oil companies must fund and meet ambitious targets to plug an estimated 40 000 idle oil wells across the state, prioritizing those identified as posing a threat to life, health, property or natural resources, a Bill which moves to the Senate Floor in August 2024 (Hart 2024)—much more remains to be done at regional, national, and global scales.

6. Conclusion

The disparate experiences with oil decommissioning in this small region offer two critical, and sobering, points of reflection for mid-transition scholars and practitioners. The first point, as the four cases recounted here illustrate, is that decommissioning must be actively managed through coordinated, well-funded, multi-agency action, ideally grounded in historical awareness of policy trajectories. In Santa Barbara, oil has developed under various conditions—high and low levels of regulatory scrutiny by state and federal agencies, led by small and big companies, in boom times moved by urgency and more slowly against local opposition. Yet no matter the conditions in place when wells were built, decommissioning was poorly anticipated, leaving a host of unintended consequences. Unintended does not mean unforeseen, however: in Santa Barbara, as elsewhere, the links between oil and toxicity were clear from the start (Acker *et al* 2023; see also, Oreskes and Conway 2011, Sawyer 2022). Bonds in place here have also fallen short of covering costs, as in Colorado, Texas, and elsewhere, leaving taxpayers liable for cleanup costs meanwhile companies use bankruptcy and corporate restructuring as a strategy to avoid responsibility (see also Boomhower 2019).

This history cautions against a kind of historical hubris which assumes that policies, laws, technologies and practices are better today than in the past (Partridge and Barandiaran 2024). These Central Coast wells were built with access to advanced technologies and regulations—a statewide reputation for high standards that the oil industry still mobilizes to justify new oil drilling in California (Vogel 2019, Partridge *et al* 2020). Yet decommissioning here has been messy, erratic, costly for taxpayers, and not always effective. In the future, it may be even harder—for three key reasons. The first reason is the *scale* of oil infrastructure in need of plugging, which has grown even since the 1990s. For perspective, Santa Barbara oil is small compared to California’s Central Valley, the Gulf of Mexico, and other areas where whole landscapes were turned over to oil and gas drilling. The second reason is that, since 1980, government agencies have been de-funded and stripped of authority (MacNeil and Paterson 2012, Duit 2016, Mol 2016). Whether state agencies will have the capacities and authority to lead decommissioning, as they have often done on the Central Coast, will vary across jurisdictions and over time, and depend on hard-fought political decisions. The third reason, as implied by the mid-transition concept, is that the oil industry will be operating sub-optimally and may find

it harder than in the past to mobilize resources for the complex work of decommissioning. That said, the industry's capacities to lobby and litigate are strong as ever, in both Santa Barbara and California (e.g. Sable Energy's litigation discussed above, and state-wide lobbying against set-back and idle wells legislation) (Dewing 2024).

The second overall point of reflection for mid-transition scholars and practitioners, also illustrated by events along the Santa Barbara coast, is that oil wells and associated infrastructure will remain on the landscape for a long time. Decommissioning will advance slowly due to several factors. Among these factors there is: (i) again, the growing scale of the problem, which includes a huge number of existing abandoned wells plus producing wells that need to be closed to reduce carbon emissions. A second factor is (ii) gaps in experience and training. In Santa Barbara, many oil workers have re-trained on the job into decommissioning work, yet each experience advances as if it was the first—though many related skills are complimentary, preparation for extraction work does not fully address the challenges of post-production work. If the goal is an energy transition, then engineering programs for oil and gas workers should require courses on decommissioning. A third factor slowing the pace of decommissioning is (iii) regulatory needs, for example, establishing *standards* for types of wells, for removal options, and for the decision-making process. Santa Barbara residents have been opposing new oil wells for over a century, and recently gained public participation rights on oil operations. Yet decommissioning debates have been reduced to discussions of complete versus partial removal, and only recently have decisions about new wells been made with some attention to long-term considerations. Research could inform protocols for decommissioning, building on lessons from the closure of nuclear power plants (Cram 2023) and coal facilities (Srinivasan *et al* 2022).

Preparing for the post-productive life of oil and gas infrastructure is essential in this early part of the mid-transition, giving urgency to the need for establishing clear protocols to guide decommissioning and restructuring education for oil engineers. Even wells built to produce for a few years have end-of-life management needs for decades after, and most oil infrastructure is built to last well beyond wells' projected life-span. In Santa Barbara, decommissioning thus far has happened only by *force majeure*—oil spills, broken infrastructure, dried wells—not by choice. Both the economics and the policies remain against swift or effective decommissioning, thus threatening to delay or drag out the mid-transition. If the goal is to accelerate oil decommissioning, the experience of Santa Barbara suggests that dramatically higher bonds, a ban on new wells, the obligation close idle wells and submit detailed and ambitious decommissioning plans (which do not assume that oil infrastructure is permanent) are all required¹. In short, how to hold companies, which are constantly shifting and changing hands, accountable over the *longue durée* of decommissioning is a challenge, and points to a central tension between temporalities of short-term profit and long-term decommissioning needs.

Data availability statement

All data that support the findings of this study are included within the article (and any supplementary information files).

Acknowledgment

Funding from CREW Center for Restorative Environmental Work at the University of California, Santa Barbara and the US National Science Foundation (Award #2334233). The authors would like to thank: Nick Triozzi and Toni Valtierra; Emily Grubert and all participants in the April 2024 workshop at UCSB, Decarbonization: Restorative Transitions in the US and the Americas; and two journal reviewers for their detailed and insightful comments.

Conflict-of-interest statement

The Authors declare that there is no conflict of interest.

ORCID iDs

Tristan Partridge  <https://orcid.org/0000-0003-3770-8494>

Javiera Barandiaran  <https://orcid.org/0000-0001-6435-675X>

¹ California Assembly Bill 1866, currently in progress in the state legislature, eliminates pathetically low fines for keeping idle wells with a requirement to decommission at least 10% of an operator's idle wells, rising to 20% in subsequent years. In a bow to the oil lobby legislators eliminated a civil penalty for non-conforming operators. See: https://digitaldemocracy.calmatters.org/bills/ca_202320240ab1866. Accessed 19 August 2024.

References

- Acker A, Becker L, Schutzer M and Capellini N 2023 Fossil fuels from extraction to emissions *The Routledge Handbook of Environmental History* 1st edn, ed E Chatterjee, W S Martin, M Carey and S Swart (Routledge) pp 229–44
- Basavalinganadoddi C and Mount P 2004 Abandonment of Chevron platforms hazel, hilda, hope and heidi *Paper Presented at the The Fourteenth Int. Offshore and Polar Engineering Conf. (Toulon, France, May 2004)* (Paper Number: ISOPE-I-04-013)
- BOEM 2021 *Relinquishments and Lease Expirations—Pacific* (U.S. Department of the Interior: Bureau of Ocean Energy Management) (available at: www.boem.gov/Relinquishments-and-Lease-Expirations-Pacific)
- Boomhower J 2019 Drilling like there's no tomorrow: bankruptcy, insurance, and environmental risk *Am. Econ. Rev.* **109** 391–426
- BSEE 2017 *Platforms Operated by DCOR, LLC* (Bureau of Safety and Environmental Enforcement) (available at: www.bsee.gov/stats-facts/ocs-regions/pacific/pacific-ocs-platforms/dcor)
- BSEE 2018 Decommissioning of leases OCS-P 0205 and OCS-P 0217 (Accessed 4 January 2018)
- BSEE 2024 *Pacific Region Federal OCS Decommissioning* (Bureau of Safety and Environmental Enforcement) (available at: www.bsee.gov/stats-facts/ocs-regions/pacific/pacific-region-federal-ocs-decommissioning)
- Callahan E. 2017 *Gaining Perspective On The Opposition: the Other Side of Rigs to Reefs* 6 December 2017 edn (HuffPost) (available at: www.huffpost.com/entry/gaining-perspective-on-th_b_5149597) Sec. Environment
- Carone 2001 *Scoping Document: Carone Petroleum Corporation, Development of Carpinteria Field Area (State Oil and Gas Leases PRC-4000, PRC-7911, & PRC-3133)* (Carone Petroleum Corporation)
- CEQA 2002 *4H Platform Shell Mounds Disposition* (California Environmental Quality Act/California State Lands Commission) (available at: <https://ceqanet.opr.ca.gov/2002061002>)
- CFR 2023 § 250.1702 *When Do I Accrue Decommissioning Obligations?* (U.S. Code of Federal Regulations) (available at: www.ecfr.gov/current/title-30/section-250.1702)
- Cram S 2023 *Unmaking the Bomb: Environmental Cleanup and the Politics of Impossibility (Critical Environments: Nature, Science, and Politics)* (University of California Press)
- CSLC 2022 *Rincon Phase 2 Decommissioning Feasibility Study* (California State Lands Commission)
- CSLC 2023a 2023 progress report: coastal hazards and legacy oil & gas well removal and remediation program (California State Lands Commission) (available at: www.slc.ca.gov/coastal-hazards-legacy-wells/)
- CSLC 2023b Staff Report 63/Work Order Number: w 30159.5 (California State Lands Commission)
- CSLC 2024a *Coastal Hazards & Legacy Wells* (California State Lands Commission) (available at: www.slc.ca.gov/coastal-hazards-legacy-wells/)
- CSLC 2024b *South Ellwood Project* (California State Lands Commission) (available at: www.slc.ca.gov/oil-and-gas/southellwood/)
- CSLC 2011 *Summerland Oil Field (Report by Steve Curran, Drilling Engineer)* (California State Lands Commission)
- Curwen T 2019 *A Historic Oil Platform off Santa Barbara Turns into a Rusty Ghost Ship* 14 March 2019 edn (LA Times)
- Davis L W 2015 Policy monitor—bonding requirements for U.S. natural gas producers *Rev. Environ. Econ. Policy* **9** 128–44
- Dewing A 2024 Q2 Lobbying: big Oil on record annual spending pace fighting polluter accountability bills *Last Chance Alliance* (available at: <https://lastchancealliance.org/q2-lobbying-big-oil-on-record-annual-spending-pace-fighting-polluter-accountability-bills/>) (Accessed 12 August 2024)
- Dillon L 2022 Civilizing swamps in california: formations of race, nature, and property in the nineteenth century U.S. West *Environ. Plann. D* **40** 258–75
- Duit A 2016 The four faces of the environmental state: environmental governance regimes in 28 Countries *Environ. Polit.* **25** 69–91
- Dunbar-Hester C 2023 *Oil Beach: How Toxic Infrastructure Threatens Life in the Ports of Los Angeles and Beyond* (University of Chicago Press) (<https://doi.org/10.7208/chicago/978-0-226-81970-9.001.0001>)
- EDC 2020 *Chevron's Toxic Debris Mounds* (Environmental Defense Center) (available at: www.environmentaldefensecenter.org/programs_post_type/climate-energy/chevrons-toxic-debris-mounds/)
- Fastman B 2015 The mysterious case of the automatic shutoff valve (The Santa Barbara Independent) (available at: www.independent.com/2015/05/29/mysterious-case-automatic-shutoff-valve/) (Accessed 29 May 2015)
- Fausey C 2023 Efforts underway to cap and map summerland's abandoned oil wells (The Santa Barbara Independent) (available at: www.independent.com/2023/08/15/efforts-underway-to-cap-and-map-summerlands-abandoned-oil-wells/) (Accessed 15 August 2023)
- Grubert E and Hastings-Simon S 2022 Designing the mid-transition: a review of medium-term challenges for coordinated decarbonization in the United States *WIREs Clim. Change* **13** e768
- Hart G 2024 *Legislation to Address California's Idle Oil Well Crisis Advances to Senate Floor* edhat 17 August
- Hart 2021 *California Decommissioning Project Hits Oil Well Abandonment Milestone* 8 February 2021 edition (Hart Energy) (available at: www.hartenergy.com/exclusives/california-decommissioning-project-hits-oil-well-abandonment-milestone-192269) (sec Energy Industry)
- IDWG 2019 *A Citizen's Guide to Offshore Oil and Gas Decommissioning in Federal Waters off California* (Interagency Decommissioning Working Group) (available at: www.slc.ca.gov/wp-content/uploads/2019/07/IDWG-Decom-Citizens-Guide-6-24-19.pdf)
- Independent 2019 *Offshore Oil: The Long Goodbye* 30 January 2019 edition (The Santa Barbara Independent) (available at: www.independent.com/2019/01/30/offshore-oil-long-goodbye/)
- Kacik A. 2015a 3 months after oil spill, santa barbara region recovering (Pacific Coast Business Times) (available at: www.pacbiztimes.com/2015/08/14/3-months-after-oil-spill-santa-barbara-region-recovering/) (Accessed 14 August 2015)
- Kacik A 2015b Refugio oil spill cleanup costs near \$100 million (Pacific Coast Business Times) (available at: www.pacbiztimes.com/2015/06/27/refugio-oil-spill-cleanup-costs-near-100-million/) (Accessed 27 June 2015)
- Lange I and Redlinger M 2019 Effects of stricter environmental regulations on resource development *J. Environ. Econ. Manage.* **96** 60–87
- LeMenager S 2014 *Living Oil: Petroleum Culture in the American Century (Oxford Studies in American Literary History)* vol 5 (Oxford University Press)
- Lima J 1994 The politics of offshore energy development *PhD Dissertation* Department of Political Science, University of California, Santa Barbara
- Lovely M 2024 *Sable Takes Santa Barbara's Environmental Defense Center, State Fish and Wildlife to Court over Public Records Request* (The Santa Barbara Independent) 16 August
- Loxton M 2023 As oil platform holly is decommissioned, what happens to the ecosystems on the underwater structure? (KCLU) (available at: www.kclu.org/local-news/2023-05-26/as-oil-platform-holly-is-decommissioned-what-happens-to-the-ecosystems-on-the-underwater-structure) (Accessed 26 May 2023) (sec. Local News)

- MacNeil R and Paterson M 2012 Neoliberal climate policy: from market fetishism to the developmental state *Environ. Polit.* **21** 230–47
- Magnoli G 2019 *Plains Ordered to Pay \$3.3 Million Fine In Refugio Oil Spill Criminal Case* (Noozhawk) (25 April 2019 edition) (available at: www.noozhawk.com/article/santa_barbara_judge_orders_plains_to_pay_3.3_million_in_refugio_oil_spill)
- Magnoli G 2022 ExxonMobil selling santa ynez unit offshore oil platforms, las flores canyon processing facility (Noozhawk) (available at: http://noozhawk.com/exxonmobil_selling_santa_ynéz_unit_offshore_oil_platforms_processing/) (Accessed 16 November 2022)
- Max H, Weber J G and Berkowitz D 2022 Environmental hazards and local investment: a half-century of evidence from abandoned oil and gas wells *J. Assoc. Environ. Res. Econom.* **9** 721–53
- McWilliams G 2022 Exxon faces \$2 billion loss on sale of troubled california oil properties (Reuters) (available at: www.reuters.com/business/energy/exxon-faces-2-bln-loss-sale-troubled-california-oil-properties-2022-11-06/) (Accessed 6 November 2022) (sec. Energy)
- Mol A P J 2016 The environmental Nation State in decline *Environ. Polit.* **25** 48–68
- Molina J 2022 ExxonMobil acquires troubled crude oil pipelines from plains all american | local news (Noozhawk) (available at: www.noozhawk.com/exxonmobil_acquires_plains_all_american_crude_oil_pipelines/) (Accessed 17 October 2022)
- Myrick D 1988 Summerland: the First Decade *Noticias* (Quarterly Magazine of the Santa Barbara Historical Society) vol 34 pp 65–103
- National Commission 2011 A brief history of offshore oil drilling: staff working paper no. 1 (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling) (available at: www.cs.ucdavis.edu/~rogaway/classes/188/materials/bp.pdf)
- NCEI n.d. Gulf of mexico data atlas *National Oceanic and Atmospheric Administration* (National Centers for Environmental Information) (available at: www.ncei.noaa.gov/maps/gulf-data-atlas/atlas.htm?plate=Offshore%20Structures)
- OIG 2020 *Summary: Oil and Gas Company Used Offshore Platform Decommissioning Funds to Pay Other Expenses* (Office of Inspector General, U.S. Department of the Interior) pp 19–0354
- Olalde M 2021 Oil bankruptcies leave environmental cleanup bills to california taxpayers (Palm Springs Desert Sun) (available at: www.desertsun.com/in-depth/news/environment/2021/06/25/oil-bankruptcies-leave-environment-cleanup-california-taxpayers/4977647001/) (Accessed 25 June 2021)
- Oreskes N and Conway E 2011 *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (Bloomsbury Press)
- PACOPS 2009 Carpinteria—pacific operators offshore LLC (available at: <https://web.archive.org/web/20110715032418/www.pacops.com/about/field/>)
- Panzar J 2015 Pipeline firm documents reveal chaos after Santa Barbara county spill (Los Angeles Times) (available at: www.latimes.com/local/lanow/la-me-ln-beaches-cleanup-20150624-story.html) (Accessed 25 June 2015)
- Panzar J and Barboza T 2015 Senators call santa barbara oil spill response ‘insufficient’ (Los Angeles Times) (available at: www.latimes.com/local/lanow/la-me-ln-spill-senators-letter-20150528-story.html) (Accessed 29 May 2015)
- Partridge T 2022 *Energy and Environmental Justice: Movements, Solidarities, and Critical Connections* (Palgrave Macmillan)
- Partridge T and Barandiaran J 2024 Futures born of the past and present: building transitions as collaborative projects of justice *Resolving the Climate Crisis: US Social Scientists Speak Out* ed K Haltinner and D Sarathchandra (Routledge) pp 193–206
- Partridge T, Barandiaran J, Triozzi N and Toni Valtierra V 2023 Decommissioning: another critical challenge for energy transitions *Glob. Soc. Chall. J.* **2** 188–202
- Partridge T, Barandiaran J, Walsh C, Bakardzhieva K, Bronstein L and Hernandez M 2020 California oil: bridging the gaps between local decision-making and state-level climate action *Extr. Ind. Soc.* **7** 1354–9
- Purvis D 2024 Rocky mountain highs and Lows: decommissioning Colorado’s two oil industries (Carbon Tracker) (available at: <https://carbontracker.org/reports/rocky-mountain-highs-and-low/>)
- Radziner A 2022 Rigs to reefs: the sub-surface story of oil platform Decommissioning *The Montecito Journal* (available at: www.montecitojournal.net/2022/08/16/rigs-to-reefs-the-sub-surface-story-of-oil-platform-decommissioning/) (Accessed 16 August 2022)
- Radziner A 2024 Oil platforms’ removal? reefing the superior environmental option *The Montecito Journal* (available at: www.montecitojournal.net/2024/01/09/oil-platforms-removal-reefing-the-superior-environmental-option/) (Accessed 9 January 2024)
- Rivers K 2022 *State Deciding Future of Rincon Island August 23 29 July edition* (Ojai Valley News) (available at: www.ojavalleynews.com/news/state-deciding-future-of-rincon-island-august-23/article_2dcb663a-0f04-11ed-b03d-c311736880ec.html)
- Sawyer S 2022 *The Small Matter of Suing Chevron* (Duke University Press) (<https://doi.org/10.1215/9781478022572>)
- SBCK 2023 *Legacy Oil Wells* (Santa Barbara Channelkeeper) (available at: www.sbck.org/our-work/advocacy/oil-gas/legacy-oil-wells/)
- Sen S and von Schickfus M-T 2020 Climate policy, stranded assets, and investors’ expectations *J. Environ. Econ. Manage.* **100** 102277
- Sollen R 1998 *An Ocean of Oil: A Century of Political Struggle over Petroleum off the California Coast* (Denali Press)
- Spezio T S 2018 *Slick Policy: Environmental and Science Policy in the Aftermath of the Santa Barbara Oil Spill* (University of Pittsburgh Press)
- Srinivasan S, Chattopadhyay D, Govindarajulu C and Zabidin I 2022 Business models for accelerating phase-out of coal based generation: developing typologies and a discussion of the relative merits of alternative models *Electr. J.* **35** 107185
- Triozzi N 2022 Decommissioning Oil and Gas Infrastructure in California *ArcGIS Story Map* (CREW Center for Restorative Environmental Work) (available at: <https://storymaps.arcgis.com/stories/afc4b7ad4b004945bf850682e7d95fb5>)
- Vogel D 2019 Promoting sustainable government regulation: what we can learn from California *Organ. Environ.* **32** 145–58
- Weber J G, Ercoli T, Fitzgerald W, Nied P, Penderville M and Raabe E 2021 Identifying the end: minimum production thresholds for natural gas wells *Resour. Policy* **74** 102404
- Welsh N 2019 Offshore oil company evicted from lease (The Santa Barbara Independent) (available at: www.independent.com/2019/07/02/offshore-oil-company-evicted-from-lease/) (Accessed 3 July 2019)
- Wilder R J 1998 *Listening to the Sea: The Politics Of Improving Environmental Protection* (Pitt Series in Policy and Institutional Studies) (University of Pittsburgh Press)
- Yamamura J. 2021 Well plugging resumes at platform Holly (The Santa Barbara Independent) (available at: www.independent.com/2021/12/11/well-plugging-resumes-at-platform-holly/) (Accessed 11 December 2021)
- Yamamura J 2022 *Say So Long to Santa Barbara’s Offshore Platforms* (The Santa Barbara Independent) 19 January 2022 edition (available at: www.independent.com/2022/01/19/so-long-offshore-platforms/)
- York R and Elizabeth Bell S 2019 Energy transitions or additions? *Energy Res. Soc. Sci.* **51** 40–43