6 ENGINEERING PRAGMATISM

Facing the growing firestorm surrounding fracking in Colorado, petroleum engineer Aaron made listening the platform for his activities as he set out to change how his industry engaged the public. In speaking to students in my Corporate Social Responsibility course, he argued for the importance of listening by saying, "When you think you're going to change someone's mind by 'educating' them, you are assuming that the problem is in *their* understanding and comfort rather than *your* actions." Aaron was criticizing a common refrain among industry practitioners as well as engineering faculty and students that it was possible to change people's minds through "educating" them. His point resonates with a long line of science and technology studies scholarship that critiques how such an orientation positions the public as deficient while reinforcing the authority and expertise of scientists and engineers.

Aaron's statement was uniquely forward looking in the midst of growing national debates about fracking. Oil and gas associations and companies had otherwise embarked on what they called "educational" campaigns to use scientific "facts" to convince the public of the safety of their technologies and practices. For example, Energy in Depth, a group sponsored by the Independent Petroleum Association of America, created a web page that provided counterevidence for the claims vividly presented in *Gasland*, the 2010 documentary that put fracking on the national political agenda and inspired waves of anti-fracking movements. The American Natural Gas Alliance sponsored the filming of a rebuttal documentary they unironically

called *Truthland.* In Colorado, the largest oil and gas operators joined forces to create Coloradans for Responsible Energy Development (with the "credible" acronym of CRED), a group that served as a clearinghouse to "provide information to the public about the economic and environmental benefits of safe and responsible oil and natural gas development."[1] Their news releases and website underscored the validity of their perspective by appealing to scientific evidence, encapsulated in such titles as "Scientists Agree: Fracking Doesn't Harm Our Water."[2] This ethos also permeated my own institution, the Colorado School of Mines, where well-intentioned engineering students and professors adamantly believed that anti-fracking activists would cease their criticism if they just "understood the facts" about the safety of fracking.

Aaron signaled that his commitment to listening to critics raised controversy among his coworkers, saying, "It was as if by *listening* to 'those people' we were sympathizing with them" (see chapter 1). Years later, the tenor among industry personnel had changed at least partially, especially in corporate outreach materials and official presentations. Professed commitments to listening to stakeholders pervaded wider corporate social responsibility (CSR) discourses, along with admission of past mistakes and promises to improve.[3] Engineers were quick to point out that good listening could not make up for irresponsible engineering. An engineer and executive summarized this philosophy by stating, "You can't talk yourself out of a problem that you engineered yourself into." Aaron shared a similar opinion, emphatically stating that "listening is not a surrogate for quality operations."

For Aaron and other engineers I met, listening was important because it was how they could glean information to help them make engineering accountable to the public. They desired to know more about the local context of oil and gas activity so that they could attempt to reconcile industrial activities with local concerns—what some of them termed generating "compatibility" between industry and communities. In this chapter, I argue that although this everyday practice of accountability financially benefited some parts of the public while allowing companies to maintain or expand their reach, its focus on "actionable feedback" foreclosed broader questions about industrial development. Whereas engineers viewed these as win-win

scenarios that benefited companies and publics, they sidelined the concerns of people who wished for no industrial development at all.

These practices of accountability configure engineers' agency in particular ways. Chiefly, I show that they reflect and foster a deep-seated engineering pragmatism.[4] In its academic sense, pragmatism refers to a philosophical tradition emphasizing usefulness, workability, and practicality.[5] That tradition echoes in humorous jokes about engineers who are so committed to solving problems that they endanger their own well-being, and it animates popular distinctions between engineers as driven by application and scientists as driven by curiosity or truth.[6] Though my interlocutors also shared in this general appreciation of practicality, in this chapter I identify a more specific sense of pragmatism animating engineers' work in corporate settings. The engineers faced a dilemma that has been left unresolved after nearly a century of debate about the engineering codes of ethics analyzed in chapter 2: their professional norms held them accountable to both their corporate employers or clients and the safety, health, and welfare of the public, providing no guidance about what to do when those two accountabilities conflict. In my research in particular, engineers found themselves simultaneously facing public calls to change industry practice and pressure to keep the corporate forms employing them financially solvent. In an attempt to be accountable to both demands, they tried to make their engineering decision making both profitable for their companies and responsive to public demands. It is this particular effort at compromise that I signal when using the term *pragmatic* to describe engineers and their practices.[7]

This pragmatism is worth exploring at length because it can exist in tension with more radical forms of action and critique, especially as they relate to social, environmental, and technological upheavals. Indeed, Carl Mitcham proposes viewing the Anthropocene as the "Engineering Epoch," given the significant role engineers have played in creating and maintaining the infrastructures and forms of knowledge that created this era.[8] While there is much to admire in engineers' pride in being problem solvers, this intertwined sense of self and profession can also privilege maintenance of the status quo rather than fundamentally questioning it. As a case in point, the engineers I met almost all envisioned a more responsible—and thus

more robust—form of capitalism rather than the "potential of capitalism's undoing."[9] The practicing engineers I met and most of the engineering students I taught were willing to entertain the kind of sustained critique that drives social scientists but grew frustrated and unsatisfied when that critique could not be easily translated into some sort of productive intervention or improvement. They wanted to know what to *do* with the critique, how to act on it to address whatever problems it revealed. While this deep desire to help may be admirable in its aim to improve people's lives, such projects of "improvement" are never politically neutral.

In this chapter, I focus primarily on the fracking firestorm in Colorado to show how this engineering pragmatism can end up sidelining concerns that call into question the continued need for natural resource production itself. I draw attention to the politics of listening, specifically, how some concerns exceed institutional constraints on what content could become "actionable feedback." This analysis draws attention to the limitations of engineering agencies and therefore of their accountabilities, building on the theorization of the distributed nature of the agencies that constitute corporate forms and extending the concern with detachment detailed in previous chapters.

LISTENING AND ENGINEERS' SOCIAL RESPONSIBILITIES

In the most comprehensive study of engineers and CSR, Gwen Ottinger shows that community engagement tools ultimately reinforce the scientific authority and expertise of petrochemical companies and their engineers working in Louisiana. The vibrant community-based environmental justice group she studied dropped its lawsuit and participatory air monitoring programs in the face of corporate commitments to "open dialogue" and the surrounding community's new feeling that they were listened to and respected by corporate actors. Ottinger argues that, in this context, appeals to communication reinforced a problematic and pervasive technical/social dualism by admitting mistakes in the "social" domain of communication, all while shoring up the company's own expertise and authority in the "technical" domain of operations and environmental monitoring. She writes: "Community grievances [were] framed as social issues, requiring

thoughtful attention from managers, but no rethinking of technical practice. By taking on social responsibilities as part of their core business values, then, petrochemical companies created a space for plant managers to admit serious faults in their interactions with residents, and thereby resolve community conflicts, without jeopardizing their technical authority."[10]

The engineers I met sometimes similarly took shelter within such a technical/social dualism.[11] This dualism is predicated on depoliticization, or the belief that "technical" concerns can be purified out of their social, political, and economic context.[12] But those I met also sought to engage in professional practices that would be directly accountable to various publics. By pragmatically seeking to adapt the process of resource production to be responsive to the concerns of the people who would be most affected by it, they enacted a vision of accountability that was more sociotechnical in nature.

Their practices formed and were informed by shifts from what scholars call "old" to "new" CSR. New CSR activities change core business practices that create harm, whereas old CSR activities do not.[13] Philanthropy is the most prominent example of old CSR, as it can provide feel-good images while coexisting with the continued production of harms—picture Massey Energy CEO Don Blankenship handing out Christmas presents to poor children in West Virginia while mandating unconscionable safety cuts that would claim twenty-nine lives in the 2010 Upper Big Branch mine disaster.[14] In their ideal form, activities in the "new" model of CSR seek to address those harms directly by changing core business practices, ideally to internalize what might otherwise be externalities. In the mining and oil and gas industries, these core activities directly involve engineering, meaning that new CSR involved changing the dominant expectations and practices of engineers. For my interlocutors most committed to this version of CSR, listening was the mechanism through which they would integrate community concerns into engineering practice.

Engineering educators also point to the transformative potential of listening. Gary Downey advocates for positioning engineers as "both problem solvers and problem definers who listen."[15] Doing so also required him as a scholar to listen to the ongoing struggles of engineering educators themselves, to position his interventions in a way that they could be taken

up as critical participation rather than dismissed as external critique.[16] Building on these perspectives, Juan C. Lucena, Jen Schneider, and Jon A. Leydens emphasize listening in their efforts to harness engineering to promote sustainable community development and social justice. Noting that undergraduate engineering training in "communication" privileges speaking over listening, they offer a theory of contextual listening distinguished from what they call basic listening. Whereas basic listening can be conceptualized as information exchange through output (speaking information) and input (receiving information), contextual listening involves situating such exchanged information within the broader historical and structural factors that make it meaningful: "Information such as cost, weight, technical specs, desirable functions, and timeline acquires meaning *only* when the context of the person(s) making the requirements (their history, political agendas, desires, forms of knowledge, etc.) is fully understood."[17] This kind of listening invites engineers to put themselves in someone else's shoes to understand not just what that other person is saying but the broader context giving shape to those statements.

Some corporate actors would likely look positively at the concept of contextual listening for providing richer information either to help them truly address people's concerns, in its most altruistic formulation, or to outmaneuver their opponents and co-opt their critics, in a more mercenary formulation. This underscores the fact that listening can be put toward different political ends, from neutralizing critique of corporations in Ottinger's work to promoting social justice for communities underserved by engineering in Lucena, Schneider, and Leyden's work. This raises the question of *for what ends* listening is being put into service.

The corporate context of many engineers' work further raises the question of scale. The community development or assistive technology projects analyzed by Lucena, Schneider, and Leydens, for example, are mostly predicated on small projects that allow engineers to communicate directly with the intended beneficiaries of their work. In contrast, the engineers I met who worked in a corporate context, whether as full-time employees or as consultants, found themselves facing significant institutional barriers to direct engagement with the people affected by their work. Not only did

they work for large corporations with divisions of labor that tasked some employees with outward-facing roles while tying others to their desks, but the number of potential "stakeholders" for their projects was enormous, especially for the engineers facing the fracking controversies in the booming Denver metro.

ENGINEERING THE WIN-WIN

When giving examples of socially responsible engineering, almost all of my interlocutors pointed to projects in which they designed solutions that would create financial prosperity for companies and communities while minimizing the risks of industrial development—what they viewed to be a win-win but what social scientists would likely consider a harmony ideology (chapter 2). The question of what constitutes a "win" clearly depends on who is doing the defining. Aaron was careful to point out that simply mitigating risks and maintaining the same quality of environmental and social health was not a benefit to communities but an absolute minimum requirement to repair the disruptions they suffered.[18] The main benefits that he and other industry personnel saw for communities were economic gains in the form of taxes, royalties, and jobs. Some locals embraced such economic development, but others raised questions about the "logics of equivalence" that justified potential environmental and social harms by appealing to economic gain.[19] After all, some residents valued other "goods" than those proposed by oil and gas representatives: quiet evenings without the background noise of fracking operations, roads free of oilfield truck traffic, or minimal risk levels for air, water, or soil pollution.

In one sense, the projects of mutual benefit I analyze in this section were admirable in adapting technical practices to account for social and environmental contexts, unlike other practices of accountability that would cordon off engineering from its social context. Yet given the engineers' institutional locations as corporate employees responsible for producing profit, their practices of accountability were pragmatically aimed at continuing or expanding natural resource production. Like other harmony ideologies, the "win-win" marginalized more radical questions about resource production,

conservation, and use in the problems that the engineers were attempting to solve through technoscientific creativity.[20] Here I group these practices of accountability into two broad categories: shared infrastructure and design for community acceptance.

Shared Infrastructure

My interlocutors referred to shared infrastructure as infrastructural projects that served necessary functions for both industry and nearby communities.[21] Juanita, a senior petroleum engineer who had worked her way into executive positions in safety and sustainability in oil and gas after beginning her career in mining, made a strong case for shared infrastructure and highlighted the more dialogical approach to community relations it required. Truly shared infrastructure, she said, required having conversations with local governments, planning commissions, and citizens to "find synergies." She continued:

> And it is a one plus one equals three if you do it right. In other words, if you're gonna build an airstrip, for God's sake, build it where it meets the longer-term needs of the community and spend an incremental amount of money to create something that's kind of fit for purpose for both uses. We [in the oil and gas industry] are all famous for building our own airstrips without having that [shared purpose]. The same thing with water systems, the same thing with power, increasingly with the infrastructure around telecommunications.

Other interviewees shared her enthusiasm for the transformative potential of shared infrastructure, especially surrounding increased access to the wireless communication and the internet in addition to rail, port, and energy access.

Though Juanita was referring specifically to development work in the Global South, she also saw opportunities in the United States, where cities needed to upgrade their wastewater treatment infrastructure and oil and gas companies needed to engage in water treatment. "There could be some synergy around waste treatment, waste-water treatment," she said and then joked, "that would be a whole hell of a lot better than taking clean water and pumping it down a hole and getting dirty water back and then pumping it in underground injection wells." Juanita contrasted the value generated by shared infrastructure with spending money on popular

CSR projects that were discrete from the company's core competencies and activities. She viewed the shared infrastructure projects as the "cheapest social investment you can do versus doing whatever the hell you want and then you sprinkle a little money around for a few schoolhouses or baseball fields." Her critique of "old" CSR echoed how an anthropologist, who had dedicated his career shaping the field of social performance in mining, made fun of old CSR in a campus lecture at Mines by saying, "Communities threw rocks over the fence at industry, and the industry threw back schools and hospitals."

Engineers who worked in mining were also quick to point to shared infrastructure as an example of social responsibility and supported their observations by drawing on a small gray literature including contributions from the World Bank and the influential development economist Paul Collier. The larger scale, longer duration, and greater capital investment associated with mining activity may make this a more common practice in that industry than in oil and gas. When I asked Jennifer, a geological engineer, about a good example of CSR, she immediately referred me to the wastewater treatment plant that Freeport-McMoRan constructed in southern Peru. The company was seeking to expand its large, open-pit Cerro Verde copper mine outside of Arequipa, Peru's second largest city, but could not do so without massively increasing the water it used. The region was already arid, and company personnel worried that creating a dam on the primary river would spark controversy. Jennifer explained that consulting engineers recognized that the city of Arequipa itself, home to about one million people, did not have a wastewater treatment plant, meaning that raw sewage was disposed directly into the river. She said that they then worked with the company to "come up with a solution where we designed a sewage collection system where we collect the raw sewage and take it to a wastewater treatment plant and treat the water. And then the treated effluent, some of it goes to the mine, and then the rest of it goes back into the river as cleaned—not drinking quality water but dischargeable quality—water."[22] The $500 million plant—part of a $5 billion overall mine expansion—was completed in 2015 and received international accolades for improving the health of Arequipa's residents, including a 2016 US Secretary of State Award for Corporate Excellence

and recognition by the International Council on Mining and Metals and the Canadian International Resources and Development Institute as an exemplar in social and environmental responsibility. Yet Oxfam discovered that Freeport owed $250 million in unpaid taxes between 2006 and 2009, of which $140 million was owed to the local government, raising doubts about the company's actual commitment to public accountability.[23]

The increasingly popular notion of local procurement evinces a logic similar to that of shared infrastructure, though the "infrastructure" would be supply chains instead of physical installations. Local procurement involves companies purchasing goods and services from local businesses rather than from large companies owned by national or foreign elites. The goal is to direct as much of the company's financial investment as possible into the hands of local people, though such projects require significant training and face substantial bureaucratic hurdles in aligning local practices with industry norms and national laws.[24] As of 2020 local procurement was considered best practice for major extractive projects, with groups such as Engineers Without Borders–Canada providing analysis of how to make it benefit communities in a responsible, long-term manner. While some intended beneficiaries of these programs welcome them as a connection to global flows of capital, social scientists caution that such programs also promote an entrepreneurial ethos at the expense of other forms of claim making on states and corporations.[25]

Shared infrastructure helps address criticism from communities of the injustice of major infrastructural projects privileging industry rather than communities, as memorably captured in an ethnography of a village of Peruvian campesinos who lacked access to electricity while living underneath towering high-voltage electric lines that connected a foreign-owned mine with the national grid.[26] Yet the scale of these decisions tends to involve high-level corporate personnel and their government counterparts. It is near the executive level that major decisions about infrastructure are made inside of corporations, and the "listening" that seemed to inform them was directed at government officials. Juanita was careful to state that the synergies she praised could not emerge from engineers identifying a need and then "educating" communities about how to fix it but had to

be based in a "real engagement" that exceeded instrumentalist desires to gain permit approval. But for her, the people she suggested that companies needed to listen to were government officials, who do not always represent the concerns of the full range of their constituents.

Design for Community Acceptance

A second area of socially accountable engineering encompasses projects I group as "design for community acceptance." Unlike shared infrastructure, the material artifacts and processes being designed are not for joint use by companies and publics. Rather, engineers factor community concerns and desires into their design of the material artifacts and processes to be used by companies themselves.

Marie was a petroleum engineer who had spent most of her career working in completions, referring to the phase of oil and gas development after drilling in which the well is brought into production, including through hydraulic fracturing. She described herself as a passionate advocate for the oil and gas industry and as proud to work for a company with a reputation for being progressive about securing the social license to operate. She spoke at length about how she had tried to integrate public accountability into her work. "I don't want to do a Band-Aid fix, just putting up walls and hay bales," she said, referring to common practices of mitigating the noise and visual disturbances of active wellpads. "I was a big pusher of, 'Let's reengineer the equipment because this will fix the problem for the next ten years, not just now.'" Marie's description fits within the broader discursive shift from old to new CSR, from trying to hide noise and visual disturbance to designing them out from the start. In these practices of accountability, engineers' understanding of community acceptance figures into engineering decision making itself.

Marie was also proud of being what she called the "main engineer" who created a "stimulation center" that reduced and spatially concentrated the overall footprint of the fracking process. Horizontal drilling allows operators to place multiple wells on one larger pad rather than spacing out single vertical or directional drills on multiple pads dispersed throughout farms, ranches, and communities (figure 6.1). While this consolidation may reduce

Figure 6.1
Hydraulic fracturing job in process in the Bakken field in North Dakota. Photo courtesy Joshua Doubek via the Wikimedia Commons: https://commons.wikimedia.org/wiki/File:Frac_job_in_process.JPG.

the number of people impacted by oil and gas production, it significantly intensifies the burdens faced by the people who live in close proximity to the enlarged sites.[27] Industry data for Greeley, Colorado, estimates that by 2018 multiwell pads were "commonly about 4 acres in size, holding 24 horizontal wells with associated equipment. According to industry estimates, well pads of this size have estimated development times (24–7 drilling, completion, and flowback operations) of approximately 20 months total with *associated truck traffic of 55–108 round trips per day in that timeframe, plus ongoing 23 truck trips daily during the wells' production lifetime.*"[28] Typical hydraulic fracturing processes create such substantial truck traffic because semitrucks had to haul in the massive amounts of water, sand, and chemicals to be pumped downwell at each site. This happens multiple times per well, given that the hydraulic fracturing takes place in discrete stages, rather than all at once.

In contrast, Marie's "stim center" was one central location where technicians could pump the water, sand, and chemicals into one steel pipeline that was connected to multiple wells. This meant that, rather than trucks having to make multiple trips to each dispersed well, they could visit one stim center and direct the flow of water, sand, and chemicals to whichever well needed to be fracked. This concentrated the main aboveground activity at one site that they could locate far away from neighborhoods, businesses, and heavily trafficked roads. Safety was an obvious concern, given the long length of pipeline—up to about two miles—traversed by the materials under high pressure. Anticipating that critique, Marie pointed out that the steel pipe was manufactured to the same specification of structural competency as the pipe used on the ocean floor in the Gulf of Mexico and said that they instituted and enforced a fifty-foot "red zone" to restrict personnel from entering the area when the pipe was pressurized and utilized pipe restraints made with bullet-proof Kevlar.

All of these design decisions could be justified in terms of efficiency and economics, but for Marie there was something more: stim centers were the morally correct thing to do because they lessened impacts for nearby residents while still providing an economic benefit for them in the form of taxes and royalties. She distinguished her company's approach by saying that the others who had attempted them did so for "purely efficiency reasons, to where they could bring a bunch of stuff under a central location and lower their costs and their disturbance footprint. You were saving costs on building locations, on roads, bringing in water, things like that." In contrast, she said, using the *we* of her company,

> we wanted to also benefit from those cost efficiencies, but a lot of it was because we were butting up next to people's houses and things like that. So a stim center is definitely a tool in a toolbox that we can use. . . . I remember a specific time that it helped us get the municipal permit, because we were able to tell these residents, "We're not gonna be right next to your house. We're actually gonna be two thousand feet over here, half a mile away, so you're not gonna get the lights and the dust and the noise as much."

Here Marie acknowledged a moral case for the stim centers, framed by the social license to operate. Doing the "right thing" by minimizing impact on

residents while providing them economic benefit also helped the company secure government permits and save money—a win-win, in her eyes.

This approach also underlined the other examples of socially responsible engineering described by Marie. She worked on a project testing Colorado's first "electric frack fleet" of engines, which used natural gas and electricity instead of diesel. She described the engines as being "quieter and 95 percent better on emissions" compared with the diesel ones. "You could see the huge benefits on the emissions, and then noise and light as well," she extolled. Finally, Marie was proud of her company's innovative water pipeline project. They had laid 150 miles of pipeline that could transport water for hydraulic fracturing directly to well sites, strategically choosing to operate where they could link well sites to the pipeline. Doing so meant that, by the time of our conversation, she claimed that the company had transported over 62 million barrels of water and had eliminated over fifty thousand truck trips and over 10 million miles of truck traffic. She said it also allowed them to reduce the size of the well pads by up to 25 percent.

Excited that these efforts had provided tangible benefits to both the company and communities, Marie said, "So those were cool projects because of where we were able to incorporate feedback that we were hearing from people, you know, just our operations being in the communities and able to somewhat pivot or help lower those impacts." But, as suggested by her use of the terms *somewhat* and *lower*, she also wrestled with the limitations of how much she and her coworkers could do to appease nearby residents. Echoing chapter 4's focus on distributed agency, she recalled heated debates between different teams on how to spend money and determine timelines, describing how some teams were more motivated to cut corners on community engagement to speed up bringing a well online. "So it does come down to, sometimes, a moral decision versus an economic decision," she said. "You always have to keep both in mind. It's like the little triangle: the time, price, and quality. There's always one that suffers." By positioning time, price, and quality as trade-offs that had to be weighed against one another, she engaged in a logic of commensurability that others might seriously question or reject.[29] For example, the most

fervent critics of fracking were not willing to sacrifice environmental well-being for increased efficiency.

In wrestling through those kinds of tough decisions, Marie said, she went back and forth between putting herself in the shoes of the residents and the shoes of her colleagues who were pushing for cheaper and faster community engagement activities. "It is difficult because you're working for [the company] and you're a [company] employee, but at the same time, I can relate to these people [community members], too, and, the impacts that they . . ." Her voice trailed off before continuing to express her empathy with the community relations group at her company, saying, "They're always in the middle, torn because it's like you're trying to do the best for these people that are being impacted. But you also have to think about the bottom line for [the company] and the cost of doing, you know, the extractive industry." It is telling that, when Marie seemed to reach the push point in which the costs of being responsible to impacted communities impinged too much on the company's financial bottom line, she symbolically handed over the dilemma to the stakeholder engagement team. While she said that she tried to put herself in the shoes of neighborhood residents, she acknowledged that because of the structural constraints of their work, most of the "listening" work fell to others.

STRUCTURAL BARRIERS TO LISTENING

Divisions of labor inside companies constrained most engineers' opportunities to listen to local residents, prompting them to devise other ways to pass along information among teams, as described by Marie. She pointed to the importance of drilling engineers—some of the first people on the ground—passing along information to the teams who would follow them. As completions engineers, she said, "We'd go to the drilling engineers and be like, 'Did you guys hear any feedback?'" She recalled that their responses would vary, from "Oh, they loved us, they brought us cookies" to "Watch out for this lady. She's very vocal and she needs some coddling and she needs some extra attention." In her company, they tried to formalize that feedback by recording it in the databases associated with each well. But she

pointed out the limitations of the listening and change that could happen at the production stage of the process. "That's kind of in the reactionary space. We're already there, we're already impacting them," she explained. "So let's see what we can do right in that space. And so that communication was very good, and that's usually, like, putting up hay bales or putting up a sound wall or maybe trying to reroute our traffic." Here Marie acknowledged the limits of generating compatibility after the well facilities have already been designed and built.

Field-based experience provided some engineers with a lasting appreciation for understanding stakeholder perspectives, even as they moved into jobs that kept them at a desk. Kevin, the dedicated petroleum engineer profiled in chapter 4, spoke at length about the significance of his first years on the job as a production engineer for learning to listen to people outside the industry. As a typical entry-level position for petroleum engineers, the role involved enhancing the production of already existing wells. It required him to leave the office and visit his company's wells to assess and then implement mechanical, chemical, and other treatments to boost the well's production.[30] He always did so with one of the company's operators, a group of workers whom he described as "blue-collar men who live in the same towns where the wells are." Sitting together in a company pickup truck, he carefully observed how these men would interact with the people they encountered, including disgruntled landowners. "They just listened to them, kept their cool, and then promised to fix whatever complaint they had themselves or pass it along to someone who could," he remembered. When Kevin was promoted into reservoir engineering and helped plan when particular wells would be taken out of production, his previous experience taught him that those decisions had direct implications for his company's relationships with nearby residents. For example, he could opt to take an aging but not exhausted well out of production to improve the relationship with a local landowner. He recognized, however, that his work mostly kept him at his desk all day and that, like Marie, he was dependent on being "fed information" from the stakeholder engagement team.

Even engineers who recognized the importance of listening invoked "inside the fence" and "outside the fence" distinctions to set boundaries on

which personnel "should" be responsible for interacting with communities.[31] Austin, who was the chief mining engineer for a large operation in Central America that was under intense international scrutiny for its troublesome human rights record (see chapter 2), also emphasized direct listening to community members to mitigate conflict. He underscored the importance of managing expectations and following through with promises but pointed out how shifts in personnel who cycled through projects during their careers made that difficult: "I learned that you have to build trust with the people. You have to follow through on it, you know, basically any promises that were made. Some of the problems we run into are that a lot of promises were made by people who no longer work here, and that generates a lot of mistrust when either you don't follow through or you can't follow through for financial or other reasons."

Austin's point shows how the time scales of mining projects and the distributed nature of the corporate "person" analyzed in chapters 4 and 5 make it difficult for people to hold companies as a whole accountable.[32] And even though he praised mining companies for becoming more "inclusive" in integrating stakeholder concerns into their operations, he also found it difficult to manage both his technical responsibilities and relationship building with stakeholders: "I'm really focused on the details of what goes on inside the mine gates. I obviously need to be kind of aware of all the issues that are going on outside. But there is always a wall between those two areas. Not because they don't want to communicate. It's just, there's so much to do inside with the technical part that I can't really get too involved with those other things." Even though Austin expressed a desire and a need to understand what was happening "outside" the mine gates, he found it difficult to do so while staying on top of the technical work he was formally tasked with assigning. He critiqued the institutional "wall"—work assignments, reporting structures, disciplinary teams—that seemed to artificially separate the mine from the world of social concerns "outside" of it, implicitly recognizing that the thoughts, feelings, and activities of people in the nearby villages would affect the mine's daily operation, and vice versa. But he also reinscribed the technical/social dualism by signaling the "inside" as being the "technical" domain that was his responsibility.

WHEN WIN-WINS ARE NOT POSSIBLE

The engineers I met held up shared infrastructure and design for community acceptance as aiming to maximize potential shared benefits between companies and their publics. In contrast, the limitations of the win-win proposition were explicitly recognized in compensation practices, since these acknowledged that not all harms could be designed out of the process and that affected people needed to be compensated for experiencing those harms. Anthropologists critique the underlying assumptions of compensation, arguing that it attempts to create commensurability between things that would otherwise circulate in different value regimes, for example, by proposing to replace a sacred and sentient glacier with trucked in water or replacing the loss of place-based livelihoods with cash.[33]

The engineers I met who were the most committed to greater public accountability viewed compensation as a last resort when other attempts to harmonize industrial activity with local concerns failed. Marie disparagingly called compensation "hush money." Aaron found placing a price tag on someone's complaint to be ethically troublesome, so he attempted to remedy the concern itself as much as possible. When speaking in my class, he illustrated his team's technique of "ask and listen" by describing their encounter with a vocal opponent of fracking near one of their operations. "When I actually sat down and talked with him, it turned out the thing he hated the most was that his car was continually getting dusty because of the dirt our guys were kicking up," Aaron said. "So I asked him if it would help if I arranged for him to have free premium car washes for the remainder of our time working on site." The neighbor agreed, and Aaron went to a locally owned carwash and purchased a punch pass for the man to use at his leisure, explaining, "There you go, he had his problem solved and we were able to support a local business at the same time." Aaron was careful to point out that even this "reactionary" sphere of listening could still improve future projects if it was fed back to the "beginning of the cycle when you plan the next project."

John saw similar limitations and opportunities of compensation from his position shaping the field of stakeholder engagement and performance

standard compliance. After graduating in the mid-1970s with an undergraduate degree in mining engineering, he began his career in the burgeoning field of environmental remediation. He traveled the world, working as a contractor on large headline-grabbing projects before eventually accepting a full-time job with one of the oil and gas majors, where he specialized in strategic but controversial new international projects. He was in that position when the field of social and environmental sustainability reporting surged in the wake of the 1987 Brundtland Commission, which defined and set a globally influential agenda for *sustainable development*, and the 1990s transparency boom.[34] For the projects he worked on, he took on the role of navigating a host of new and evolving performance standards, most notably from the World Bank and International Finance Corporation. As of 2020, those standards covered eight key areas: risk management, labor, resource efficiency, community, land resettlement, biodiversity, indigenous people, and cultural heritage.[35] John had to make sure their projects met those standards; otherwise, the company would risk losing its funding.

Like Aaron, John discovered that he had to do considerable work inside of his company to convince his coworkers and managers of the importance of the performance standards. He said that it took major financial losses to eventually push the company's engineers—and the engineering-dominated management teams—to incorporate listening to local communities into the planning process. To illustrate, he described a multibillion dollar project to build new production fields, transportation facilities, and a plant in the South Pacific. In the following interview excerpts, he refers to his team by using *we* and refers to the engineers and other top managers as *they*, vividly underscoring the different and distributed agencies that make up corporate forms.

> The engineers in Houston looked at topo[graphic] maps and they had all the satellite imagery and the geotech, and they thought, "Oh, here's a great piece of ground. It's in the right place. We're going to put the gas plant right here and have design firms do it and whatnot." They drew the right-of-ways through the terrain for the pipelines based on purely technical criteria, all of the classical engineering conditions. What's the ground like? Is it a nonslip zone? Is it level? Where is it situated? So we got in the country, started doing

> the surveys, and realized the pipelines were going through hunting grounds and sacred areas. We said, "Oh, we're going to have to move fifty families. It'd be easier to move the gas plant." They said, "Oh, no we've already invested the time and money in the design. So you'll just have to move the families. Oh, by the way we're going to start in a couple months."

Here John criticized the design fixation on the part of the engineers and invoked the "cost of conflict" argument used by many CSR specialists to shore up support for their work. The engineers' unwillingness to change the pipeline pathways ended up causing "more than eight months of delay and millions of dollars in compensation payments" for the families they had to resettle. This process generated considerable social unrest on the ground and eventually sparked what he called a "shift in design" inside the company, which involved substantial effort to overcome obduracy in how the engineers and managers planned infrastructure.[36]

> It was recognized that the transactional delays and the transactional costs were much, much greater than just a simple engineering decision, "Yeah, we can shift the pipeline one hundred meters this way and boom off we go." From that point going forward as they were routing the pipeline through the countryside, the engineering team took great pains to avoid residences and gardens and that sort of stuff wherever they could. Rather than just rely strictly on the right of way, we had teams out in advance talking to communities. "What are your sacred grounds? What's important? Which are the best marking areas? What is important to you, and whatnot?" So we were moving that right of way based on consultations with communities, as opposed to, "Okay, we're just gonna put it here because technically this is the right answer." Because, you know, they had to learn through the hard way that, in a traditional society, moving residences and moving people can be extremely difficult.

John's early prediction of the difficulties resettlement would pose for the project stemmed from the knowledge he gained from listening to local people and reading anthropological research on the area. He learned that they had a different relationship with the land than he and his North American coworkers: they recognized multiple and overlapping "use" rights embedded in a complex and malleable kinship system. Local people also

viewed parts of the land as being home to their ancestors, even if their bodies were not physically buried there. These factors made compensation difficult and underscored the importance of what John called "active listening" and an "active feedback loop."

> What's the purpose of having stakeholder engagement if it's only a one way conversation, and you don't want to take feedback? Admittedly, some of that feedback might be painful, but, to me, that's the heart of it. You need to have that active feedback loop to go back to people and say, "Okay. We heard your complaint. We're going to do something about it. Here's what we're going to do. It's going to take this length of time." That communication process, that grievance management process, needs to be a robust, active, continually working cycle forwards and backwards. You've got to take it, and you've got to respond to it, and then you've got to live up to your commitments. If you tell people you're going to do something, then you've got to do it. Trucks driving too fast? Well, we'll go work with the project teams, and we'll get guys out there with flags. We'll do something to slow down the trucks. Kids can't cross safely to school? Okay. We can fix that, right? They may say, "We don't like the dust the vehicles are generating." Okay. That we can work around. "Here's what we're going to do. What do you think about this?" You need to take a look at what are the things that are due to us—and when I say *us*, the project—and how do we go about improving it?

In this narrative, John used the *us* to refer to a project in which the company's employees and contractors were united in making their operations accountable to the people they impacted. His years of experience on controversial projects convinced him that the public disturbances and protests were almost always "the result of a grievance that hasn't been answered." In so doing, he placed listening and response at the heart of companies' ultimate financial security—as long as that listening could generate feedback that they could pragmatically act on.

PRAGMATISM AND "ACTIONABLE FEEDBACK"

Challenging a persistent technical/social dualism, Aaron became convinced that the success of the stakeholder relations team rested on changing how

their company's engineers and managers planned and executed their work. He and his team saw that leaving the community relations work until after wells were already drilled made it difficult and ineffective to address people's concerns, since there was very little they could do to change the practice of drilling or the well itself in response to the concerns they discovered.[37] They therefore professionalized a listening function inside of the company that aimed to integrate social concerns into the planning of specific wells and entire fields, as well as their everyday operation and eventual plugging and abandoning. Aaron valued listening as a tool to generate feedback: "There has to be listening, otherwise there is no feedback and no change."

The team developed multiple tools for this listening and feedback. In the areas closest to their potential operations, they went door to door to talk with as many people as possible. They invited a larger radius of people to neighborhood meetings that would allow more people to speak and ask questions than the typical kind of public hearing required by state and federal law. They made themselves available at community events. They created a response line that they personally staffed, categorizing calls according to type and tracking the resolution of complaints. They then developed creative techniques for translating the wealth of information they gathered from these sources into a form that was "actionable" by other teams inside of the company. These included maps of complaint locations, charts showing the time of day/night of calls to their grievance line, charts distinguishing types of calls into their hotline (e.g., complaints vs. requests for information), and GIS layers of schools, hospitals, and other key places that should be avoided when siting wells. Aaron explained:

> If we went and spoke narrative about someone who couldn't sleep at night, there's nothing that a drilling engineer can do with a narrative. . . . They don't become more efficient drilling a well from narrative. They don't control costs by narrative. Nothing happens in their world in just talking. They have to look at data, analyze it, and then make an action to it. It's the exact same thing. So we didn't have a narrative around the noise of rig activities at night. We showed a graph of complaints and time of day and it said, "The common element in this is you are delivering the steel pipe at three o'clock in the morning. Do we have to do that?" [They would reply] "Well, no. We could deliver

> it at three o'clock in the afternoon." You could've spun that narrative and it wouldn't have mattered. It wouldn't have sunk in and attached to people. When you showed them the data, and then provided the context, you nailed it. Or if you showed the map exhibit and your rig A over here has these complaints, and rig B has no complaints, here's the proof that it's related to rig A and it's not some other company's rig. It's your rig and it's this specific item.

When Aaron said, "It's the same exact thing," he was referring to his team's ability to turn narrative into data that could be understood and engaged by people more skilled and comfortable with quantitative information. These tools helped engineers see the patterns and common themes in the narratives that the stakeholder team heard day in and day out. By creating graphs and charts, his team was able to carve a space for engineers to change their professional practice in ways that improved stakeholder relationships. This translation, however, was asymmetrical. To orchestrate an alignment of views, Aaron had to make the narrative information gathered by his team "speak the language" of their technical peers:

> That's the power of those exhibits and that's one of the ways that the technical person can participate in this is to help the socially oriented, the communications major, the sociologist, convert their world, translate their world into something that the oil and gas operative, technical person, blue collar team member can do something with. . . . The power of a map isn't that all the dots are accounted for. The power of a graph isn't that the trend is up. The power is that all of us who are looking at it have the same conclusion of what is going on. We all agree that those are the sum total of the dots.

One of the reasons this approach was compelling is that it illuminated specific causes of social problems that might otherwise appear irrational, unpredictable, or arbitrary, allowing both the stakeholder and engineering teams to formulate solutions that were more likely to result in good stakeholder relationships. This approach resonates with root cause analysis, a familiar exercise to engineers accustomed to identifying the causes of events like equipment failure. According to Aaron, "The power for the internal people is to dissect, 'Why did that generate that, and can we be aware of that as we go to plan the next piece, the next step? Can we be better when we plan the next

step?'" The idea that there is a discoverable, underlying pattern of community conflicts bolstered their work because it suggested that such conflicts can be prevented in the future.

This stakeholder engagement group went on to become one of the most effective and emulated in Colorado for the positive working relationships they developed both outside and inside their company. But not even they could fully address each of the community concerns that came to their attention through listening, because not every complaint could be translated into actionable feedback. Given the wide range of opinions, concerns, hopes, and fears surrounding oil and gas production, they could not meet every person's expectation of them and their companies. A geological engineer named Ryan, for example, poured his soul into trying to address the complaints he received when he answered the company response line or met people in the town. Yet he also said that sometimes his hands were tied and the best thing he could offer upset people was acknowledgment of their criticism:

> When folks are in a situation like that, one of the things that they do is just let it out. Being able to just sit there and listen is huge. If I'm at a booth, I'm at a booth that says [my company name] and I'm wearing a shirt, and so it's clear that I represent the industry. I answer the phone, and I am a representative of oil and gas to them that they have the attention of. Some people—and I don't fault them at all for it, I certainly am one to do it myself at times—but they will take that opportunity and just talk and let everything out. It's my job to, as quickly and as efficiently as I can, help them in whatever way I can, and I personally find that tremendously rewarding.

Ryan found personal fulfillment in enacting the corporate form as a sympathetic listener, and he tried to influence the other agencies that made up that that same corporate person to address the criticisms and requests he received. But he also recognized that his own ability to truly address their concerns was limited by his structural position working for the company. He had to be pragmatic; he could listen at length but act only inasmuch as he did not hinder his company's ability to continue operating and drilling oil and gas wells. His experiences show how the constraints of the

corporate context of their work generated "overflows" of perspectives and critiques of resource production that could not be contained within the category of actionable feedback.[38]

CONCLUSION

The engineers described in this chapter endeavored to make themselves, their companies, and their industries more accountable to multiple publics by creating "solutions" they considered to be mutually beneficial: those that would address residents' concerns while still generating financial benefits for companies and communities. I propose viewing this orientation to their work as pragmatic in nature, as it seeks to harmonize accountabilities to the public with their accountabilities to generate profit for the corporate forms employing them. In their accounts, the engineers positioned socially responsive technology—from stim centers to responsibly sited pipelines—as a source of industry progress in addressing the problem of community acceptance of resource production. Engineers such as Marie recognized their and their colleagues' agency in developing, testing, and implementing those technologies, even as they simultaneously pointed to the structural limitations of that agency: very few engineers had opportunities to interface directly with the people affected by their company's activities.[39] Even those that did, like Ryan, could not always act on the feedback gained through listening because they had to maintain rather than curtail industrial development.

But what kind of agency was this? First, it was *distributed*. The engineers had to work with others and work with others in mind. In addition to listening externally to nearby residents, they had to listen internally to their own coworkers and managers to learn how to advocate most effectively for the plans they were proposing. They tried to create alignment among the multiple agencies they encountered by creating actionable feedback that was more likely to be respected and taken up by their coworkers. This meant translating a wide array of public concerns, fears, and hopes into "data" that was more readily legible by other engineers, such as graphs and maps, and then situating this data within internally politically efficacious ideological frameworks, such as the business case for the social license

to operate. While the engineers I met tried to influence the agencies of others to align with their own senses of what was right or best, they could not always force their coworkers or persuade their supervisors to follow their wishes. This limitation provides fodder for those who argue that the bureaucratic nature of engineers' work can disperse accountability: if everyone is accountable in some way, then no one is.[40]

Second, this agency was *pragmatic.* While the engineers were sympathetic listeners, their visions of reform were grounded in spaces of compatibility between the corporate forms employing them and the communities affected by them. They tended to define "wins" for both their employers and the public in financial terms. A senior petroleum engineer illustrated this point especially clearly. He prefaced his comments on social responsibility in the interview by asserting that mineral rights take legal precedence over surface rights, signaling that companies have more of a right to develop subsurface resources than surface owners have to prohibit it. Companies should not exercise its legal right, he said, to "force their way onto somebody's land" but "have a discussion with the people about what's going to go on, listen to their thoughts, their needs, their wants, their desires, and really come to a win-win." Imagining himself speaking to a resident, he said, "There will be a lease payment, and then royalties if there's a well on your land. And we're going to be paying taxes to your school district, so the schools should be better. We can improve the roads. You'll have some income."

This economic view of win-wins may appeal to those with the most to gain from it but does not acknowledge that others may differently define what a good life is, including by foregoing the economic benefits of industrial development to safeguard against potential social and environmental risks. When engineers have more power to define what a "win" is, it positions them as the developers of solutions *for* the people impacted by their work, rather than *with* them.[41] While a few of my interlocutors acknowledged the value of participatory environmental monitoring for increasing trust in industry, for example, they seemed to assume that "empowering" citizens to do science would ultimately vindicate the company against false accusations of harm—a far cry from activists who advocated for community-based

research to make visible the harms of industrial activity concealed by industry-sponsored science.[42] One of the few engineers who seriously questioned the structures of expertise and authority that privileged engineers was Sofia, who found that she could not maintain that questioning and find peace with her job inside of industry (see chapter 4).

Questioning resource production itself played a minor role in this configuration of engineers' agencies. This is likely because this agency must be expressed through corporate forms that are financially invested in posing the question of natural resource production as one of *how* rather than *if* (see chapter 3), using the ethic of material provisioning as a justification for their activities (see chapter 2). The most radical questioning my interlocutors engaged in was whether, in certain times or places, natural resource production should not take place at all. As much as Aaron sought to make his company's oil and gas operations "compatible" with Denver suburbs, for example, he strongly opposed placing wells near schools and hospitals, and he advocated for the largest setbacks possible between potential wells and neighborhoods. Even the petroleum engineer who spent most of our interview talking about philanthropy (see note 14 of this chapter), thus striking me as firmly situated in the "old" CSR camp, surprised me by saying that her family's private company specifically avoided operating close to neighborhoods. "We've always tried to develop areas or drill on areas that are not developed, that are not subdivisions, as nobody really wants an oil well or a wellhead in their backyard," she said. "It was kind of our philosophy that we really didn't want to be there either because we didn't want it in our backyards. Why would they?" While the engineers' own aspirations of avoiding development where it is unwanted are laudable, it is also true that these industries as a whole have a highly uneven track record, along with national governments, of respecting people's rights to refuse natural resource production entirely.[43]

This pragmatic orientation of engineers to their work exists in tension with growing calls to radically change structures of natural resource production, consumption, and waste in the face of the accelerating climate crisis. Chapter 7 takes up this tension in detail.

Extracting Accountability

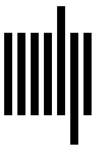
Engineers and Corporate Social Responsibility

By: Jessica M. Smith

Citation:

Extracting Accountability: Engineers and Corporate Social Responsibility
By: Jessica M. Smith
DOI: 10.7551/mitpress/12677.001.0001
ISBN (electronic): 9780262366151
Publisher: The MIT Press
Published: 2021

The open access edition of this book was made possible by generous funding and support from The National Science Foundation



The MIT Press

The MIT Press would like to thank the anonymous peer reviewers who provided comments on drafts of this book. The generous work of academic experts is essential for establishing the authority and quality of our publications. We acknowledge with gratitude the contributions of these otherwise uncredited readers.

This book was set in Adobe Garamond Pro and Berthold Akzidenz Grotesk by Westchester Publishing Services.

Library of Congress Cataloging-in-Publication Data is available.

Names: Smith, Jessica M., author.
Title: Extracting accountability : engineers and corporate social responsibility / Jessica M. Smith.
Description: Cambridge, Massachusetts : The MIT Press, [2021] | Series: Engineering studies | Includes bibliographical references and index.
Identifiers: LCCN 2020052840 | ISBN 9780262542166 (paperback)
Subjects: LCSH: Engineering ethics. | Social responsibility of business.
Classification: LCC TA157 .S588 2021 | DDC 174/.962--dc23
LC record available at https://lccn.loc.gov/2020052840