CORPORATE SOCIAL RESPONSIBILITY IN THE SHALE PATCH?

by
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Mineral rich countries often suffer from heightened economic inequality, corruption, instability, and poor economic performance. This inverse correlation between a nation's mineral endowment and its economic, social, and political performance is called the oil curse. Corporate social responsibility (CSR) spending by large investor owned oil companies aims to mitigate the negative impacts of the oil curse. CSR investment takes many different forms such as implementing human rights policies, mitigating environmental harm, or programs that focus on social investment. CSR spending is now a systematic and routine part of oil company spending. This Article examines how oil and gas industry CSR investment in the United States varies from its overseas counterparts. Over the last decade, shale oil and gas production has brought profound socioeconomic changes to U.S. communities. Although fracking operations in the U.S. have yet to yield consensus conclusions regarding their impacts on human health, it is clear that fracking operations produce socioeconomic change, air emissions, and (in some places) the risk of increased seismic activity or water pollution. Consequently, companies that produce oil and gas in the U.S. also engage in CSR investment in an attempt to mitigate the negative impacts of fracking on local communities. Domestic CSR investments differ from their overseas counterparts in a number of ways. In particular, domestic CSR investments tend to be smaller in scale, less likely to address environmental issues, and include fewer examples of pure corporate philanthropy.

One reason why U.S. CSR spending differs from the more robust CSR spending overseas is because of the large number of producers in American shale plays, creating a sense of diffused responsibility for the impacts of production. Each of the many small producers in a single shale play contributes only a fraction of the impacts to the local community, while mitigating those impacts requires a collective effort. By comparison, large conventional oil and gas projects in the developing world usually feature very few producers working together on a single project. Therefore, in American shale plays CSR spending is a more difficult collective action problem—a "tragedy of the commons," in that multiple producers face

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difficulties in cooperating to mitigate the impacts imposed on local communities. The cooperation problem is exacerbated by the fact that in the U.S. private landowners own the mineral estates, allowing producers to secure access through a series of private negotiations. Overseas, the single mineral owner—the government—has more leverage with producers, and so can extract more CSR commitments. All that said, the larger companies in American shale plays have developed domestic CSR programs in recent years, and some make significant investments in CSR, even if those investments differ from their overseas counterparts. Shale oil and gas production in the U.S. is only about a decade old. As communities develop more sophisticated bargaining positions with producers and producers continue to refine their voluntary spending programs, we can expect CSR investment in the U.S. to continue to develop, and it may eventually come to more closely resemble CSR spending on overseas oil and gas projects.

INTRODUCTION

When the world's largest oil and gas companies, the so-called "supermajors,"[1] develop large upstream (oil and gas production)[2] projects in the developing world, they routinely spend large amounts of money on

[1] Within the oil and gas industry the term supermajor is reserved for the largest integrated firms, and includes ExxonMobil, Royal Dutch Shell, BP, and ChevronTexaco, among a few others.

[2] In the industry jargon, the term "upstream" refers to exploration and production operations, while "downstream" refers to refining and the sale of refined products.

what might be described as "corporate social responsibility" (CSR)[3] or "sustainability"[4] initiatives, money spent in addition to royalties and taxes paid to host governments. CSR expenditures may include things like (i) pollution controls and other investments that satisfy self-imposed environmental standards beyond those required by local law (which may be weak),[5] (ii) investments in local infrastructure, such as roads, sanitation, housing, etc.,[6] and (iii) other social investments that benefit locals, such as programs to fight local diseases, education and training programs, or investments in women-owned businesses.[7] While scholars have found it difficult to disentangle the multiple motivations for these kinds of initiatives, they likely involve some combination of short term self-interest, concerns over long-term reputational risk for the firm, and the desire to be a good corporate citizen.[8] In particular, CSR investment by the oil and gas industry may be viewed in part as a response to public attention to the "oil curse," the notion that rich mineral endowments may be correlated with poor economic performance or other environmental and socioeconomic ills.[9]

The supermajors were relatively late to the American shale boom—the rapid growth in oil and gas production from American shale plays over the last decade.[10] The boom was made possible by technological advances in horizontal drilling and hydraulic fracturing (fracking)[11] that have rendered shale oil and gas production economical where it was not previously. Local communities in American shale plays, like their overseas counterparts, now experience some of the same the socioeconomic

[3] Corporate social responsibility is a catch-all term referring to a wide variety of programs and socially beneficial expenditures undertaken by firms, including charitable contributions, investments in local infrastructure, social institutions, and environmental protection not required by law.

[4] Some firms use the term sustainability as a synonym for CSR, but sustainability also connotes limits on the exploitation of short-term economic gains so as to ensure that the opportunity to realize future gains is not jeopardized.

[5] *See infra* Part I, p. 394.

[6] *See infra* Part II.B, pp. 407–409.

[7] *See infra* Part I, p. 396.

[8] For a more detailed discussion of the motives for CSR spending, see *infra* Part I, pp. 396–397.

[9] For a summary of the oil curse literature, see *infra* Part I, p. 391.

[10] For a chronicle of the boom, see Russell Gold, The Boom: How Fracking Ignited the American Energy Revolution and Changed the World (2014).

[11] Fracking involves the injection of large volumes of water, mixed with sand and chemicals (collectively, "fracking fluids") deep into shale formations to fracture rock, thereby freeing the formerly inaccessible natural gas, oil and other liquid hydrocarbons therein. Drillers have been fracking vertical wells for decades, but HVHF was first used widely in the Barnett Shale (Texas) and the Haynesville Shale (Louisiana). Horizontal fracking quickly spread to other areas, including North Dakota's Bakken Shale, Arkansas' Fayetteville Shale, the Eagle Ford Shale in south Texas, and the Marcellus Shale in the northeastern United States.

disruptions and environmental risks typically associated with the oil curse overseas. All of which suggests a question: do we find the same kind of CSR investment by oil and gas producers in American shale plays that we see overseas? If not, why not? Why might CSR investment in these two contexts differ? This Article explores those questions.

Part I summarizes the literature addressing the nature and causes of the oil curse, and explores how large, integrated[12] oil and gas companies (particularly the supermajors) structure their CSR investments overseas in part to try to mitigate elements of the oil curse. Part II summarizes briefly the nature and magnitude of the impacts shale oil and gas production in local communities in the United States, asking whether shale production is creating a domestic analog of the oil curse. There are important differences between the two situations, but in both contexts locals experience powerful and disruptive socioeconomic (and to a lesser extent, environmental) impacts, impacts that local governments may lack the capacity or authority to address through regulation. Consequently, most of the larger firms in American shale plays now make CSR investments in local communities, though in some ways these investments seem less systematic and extensive across the industry than those made routinely by the supermajors overseas.

Part III explores three reasons why CSR spending in the shale patch might lag behind its overseas counterpart. The first and most important reason is the collective action/diffuse responsibility problem: whereas a typical upstream project overseas is developed by a small number (often 1–3) of large, integrated companies, oil and gas production in the shale patch involves many tens of producers working alongside one another—some large and well-heeled and others small and laden with debt. Therefore, no single producer shoulders all the blame for the local impacts of fracking. Second, American regulators lack a powerful source of leverage over shale producers that their overseas counterparts hold: namely, government ownership of mineral resources. If some of the CSR investment undertaken by overseas producers is the direct or indirect product of this leverage, we would expect a correspondingly lower amount of CSR investment domestically. Third, public perceptions may drastically reduce the pressure to invest in CSR for producers. Rightly or wrongly, the public ascribes to the American government a greater capacity to translate public preferences into policy, and so may trust that existing regulation will require all the mitigation of production's impacts that is advisable or necessary. Alternatively (or additionally), public concern may be focused in the wrong place: less well-grounded public fears over health risks associated with air and water pollution from fracking may crowd out (or re-

[12] "Integrated" oil and gas companies own both upstream (production) and downstream (refining) assets.

duce the salience of) the less frightening, but more common impacts of fracking that affect locals in more substantial and measurable ways.

I. CSR INVESTMENT OVERSEAS: FIGHTING THE OIL CURSE?

The term "oil curse" (or "resource curse") refers to a family of theories within political economy scholarship that seek to explain the apparent inverse correlation between a nation's endowment of mineral resources and its relative economic, social and political performance.[13] Ac-According to the curse, since the late 1970s mineral rich nations have not been able to capitalize on their mineral wealth: to the contrary, they have grown more slowly, been less democratic, and have suffered from more violent conflict than their peers.[14] This thesis is controversial, and for every example supporting the thesis there is a counterexample undermining it: that is, for every Nigeria there is a Norway. Indeed, it is the resource-rich nations of the *developing* world—poorer nations—that seem more likely to succumb to problems when faced with a sudden burst of investment and industrial activity.[15] Scholarly attempts to explain the variation among resource-rich nations point to: (i) economic factors, including the demise of the nation's manufacturing and agricultural sectors as capital and labor flow toward the more lucrative mineral sector,[16] and the consequent currency appreciation that harms manufactured exports;[17] (ii) the failure of governments to distribute oil revenues fairly[18] or invest them wisely,[19] due to corruption or weak political institutions; and (iii) social and political unrest caused by both disparities between the mineral sector "haves" and the "have nots" elsewhere in the economy,[20] and the volatility of world commodity prices—and hence revenues.[21] At the same time, scholars have proposed remedies for the curse, including countercyclical

[13] For a good recent summary of this literature, see MICHAEL L. ROSS, THE OIL CURSE: HOW PETROLEUM WEALTH SHAPES THE DEVELOPMENT OF NATIONS (2012).

[14] *Id.* at 4–7; *see also* Jeffrey D. Sachs & Andrew M. Warner, Natural Resource Abundance and Economic Growth (Nat'l Bureau of Econ. Research, Working Paper No. 5398, 1995), http://www.nber.org/papers/w5398.pdf.

[15] ROSS, *supra* note 13, at 2.

[16] *See* Hilde Christiane Bjørnland, *The Economic Effects of North Sea Oil on the Manufacturing Sector*, 45 SCOTTISH J. POL. ECON. 553, 554–55 (1998).

[17] *See* Aline Souza Magalhães & Edson Paulo Domingues, *Blessing or Curse: Impacts of the Brazilian Pre-Salt Oil Exploration*, 15 ECONOMIA 343, 344 (2014).

[18] *See* Gilles Carbonnier, *The Governance of Extractive Resources*, 17 GLOBAL GOVERNANCE 135, 140 (2011).

[19] *See* Chris Geiregat & Susan Yang, *Too Much of a Good Thing?*, FIN. & DEV., Sept. 2013, at 1, 8–10.

[20] *See The Curse of Oil: The Paradox of Plenty*, ECONOMIST (Dec. 20, 2005), http://www.economist.com/node/5323394.

[21] *Id.* ("The inherent volatility of commodity prices hurts the poor the most, as they are least able to hedge their risks.").

investment and spending strategies like sovereign wealth ("rainy day") funds,[22] greater transparency in the flow of oil revenues within the host country,[23] directing oil revenues to local governments or the people,[24] and policies to empower female participation in the labor force in host countries.[25]

The oil curse scholarship has developed against a backdrop of anecdotal evidence of social, environmental, and economic disruption in petroleum-rich countries where the western supermajors work. Perhaps the poster child for these sorts of problems is Nigeria, producer of oil for more than four decades.[26] For much of that time Nigeria has suffered from poor economic performance[27] and corrupt political leadership,[28] and has endured bribery scandals[29] and political violence that have been tied to oil producers' (particularly Royal Dutch Shell's) presence there.[30] Indeed, each of the supermajors has experienced some sort of sociopolitical or environmental problems producing oil in the developing world. For example, activists and critics accuse ExxonMobil and Unocal of promoting violent repression in Indonesia[31] and Burma,[32] respectively. Chev-

[22] *Id.* (providing a brief discussion of stabilization policies).

[23] *See* Virginia Haufler, *Disclosure as Governance: The Extractive Industries Transparency Initiative and Resource Management in the Developing World*, 10 GLOBAL ENVTL. POL., no. 3, Aug. 2010, at 53, 53.

[24] *See* SANJEEV GUPTA, ALEX SEGURA-UBIERGO, & ENRIQUE FLORES, INT'L MONETARY FUND, DIRECT DISTRIBUTION OF RESOURCE REVENUES: WORTH CONSIDERING? 5 (2014), https://www.imf.org/external/pubs/ft/sdn/2014/sdn1405.pdf.

[25] Female participation in the labor force reduces population growth, thereby increasing per capita income from oil revenues, and is associated with a suite of other positive economic and social attributes. *See* ROSS, *supra* note 13, at 111–12.

[26] *See* AARON SAYNE & ALEXANDRA GILES, CTR. FOR GLOB. DEV., PROSPECTS FOR CASH TRANSFERS IN THE NIGER DELTA: A SKEPTICAL VIEW 4 (Oct. 2011).

[27] *Nigerian Economy Slips into Recession*, BBC NEWS (Aug. 31, 2016), http://www.bbc.com/news/business-37228741.

[28] *Corruption in Nigeria: The $20-Billion Hole in Africa's Largest Economy*, ECONOMIST (Feb. 2, 2016), http://www.economist.com/news/middle-east-and-africa/21689905-most-nigerians-live-poverty-millions-would-be-spared-if-officials-stopped.

[29] *Halliburton Settles Nigeria Bribery Claims for $35 Million*, CNN (Dec. 21, 2010, 8:46 PM), http://www.cnn.com/2010/WORLD/africa/12/21/nigeria.halliburton/.

[30] Royal Dutch Shell settled an Alien Tort Claims Act claim against it in connection with the Nigerian government's trial and execution of anti-Shell activist Ken Saro-Wiwa. *Shell Settles Nigeria Deaths Case*, BBC NEWS (June 9, 2009, 9:43 PM), http://news.bbc.co.uk/2/hi/africa/8090493.stm.

[31] ExxonMobil defended itself against claims brought in American courts under the Alien Tort Claims Act that the company hired security personnel who tortured, detained, killed, and committed other crimes against Indonesian citizens. John Doe v. Exxon Mobil Corp., 393 F. Supp. 2d 20, 21 (D.D.C. 2005).

[32] Unocal was charged with a variety of human rights violations under the Alien Tort Claims Act in connection with its operations in Myanmar. The case was settled prior to Unocal being purchased by Chevron. *See* Doe v. Unocal, 395 F.3d 932, 936

ron and BP have also been accused of environmental malfeasance in Ecuador[33] and the United States,[34] respectively.

At the same time, the last four decades have also seen a steady loss of power and leverage among investor-owned oil companies (IOCs), including the supermajors—leverage that has shifted to host nations and to national oil companies (NOCs) in resource-rich regions. Developing countries have become much more sophisticated and savvy about negotiating access agreements with the IOCs and securing a greater share of the financial benefits associated with oil and gas development,[35] leveraging their control over mineral resources to secure technology and expertise from IOCs, improve IOCs' training and use local workers, invest in social and economic infrastructure, and protect the environment.[36]

This same period has also seen steady increases in CSR spending and reporting by oil and gas firms in the developing countries in which they do business. Indeed, CSR is now a systematic and routine part of upstream developments by the largest oil and gas IOCs in the developing world. Of the $122 million Royal Dutch Shell estimated that it spent on CSR activities in 2015, roughly $43 million was spent in the developing world.[37] BP's CSR spending in the developing world was comparable—approximately $38 million in 2015.[38] ExxonMobil reported that it spent about $58 million on CSR activities in Latin America, Asia and Africa.[39] Each of these companies spends some of that money on company-wide initiatives, and some on CSR activities that are specific to each large, upstream project. And trade associations like the American Petroleum Insti-

(9th Cir. 2002), *reh'g granted*, 395 F.3d 978 (9th Cir. 2003), *vacated*, 403 F.3d 708 (9th Cir. 2005).

[33] For an account of litigation against Chevron over Texaco's alleged unremedied environmental degradation in Ecuador, see PAUL M. BARRETT, LAW OF THE JUNGLE: THE $19 BILLION LEGAL BATTLE OVER OIL IN THE RAIN FOREST AND THE LAWYER WHO'D STOP AT NOTHING TO WIN (2014).

[34] BP's problems in the United States include not only the Deepwater Horizon accident, but also two other prominent environmental and safety disasters. *A History of BP's US Disasters*, TELEGRAPH (Nov. 15, 2012, 3:16 PM), http://www.telegraph.co.uk/finance/newsbysector/energy/oilandgas/9680589/A-history-of-BPs-US-disasters.html.

[35] *See* DANIEL YERGIN, THE PRIZE: THE EPIC CONQUEST FOR OIL, MONEY, AND POWER 585 (1991).

[36] *Id.* at 568, 587.

[37] ROYAL DUTCH SHELL, SUSTAINABILITY REPORT 2015 53 (2015), http://reports.shell.com/sustainability-report/2015/servicepages/downloads/files/entire_shell_sr15.pdf.

[38] BP, SUSTAINABILITY REPORT 2015 48 (2015), https://www.bp.com/content/dam/bp/pdf/sustainability/group-reports/bp-sustainability-report-2015.pdf.

[39] EXXONMOBIL, CORPORATE CITIZENSHIP REPORT: 2015 64 (2015), http://cdn.exxonmobil.com/~/media/global/files/corporate-citizenship-report/2015_corporate_citizenship_report_full_approved-pdf.pdf.

tute and IPIECA[40] also help their member firms organize compliance with international CSR regimes like the Global Reporting Initiative, a widely followed sustainability reporting regime.[41] And every supermajor publishes long and glossy CSR or Sustainability reports annually, detailing their CSR programs and initiatives.

Oil and gas CSR investment overseas addresses a multiplicity of issue areas: one is company environmental performance. Some of the highest profile environmental disasters in history have involved the oil industry. The Santa Barbara oil spill of 1969, the Exxon Valdez spill of 1989, and the Deepwater Horizon explosion and spill of 2010 each loom large in the American public mind, and there are corresponding historical lists of industry spills in other parts of the world.[42] Each of the supermajors now pledges to follow minimum environmental standards overseas irrespective of whether the local host governments require it. For example, Royal Dutch Shell's voluntary minimum "HSSE"—health, safety, sustainability and environment—standards are touted on its web site, and explained via supporting documentation there.[43] Chevron and ExxonMobil incorporate their self-imposed environmental management systems and standards into mandatory rule-based management systems governing all company projects.[44] Most of these companies have also adopted international environmental standards and management systems, such as ISO 14000,[45] for themselves and their contractors.

[40] IPIECA once stood for the International Petroleum Industry Environmental Conservation Association, but the organization has dropped that name and uses only the acronym now.

[41] For a description of how these trade groups assist their members in this regard, see IPIECA, OIL AND GAS INDUSTRY GUIDANCE ON VOLUNTARY SUSTAINABILITY 2–3 (2015).

[42] *See 10 Largest Oil Spills in History*, TELEGRAPH (Oct. 7, 2011), http://www.telegraph.co.uk/news/worldnews/australiaandthepacific/newzealand/8812598/10-largest-oil-spills-in-history.html; *Timeline: 20 Years of Major Oil Spills*, ABC NEWS (May 6, 2010, 7:30 PM), http://www.abc.net.au/news/2010-05-03/timeline-20-years-of-major-oil-spills/419898; *Various Oil Spills and Blowouts*, JOYE RESEARCH GROUP, http://www.joyeresearchgroup.uga.edu/public-outreach/marine-oil-spills/oil-spills.

[43] *See Commitments, Policies and Standards*, SHELL GLOB., http://www.shell.com/sustainability/our-approach/commitments-policies-and-standards.html (last visited Apr. 9, 2017).

[44] Chevron explains its "Operational Excellence Management System" on its environment web page, available at: *Environment*, CHEVRON, https://www.chevron.com/corporate-responsibility/environment. ExxonMobil explains how its "Operations Integrity Management System" incorporates environmental standards and management practices on their environmental performance web site, available at: *Environmental Performance*, EXXONMOBIL, http://corporate.exxonmobil.com/en/environment/environmental-performance/environmental-stewardship/overview.

[45] The standard is summarized at the ISO web site, *ISO 14000-Environmental Management*, ISO, http://www.iso.org/iso/iso14000 (last visited Apr. 9, 2017).

Likewise, each of these companies has adopted human rights policies and practices aimed at preventing human rights violations in connection with their activities in the developing world, including violations of workers' rights, religious or other individual rights, human trafficking, and more. BP and Shell are typical in that they detail their human rights policies on dedicated human rights webpages,[46] and in their annual reports.[47] All of the supermajors endorse or participate in international and NGO-led institutions aimed directly at mitigating the human rights impacts of their operations, including: (i) the U.N. Universal Declaration of Human Rights[48] and the U.N. Declaration on the Rights of Indigenous Peoples,[49] each of which has been translated into human rights guidance for multinational firms by the U.N Special Representative on Business and Human Rights;[50] (ii) the Voluntary Principles on Security and Human Rights, a collaboration of governments, NGOs, and companies in which supermajors, NGOs and governments participate; and (iii) the International Labor Organization's (ILO) guidelines on rights in the workplace,[51] which are aimed at preventing the use of child labor, bonded labor, and other violations of worker rights. The supermajors each tout their efforts to address human rights issues with anecdotes, as well. For example, Chevron participates jointly with the Nigerian National Petroleum Corporation in a community engagement program aimed at managing conflict and addressing community needs near Chevron's areas of operations in the Niger Delta.[52] BP touts its work helping indigenous people build local economic capacity near its operations in Indonesia.[53]

[46] *Respecting Human Rights*, BP, http://www.bp.com/en/global/corporate/sustainability/respecting-human-rights.html (last visited Apr. 9, 2017); *Human Rights*, SHELL GLOB., http://www.shell.com/sustainability/transparency/human-rights.html (last visited Apr. 9, 2017). For a fuller discussion of how BP implements these policies in connection with major upstream projects, see CHRISTINE BADER, THE EVOLUTION OF A CORPORATE IDEALIST: WHEN GIRL MEETS OIL 78–92 (2014).

[47] BP, ANNUAL REPORT AND FORM 20-F 48 (2015); ROYAL DUTCH SHELL, ANNUAL REPORT AND FORM 20-F FOR THE YEAR ENDED DECEMBER 31, 2015 59 (2015).

[48] G.A. Res. 217 (III) A, Universal Declaration of Human Rights (Dec. 10, 1948).

[49] G.A. Res. 61/295, Declaration on the Rights of Indigenous Peoples (Sept. 13, 2007).

[50] John Ruggie (Special Representative of the Secretary-General on the Issue of Human Rights and Transnational Corporations and Other Business Enterprises), *Promotion and Protection of All Human Rights, Civil, Political, Economic, Social and Cultural Rights, Including the Right to Development*, U.N. Doc. A/HRC/8/5 (Apr. 7, 2008) [hereinafter *Promotion and Protection*].

[51] *Topics*, INT'L LABOUR ORG., www.ilo.org.

[52] CHEVRON, 2015 CORPORATE RESPONSIBILITY REPORT HIGHLIGHTS 23 (2015), https://www.chevron.com/-/media/chevron/shared/documents/2015-corporate-responsibility-report.pdf.

[53] *Mutual Benefit: How a Gas Plant in Indonesia is Building Connections with Local Communities*, BP, http://www.bp.com/en/global/corporate/bp-magazine/locations/bp-in-the-tangguh-community.html (last visited Apr. 9, 2017).

The oil curse literature suggests that local political corruption exacerbates the economic aspects of the curse, and the supermajors participate in efforts to combat corruption and bribery in connection with oil and gas operations. ExxonMobil and other oil companies were among the drivers of the Extractive Industries Transparency Initiative,[54] another collaboration between firms, NGOs, and governments—this one designed to make transparent the ways in which host governments spend oil and gas revenues. The U.N. Special Representative on Business and Human Rights has also made fighting corruption and bribery in host countries part of his mission.[55] These efforts are meant to complement the companies' efforts to navigate the sometimes-complicated task of complying with the Foreign Corrupt Practices Act[56] and the Convention on Combating Bribery of Foreign Public Officials in International Business Transactions.[57]

The supermajors also invest in host nations in longer-term ways via their corporate CSR strategies. For example, ExxonMobil focuses on programs to eradicate malaria and empower women in society.[58] Shell's corporate CSR priorities are enterprise development, road safety, and energy access in host communities.[59] Chevron's focus seems to be on local enterprise development and improving STEM and vocational education.[60]

Thus, CSR spending is now integrated into upstream project planning for large, conventional oil and gas developments overseas. Discerning the motives for these efforts, however, is fraught with difficulty. Companies may be *impelled* by the desire not to do harm, and therefore might prefer not to contribute to the problems comprising the oil curse; or they may be motivated to burnish their reputations, and so prefer not to be *perceived* as contributors to those problems. At the same time, they may also feel *compelled* to spend more on CSR by increasingly assertive host

[54] *See Why Companies Support the EITI: Companies*, EITI, https://eiti.org/supporters/companies (last visited Apr. 9, 2017); *see also* Emeka Duruigbo, *The World Bank, Multinational Oil Corporations, and the Resource Curse in Africa*, 26 U. PA. J. INT'L ECON. L. 1, 47–48 (2005).

[55] *Promotion and Protection*, *supra* note 50.

[56] Foreign Corrupt Practices Act of 1977, 15 U.S.C. §§ 78dd-1 to -3 (2012).

[57] OECD, CONVENTION ON COMBATING BRIBERY OF FOREIGN PUBLIC OFFICIALS IN INTERNATIONAL BUSINESS TRANSACTIONS (Nov. 21, 1997).

[58] *Malaria Initiative*, EXXONMOBIL, http://corporate.exxonmobil.com/en/community/malaria-initiative (last visited Apr. 9, 2017); *Women's Economic Opportunity*, EXXONMOBIL, http://corporate.exxonmobil.com/en/community/womens-economic-opportunity (last visited Apr. 9, 2017).

[59] *Local Employment and Enterprise*, SHELL GLOB., http://www.shell.com/sustainability/communities/local-employment-and-enterprise.html (last visited Apr. 9, 2017).

[60] *Education*, CHEVRON, https://www.chevron.com/corporate-responsibility/creating-prosperity/education (last visited Apr. 9, 2017).

governments (even when such spending is not mandated by law), or by customers or other external stakeholders capable of punishing the company for poor social or environmental performance. Indeed, all of these motives may be at work at once. That is, oil and gas companies include managers who take satisfaction and pride in a company's CSR programs because it is "the right thing to do," as well as managers who view CSR in purely strategic terms.[61] Both groups are limited by business imperatives, the recognition that the company is in the business of producing oil and gas, and that the company must make a profit.

For their part, scholars cannot agree on the motives for most CSR spending, attributing it to managers' desire to satisfy the desires of external stakeholders[62] long-term risk management,[63] and more. Activist critics see many of these efforts as just so much "greenwashing," particularly if the socially beneficial spending also benefits the firm in some way.[64] Others criticize CSR spending as "borrowed virtue" because managers spend shareholders' money on CSR initiatives that shareholders may not want.[65] Economists from Adam Smith[66] to Milton Friedman[67] have objected to

[61] *See* Matthew Genasci & Sarah Pray, *Extracting Accountability: The Implications of the Resource Curse for CSR Theory and Practice*, 11 YALE HUM. RTS. & DEV. L.J. 37, 39–42 (2008).

[62] R. Edward Freeman of the University of Virginia's Darden School of Business, has been perhaps the leading proponent of the idea that managers manage for stakeholders rather than only for shareholders. R. EDWARD FREEMAN, JEFFREY S. HARRISON & ANDREW C. MIX, MANAGING FOR STAKEHOLDERS: SURVIVAL, REPUTATION, AND SUCCESS 3–5 (2007).

[63] This view of CSR is sometimes called "enlightened shareholder value," because it ties shareholder interests to stakeholder interests over the long run. For a discussion of enlightened shareholder value, see David Millon, *Enlightened Shareholder Value, Social Responsibility, and the Redefinition of Corporate Purpose Without Law*, (Washington & Lee Legal Studies, Working Paper No. 2010-11, 2010). Haas School of Business maintains an online list of studies addressing these questions, most of which support the notion that CSR investment builds value. *Curriculum*, CTR. FOR RESPONSIBLE BUS., HAAS SCH. OF BUS., UNIV. OF CAL. https://responsiblebusiness.haas.berkeley.edu/curriculum/hsrif.html.

[64] *See* Joshua Karliner, *A Brief History of Greenwash*, CORPWATCH (Mar. 22, 2001), http://www.corpwatch.org/article.php?id=243.

[65] *The Economist* divides CSR activities into three general categories: (1) corporate philanthropy, giving money to worthy causes such as the local food bank; (2) CSR as risk management, or community investments aimed at reducing legal and reputational risk and (3) win-win CSR, the kinds of actions companies take that provide a social benefit and save money, such as being more energy efficient, reducing the use of toxic chemicals as manufacturing inputs, etc. *See Corporate Social Responsibility: Just Good Business*, ECONOMIST (Jan. 17, 2008), http://www.economist.com/node/10491077. It applies the term "borrowed virtue" to the first category. *The Union of Concerned Executives*, ECONOMIST (Jan. 20, 2005), http://www.economist.com/node/3555194.

[66] Adam Smith's description of the invisible hand includes this line, from *The Wealth of Nations*: "I have never known much good done by those who affected to

CSR because it distorts the process by which the invisible hand of the market channels resources so as to maximize social benefit, a view also endorsed by Richard Posner.[68] Still others object that much CSR spending addresses problems that are the proper province of government, and so it reduces the popular demand for governments to govern well.[69]

An ethical analysis of CSR in the oil and gas sector is beyond the scope of this Article. Regardless of why the supermajors invest in CSR, it is true that each now operates sophisticated CSR programs spending considerable resources in developing countries to address many of the issues that comprise the oil curse.[70]

II. AN OIL CURSE IN AMERICAN SHALE PLAYS?

Over the last decade or so, local communities in the parts of the United States where shale oil and gas resources exist have experienced an oil and gas production boom (and in some places, a subsequent bust). Figure 1 maps the major shale plays (formations) in the United States.[71] In some ways, the shale boom has brought the same sorts of profound socioeconomic changes to American communities that overseas oil and gas projects bring to communities there. While a full description of the American shale boom and its impacts is beyond the scope of this Article (and has been recounted elsewhere),[72] this Part offers a brief sketch of

trade for the public good." ADAM SMITH, AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS 456 (R. H. Campbell & A.S. Skinner eds., Liberty Fund ed. 1981) (1776).

[67] In 1970 Friedman argued that the "only . . . social responsibility of business" is to "increase its profits so long as it stays within the rules of the game." Milton Friedman, *The Social Responsibility of Business Is to Increase Its Profits*, N.Y. TIMES MAG., Sept. 13, 1970, at 32, 126.

[68] According to Judge Posner, all of this spending on CSR makes little sense from an economic perspective because "[i]n competitive markets, a sustained commitment to any goal other than profitability will result in [destruction of the firm]." RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW 419 (4th ed. 1992).

[69] This is the position of former Clinton administration official Robert Reich. Robert B. Reich, *The Case Against Corporate Social Responsibility* 3–4 (Univ. of Cal. at Berkeley, Goldman Sch. of Pub. Policy, Working Paper No. GSPP08-003), http://ssrn.com/abstract=1213129.

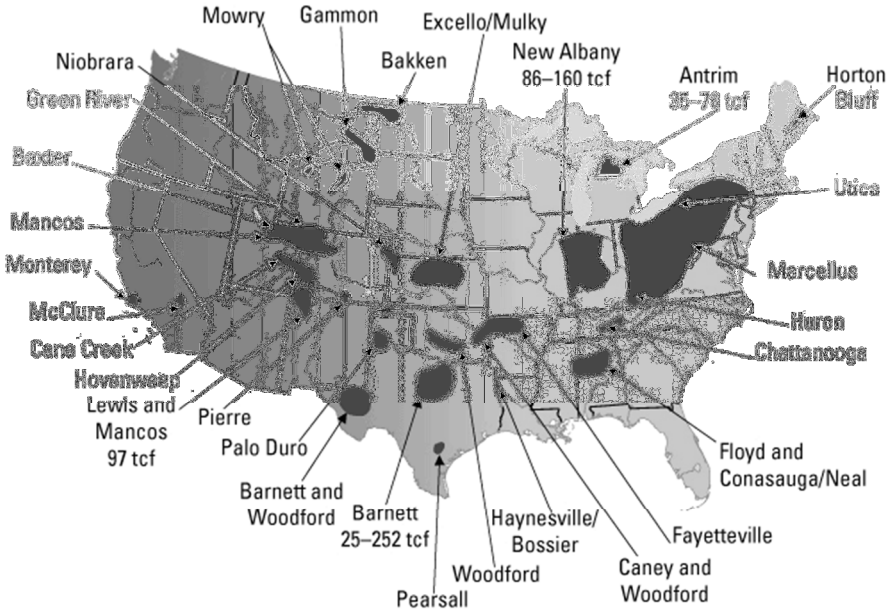
[70] For a description of the rise of CSR within the oil industry, see Michael J. Watts, *Righteous Oil? Human Rights, the Oil Complex, and Corporate Social Responsibility*, 30 ANN. REV. ENV'T & RESOURCES 373 (2005).

[71] *New Maps Highlight Geologic Characteristics of U.S. Tight Oil, Shale Plays*, U.S. ENERGY INFO. ADMIN. (Apr. 17, 2015), http://www.eia.gov/todayinenergy/detail.cfm?id=20852.

[72] For fuller discussions of the impacts of fracking, see David B. Spence, *Federalism, Regulatory Lags, and the Political Economy of Energy Production*, 161 U. PA. L. REV. 431 (2013); *see also* GOLD, *supra* note 10; GREGORY ZUCKERMAN, THE FRACKERS: THE OUTRAGEOUS INSIDE STORY OF THE NEW BILLIONAIRE WILDCATTERS (2013);

the impacts of the shale boom in the United States, with special emphasis on the less speculative impacts that are most likely to accompany shale oil and gas production.

Figure 1: Shale Plays in the Continental U.S.[73]



A. Fracking's Social, Economic and Environmental Footprint

1. Environmental and Health Risks

Fracking operations pose a (greater-than-zero) risk that methane,[74] fracking fluids,[75] and wastewater[76] could find their way into groundwater

Hannah Wiseman, *Untested Waters: The Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation*, 20 FORDHAM ENVTL. L. REV. 115, 142–67 (2009).

[73] U.S. ENERGY INFO. ADMIN., *supra* note 71.

[74] Natural gas is mostly methane. For summaries of the scientific literature on methane contamination of groundwater and surface waters, see U.S. ENVTL. PROT. AGENCY, EPA-600-R-16-236Fa, HYDRAULIC FRACTURING FOR OIL AND GAS: IMPACTS FROM THE HYDRAULIC FRACTURING WATER CYCLE ON DRINKING WATER RESOURCES IN THE UNITED STATES (Dec. 2016) [hereinafter EPA-600-R-16-236Fa]. We can distinguish the number of cases of methane-contaminated groundwater from the number of cases of methane in groundwater caused by fracking. The former number is very large, as methane occurs naturally in groundwater in many places. *See, e.g.*, SEAMUS MCGRAW, THE END OF COUNTRY 31 (2012) (describing the story of a Pennsylvania man in the 1820s building a chimney of stones to capture methane bubbling out of Canadaway Creek and setting fire to it); ZUCKERMAN, *supra* note 72, at 376 (quoting a Dimock, PA resident saying that "she and her friends regularly lit

or surface waters.[77] Each of these types of water contamination have occurred in shale plays in recent years, but based on a substantial body of extant research the probability of water contamination associated with fracking operations appears to be very small, and the risks to human health from water contamination very low.[78] Research on air pollution from fracking lags the research on water contamination, but is growing rapidly. The air pollution risks of fracking include potential harm associ-

water afire in their grade school bathroom in the late 1960s, long before fracking came to her part of the state.").

[75] EPA-600-R-16-236Fa, *supra* note 74, at 9-80. Some fracking fluid constituents are carcinogenic or otherwise toxic. These chemicals appear in fracking fluids in extremely dilute concentrations, however. U.S. ENVTL. PROT. AGENCY, EPA 816-R-04-003, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS 7-5 (June 2004) [hereinafter EPA 816-R-04-003].

[76] Wastewater includes fracking fluids that flow back up the well (flowback water) and so-called "produced water," water that flows through the well from underground aquifers. *See, e.g.*, EPA-600-R-16-236Fa, *supra* note 74; Lara A. Haluszczak et al., *Geochemical Evaluation of Flowback Brine from Marcellus Gas Wells in Pennsylvania, USA*, APPLIED GEOCHEMISTRY, Jan. 2013, at 55, 55; U.S. Geological Survey, *Environmental Impacts Associated with Disposal of Saline Water Produced During Petroleum Production*, USGS, http://toxics.usgs.gov/photo_gallery/osage.html (last updated Aug. 5, 2015).

[77] In 2012, researchers at the State University of New York at Stony Brook sought to quantify the risks of groundwater contamination by estimating the probabilities of various types of accidents that could result in a spill. The study found significant spill risks, even in the best-case scenario, and urged mandatory recycling of wastewater. Daniel J. Rozell & Sheldon J. Reaven, *Water Pollution Risk Associated with Natural Gas Extraction from the Marcellus Shale*, 32 RISK ANALYSIS 1382, 1388–91 (2012); *see also* Sheila M. Olmstead et al., *Shale Gas Development Impacts on Surface Water Quality in Pennsylvania*, 110 PROC. NAT'L ACAD. SCI. 4962 (2013) (finding elevated levels of chlorides but not suspended solids in streams near natural gas production areas on the Marcellus Shale); Nathaniel R. Warner et al., *Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania*, 47 ENVTL. SCI. & TECH. 11849 (2013) (finding elevated levels of contaminants found in produced water downstream of produced water treatment facilities in the Marcellus Shale).

[78] The U.S. Geological Survey compared concentrations of methane and other constituents in 127 water wells in the Fayetteville shale gas production region before and after shale gas production operations, finding no evidence of contamination in either of methane or fracking fluid constituents and wells. TIMOTHY M. KRESSE ET AL., USGS, SHALLOW GROUNDWATER QUALITY AND GEOCHEMISTRY IN THE FAYETTEVILLE SHALE GAS-PRODUCTION AREA, NORTH-CENTRAL ARKANSAS, 2011: SCIENTIFIC INVESTIGATIONS REPORT 2012–5273 (2012); *see also* ERNEST J. MONIZ ET AL., MICH. INST. TECH., THE FUTURE OF NATURAL GAS: AN INTERDISCIPLINARY MIT STUDY 39 (2011) (finding that out of 20,000 shale wells drilled in a ten-year period, only 20 incidents of groundwater contamination were reported). A 2011 Pennsylvania State University study sampled drinking-water wells before and after nearby fracking operations, and found no significant increase in well contamination from either methane or fracking fluid constituents. ELIZABETH W. BOYER ET AL., CTR. FOR RURAL PA., THE IMPACT OF MARCELLUS GAS DRILLING ON RURAL DRINKING WATER SUPPLIES 15–18 (Mar. 2012).

ated with the emissions of conventional and toxic pollutants from engines and compressors in the production area, as well as fugitive emissions of volatile organic compounds (VOCs) and methane (a greenhouse gas) from the natural gas production and transport network. An increasingly conflicted and disputatious scientific literature has yielded no scientific consensus regarding the risks posed by well pad emissions to nearby residents,[79] or on the question of whether methane leakage from natural gas operations is systematically large enough to exacerbate global warming problems as gas replaces coal in combustion plants, since methane is a greenhouse gas.[80]

What is much more clearly established is that underground injection of fracking wastewater into disposal wells near fault lines is causing seismicity (earthquakes).[81] Recent earthquakes linked to fracturing operations in Texas,[82] Ohio,[83] Oklahoma,[84] and Arkansas[85] appear to be the product of disposal of wastewater from gas production operations. While most of these tremors have been small and localized, Oklahoma has experienced two quakes exceeding 5.0 on the Richter Scale.[86] Even small

[79] *See* Meleah D. Boyle et al., *Hazard Ranking Methodology for Assessing Health Impacts of Unconventional Natural Gas Development and Production: The Maryland Case Study*, PLOS ONE 1, 7 (2016); Bernard D. Goldstein et al., *Missing from the Table: Role of the Environmental Public Health Community in Governmental Advisory Commissions Related to Marcellus Shale Drilling*, 120 ENVTL. HEALTH PERSP. 483, 486 (2012).

[80] The literature on methane leakage is too large to cite here. For a summary, see A. R. Brandt et al., *Methane Leaks from American Natural Gas Systems*, 343 SCI. 733 (2014); *Methane: The Other Important Greenhouse Gas*, ENVTL. DEF. FUND, https://www.edf.org/methane-other-important-greenhouse-gas (last visited Apr. 9, 2017).

[81] *See* David J. Hayes, *Is the Recent Increase in Felt Earthquakes in the Central US Natural or Manmade?*, U.S. DEP'T OF INTERIOR: BLOG (Apr. 11, 2012), https://www.doi.gov/blog/Is-the-Recent-Increase-in-Felt-Earthquakes-in-the-Central-US-Natural-or-Manmade.

[82] Jim Efstathiou Jr., *Texas Earthquakes Tied to Extraction in Fracking*, BLOOMBERG (Aug. 27, 2013), http://www.bloomberg.com/news/2013-08-27/texas-earthquakes-linked-to-oil-extraction-by-fracking.html.

[83] *See* Pete Spotts, *How Fracking Might Have Led to an Ohio Earthquake*, CHRISTIAN SCI. MONITOR (Jan. 2, 2012), http://www.csmonitor.com/Science/2012/0102/How-fracking-might-have-led-to-an-Ohio-earthquake (noting that quakes reported in Ohio appear to be associated with a deep wastewater disposal well located near a fault line).

[84] *See* Katie M. Keranen et al., *Potentially Induced Earthquakes in Oklahoma, USA*, 41 GEOLOGY 699, 699–700 (2013); *see also* John Daly, *U.S. Government Confirms Link Between Earthquakes and Hydraulic Fracturing*, OILPRICE.COM (Nov. 8, 2011, 1:49 PM), http://oilprice.com/Energy/Natural-Gas/U.S.-Government-Confirms-Link-Between-Earthquakes-and-Hydraulic-Fracturing.html.

[85] Alec Liu, *Earthquakes in Arkansas May Be Man-Made, Experts Warn*, FOXNEWS.COM (Mar. 1, 2011), http://www.foxnews.com/scitech/2011/03/01/fracking-earthquakes-arkansas-man-experts-warn/.

[86] Matthew Phillips, *Why Oklahoma Can't Turn Off Its Earthquakes*, BLOOMBERG (Nov. 7, 2016, 4:23 PM), https://www.bloomberg.com/news/articles/2016-11-08/why-oklahoma-can-t-turn-off-its-earthquakes.

quakes have triggered fear and mounting local opposition in areas where disposal wells are located.[87] State regulators in Ohio and Oklahoma have responded by shutting down wastewater disposal wells used by oil and gas producers in those states.[88]

Each of these three sets of risks—water pollution, air pollution, and seismicity risks—is addressed by a hodgepodge of state oil and gas regulations,[89] federal statutes and rules,[90] and private liability rules.[91] Generally, local governments lack the regulatory authority (and often the capacity) to address them directly or to regulate them more stringently than federal or state regulators choose to, because in most states the state's oil and gas regulation preempts some or all local regulation of fracking.[92] Thus, if the lack of local regulatory power feeds local concerns about these risks, producers concerned about political and legal risk may choose to address these sorts of risks in their CSR investment decisions.

[87] Jason Allen, *North Texans Protest Fracking, Earthquakes at Railroad Commission Meeting*, CBS11NEWS (Jan. 21, 2014), http://dfw.cbslocal.com/2014/01/21/north-texans-protest-fracking-earthquakes-at-railroad-commission-meeting/; Erica Greider, *Shaken and Stirred: How the Earthquakes in the Barnett Shale Turned Some Small-Town Folks into Environmentalists*, TEX. MONTHLY (Mar. 2014), http://www.texasmonthly.com/politics/shaken-and-stirred/.

[88] Don Hopey, *Ohio Closes Wastewater Disposal Wells After Earthquakes,* PITTSBURGH POST-GAZETTE (Jan. 3, 2012), http://www.post-gazette.com/local/region/2012/01/03/Ohio-closes-wastewater-disposal-wells-after-earthquakes/; *Oklahoma Orders Wastewater Disposal Wells Shut Down After Earthquake*, GUARDIAN (Sept. 4, 2016), https://www.theguardian.com/us-news/2016/sep/04/oklahoma-wastewater-wells-earthquake.

[89] *See* NATHAN RICHARDSON ET AL., RES. FOR THE FUTURE, THE STATE OF STATE SHALE GAS REGULATION 87 (June 2013); *see also* Christopher S. Kulander, *Shale Oil and Gas State Regulatory Issues and Trends*, 63 CASE W. RES. L. REV. 1101, 1102–03 (2013) (summarizing recent legislative developments in six states); Wiseman, *supra* note 72, at 142–46, 156–57, 167.

[90] For a general description of these rules, see Spence, *supra* note 72, at 437–47.

[91] *See generally* Thomas W. Merrill & David M. Schizer, *The Shale Oil and Gas Revolution, Hydraulic Fracturing, and Water Contamination: A Regulatory Strategy*, 98 MINN. L. REV. 145 (2013) (summarizing a liability-based approach to regulating fracking).

[92] For a fuller discussion of this issue, see David B. Spence, *The Political Economy of Local Vetoes*, 93 TEX. L. REV. 351 (2014).

2. Local Socioeconomic Impacts

While the air, water, and seismic impacts of fracking dominate public debates, most local communities hosting shale production will not experience health harms from groundwater contamination, violations of air pollution standards, or earthquakes. They are virtually certain, however, to experience a suite of significant local socioeconomic impacts: the so-called "boom" effects comprising various demands on local infrastructure, changes to the local economy, and changes to the local quality of life (neighborhood character), during the drilling and fracking process.

The boom is most easily measured in economic terms. From 2007 to 2012, the average annual employment across all U.S. industries decreased by 3.7 million (-2.7%), but increased in the oil and gas sector by 135,084 (31.6 percent).[93] Most of that growth was concentrated in a few shale plays. In Pennsylvania (which overlays part of the Marcellus Shale), for example, the state's average employment numbers dropped by 74,133(-1.3%) over that period, but rose in the oil and gas sector by 15,114 (259.3%).[94] Average annual pay increased by $22,104 (36.3%) in the oil and gas sector, as compared with $5,158 (11.9%) statewide.[95] Three other states added more than 10,000 jobs during that period (North Dakota, Oklahoma, and Texas), and 11 others added more than 1,000 jobs in the oil and gas sector.[96] Since 2014, however, oil and gas prices have fallen and the oil and gas sector has lost more than 20,000 jobs.[97]

All this economic activity has social consequences. During a shale boom, oil and gas companies purchase leases from, and pay royalties to, landowners in the shale plays.[98] They pay fees and taxes to state governments.[99] Oil and gas workers spend their money on housing, food and other needs in and around communities, which brings jobs and consumer spending to the shale regions for as long as the boom lasts.[100] At the

[93] *The Marcellus Shale Gas Boom in Pennsylvania: Employment and Wage Trends*, MONTHLY LAB. REV.: BUREAU OF LAB. STAT. (Feb. 2014), at 3.

[94] *Id.* at 5–6.

[95] *Id.* at 6–7.

[96] *Id.* at 5.

[97] *Oil and Natural Gas Job Production Declines Tend to Lag Oil Price Declines*, U.S. ENERGY INFO. ADMIN.: TODAY IN ENERGY (June 23, 2015), http://www.eia.gov/todayinenergy/detail.php?id=21772.

[98] *See Natural Gas Boom Helps Landowners; Economy, Not So Much*, TRIBLIVE.COM (Jan. 27, 2013, 8:14 PM), http://triblive.com/state/marcellusshale/3373465-74/gas-pennsylvania-royalties.

[99] *See* CASSARAH BROWN, NAT'L CONF. OF STATE LEGISLATURES, STATE REVENUES AND THE NATURAL GAS BOOM: AN ASSESSMENT OF STATE OIL AND GAS PRODUCTION TAXES 1 (June 2013).

[100] Yale Graduates Energy Study Group found that in 2008, the consumer savings from reductions in price from shale gas production was worth over $100 billion. Robert M. Ames et al., The Arithmetic of Shale Gas 8 (June 15, 2012) (unpublished manuscript), http://dx.doi.org/10.2139/ssrn.2085027.

same time, workers' spending can also attract prostitution and drugs to communities, strain local police and other resources,[101] and can cause inflation, rendering goods and services unaffordable (or less affordable) to locals, some of whom do not benefit financially from the production boom.[102] These changes can create friction or divisions in local communities between those who capture the benefits of the boom, and those who do not.[103]

Local quality of life can be impacted in other ways. Drilling and fracking are industrial processes that bring noise, traffic, odors, and other activities associated with industrial land uses.[104] Wastewater pits at the well pad sometimes produce noxious odors. The boom in people and traffic can burden other local infrastructure as well. In oil shale plays that lack the pipeline infrastructure to capture natural gas (for example, the Bakken and Eagle Ford shales), natural gas flares illuminate the night sky.[105] Even though some of these effects might otherwise be regulable through zoning restrictions, if local regulation has been preempted by state law, local governments may lack the power to address these issues to locals' satisfaction.[106] States have responded to some of these local con-

[101] Sari Horwitz, *Dark Side of the Boom: North Dakota's Oil Rush Brings Cash and Promise to Reservation, Along with Drug-Fueled Crime*, WASH. POST (Sept. 28, 2014), http://www.washingtonpost.com/sf/national/2014/09/28/dark-side-of-the-boom/.

[102] *See* MCGRAW, *supra* note 74, at 155 (recounting how some residents of the Marcellus Shale in Pennsylvania are reaping great rewards from shale gas production, while others gain nothing, either because they do not own property or businesses that benefit from the shale boom); *see also* Joseph De Avila, *Battle Over 'Fracking' Goes Local*, WALL STREET J. (Aug. 29, 2012), http://online.wsj.com/article/SB10000872396390444327204577617793552508470.html; Ann Choi & Michael Marks, *Eagle Ford Windfall Goes to Fix What the Boom Broke*, STATESMAN (Feb. 22, 2014, 6:40 PM), http://www.statesman.com/news/news/eagle-ford-windfall-goes-to-fix-what-the-boom-brok/ndYjw/ (quoting a teacher in the Eagle Ford Shale region of Texas: "I have a rental property so I am benefiting from the boom, but for other people, the only change they see are roads getting more dangerous."); Deon Daugherty, *A Look Inside an Eagle Ford Boomtown—and Its Traffic*, HOUS. BUS. J. (Oct. 28, 2011, 4:03 PM), http://www.bizjournals.com/houston/blog/2011/10/a-look-inside-an-eagle-ford-boomtown—.html?page=all; *North Dakota Boomtown Suffers Growing Pains Trying to Keep up with Demand*, PBS NEWSHOUR (Aug. 7, 2012), http://www.pbs.org/newshour/bb/business-july-dec12-boomtown_08-07/.

[103] Elizabeth McGowan, *Gas Drilling's 'Haves' and 'Have-Nots' Emerge in Pennsylvania*, INSIDECLIMATE NEWS (May 20, 2011), https://insideclimatenews.org/news/20110517/fracking-marcellus-shale-natural-gas-montrose.

[104] *See* MCGRAW, *supra* note 74, at 96–97 (describing the transformation of a "quiet mountain scene" into "an industrial site, crammed with equipment and men and thundering with the deafening roar of drills and generators and trucks").

[105] Because flaring in these two sparsely populated shale plays is so extensive, each looks like a major metropolitan area in nighttime satellite photos of the United States.

[106] The degree to which local regulation is permitted is a matter of state law and varies state to state. Spence, *supra* note 92, at 370–71.

cerns by changing state rules (governing wastewater management, setback requirements from the well pad, etc., for example);[107] but because the state captures many of the benefits of the boom while locals absorb most of the costs, state regulators may not have a sufficient incentive to regulate as stringently as locals would if given the chance.[108]

Even more than noise, lights, flares, and odors, the boom has brought traffic (particularly truck traffic) to rural areas. Because of the high volumes of water involved, each time a well is fracked, an average of more than 1,000 tanker truck trips is required.[109] Truck traffic can destroy local roads built for smaller vehicles and smaller traffic volumes, a problem that is sometimes beyond the capacity of local governments to address, depending on the vagaries of local finance and how the state allocates responsibility for road maintenance.[110] For example, in Texas, the deterioration of rural roads in the major shale plays is a state (not local) responsibility, and in 2013, funding constraints forced the Texas Department of Transportation to revert to paving some of the rural roads with gravel instead of pavement.[111] In 2014, the Texas Legislature responded by passing legislation that diverted oil and gas severance tax revenue and vehicle tax revenue into the state highway funds.[112] These are second-best, stopgap responses however, in that the State has estimated that *preventative* maintenance would reduce its road repair costs by more than 550 percent.[113]

A few studies have attempted to measure the *net* effects of the shale boom, much as the oil curse literature tries to measure the net effects of hydrocarbon development on developing countries. Professors Maniloff and Mastromonaco found a positive relationship between new shale gas development and local employment/income, noting also that the boom drives technical innovation that reduces the cost of production and

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[107] RICHARDSON ET AL., *supra* note 89, at 22–57.

[108] *See* Spence, *supra* note 92, at 412.

[109] *See, e.g.*, N.Y. DEP'T OF ENVTL. CONSERVATION, SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT, 6-305 tbl.6.60 (2015), http://www.dec.ny.gov/docs/materials_minerals_pdf/fsgeis2015ch6b.pdf. If pipelines are built, the number of heavy truck trips can be cut in half, though the number of light truck trips is not particularly mitigated. *Id.*

[110] In Texas's Eagle Ford Shale, one county spent 90 percent of its 2013 budget on road repair. *See* Choi & Marks, *supra* note 102; Jim Efstathiou Jr., *Taxpayers Pay as Fracking Trucks Overwhelm Rural Cow Paths*, BLOOMBERG (May 15, 2012, 12:19 PM), http://www.bloomberg.com/news/2012-05-15/taxpayers-pay-as-fracking-trucks-overwhelm-rural-cow-paths-1-.html.

[111] Aman Batheja, *TxDOT to Convert Some South and West Texas Roads to Gravel*, TEX. TRIB. (July 25, 2013), https://www.texastribune.org/2013/07/25/with-funds-lacking-txdot-converts-road-to-gravel/.

[112] Tex. Const. art. III, § 49–g(c).

[113] TEX. DEP'T OF TRANSP., 2015–2019 STRATEGIC PLAN 9 (July 2014).

thereby mitigates the effects of a price-driven bust.[114] A 2012 report on rural land-value trends in Texas concluded that demand for recreational ranches was higher outside of the hydrocarbon producing region; inside the producing region, ranches with mineral rights were in demand, while ranches with mineral rights severed from the surface rights (not surprisingly) were not.[115] Similarly, another study found a negative relationship between groundwater-dependent homes in the Pennsylvania Marcellus region and their respective property values, but that the boom had increased the value of homes that relied on piped water.[116] Professors Hausman and Kellogg concluded that the reduction in natural gas prices triggered by the shale boom represented a transfer of $48 billion annually from producers to consumers, but that estimate excludes environmental costs.[117] Feyrer *et al.* attributed a total increase of 640,000 jobs in the U.S. to the shale boom, including ripple effect job growth outside the oil sector.[118]

A recent, more granular, analysis by Sergey Reid examined county-level effects in four shale plays within Texas, and found that the economic impacts of fracking varied with the nature of the resource (oil or gas) and the price of the resource over time.[119] Interestingly, the rural shale regions like the Eagle Ford experienced much sharper increases in hotel and other hospitality related sales than regions with higher population densities, like the Barnett Shale near Dallas/Fort Worth, suggesting more vulnerability to boom-bust cycles in rural areas.[120] These rural areas also experienced sharp increases in traffic accidents and road-related funding

[114] Peter Maniloff & Ralph Mastromonaco, *The Local Economic Impacts of Hydraulic Fracturing and Determinants of Dutch Disease* 3 (Colo. Sch. of Mines, Working Paper No. 2014-08).

[115] *See* Am. Soc'y of Farm Managers & Rural Appraisers, Texas Rural Land Value Trends 2012 6, 18, 37–39 (Apr. 2013).

[116] *See* Lucija Muehlenbachs et al., *Shale Gas Development and the Costs of Groundwater Contamination Risk* 30 (Res. for the Future, Discussion Paper No. RFF DP 12-40-REV, Mar. 2013), http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-12-40-REV.pdf.

[117] Catherine Hausman & Ryan Kellogg, *Welfare and Distributional Implications of Shale Gas* 3 (Mar. 2015) (Brookings Papers on Econ. Activity, BPEA Conf. Draft Mar. 19–20, 2015).

[118] *See* James Feyrer, Erin T. Mansur, & Bruce Sacerdote, Geographic Dispersion of Economic Shocks: Evidence from the Fracking Revolution 4 (Nov. 9, 2016) (unpublished manuscript).

[119] For example, because it is a gas play, the Barnett Shale became less profitable after natural gas prices fell in 2012, while oil plays like the Eagle Ford and Permian Basic shales remained active and profitable longer. Sergey K. Reid, *Economic Evaluation of the Major Hydrocarbon Producing Regions in Texas*, at 109 (May 2015) (unpublished M.A. thesis, Univ. of Tex. at Austin) (on file with University of Texas at Austin).

[120] *Id.* at 110–11.

allocations from the state, reflecting sharp increases in traffic in producing regions.[121]

This litany of local impacts implies that particular local communities, and particular segments thereof that do not capture benefits from the boom, may be especially vulnerable to the kinds of social and economic costs the boom brings. This suggests opportunities for productive CSR investment by producers to address both the likely socioeconomic impacts to local communities in the shale regions, as well as those communities' fears about less likely health impacts. The next Part outlines some of the CSR investment that is happening in the shale patch.

B. CSR Spending in the Shale Regions

Most of the larger players in American shale plays are not among the supermajors that dominate large upstream projects overseas (the notable exceptions being the ExxonMobil subsidiary XTO, ConocoPhillips and Norway's Statoil); but many are good-sized companies nevertheless. Companies like Apache, Range Resources, Cabot, EOG (descendant of Enron) and Encana have profited handsomely from the shale boom. They produce significant amounts of hydrocarbon resources and control significant acreage in major American shale plays,[122] reflecting their technical and financial prowess.[123] They are joined in each shale play by another 20–50 smaller to mid-sized companies.[124] The larger shale producers have all undertaken CSR expenditures in the shale regions (their smaller counterparts less so).

While it is difficult to know what motivates each expenditure, many look from the outside like attempts to mitigate some of the local impacts commonly associated with the shale boom. For example, many American shale producers have made contributions to local governments that seem aimed at alleviating the strain the boom has placed on local infrastructure. XTO donated more than $100,000 to local fire departments in multiple shale plays in 2016.[125] Cabot Oil and Gas, which is especially active in

[121] *Id.* at 30–32, 56–57, 69–70.

[122] For a list of companies working in the Bakken, Marcellus and Eagle Ford Shales, see *infra* Appendix.

[123] *See id.*

[124] *See* Ed Crooks, *Smaller Companies at Vanguard of US Shale Oil Revolution*, FIN. TIMES (July 7, 2013), https://www.ft.com/content/ae2392aa-e57c-11e2-8d0b-00144feabdc0.

[125] *Bakken Area First Responders Receive $65,000 from XTO Energy*, XTO ENERGY (Sept. 7, 2016), http://xtoenergy.com/en-us/company/news-and-resources/news-releases/bakken-area-first-responders-received-65000?parentId=e384bd15-bbb4-4ac9-be92-cf55dcd34e21; *East Texas Fire Departments Receive $57,500 from XTO Energy*, XTO ENERGY (July 14, 2016), http://xtoenergy.com/en-us/company/news-and-resources/news-releases/east-texas?parentId=809ca577-e681-4d99-ad1a-28f78a786caf; *Louisiana Fire Departments Receive $17,000 from XTO Energy*, XTO ENERGY (July 14, 2016),

the Marcellus Shale, established an annual grant program for first responder organizations in Pennsylvania.[126] Several shale producers claim credit for sizeable (tens of millions of dollars) donations toward road repairs where they operate, including EOG Resources,[127] Cabot,[128] and Range Resources.[129]

Other CSR spending in the shale regions is aimed at the social impacts of the boom, such as Cabot's fundraising for health care organizations in Pennsylvania, including a $2.2 million donation toward a new medical facility there,[130] and XTO's 2016 gift of $100,000 to a family crisis center in the Bakken Shale of North Dakota.[131] Range Resources, which is active in several shale plays, emphasizes its commitment to incentivizing local business by using local contractors.[132] Some shale producers invest in education and training in the shale regions. Apache has contributed to schools in Oklahoma.[133] Cabot has established a training partnership with the Lackawanna College School of Petroleum & Natural Gas, including a

http://xtoenergy.com/en-us/company/news-and-resources/news-releases/louisiana?parentId=809ca577-e681-4d99-ad1a-28f78a786caf; *North Texas Emergency Services Organizations Receive $46,000 from XTO Energy*, XTO Energy (July 14, 2016), http://xtoenergy.com/en-us/company/news-and-resources/news-releases/fort-worth?parentId=809ca577-e681-4d99-ad1a-28f78a786caf; *Southern Oklahoma Fire Departments Receive $23,000 from XTO Energy*, XTO Energy (May 26, 2016), http://xtoenergy.com/en-us/company/news-and-resources/news-releases/s-oklahoma-fire-depts-receive-23000-from-xto?parentId=809ca577-e681-4d99-ad1a-28f78a786caf. Apache has also assisted local volunteer fire departments by purchasing equipment and supplies. Apache Corp., Our Strategy for Sustainability: 2015 Summary Sustainability Report 4 (2015).

[126] Cabot Oil & Gas Corp., Clean Energy Stronger Communities: Report to the Community 2014 13 (2014) [hereinafter Cabot 2014 Report].

[127] EOG claims to have contributed to road construction in the Eagle Ford Shale. *Our Communities*, EOG Res., http://www.eogresources.com/responsibility/communities.html.

[128] Cabot puts its contributions toward road repairs in the Marcellus Shale at $45 million. Cabot 2014 Report, *supra* note 126, at 21.

[129] Range claims to have invested over $50 million in road infrastructure, but it is unclear how much of that was construction that was required in order to get their equipment into the production area, and how much was remedial repair. *See Investing in Our Communities*, Range Res., http://www.rangeresources.com/corp-responsibility/community-engagement-and-leadership/investing-in-our-communities.

[130] Cabot 2014 Report, *supra* note 126, at 7.

[131] *XTO Energy Awards $25,000 Grant to Family Crisis Shelter; $100,000 Total Since 2013*, XTO Energy (Apr. 14, 2016), http://xtoenergy.com/en-us/company/news-and-resources/news-releases/xto-energy-awards-25000-grant-to-family-crisis-shelter-100000-total-since-2013?parentId=809ca577-e681-4d99-ad1a-28f78a786caf.

[132] *Responsibility—Community Engagement & Leadership*, Range Res., http://www.rangeresources.com/corp-responsibility/community-engagement-and-leadership/local-sourcing.

[133] Press Release, Apache Corp., Apache Donates $1 Million to University of Oklahoma Petrophysics Program (June 14, 2010), http://investor.apachecorp.com/releasedetail.cfm?ReleaseID=479114.

$2.5 million gift to the school.[134] Encana has made contributions to various universities in western shale plays where it operates, including a $2 million gift to fund a petroleum engineering research facility at the University of Wyoming.[135]

These investments can be explained as attempts to address some of the specific effects of the shale boom, or as long term investments aiming to improve the business environment for producers in the shale regions. By contrast, there are relatively few examples of giving that can be described as pure corporate philanthropy. Encana, which is active in the Colorado shale plays, seems to do some of this kind of giving: it donated $1 million to a children's museum[136] and another $1 million to a police youth initiative in Denver.[137] Before its financial demise, Chesapeake Energy gave grants to arts and other community organizations in places where it did business.[138] But these sorts of contributions seem to be the exception rather than the rule among shale producers.

In some ways, these CSR initiatives by the larger shale producers mirror the types of CSR programs used by the supermajors in the developing world, with a focus on training, local content, local infrastructure, and with investments that serve both the company needs and provide social benefits. Cabot's CSR program in Susquehanna County, Pennsylvania, for example, included sizeable infrastructure investments in an extremely rural county that lacked basic services. The county offered no natural gas service to homes, no hydrant system for firefighters to pump water to fight fires, and only a single 25-bed emergency rural health care facility serving the entire county.[139] Cabot raised $4.4 million (including its own, aforementioned, $2.2 million contribution) to upgrade the health center, installed natural gas lines and service throughout the county, and created a hydrant system for its own water withdrawals that also enables firefighters to more easily and quickly pump water for firefighting.[140] This kind of large-scale infrastructure investment looks not unlike the types of

[134] *Lackawanna College Announces $2.5 Million Gift from Cabot Oil & Gas Corporation*, LACKAWANNA C. (Apr. 11, 2014), http://www.lackawanna.edu/falcon-headline/lackawanna-college-2-5-million-gift-cabot-oil-and-gas/.

[135] *State to Double EnCana Gift to UW*, BILLINGS GAZETTE (June 9, 2006), http://billingsgazette.com/news/state-and-regional/wyoming/state-to-double-encana-gift-to-uw/article_246de22f-6fdc-50ef-85c7-d46bee315f72.html.

[136] *Bringing Energy to the Denver Children's Museum*, ENCANA, https://www.encana.com/news-stories/our-stories/bringing-energy-denver-children-museum.html.

[137] *Encana Is Proud to be an Ongoing Sponsor of YouthLink*, ENCANA, https://www.encana.com/news-stories/our-stories/proud-ongoing-sponsor-youthlink.html.

[138] *Community Grant Support Programs*, NAT'L NEIGHBORHOOD WATCH, http://www.nnw.org/community-grant-support-programs.

[139] CABOT 2014 REPORT, *supra* note 126, at 7.

[140] *Id.* at 13–14; *Our Community*, CABOT OIL & GAS CORP., http://www.cabotog.com/our-community/.

investments the supermajors make in connection with large projects in the developing world.

In other ways, however, CSR spending in the shale regions differs from its overseas counterpart. One is scale. CSR spending by shale producers reflects the smaller scale of individual operations in the shale plays. Conventional upstream projects in the developing world often represent billions of dollars in investment in a single field developed by very few producers, done cooperatively under one management team; each American shale play is developed by 25–40 producers, each drilling their own individual wells at their own well pads. The individual wells may cost a few million dollars to drill and frack. Even though each company is drilling multiple wells from multiple pads, they are not necessarily treated as part of a single project. These differences affect the way companies conceptualize and budget for CSR expenditures. For a billion-dollar project overseas, the project team may develop a single project-specific CSR plan; in the shale regions, CSR strategy may be developed not at the project level but at the regional or company-wide level.

In addition, compared to the large upstream producers overseas, American shale producers seem to do relatively little voluntary spending on environmental mitigation or prevention. Cabot touts the environmentally and culturally sensitive approach it took to development on the historic "Dennis Farm" in Pennsylvania,[141] but most of its CSR activity seems focused around infrastructure and social impacts. Apache's tree planting and revegetation program in Louisiana, Oklahoma, New Mexico, Texas and Wyoming (states where it does business) is one of the larger, voluntary environmental initiatives touted by shale producers.[142] The dearth of environmental initiatives may be a function of producers' belief that existing regulations already represent best practices environmentally. Or, in the bitter political debate over the environmental effects of fracking in the shale regions and beyond, perhaps producers are concerned that environmental CSR spending will trigger claims of hypocrisy, or be seen as admissions of environmental culpability. Either way, environmental self-regulation seems less prominently featured in American shale producers' CSR plans than in the supermajors' CSR spending overseas.

Finally, and perhaps unsurprisingly, the bulk of the CSR investment in the shale regions seems to be coming from the largest producers. Range, EOG, Cabot, XTO, and Apache are all among the larger firms operating in the shale regions. The smaller or financially marginal firms seemed less inclined to make major CSR investments. Several of the producers that were active in shale plays when prices were high have since

[141] The Dennis Farm is more than 200 years old, and has remained in the same African American family since before the Revolutionary War. CABOT 2014 REPORT, *supra* note 126, at 9.

[142] *Apache Tree Grant Program*, APACHE CORP., http://www.apachecorp.com/About_Apache/Philanthropy/Apache_Corporation_Tree_Grant_Program/index.aspx.

sold off shale assets, after oil and gas prices fell.[143] Several producers that were highly leveraged with debt fell into financial trouble after the price decreases, the most public example of which was Chesapeake Energy, which had been one of the most active producers in the Marcellus Shale.[144] If CSR spending varies sharply with the firm's financial health, it follows that more highly leveraged shale producers, and producers otherwise experiencing financial difficulty, would spend less on CSR than other firms.

III. WHY CSR INVESTMENT IN AMERICAN SHALE PLAYS IS DIFFERENT

While we see some similarities between CSR investment associated with oil and gas production overseas, we see some differences as well. Why might the two situations differ? This Part suggests three reasons: the problem of diffuse responsibility, differences in the mineral resource ownership regime, and how high-magnitude/low-probability risks reduce the relative salience of the more tangible impacts of shale oil and gas production.

A. The Problem of Diffuse Responsibility

As noted, upstream developments overseas typically involve a very few companies (sometimes a single company) managing production from multiple wells in a single field. These projects require huge investments of capital, often comprising billions of dollars.[145] Their sheer size and complexity acts as a barrier to entry to all but the largest, most sophisticated companies.[146] When large upstream projects are developed by more

[143] Bradley Olson, *Shale Drillers Turn to Asset Sales as Early Swagger Wanes*, BLOOMBERG (Sept. 9, 2015, 9:01 PM), https://www.bloomberg.com/news/articles/2015-09-10/shale-companies-get-real-on-asset-sales-as-early-swagger-wanes.

[144] Jessica DiNapoli & Mike Stone, *Chesapeake Moves to Quash Bankruptcy Fears as Shares Plunge*, REUTERS (Feb. 8, 2016, 4:01 PM), http://www.reuters.com/article/us-chesapeake-restructuring-idUSKCN0VH1F2.

[145] *See, e.g.*, *ExxonMobil Confirmed as Bidder for Papua New Guinea Gas Player InterOil*, PLATTS (July 18, 2016), http://www.platts.com/latest-news/natural-gas/sydney/exxonmobil-confirmed-as-bidder-for-papua-new-26494250; *Shell and Kaztec Engineering Limited Sign Pipeline Deal in Nigeria*, OIL REV. AFR. (July 17, 2013), http://www.oilreviewafrica.com/technical-focus/technical-focus/shell-kaztec-engineering-limited-sign-pipeline-deal-in-nigeria.

[146] Some host nations are using their control over desirable hydrocarbon resources as leverage to force the transfer of technical expertise from the supermajors to their national oil companies (NOCs), such that NOCs now number among the largest and most sophisticated oil companies in the world. As a consequence, some compete against the supermajors for upstream development opportunities outside their home countries. Examples include Norway's Statoil, Brazil's Petrobras, and Malaysia's Petronas. *See, e.g.*, HELGE RYGGVIK, THE NORWEGIAN OIL EXPERIENCE: A

than one company, the multiple owners work in tandem and coordinate their efforts, designating a single operator to manage construction and development of the entire field. The impacts of these large upstream projects are sizeable and geographically broad, sometimes encompassing entire regions of the host country such that production by a single company comes to be associated in the public mind with all of the impacts of oil and gas production in a region. This has been the case with Royal Dutch Shell in the Niger Delta,[147] Chevron Texaco in Ecuador,[148] or Exxon Mobil in Papua New Guinea,[149] for example. The risk of being identified so closely with an entire industry in the public mind provides strong incentives for the developing company to invest in CSR so as to manage reputational risk, particularly if the host government is undemocratic or otherwise unresponsive to popular opinion.

In American shale plays, by contrast, individual projects are much smaller, both financially and geographically. Hence the ability of smaller companies to enter the market, and to secure the capital and minimum acreage necessary to be able to explore and produce oil and gas in the shale plays. For these companies, each shale well represents its own upstream project. As described in Part II, the impacts of development are felt most intensively near the well pad, with the most direct impacts felt by well pad neighbors. Impacts are less intensive as one moves away from the well pad: first along the transportation corridors that are used to carry water and equipment to and from the well pad, and finally in the form of socioeconomic impacts to the surrounding area in which workers live and spend their earnings. Collectively, the impacts of all these shale oil and gas projects may loom every bit as large to local communities in the United States as the impacts of large upstream projects do to communities in Asia, Africa and South America. But that public concern is less easily translated into the kind of reputational risk that induces CSR spending in the American shale plays, because that pressure is exerted across a much larger group of companies.

The Appendix lists companies involved in shale oil and gas production in three major American shale plays: the Marcellus, the Bakken and the Eagle Ford, and each list comprises more than 40 companies of vary-

TOOLBOX FOR MANAGING RESOURCES? 7 (2010); *see also* Daniel Wagner & Bethany Johnson, *The Rise of National Oil Companies*, HUFFINGTON POST: BLOG (Nov. 15, 2012) (updated Jan. 15, 2013), http://www.huffingtonpost.com/daniel-wagner/the-rise-of-national-oil-_b_2138965.html.

[147] *See, e.g.*, *Nigeria's Delta Is Where Western Oil Giants Meet Local Militants*, TELEGRAPH (Apr. 29, 2008), http://www.telegraph.co.uk/finance/markets/2789120/Nigerias-Delta-is-where-Western-oil-giants-meet-local-militants.html.

[148] *History of Texaco and Chevron in Ecuador: Map of Operations*, TEXACO, https://www.texaco.com/ecuador/en/history/mapofoperations.aspx.

[149] *Papua New Guinea*, EXXONMOBIL, http://corporate.exxonmobil.com/en/company/worldwide-operations/locations/papua-new-guinea.

ing sizes and levels of involvement. They include vertically integrated supermajors like ExxonMobil (owner of XTO Energy), as well as tens of smaller companies.[150] They include companies with huge cash reserves, and companies carrying enormous debt.[151] In each shale play, some companies control large amounts of acreage, and others control relatively little.[152] Some companies boast safety and environmental records that are nearly spotless, while others that have made mistakes. A well-known example of the latter is Cabot Energy, which experienced a high-profile blowout in the Marcellus Shale in 2009, and was temporarily banned from drilling in the state of Pennsylvania thereafter.[153]

The presence of so many companies working in each American shale play poses the same kind of cooperation problem—a "tragedy of the commons"[154]—that has long plagued the oil and gas industry in the United States.[155] Just as the rule of capture made it difficult for multiple producers to cooperate so as to maximize yields from a single field, so it is difficult today for multiple producers in the shale region to voluntarily cooperate to mitigate the impacts they collectively impose on local communities: noise and visual impacts, odor management, damage to roads, boomtown effects, etc.

For example, if tanker trucks from ten companies use the same small rural road to travel to and from their well pads, the task of organizing those ten companies to voluntarily pay for road repairs is difficult. Even if all ten can be brought to the table, how should they allocate their individual shares of the total road repair costs? Should the allocation be based upon the number of truck trips attributable to each company?

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[150] One way to illustrate the relative size difference between supermajors and domestic shale producers is by looking at each company's market capitalization. Of the four supermajors referenced here that develop large projects overseas, ExxonMobil's market capitalization is the largest at more than $330 billion, while BP's is the smallest at more than $105 billion; by contrast, the market capitalization of the five relatively large domestic shale play producers referenced here (Apache, Cabot, Encana, EOG Resources, and Range Resources) range between $8 billion and $57 billion. For daily market capitalization data for all of these companies, see Yahoo Finance's "Y charts" at https://ycharts.com/companies/.

[151] For a discussion of the highly leveraged way in which Chesapeake Energy became one of the leading fracking companies in the United States, see GOLD, *supra* note 10, at 194–97.

[152] *See* Appendix.

[153] Michael Rubinkam, *Contamination Suspends Cabot's Pa. Gas Drilling*, BOSTON.COM (Apr. 15, 2010), http://archive.boston.com/business/articles/2010/04/15/contamination_suspends_cabots_pa_gas_drilling/.

[154] The phrase comes from Garrett Hardin's seminal article by the same name. Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243 (1968).

[155] *See* Russell Gold & Erin Ailworth, *Oil Firms' Predicament: Who Should Cut Output? Companies Act Against Collective Interest by Waiting for Rivals to Turn Off Tap First*, WALL STREET J. (Dec. 23, 2014, 1:08 PM), http://www.wsj.com/articles/oil-companies-predicament-who-should-cut-production-1419358086.

Should the allocation be adjusted based on the size or weight of the individual trucks? What if two of the ten producers refuse to cooperate? Should the other eight cover the missing shares, or should the local government kick in the missing money? What if the government cannot afford to pay the missing shares? This situation is not unlike multiparty negotiations to clean up inactive waste sites under the federal Superfund statute, except that that statute imposes the threat of individual, retroactive, joint and several liability on each party should negotiations break down.[156] Local governments have no such leverage over shale producers.

Consider another cooperation problem in shale plays: namely, managing the visual, noise, and odor impacts of production. Drilling is a noisy and visually disruptive operation, and wastewater pits can produce noxious odors. State regulations may or may not mitigate those impacts to locals' satisfaction. Companies can (and sometimes do) erect barriers that mitigate noise and visual impacts; and companies sometimes undertake wastewater management practices that minimize the odors surrounding wastewater storage. However, if state rules do not require this sort of mitigation and some companies refuse to do so voluntarily, it puts companies bearing those mitigation costs at a competitive disadvantage.

The same sort of cooperation problem contributes to the widespread flaring problem in the Bakken and Eagle Ford Shale. Most companies in the Bakken and Eagle Ford are interested in producing oil, but with that oil comes associated gas.[157] In both North Dakota and Texas, state rules allow regulators to permit flaring of natural gas when there are no existing gathering lines nearby through which to introduce the gas into the pipeline system,[158] and regulators have granted repeated waivers to allow widespread flaring in both regions. This is another tragedy of the commons in that all companies recognize that the introduction of the natural gas into the pipeline system would be preferable to its physical waste (and production of greenhouse gases) through flaring, but producers cannot or will not agree upon a way to share the costs of constructing the gathering lines necessary to connect the production region to the interstate pipeline system. Of course, the classic solution to the tragedy of the commons is regulation: "mutual coercion[,] mutually agreed upon."[159] However, Texas and North Dakota regulators have chosen not to coerce producers in this way, and local governments lack the power to do so.

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[156] The proper name of the Superfund statute is the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9601 (2012).

[157] "Associated gas" is gas that is dissolved within oil or other liquid hydrocarbons and separates from the liquid hydrocarbons only when it reaches lower pressures at or near the surface of the wellbore.

[158] N.D. ADMIN. CODE 43-02-03-60.2 (2017); 16 TEX. ADMIN. CODE § 3.32 (2016); TEX. NAT. RES. CODE ANN. § 85.202(b) (West 2015).

[159] Hardin, *supra* note 154, at 1247.

B. Resource Ownership and Bargaining Leverage

If CSR spending is (partly) a strategic reaction to external forces (like reputational risk), we might speculate that owners of mineral resources may also use their control over access to the resource to drive producers to spend on CSR programs, even if those requirements are not enshrined in the law. If that is so, differences in the bargaining environment between producers and resource owners in American shale plays compared to overseas development may also explain differences in spending in the two places.

Outside of the United States, mineral resources are typically owned by the state. Companies seeking access to the state's oil and gas resources face, in the state, a monopoly seller (of access) and a monopsony buyer (of the companies' services and expertise). Companies must first earn the right to develop the resource by prevailing in a bidding process or otherwise negotiating in the face of competition from other companies; the winner must then navigate a second hurdle, the country's regulatory and fiscal regime governing resources extraction. As host nations have become more assertive and sophisticated in the way they use their leverage against the supermajor IOCs, they not only collect increasing shares of hydrocarbon revenues over time,[160] they also elicit more CSR spending by supermajors in project plans (and proposals) overseas.[161] That is, companies now use CSR to compete with one another in their efforts to sell their expertise to host nations.[162]

In the United States, by contrast, the bargaining environment looks very different. Private landowners own the mineral estate.[163] Companies secure access to the resource by negotiating individual leases with multiple individual landowners. While some landowners may be able to extract CSR-like commitments from producers in their mineral lease agreements,[164] many face information asymmetry and coordination barriers

[160] *See* Ross, *supra* note 13, at 10–11; Yergin, *supra* note 35, at 542.

[161] Pauline Jones Wong & Erika Weinthal, Oil Is Not a Curse, Ownership Structure and Institutions in Soviet Successor States 68 (2010) (ascribing CSR spending since the 1990s as a way for producers to legitimate their property rights in the host country's resources); *see also* Douwe Tideman, et al., *Local Content in Oil and Gas: Recasting the Conversation*, Strategy& (PricewaterhouseCoopers), 2015 (chronicling the use of host nation leverage to insist on increased company investment in local business and training).

[162] Wong & Weinthal, *supra* note 161, at 193 (describing an overseas production environment in which producers are expected to "vastly increase the scope of their social and economic activities so as to improve the conditions in host countries—that is, to engage in CSR").

[163] Of course, the United States owns mineral rights on federal land, including the Outer Continental Shelf.

[164] *See, e.g.*, McGraw, *supra* note 74, at 59–63; Ann M. Eisenberg, *Land Shark at the Door? Why and How States Should Regulate Landmen*, 27 Fordham Envtl. L. Rev. 157, 176–77 (2016).

that reduce their bargaining leverage against companies.[165] Producers' understanding of the geological or market conditions is always superior to that of the resource owner, but more so in the American shale regions than overseas, where national oil ministries have become quite sophisticated about monetizing their mineral resources. To the extent that CSR investment in the shale regions lags that investment overseas, these differences in bargaining leverage may constitute part of the explanation.

Local governments in the shale regions could act as conveners, to help landowners within their borders overcome local collective action problems, and to develop more sophisticated bargaining positions. But local governments lack the legal leverage that comes with mineral ownership. A few local governments hold the power to tax shale production. Interestingly, those jurisdictions are less likely to enact fracking bans than local governments that lack taxing authority,[166] suggesting that given some leverage over shale production municipalities would be interested in using that leverage to secure benefits from producers. Perhaps if holders of mineral rights in the shale regions could find a way to bargain collectively (under the auspices of local governments or some other convener), they might extract more CSR investment from producers through that bargaining process, as has become the norm in mineral rich nations overseas.

C. Public Perceptions and Externally-Driven CSR

It seems likely that external pressure to engage in CSR spending (from customers, banks, NGOs, etc.) will vary with public perceptions of the need for firms to act. Thus, we might expect CSR investment to be inversely correlated with public perceptions of the government's capacity to regulate. When the firm's external stakeholders believe that government is willing and able to regulate to protect the public against environmental, health and safety risks, they may place fewer demands on firms to self-regulate. When supermajor IOCs develop projects in developing countries, these external stakeholders may believe that host governments lack the capacity to regulate effectively, and so may increase their expectations that companies spend voluntarily on CSR so as to protect the interests of locals. Conversely, when external stakeholders believe that the host nation has the capacity and the will to regulate effectively, those stakeholders may reduce their expectations that producers will spend on CSR.

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[165] *See* MCGRAW, *supra* note 74, at 60–61 (explaining how farmers in rural Pennsylvania had difficulty understanding their bargaining power versus producers and how to determine reasonable bargaining positions); *see also* GOLD, *supra* note 10, at 229–37 (making the same observation); Eisenberg, *supra* note 164, at 167.

[166] Robert D. Cheren, *Fracking Bans, Taxation, and Environmental Policy*, 64 CASE W. RES. L. REV. 1483, 1484 (2014).

Thus, it may be that the public, customers and other external stakeholders assume that the American regulatory regime will look out for the interests of locals adequately, and so place fewer demands on shale producers to engage in CSR spending. This dynamic is difficult to measure, or to separate from other causes of variance in CSR spending across production environments. We have other reasons to infer that CSR spending in the shale regions may represent efforts to mitigate reputational risk, or to protect the social license to operate, however. Some of the most active spenders on CSR in the shale regions are firms that have suffered reputational damage from spills, litigation, or other charges of misconduct in the shale patch, like Range[167] and Cabot.[168] Others are larger firms active in the conventional upstream industry, where CSR-as-risk-mitigation was already becoming common, such as Apache, Shell, XTO (ExxonMobil), and Statoil.[169] Nonetheless, it may be that we don't see a more institutionalized set of CSR investments across the shale industry (as we do for overseas developments) because, in part, external stakeholders assume that regulation protects locals from the adverse effects of fracking.

As noted above, locals often believe that is not the case, and would prefer to wield more regulatory authority over shale producers in states where local regulation is fully or partially preempted by state law. On the other hand, state regulators *are* learning to regulate fracking more effectively over time, having revised their regulations frequently in recent years to address impacts uniquely associated with fracking operations and to respond to public concerns. These include changes to well construction standards, wastewater handling, noise mitigation, wastewater disposal, placement of disposal wells, and more.[170] However, these efforts often seem unsatisfactory to locals, who bear the lion's share of adverse impacts from oil and gas operations. In this sense, the producers' external stakeholders may overestimate the ability of locals to use regulation to protect themselves from the impacts of fracking, and may be exerting less pressure on shale producers to engage in CSR as a consequence.

There is another force reducing demand from external stakeholders that producers undertake CSR investments that address the most signifi-

[167] *See Corporate Giving*, RANGE RES., www.rangeresources.com/corp-responsibility/community-engagement-and-leadership/corporate-giving; *see also* Don Hopey, *DEP Fines Range Resources $8.9 Million for Marcellus Shale Gas Well*, PITTSBURGH POST-GAZETTE (June 16, 2015), powersource.post-gazette.com/powersource/policy-powersource/2015/06/16/DEP-fines-Range-Resources-8-9-million-for-Marcellus-shale-gas-well-pennsylvania/stories/201506160173.

[168] *See* CABOT 2014 REPORT, *supra* note 126, at 2; *see also* Marie Cusick, *Cabot Oil and Gas Fined $120,000 for Explosion and Spill*, STATEIMPACT (Dec. 2, 2014), https://stateimpact.npr.org/pennsylvania/2014/12/02/cabot-oil-and-gas-fined-120000-for-explosion-and-spill/.

[169] *See* Appendix.

[170] *See* RICHARDSON ET AL., *supra* note 89, at 22–46; Spence, *supra* note 92, at 357–58, 368.

cant impacts of fracking: namely, the polarized and vitriolic public debate over fracking. As I have described elsewhere,[171] polarization and vitriol tend to distort each side's perceptions of the risk, particularly when the scientific record is incomplete or inchoate, making it difficult to find common ground. For our purposes here, the contentious public debate focuses less on the kinds of impacts fracking usually brings to a community than on low probability, high magnitude events such as the prospect of harm to human health from air and water pollution. The human tendency to elevate the salience of higher magnitude, lower probability risks—like a plane crash—over higher probability, lower magnitude risks—like a car accident—is well documented and well understood.[172] The tendency is particularly powerful when fear is involved, because the fear circuitry of the brain can override reason;[173] this suggests, in turn, that we should be wary about how vulnerabilities in our fear circuits are exploited by others.[174] The award-winning documentary *Gasland*, for example, appeals to fear, depicting residents who live near natural gas drilling lighting their tap water on fire, suggesting that drilling operations caused methane to leach into their well water.[175] It chronicles the contamination of drinking water wells with methane in Dimock, Pennsylvania in 2009,[176] and shows the mayor of a Texas town who believes that pol-

[171] *See* David B. Spence, *Responsible Shale Gas Production: Moral Outrage vs. Cool Analysis*, 25 FORDHAM ENVTL. L. REV. 141, 143–55 (2013).

[172] *Id.* at 183; *see also* Dan M. Kahan, *Two Conceptions of Emotion in Risk Regulation*, 156 U. PA. L. REV. 741, 752 (2008); Jonathan S. Masur, *Probability Thresholds*, 92 IOWA L. REV. 1293, 1338–39 (2007); Eric A. Posner, *Law and the Emotions*, 89 GEO. L.J. 1977, 2002 (2001).

[173] DEAN BUONOMANO, BRAIN BUGS: HOW THE BRAIN'S FLAWS SHAPE OUR LIVES 141 (2011) ("[W]e are all too well prepared to learn to fear through observation. . . . Because vicarious learning is in part unconscious, it seems to be partially resistant to reason.").

[174] *Id.*

[175] GASLAND (HBO Documentary Films 2010).

[176] *Id.*; Rubinkam, *supra* note 153. Similar claims have been brought against Southwest Energy Production Company and Atlas Energy. *See Berish v. Sw. Energy Prod. Co.*, JUSTIA: DOCKETS & FILINGS, https://dockets.justia.com/docket/pennsylvania/pamdce/3:2010cv01981/82355/; *see also* Jon Hurdle, *Pennsylvania Lawsuit Says Drilling Polluted Water*, REUTERS (Nov. 9, 2009, 9:37 AM), http://www.reuters.com/article/2009/11/09/us-fracking-suit-idUSTRE5A80PP20091109. While the settlement did not establish the cause of the methane contamination, the Pennsylvania Department of Environmental Protection subsequently banned Cabot from using hydraulic fracturing in the region. Rubinkam, *supra* note 153. For an analysis of the factual issues at play in groundwater contamination claims in the Marcellus Shale, see Lynn Kerr McKay et al., *Science and the Reasonable Development of Marcellus Shale Natural Gas Resources in Pennsylvania and New York*, 32 ENERGY L.J. 125, 138–43 (2011). Pennsylvania subsequently lifted that ban. Laura Legere, *DEP Allows Cabot to Resume Natural Gas Fracking in Susquehanna County*, SCRANTON TIMES TRIB. (Oct. 17, 2009), www.thetimes-tribune.com/news/dep-allows-cabot-to-resume-natural-gas-fracking-in-susquehanna-county-1.340467.

lution associated with fracking operations has increased the incidence of serious illnesses among his constituents.[177] The record shows that many of the inferences about risk that *Gasland* invites the viewer to make are unsupported by the facts. For example, the bulk of expert opinion contradicts the implication in the film that fracking operations caused tap water in Colorado to become flammable,[178] or the health problems experienced by Texas residents.[179] Nevertheless, the dread (fear of these impacts) is real.

The heightened salience of air and water pollution concerns drive the efforts of more than 400 municipalities to ban fracking within their borders,[180] litigation and legislation addressing those bans in at least four states,[181] and the ongoing efforts of NGOs and others to ban fracking nationwide. It channels scarce human and financial resources toward those issues, leaving less room in the public policy debate for the more mundane, common and tangible socioeconomic and quality of life impacts fracking brings to all local communities. To the extent that CSR investment is driven by public expectations or pressure, the focus on health impacts may crowd out public pressure on companies to address the lower magnitude impacts of fracking.

Which is not to suggest that there are *no* efforts afoot to address the everyday infrastructure and socioeconomic impacts of fracking. As described in Part II, there are, but those efforts receive less attention, and tend to involve government officials and quasi-governmental organizations delving into the nitty-gritty details of how changes in the practices, standards and regulations under which fracking occurs might improve the lot of locals in the shale regions. These efforts include: (1) the Secretary of Energy's Advisory Board ("SEAB"), Subcommittee on Shale Gas Production, which produced a list of recommendations designed to

[177] Specifically, the film interviews Calvin Tillman, then the mayor of Dish, Texas, and now an anti-fracking activist. GASLAND, *supra* note 175.

[178] *See* Owen A. Sherwood et al., *Groundwater Methane in Relation to Oil and Gas Development and Shallow Coal Seams in the Denver-Julesburg Basin of Colorado*, 113 PROC. OF THE NAT'L ACAD. OF SCI. 8391 (2016).

[179] *See* Kevin Begos, *Experts: Some Fracking Critics Use Bad Science*, MPRNEWS (July 23, 2012), https://www.mprnews.org/story/2012/07/22/environment/fracking-science.

[180] *See* Andrew Ba Tran, *Where Communities Have Banned Fracking*, BOS. GLOBE (Dec. 18, 2014); https://www.bostonglobe.com/news/nation/2014/12/18/where-communities-have-banned-fracking/05bzzqiCxBY2L5bE6Ph5iK/story.html.

[181] Phelps T. Turner, *To Ban or Not to Ban? The Fight over Fracking Intensifies*, AM. BAR ASS'N (Sept. 3, 2014), http://www.americanbar.org/groups/litigation/committees/realestate/news_analysis/articles_2014/open/0814-fight-to-ban-fracking.html; *see also* Richard F. Rodriguez, *Municipalities Cannot Ban or Impose Moratorium on Fracking, Says Top Colorado Court*, AM. BAR ASS'N. (May 10, 2016), http://www.americanbar.org/groups/litigation/committees/realestate/news_analysis/news_developments/municipalities-cannot-ban-or-impose-moratorium-on-fracking-colorado.html.

promote responsible Shale gas development,[182] (2) the previously mentioned EPA study[183] of hydraulic fracturing operations and proposed regulatory changes that have[184] and will[185] spring from that study, (3) the Environmental Defense Fund's efforts to promote responsible management and regulation of methane leakage,[186] (4) the Center for Sustainable Shale Gas Development, a collaboration with energy companies and environmental organizations developing performance standards for shale gas production,[187] and (5) the state and local government officials who have tried to find solutions to the everyday impacts fracking visits on locals.[188] Presumably, however, efforts like these would be better funded and would occupy a more prominent place on the public agenda but for the intensity of the fears fracking will visit health harms on locals via water and air pollution.

CONCLUSION

CSR investment in the shale regions seems to lag its overseas counterpart, but some producers are making sizeable and diverse CSR investments in the shale regions. Given the collective action problems (multiple producers working independently in close proximity), the usual absence of local government, legal leverage, and public (mis)perceptions about the need for CSR investment to address pressing local concerns, it is perhaps surprising that we see as much CSR investment as we do in the shale patch. Existing efforts seem to be dominated by the biggest producers with the highest profiles in each region. Interestingly, where CSR investment happens, it seems to focus not on the low-probability, health-

[182] SHALE GAS PROD. SUBCOMM., U.S. DEP'T OF ENERGY, SECOND NINETY DAY REPORT 1 (Nov. 18, 2011).

[183] *See* EPA 816-R-04-003, *supra* note 75.

[184] *See* Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 77 Fed. Reg. 49,490, 49,490 (Aug. 16, 2012) (codified at 40 C.F.R. pts. 60 and 63 (2016)) (creating new source performance standards for onshore natural gas-processing plants and finalizing risk- and technology-review procedures for natural gas production, transmission, and storage). Existing equipment standards can be found at Standards of Performance for Equipment Leaks of VOC From Onshore Natural Gas Processing Plants, 40 C.F.R. § 60.630–36 (2016).

[185] *See* Nicholas Kusnetz, *EPA Plans to Issue Rules Covering Fracking Wastewater*, PROPUBLICA (Oct. 20, 2011, 5:01 PM), http://www.propublica.org/article/epa-plans-to-issue-rules-covering-fracking-wastewater.

[186] *See Methane: The Other Important Greenhouse Gas*, ENVTL. DEF. FUND, https://www.edf.org/methane-other-important-greenhouse-gas.

[187] *See* Susan Phillips, *Fractures in the Anti-Fracking Movement*, STATEIMPACT PA. (May 1, 2013, 6:19 PM), http://stateimpact.npr.org/pennsylvania/2013/05/21/fractures-in-the-anti-fracking-movement/ (reporting that other environmental groups are "shunning" EDF for their participation in the regulatory effort with industry).

[188] Turner, *supra* note 181.

related risks that have dominated the national fracking debate, but rather on the everyday infrastructure and socioeconomic impacts that accompany shale production everywhere. It is difficult to discern why this is so. It may be because of producers' belief that the latter are more significant than the former. It may be because local civic institutions (as recipients of producers' CSR investment dollars) can address the latter and not the former, and so they seek money for these kinds of investments. In any case, CSR investment in the shale regions happens, but seems less systematic and institutionalized than CSR investment in the developing world.

Given the differences between the social, economic and political dimensions of oil and gas production in developing countries and in the American shale patch, it is not surprising that the CSR investment strategies of producers in these two contexts differ.[189] There is another difference worth noting: the modern shale production era is only about a decade old, giving producers much less time to develop and implement systematic CSR programs than their counterparts engaged in conventional production overseas. Producers and communities are only beginning to understand the expectations each has of the other, and the role that law will (or will not) play in structuring their relationship. Neither the institutional environment, the risk profile of fracking, nor best practices for mitigating fracking's impacts are fully understood, but all of these are becoming better understood over time. We are already seeing interesting and innovative ways that bargaining between locals and producers is mitigating fracking's impacts. Perhaps in another decade we will have reached an equilibrium analogous to that associated with large overseas oil and gas projects—one in which all shale producers will be implementing broadly similar CSR programs in the shale regions, programs that address many or most of locals' concerns.

[189] Changing economic conditions in the oil and gas market have triggered a wave of consolidation in the industry within the last 18 months. *See* Alison Sider, *Fracking Firms That Drove Oil Boom Struggle to Survive*, WALL STREET J. (Sept. 23, 2015), https://www.wsj.com/articles/fracking-firms-that-drove-oil-boom-struggle-to-survive-1443053791. This could push remaining firms' incentives to engage in CSR spending in American shale plays toward the incentives faced by supermajors overseas.

APPENDIX: List of Operators in Three Major Shale Plays

This appendix provides a list of companies active in the Marcellus, Bakken and Eagle Ford shale plays, along with some of the available information about their assets in each play to give the reader a sense of the relative presence of each firm in each play.[190] The Marcellus is in the northeast, mostly in Pennsylvania. Most of the Bakken Shale is in North Dakota. The Eagle Ford Shale is in Texas. The Bakken and the Eagle Ford are mostly oil plays, and so some of the production data is expressed in barrels of oil equivalent (BOE) per day (/d); the Marcellus is mostly a natural gas play, so some of the production data is expressed in cubic feet (cf) per day.

A-1: Marcellus Shale

Operator	Acreage	Miscellaneous Production or Capacity Information
American Energy Partners		
Anadarko	654,000 gross acres	
Antero Resources	425,000 acres	452 wells
BG Group		
Cabot O&G	200,000 acres	Second largest producer in Pennsylvania during 2015
Carrizo O&G	19,300 acres	
Chesapeake Energy		Net production: 820 million cf/d (2nd largest producer of natural gas)
Chevron	600,000 acres	
Chief O&G	210,000 acres	200 wells
Consol Energy		Natural gas reserves of 4.0 trillion cubic feet
Energy Corporation of America		375 wells
Enerplus	47,000 acres	
EOG Resources	200,000 acres	2015 net production: 24 million cf/d
Epsilon Energy	5750 acres	
EQT Corp	630,000 acres	
EV Energy Partners		
EXCO Resources	149,000 acres	2015: 126 wells
Gastar Exploration	58,900 acres	
Huntly & Huntley		
Little Pine Resources		
Magnum Hunter Resources	79,000 acres	
Mountain V O&G	9,923 acres	256 wells
National Fuel Gas Company		
Newfield Exploration Co.	190,000 acres	
Noble Energy	350,000 acres	573 million cf/d
Penn Virginia O&G	14,000 acres	

[190] Acreage, well, and production data are the most recent published figure for each company. All information comes from company reports.

Penneco O&G		
Pennsylvania General Energy	400,000 acres	120 wells in Marcellus
Range Resources	900,000 acres	1.27 billion cf/d
Reliance Industries		
Republic Energy	30,000 acres	
Rex Energy Corp	207,000 acres	
Rice Energy	86,000 acres	
Seneca Resources Corp	745,000 acres	
Shell		630 wells in 2013; selling assets since
Southwestern Energy	425,098 acres	
Statoil	512,000 acres	
Stone Energy	2014: 90,000 acres	
Trans Energy	28,659 acres	
Triana Energy		
Turm Oil		
Ultra Petroleum	149,000 acres	131 wells
Vantage Energy	48,000 acres	
Whitmar Exploration		
XTO Energy	576,533 acres	

A-2: Bakken Shale

Operator	Acreage	Miscellaneous Production or Capacity Information
Abraxas Petroleum Corp.	43,855 acres	788 Gross Producing Wells
American Eagle Energy	29,600 acres	
Apache	300,000 acres	
Arsenal Energy Inc.		
ConocoPhillips	620,000 acres	
Continental Resources	1,140,000 acres (largest according to website)	
Crescent Point Energy Corp.		
Earthstone Energy	11,050 net acres	136 producing wells
Emerald Oil	122,000 net acres	
Enerplus	74,000 net acres	27,000 BOE/D
EOG Resources		1,540 wells
Fidelity Exploration & Production Company		
Forestar Group	9,000 net mineral acres	
FX Energy		
Halcon Resources	129,000 net acres	
Hess		
Lario Oil & Gas	16,000 net acres (2015)	610 wells
Lightstream Resources		750 wells
Linn Energy	390,000 acres in Rockies	
Magnolia Petroleum		165 wells

Marathon Oil	290,000 net acres	
MDU Resources Group		
Murex Petroleum Corp.	84,000 mineral acres	
Newfield	40,000 net acres	20,000 BOE/D
Norstra Energy		
Northern Oil & Gas Inc.		200 producing wells; 16,857 BOE/D
Oasis Petroleum	506,000 net acres	
Penn Virginia Corp.	100,000 acres	330 producing wells; 94.1MBOE reserves
Petro-Hunt		
QEP Resources		
Samson Resources	70,000 acres	
Slawson Exploration		
SM Energy (St. Mary Land & Exploration		31.1 thousand BOE/d (18% of company's total production)
Statoil (Brigham)	265,000 net acres	59,800 BOE/D
Tracker Resource Development		Sold 2,738 acres/40 wells to various operators in 2014 for $67M
Triangle Petroleum	126,037 acres (Jan 2015 10K)	96 gross operated wells
Vanguard Natural Resources		
Whiting Petroleum	85,000 net acres	199 thousand BOE; 53 gross wells
Whitmar Exploration		
WPX Energy	85,000 acres	177 wells
XTO (Exxon)	515,014 net acres	
Yuma	17,000 net acres	

A-3: Eagle Ford Shale

Operator	Acreage	Other Info
Abraxas Petroleum	13,577(2014)	
Anadarko	388,000 acres	2015: net sales: 89,000 BOE/d
Apache		73,000 BOE/d
BHP Billiton Petroleum		
BP America	450,000 acres	1,400 wells
Cabot O&G	85,500 acres	
Carrizo Oil & Gas	88,000 acres	144 MBOE proved reserves; 57 wells
Chesapeake Energy		1.1 billion BOE net recoverable reserves; 20 rigs; 6 hydraulic fracturing fleets
Cinco Natural Resources	21,600 acres	
Clayton Williams Energy	170,000 acres in Giddings Area	11.4 MBOE
Comstock Resources	22,200 acres	20 MBOE
ConocoPhillips	220,000 net acres	174 MBOE/d; 950 producing wells
Contango O&G	21,829 acres	

Crawford Hughes Energy	40,000 acres	
Encana Corp	43,200 acres	30 Wells
Enervest		Acquired EF assets worth $1.3 billion in three deals since 5/17/16
EOG Resources	608,000 acres	Largest crude oil producer in EF; completed 329 net wells in 2015
EP Energy Corp	91,675 acres	946 drilling locations
Escondido Resources II	60,000 acres across EF, Olmos and Escondido formations	
EXCO Resources	65,900 acres	238 wells; 7,167 BOE/d
ExxonMobil		
Halcon Resources	101,000 acres	
Hilcorp Energy Company		Sold Eagle Ford assets to Marathon in 2011
Laredo Energy		27 wells
Lewis Energy Group	430,000 (2011)	
Lucas Energy	10,000 acres	
Marathon Oil	180,000 acres (2014)	
Matador Resources		
Memorial Production Partners	Acquired 15,000 acres from Alta Mesa in 2014	
Murphy Oil	148,000 acres	55,000 BOE/d
Newfield Exploration	35,000 acres	
Nexen	100,000 acres	
Occidental	4,000 acres	
Penn Virginia O&G	100,000 acres	330 wells; 49 MBOE reserves
Petrolympic	8,000 acres	
Pioneer Natural Resources	230,000 acres	84 wells
Reliance Industries		
Sanchez O&G	200,000 acres	
Shell		
SM Energy		132.9 MBOE/d
Statoil	58000 acres	35,400 Boe/d; 537 wells
Sundance Energy Company		
Swift Energy Co.	70,000 acres	
Tidal Petroleum		
U.S. Energy Corp.	Around 12,000 acres	
Ursa Resources Group	40,000 acres	
XTO Energy	3,841,218 total acres in Texas	