



Analysis

Fracking and environmental (in)justice in a Texas city

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ABSTRACT

Shale gas development (SGD) via horizontal drilling and fracking is touted for economic benefits and spurned for health and environmental impacts. Despite SGD's socioecological salience, few peer-reviewed, empirical studies document the distribution of positive and negative effects. The City of Denton, Texas has ~280 active gas wells and over a decade of SGD. Here we use an environmental justice framework to analyze the distribution of SGD's costs and benefits within Denton. Using data on mineral property values from 2002 to 2013 and gas well locations, we ask: who owns Denton's mineral rights (i.e. the greatest financial beneficiaries) and how does this ownership pattern relate to who lives near gas wells (i.e. those who shoulder the nuisances and health impacts)? Our results show that Denton's mineral wealth is widely distributed around the U.S., residents own 1% of the total value extracted, and the city government is a large financial beneficiary. In addition to distributional inequities, our analysis demonstrates that split estate doctrine, legal deference to mineral owners, and SGD's uniqueness in urban centers create disparities in municipal SGD decision-making processes. The environmental justice issues associated with fracking in Denton also provide one possible explanation for residents' November 2014 vote to ban hydraulic fracturing.

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1. Introduction

In 1982, Mitchell Energy connected the C.W. Slay #1 well in Wise County, Texas to their pipelines, marking the origin of commercial-scale natural gas production on the Barnett Shale. It also set in motion a global energy revolution. The work of Mitchell Energy founder, George P. Mitchell, on the Barnett brought together massive slickwater light sand hydraulic fracturing (i.e., fracking) with 3-D seismic imaging and horizontal drilling (Steward, 2007). By the turn of the 21st century, this innovation made the development of unconventional shale deposits of oil and gas economically viable. With few federal regulations and relatively high prices, oil and gas production in the United States boomed, in turn sparking controversy about fracking's costs and benefits.

The local effects of shale gas development (SGD) are especially controversial. Most concerns revolve around environmental and public health risks. However, despite growing evidence of carcinogenic emissions, water contamination, and negative health effects (e.g. Eastern Research Group, 2011; Oswald and Bamberger, 2012; Osborn et al., 2011; Kassotis et al., 2013; Hill, 2013; McKenzie et al., 2014; Schonkoff et al., 2014), uncertainties remain due to the limited number of long-term, peer-reviewed, empirical studies (Mitka, 2012; Thompson, 2012).

The extent that communities benefit from SGD also remains unclear. Some reports argue that local communities benefit from drilling through economic growth and job creation (e.g. King, 2012; Engelder, 2011). In the Barnett region, drilling proponents such as Energy In-Depth and the Barnett Shale Energy Education Council cite industry-funded studies (e.g., IHS Global Insight, 2011; Perryman Group, 2011; Perryman Group, 2014) supporting 'positive economic benefits' and 'job creation' narratives. However, Weber (2012) shows that economic gains in SGD boom areas are much lower than industry-funded groups often report and Brown (2014) finds modest employment and wage gains in SGD counties. Research also highlights economic costs; for example, Litovitz et al. (2013) estimate millions of dollars of socioecological damages from SGD air pollution in Pennsylvania. In addition to cost omissions, Kinnamen (2011) argues that most non-peer-reviewed economic studies on SGD are misleading and overstate economic benefits.

Skepticism about SGD's benefits also extends to city and town officials who increasingly pass measures ranging from tighter restrictions to outright bans. Although the extent that municipalities can legally regulate SGD remains unclear (Welch, 2012), there is little doubt that cities are becoming primary sites for jurisdictional battles (Briggie, 2013). Yet this policy environment has emerged in the context of a relative paucity of empirical research about SGD's costs and benefits.

As the nation's oldest and most heavily developed shale deposit, the Barnett offers an opportunity to analyze SGD's impacts on communities. Located in North Central Texas (Fig. 1), the Barnett underlies much of

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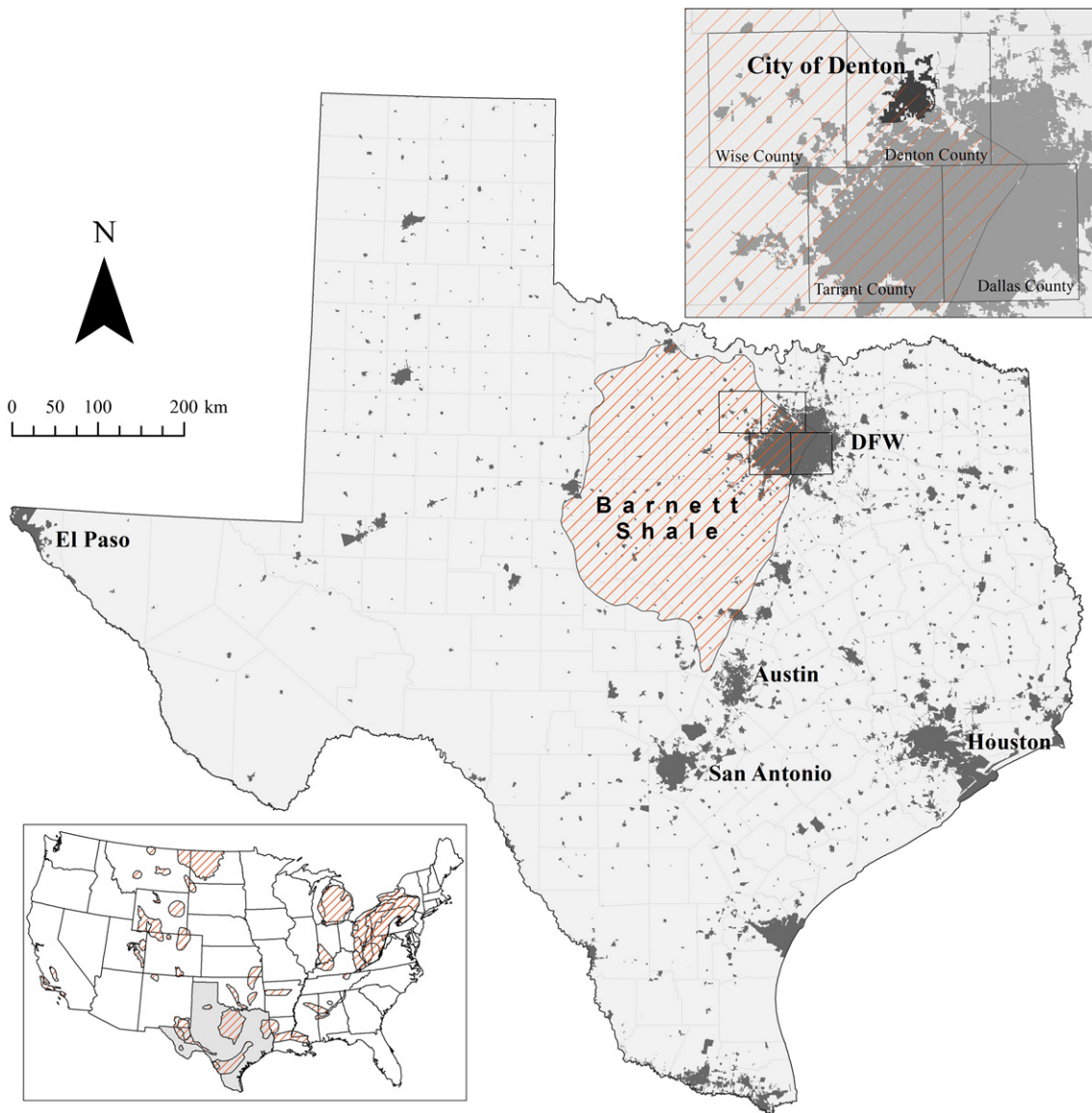


Fig. 1. Location of shale deposits in the United States (bottom inset); the Barnett Shale and urban areas in Texas; and the City of Denton in North Texas and relation to DFW (top inset).

the Dallas–Fort Worth Metroplex (DFW), the U.S.'s fourth largest metropolitan area (U.S. Census Bureau, 2011). Since 2000, nearly 15,000 shale gas wells were drilled into the Barnett bringing the total to over 17,000 and making DFW ground zero for urban SGD (RRC, 2013; Fry, 2013).

The City of Denton is in the north of DFW and at the Barnett's eastern edge. In 2002, Denton became one of fracking's first municipal hosts; in November 2014, it also became the first Texas city to ban hydraulic fracturing. With over a decade of SGD, Denton provides one of the few settings to examine how longer-term urban drilling affects communities both socially and economically. In this paper, we use an environmental justice framework and data on mineral property values from the Denton Central Appraisal District and gas well location data from the Railroad Commission of Texas (RRC) to examine the distribution of costs and benefits of SGD in Denton. Results show that the vast majority of direct SGD economic benefits are distributed elsewhere, while the social and environmental burdens remain local. In addition, these results about distribution of costs and benefits raise important questions about power and participation in decision-making processes.

2. The shale gas boom

2.1. Fracking and urban drilling

The Barnett Shale accounted for nearly 66% of U.S. shale gas production in the 2000s (EIA, 2011), and in terms of area, proven reserves, and total production to date, the Barnett is Texas' largest shale play. Many of the Barnett's most productive fields – and those initially targeted for production – underlie DFW. Some of the first urban wells were drilled in Denton and Tarrant Counties, which are demographically two of the fastest growing counties in the nation and geologically two of the Barnett 'core counties' where gas reserves are richest (RRC, 2013; US Census Bureau, 2011). This creates a perfect storm where surface development meets mineral extraction. At the start, drilling occurred on the outskirts of cities, but beginning in 2001 operators applied for permits to frack in more densely populated areas.

Federal power to regulate SGD is limited due to fracking's exemptions from the Safe Drinking Water Act and the Clean Water Act, as well as drilling's exemptions from the National Emission Standards for

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