# The Vulnerability of Polycentricity: The Case Study of Fracking Governance in Pennsylvania

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Prepared for delivery at the Workshop on the Ostrom Workshop (WOW6) conference, Indiana University Bloomington, June 19–21, 2019. 

Polycentric governance is often hailed for its ability to increase stakeholder participation, encourage political innovation and produce more sustainable outcomes when compared to traditional, hierarchical governing systems (Aligica & Tarko, 2012; E. Ostrom, 2001, 2010). While this type of governance may internalize externalities by expanding governance boundaries, polycentricism is criticized for bureaucratic inefficiencies and increased complexity (Aligica & Tarko, 2012). The conversation surrounding appropriate government systems must include discussion of rules and political values in addition to questions of efficiency (Aligica & Tarko, 2012). Using Pennsylvania's natural gas development as a case study, we explore the positive and negative aspects of polycentric governance. Pennsylvania is an interesting case study of polycentricity due to the state's unique approach to natural gas industry taxation and a patchwork of stakeholders competing for influence (Christopherson & Rightor, 2012). The lack of empirical work on the impacts of polycentric governance on different community development strategies in general and within the energy infrastructure space in particular (Goldthau, 2014), allows for the development of evaluation tools for energy governance.

**POLYCENTRIC GOVERNANCE**

Single decision-making centers or centralized systems can fall victim to the complexity of their own hierarchical structure; such as the state government, state agency or municipal government (V. Ostrom, Tiebout, & Warren, 1961, p. 837). Their centralized nature tends to foster complex channels of communication between different decision-making centers, potentially leading to governmental unresponsiveness to localized interests. Polycentric governance serves as an alternative approach for social-ecological systems that transcend political boundaries (McGinnis & Ostrom, 2012). Polycentric governance encompasses both federalism (Murtazashvili & Piano, 2018), where the division of powers between individual centers is encouraged, and network governance theory (Jones, Hesterly, & Borgatti, 1997), which emphasizes informal social system solutions such as privatization or public/private partnerships to approach collective action problems. Polycentric governing systems encompass diverse systems including public, private, and voluntary sectors such as environmental organizations or grassroots organizers engaging collaboratively with one or more government jurisdiction and government jurisdictions with overlapping functions and responsibilities

(McGinnis & Ostrom, 2012). Polycentric governance structures are defined as having various overlapping, independent decision-making centers often made up of public, private, and quasi-governmental entities (V. Ostrom et al., 1961) which share power between scales (Sovacool, 2011). Governance levels can be distributed vertically and/or horizontally (Newig & Fritsch, 2009), where no one authority has an ultimate monopoly of power (Aligica & Tarko, 2012).

Because polycentric systems include multiple decisions-making center, in contrast to monocentric systems which vest the power of setting and enforcing rules within a single decision structure, they may be more effective at solving collective action problems (Aligica & Tarko, 2012). The provisioning of public goods and services may be more efficient under a polycentric system due to its tendency to increase innovation and participant engagement. As the lack of public participation at local levels can deter cooperation and foster free-riding behavior (E. Ostrom, 2010, p. 552). Additionally, polycentric systems are less susceptible to external shocks due to actor role redundancy, access to local knowledge and potential threats to the system, ability to rapidly analyze implemented policy changes and learn from the successes and failures of other system governing units (E. Ostrom, 2001). Because polycentric systems extend beyond the functional or territorial bounds of a single jurisdiction, they are able to address the needs and diversity of preferences of a wider community (V. Ostrom et al., 1961). The governance systems enables more efficient provision of goods and services due to opportunities to contract with more efficient producers, as well management of externalities that span government and/or spatial scales (Aligica & Tarko, 2012).

Much of the polycentric literature has focused on its efficiency in the abstract (notable exceptions include for example the edited volume by McGinnis (2012), policing literature by E. Ostrom and colleagues (i.e. E. Ostrom & Whitaker, 1973) and environmental governance literature (e.g Carlisle & Gruby, 2017; Epstein et al., 2015). Building upon the empirical and theoretical literature, we have developed a set of evaluation criteria to assess the effectiveness of polycentric governance strategies.

*Table 1 table comparing approaches taken by academics to evaluate the level of effectiveness of polycentric strategies.*

| Evaluation Criteria | System Strengths | System Stressors |
|---|---|---|
| ***Policy Goals*** | Adaptability predisposes system to success (Goldthau, 2014; E. Ostrom, 2008) | Unclear evaluative criteria (Su et al., 2017) |
| | | Lack of unified planning (Su et al., 2017) |
| | | Patchwork of regulations across jurisdictions adds difficultly/confusion in understanding relevant policies (Goldthau, 2014) |
| ***Equity Among Users*** | Ability for governmental units to form own rules (Carlisle & Gruby, 2017; E. Ostrom, 2008) | Increased governmental complexity and need to mobilize additional actors (Goldthau, 2014) |
| | | Unclear role definition (Aligica & Tarko, 2012) |
| ***Inclusivity of Stakeholders*** | Ability to address needs of wider community (Goldthau, 2014; V. Ostrom et al., 1961; Warner & Shapiro, 2013) | Poor coordination or lack of cooperation stakeholders (Carlisle & Gruby, 2017) |
| | Increased participation (Aligica & Tarko, 2012) | Shift in blame when policy goals fail (Carlisle & Gruby, 2017) |
| | Increased policy innovation (Carlisle & Gruby, 2017) | Role redundancy and need to mobilize additional actors (Aligica & Tarko, 2012; Warner & Shapiro, 2013) |
| | | Absence of clearly defined goals (Sovacool, 2011; Su et al., 2017) |
| ***Information Distribution*** | Access to local knowledge/threats to system (Murtazashvili & Piano, 2018; E. Ostrom, 2008) | Inability for policy-makers to access relevant information (Sovacool, 2011) |
| | Rapidly analyze policy changes (Sovacool, 2011) | Inability to support larger market exchanges or internalize policy externalities at local scales (Sovacool, 2011) |

In summation, polycentric governance approaches provide unique opportunities to incorporate local knowledge into effective policy designs that are able to better assess strategy successes and failures rapidly without compromising the entire system. Local governments are able to craft and assess policy implications at a smaller scale with comparably less capital or resources that would be needed at a higher level of government. With the potential of localities approaching collective action issues with different policy initiatives, political experimentation can occur without compromising the entire state-system. State governments can then adequately weigh policy alternatives without high capital investment. These systems are particularly effective for resources and resource externalities that present themselves at multiple scales, due to the political adaptability of the system and ability to incorporate the desires of the wider public. We test these aspects: policy goals, equity among users, inclusivity of stakeholders and information distribution in the case of natural gas governance in

Pennsylvania in order to evaluate current governance strategies. As one of the initial movers of natural gas policy in the United States (Rabe & Borick, 2013), Pennsylvania has the opportunity to serve as a model for natural gas governance.

**APPROACH**

Using archival documents and secondary data we conduct an institutional analysis (Ostrom 2005) of oil and gas governance in Pennsylvania. First, we describe the existing nature of oil and gas policies in Pennsylvania based upon archival analyses. Then we utilize content analysis of interviews with key policymakers, stakeholders, and policy experts to assess emergent themes from inductive coding (Guest, MacQueen, & Namey, 2012), as well as the codes identified in Table 1 to assess polycentric governance effectiveness known as the stated policy goals, equity among users, inclusivity of stakeholders and information distribution.

The following key stakeholders were identified due to their relation to the regulation of the natural gas industry and it is their viewpoints are analyzed. The resulting thirteen stakeholder groups were interviewed as a part of this protocol and are shown in Table 2.

*Table 2 Displays key natural gas stakeholders identified.*

| Pennsylvania Natural Gas Stakeholders Interviewed | | |
|---|---|---|
| **State Agencies** | Office of Oil and Gas Management (DEP) | Crafts regulation, guidance and policy for oil/gas development, manages all permitting |
| | Public Utility Commission | Collection and redistribution of impact fee |
| | Department of Conservation and Natural Resources | Manages all oil, gas, coal, water related issues on state lands |
| | Department of Community and Economic Development | Provides funding to local governments and incoming businesses to promote economic development |
| | Center for Rural Pennsylvania | Informs legislative decisions through urban-rural dynamic research |
| **Associations** | PA Chamber of Business and Industry | Represents state business industry interests |
| | Leading Industry Groups | Represents oil/gas companies n=2 |
| | County level representative | Represents county interests |
| | PA Farm Bureau | Works with farming communities, provides information on oil/gas permitting to mineral lease holders |
| **Environmental Groups** | PA Environmental Groups | Represents environmental interests, n=2 |
| **Economic Development** | Municipal Economic and Land Development Consultant | Provides counties information on economic development policy options that do not employ their own planner |

Interviewees were asked general questions surrounding the role their stakeholder group plays in either regulation, facilitation or information dissemination of fracking, group opinions on current policy effectiveness and implementation strategies, and the future of natural gas development. All interviews were recorded and transcribed for interview content analysis. Structural coding was used to address the concerns of Pennsylvania's governance strategy as highlighted by Hudgins and Poole (2014) and Rabe and Borick (2013) as well as in-vivo, inductive coding to identify present meta-themes (Guest et al., 2012).

The system's evaluation is based on findings from policy documents, literature and key informants which are then supported or unsupported by the generalized stakeholder viewpoint derived from field interviews. Five categories for evaluation were chosen. The first being the original policy goals as stated in Act 13, consistent with the methods used in case studies completed by Su et al. (2017) and Sovacool (2011) and conceptualization of Aligica and Tarko (2012). Equity among users, inclusivity of stakeholders and information distribution were

deductively coded based on established evaluative criteria supported by academic works previously listed in Table 1. Accountability was inductively coded as a present meta-theme.

**INSTITUTIONAL ANALYSIS**

High-volume horizontal hydraulic fracturing (also known as fracing, or more commonly fracking) is a type of advanced stimulation process, which, when accompanied with horizontal drilling, enables the recovery of tight, underground shale reserves. These technical advancements have transformed natural gas extraction into a commercially viable and practical energy source. Unconventional oil and gas wells are drilled first vertically and then horizontally, ranging up to 3000 ft, in order to maximize natural gas capture. Mixtures of water, proppants and chemical additives are pumped into the bore at high quantities and pressures to create fractures in the rock, releasing natural gas. The gas is then collected at the surface, preceded by flowback or the residuals from the chemical mixture initially used to stimulate the well (Chen, Al-Wadei, Kennedy, & Terry, 2014). There are a number of shale plays or natural gas deposits located throughout the United States, the primary shales examined as a part of this analysis include the Marcellus and Utica Shales. These overlapping deposits are located in the eastern United States, primarily in the Appalachia region (southern New York, Pennsylvania, Ohio and West Virginia). In this study, we focus on polycentric governance of unconventional oil and gas development in Pennsylvania.

As of 2017, 34 of Pennsylvania's 67 counties have at least 1 active unconventional, natural gas producing well (PA Department of Environmental Protection, 2019a), thirty of which counties are categorized as "rural" by the Center for Rural Pennsylvania (Center for Rural Pennsylvania, 2015). A map of both conventional and unconventional active gas wells by county is shown in Figure 1, wells strictly used for oil extraction or those that extract a combination of both oil and

gas are excluded from this figure. A map of population density for Pennsylvania is shown in Figure 2.

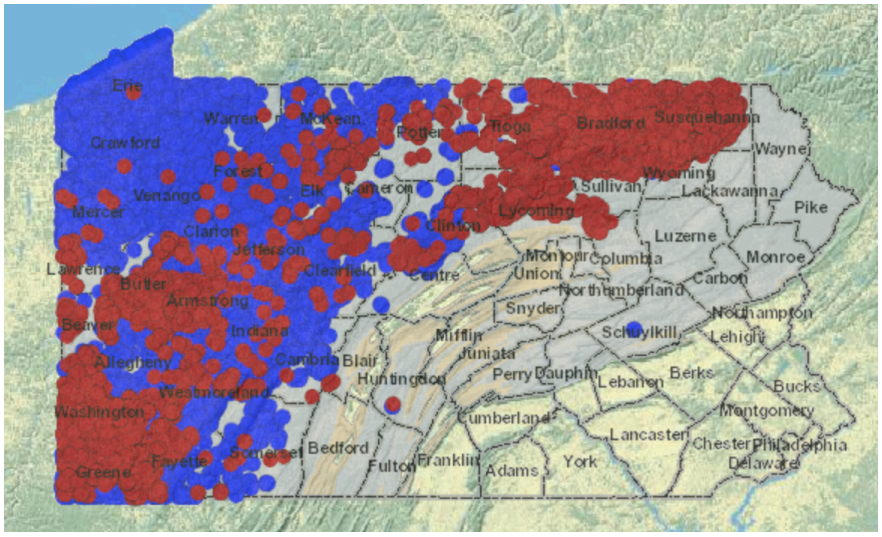


*Figure 1 Map from the Pennsylvania Department of Environmental Protection displaying active unconventional gas wells in red and active conventional gas wells in blue by county. Shale plays are displayed by different shading: The Utica shale play is shown by the tan shading and the Marcellus shale play in gray* (PA Department of Environmental Protection, 2019b).

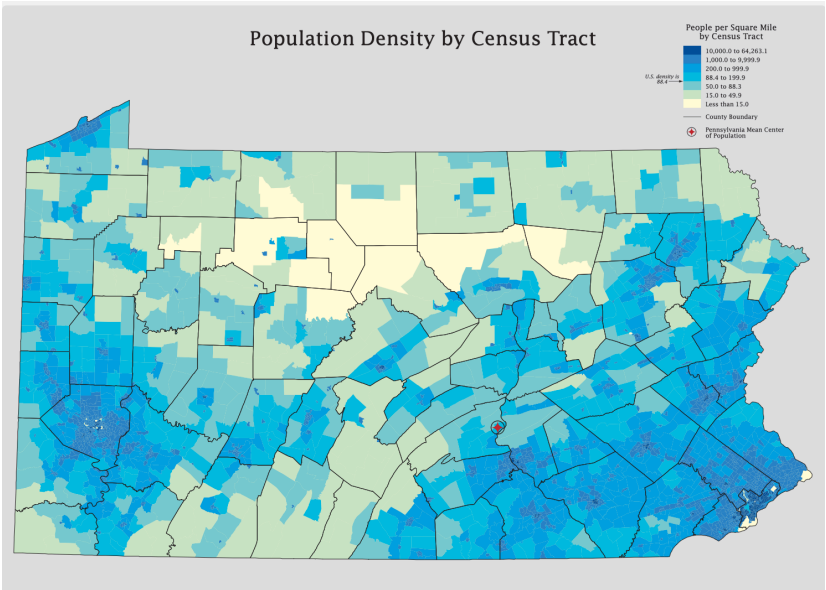


*Figure 2 Map of population density for Pennsylvania with more dense areas being noted with darker shades of blue* (United States Census Bureau, 2010)

The rural aspect of natural gas extraction comes into play when analyzing both natural gas impacts and state level representation. We now look into environmental, social and infrastructure impacts and later analyze these impacts in the context of rural-urban dynamics.

*Nature of the Good*

Natural gas exploration and production do not come without risks and costs to both local and global communities. Negative environmental externalities include methane gas emissions and air pollution which occur at the well pad and expand spatially which may impact surrounding areas without drilling activity, risks of increased earthquake activity due to waste injection wells which typically are sited away from drilled wells, clearing of natural habitat for transmission pipelines and well siting, and depletion and contamination of local fresh water reserves (Christopherson & Rightor, 2012; Energy Information Administration, 2018b; Leiter, 2015). Underground aquifers or water wells located within close proximity to oil and gas production sites run the risk of contamination from migrating chemicals used in the extraction process (Energy Information Administration, 2018a). Secondary impacts include a rising number of incidents of spills and explosions stemming from processing and transportation of materials (C. E. Davis, 2017).

Additional stressors that result of rapid natural gas development present themselves in decreases in affordable housing due to the temporary population increases of shale workers from Texas and Oklahoma (Christopherson & Rightor, 2012). Temporary increases in population may also place stressors on public transportation, health and human services, and law enforcement (Brasier et al., 2014). Temporary economic development dependent on costs of natural gas production and commodity prices have been documented to increase alcohol abuse, domestic violence, increased mental illness and rising divorce rates. These social impacts have the potential to disrupt the "social fabric" of long-term residents in rapidly developing communities (Brasier et al., 2014)

Large and frequent trucking associated with development places additional stress on roadways within and between municipalities. As development, particularly in the state of Pennsylvania, tends to occur in rural areas who have older, less traveled roads and other types of hard infrastructure, such as bridges and highways. Most rural roads in the Marcellus Shale region were not constructed to support large truck roads and weather patterns (winter and spring

thaw and subsequent road contraction conditions) compromise the integrity of the roadways. Increased trucking patterns place an undue burden on community roads (Christopherson & Rightor, 2012). These burdens are typically passed onto the taxpayer rather than industry as much of truck transportation occurs on public roads (Christopherson & Rightor, 2012). Focusing on the deterioration and stress of the roadways, potential air quality and water quality reductions, and earthquake risks, we see local public goods under stress, while the use of water is a common pool resource issue. In prior research, local public goods and common pool resource issues, especially those issues that do not fit within existing jurisdictional boundaries have been managed with polycentric systems (Goldthau, 2014).

***Existing Institutions (or Absence of Institutions)***

Often water and air quality issues are dealt with by federal legislation, but oil and gas lobbying led to the passing of the Energy Policy Act of 2005, later termed the "Halliburton loophole". This loophole created industry exemptions from safety provisions in several federal environmental laws, including the Safe Water Drinking Act, Clean Water Act, and Resource Conservation and Recovery Act. As well as expanded exemptions of the Comprehensive Environmental Response, Compensation, and Liability Act (Powers, 2011). Some fracking industry practices would otherwise have been covered under these regulations (Burger, 2013). The absence of federal regulation has been replaced by "state opacity and heterogeneity" (Leiter, 2015, p. 108), leading to a patchwork of policies governing the nationwide industry (Powers, 2011).

Within states the distribution of decision-making authority, local and state control, varies with many, often western states enabling broad authorities through home rule CITE. In contrast, the state of Pennsylvania reserves the right to preempt municipal decisions under Dillion's rule. Historically in Pennsylvania, all local government authority was derived from the state and thus local action was only allowable in ways granted by the state constitution or state law. This differs from a home-rule system, where municipalities are able to address anything outside of the prescribed roles of the state government (C. Davis, 2014). While initially unable to adopt a

home-rule charter, Pennsylvanian municipalities are now allowed to opt-in to home rule and enact regulatory decisions, given those decisions do not conflict with prohibited actions defined by the state constitution (Arnold & Holahan, 2014; C. Davis, 2014). Out of the 67 counties in PA, 10% have enacted a home-rule charter (PA Department of Community & Economic Development, 2018). While only 4% of the 2,562 municipalities, which in PA encompasses cities, townships, boroughs or towns, are governed under home-rule (PA Department of Community & Economic Development, 2018). However, local and state officials frequently disagree on the boundaries of local and state governance and the extent at which the state government can preempt municipal decision making (C. Davis, 2014; Hicks & Weissert, 2018).

The struggle of power between levels of government is seen through the passage of Act 13: The Oil and Gas Act and court decisions that soon followed its implementation. Pennsylvania is the nation's second-largest producer of natural gas and maintained similar levels of production and has retained this title for four years. Despite major development in the energy sector between 2008-2011, Pennsylvania did not impose additional regulations on oil and gas operators until 2012. Leading up to this passage, oil and gas operators were regulated under the Oil and Gas Conservation Law of 1961 and the Solid Waste Management Act of 1980. While both laws collected fines for operators who breached discharge requirements and/or operated without permits, neither collected an additional tax or fee (Oil and Gas Conservation Law, 1961; Solid Waste Management Act, 1980).

In 2012 the state passed Act 13: The Oil and Gas Act, which updated preexisting regulations and specifically targeted aspects of the natural gas industry that were not regulated under general waste disposal and water quality conditions of the Oil and Gas Conservation Law or the Solid Waste Management Act. The goal of this enacted law is to:

1) Permit "optimal development" of oil and gas resources that comply with current health, safety and environmental regulations
2) Protect the safety of personnel working for oil and gas production companies and citizens living in the surrounding area of development

3) Protect resources, environmental rights and values established by the Pennsylvania state constitution (Oil and Gas Act, 2012)

Act 13 was adopted for a variety of reasons, including rapid natural gas exploration and extraction and pressures stemming from industry lobbyists ("Environmental Group," 2018) and state budgetary concerns and the ability for the industry to close funding gaps through additional taxation ("Municipal Economic and Land Development Consultant," 2019; "Public Utility Commission," 2018). The act outlines specific rules for permitting; well location, restoration, and reporting; underground storage; eminent domain; and enforcement and remedies. This act also protects hydraulic fracturing company disclosures regarding proppants and lubricants used during the extraction process (Oil and Gas Act, 2012), given the toxic mix of chemicals used during the injection process the inability of local government officials to access these blends can impede decision making.

To compensate the state and local communities for environmental degradation associated with oil and gas development, an impact fee is administered and collected by the PA Public Utility Commission; the monies are then deposited into the Unconventional Gas Well Fund (Oil and Gas Act, 2012). An impact fee is different than a severance tax, a severance tax is based on the amount of natural gas or non-renewable resource that is extracted at the wellhead and typically goes to the state or local government (C. E. Davis, 2017) and is more widely used as a form of natural gas taxation (cite). The PA impact fee is calculated based on the number of wells drilled in that year and the price of natural gas (Oil and Gas Act, 2012). Pennsylvanian counties are required to pass their own ordinance enacting the impact fee in order to receive distributed funds from the state (Oil and Gas Act, 2012). In addition to this stipulation, impact fee funds may be withheld from local governments by the state if a local ordinance is determined to be inconsistent with any of the state land provisions detailed in Act 13 (Oil and Gas Act, 2012). Following fee distribution to county conservation districts, PA Fish and Boat Commission, Emergency Management Agency, Office of State Fire Commissioner, and Department of Transportations, 60% of the remaining impact fee revenue is appropriated to

counties and municipalities where newly developed unconventional wells are located. Allocated funds are based on the number of wells within the municipality and the total number of wells located within the Commonwealth (Oil and Gas Act, 2012).

Redistributed municipal funds are restricted in use and can only to be used for purposes associated with natural gas production including infrastructure maintenance; water systems; emergency preparedness; environmental programs and preservation; tax reductions; safe and affordable housing projects; record management and geographic information systems; delivery of social services; judicial services; career and technical centers for training within the oil and gas industry; local or regional planning (Oil and Gas Act, 2012). Municipalities are not required to report exactly how the funds are being used but rather generally under which fund they are depositing the money. While impact fees are collected from natural gas producing counties and municipalities, not all money collected to redistributed to these counties. Impact fees are redistributed to all counties in the Commonwealth including non-producing counties (Oil and Gas Act, 2012) such as Philadelphia county, Chester county or Montgomery county.

Pennsylvania has previously granted local governments a considerable amount of authority regarding local land use decisions (Rabe & Borick, 2013). This autonomy was stripped under the original passage of Act 13 where the state government prohibited local governments from regulating natural gas producers via zoning and removed local government ability to challenge state decisions of shale gas well permits (Oil and Gas Act, 2012). Passed with the intention of easing hinderances felt by the natural gas industry by removing potential local obstacles and creating uniform standards for gas development (Rabe & Hampton, 2015), this policy hinders the ability of local governments to challenge or modify state regulations for well siting and operations, restrict well site hours of operation, review well pad setback distances from residential or commercial areas, and impose additional constraints more stringent than imposed at the state level. Under Act 13, municipalities cannot treat hydraulic fracturing any different than they would another type of industrial activity (Oil and Gas Act, 2012). Thus, this

piece of legislation centralizes state governing authority and largely removes input from municipalities (Rabe & Borick, 2013, p. 332)

Some of the contingences set forth in the original passing of Act 13 have been repealed since the law's initial passing. The Pennsylvania Supreme Court found portions preempting local ordinances regarding oil and gas operations to be unconstitutional in 2013, with the decision in *Robinson Township v Commonwealth of Pennsylvania.* This decision granted local governments the ability to regulate oil and gas development based on zoning without granting localities the option to rule out fracking entirely. The court concluded that imposing statewide oil and gas industrial standards decreases environmental and habitability protections in sensitive districts, allowing for degradation of public resources (*imbd, 2012)*. *Robinson Township v Commonwealth of Pennsylvania* is one of the few cases that has impacted the fracking governance strategy employed within the state. In sum, localities are able to regulate the siting location of wells while the state regulates environmental protection provisions and the majority of local public goods and CPR impacts through the collection and redistribution of impact fees.

**ASSESSMENT OF PENNSYLVANIA'S GOVERNANCE STRATEGY**

While aspects of fracking fall within preexisting oil and gas statutes, technical aspects of extraction have outpaced legislation capabilities of a number of natural gas producing states leaving regulation gaps. Pennsylvania was considered an "early-mover" in a type of legislation that aimed to produce a detailed, far reaching regulation (Rabe & Borick, 2013). They have since been criticized for the method by which Act 13 was crafted and outputs which ultimately restrain agency innovation and local engagement. Rabe and Borick (2013) and Hudgins and Poole (2014) have called attention to system failures including the lack of stakeholder participation in the crafting of the legislation and reaches of state preemption.

*Evaluation: Act 13 Goals*

Original goals of PA's oil and gas policies are stated in the act as:

> The permitting of optimal development of oil and gas resources that comply with current health, safety and environmental regulations; Protect the safety of personnel working for oil and gas production companies and citizens living in the surrounding area of development; Protect resources, environmental rights and values established by the Pennsylvania state constitution (Oil and Gas Act, 2012).

There are conflicting viewpoints about the overall policy approach. State government officials, industry representatives and economic development officials tend to support current regulations whereas local representatives and environmental groups advocate for stricter environmental regulations and increased municipal autonomy. Both those in favor of and opposed to development, are cited by opposing parties as using "fearmongering" tactics. Individuals with a political agenda can "totally derail everything" ("Trade Association," 2018). Without a broader sense of goals that extend beyond compliance with existing regulations and protection of human health and the environment, the evaluation of Act 13 from original goals is difficult.

*Evaluation: Equity Among Users*

The wording of Act 13 strictly limits municipalities' power, which was reaffirmed by a member at the County Commissioner's Association who expressed that local governments cannot "really regulate" the industry. There have been numerous issues within communities regarding natural gas transmission line development because it is difficult to stop any type of development without having state or federal permits entirely withheld from transmission companies ("PA County Commissioners Association," 2019). Local government engagement and public participation has been restricted. The state government prohibits municipal challenges of state issued permits, the threat of legally withholding impact fee funds from local governments, uniform standards that do not necessarily fit with the needs of the local citizens and environment as well as by preventing the disclosure of proprietary chemicals used during the fracking process (Oil and Gas Act, 2012; Rabe & Borick, 2013). These steps have centralized

authority under “state auspices” and “eviscerated the possibility of constructive engagement” between state and local governing bodies (Rabe & Borick, 2013, p. 332).

Despite these concerns, the County Commissioners Association representative does not find the local government impact fee investment categories restrictive. They have not come across an investment opportunity that they were unable to fund due to the restrictive spending categories (“PA County Commissioners Association,” 2019). This opinion contrasts Rabe & Borick’s (2013) claims surrounding agency and governmental restrictions on engagement due to impact fee funding limitations.

General worries surround the political power wielded by the natural gas industry. The “natural gas industry is extraordinarily powerful in PA politics and it’s a pretty tall task to try to get things though because there’s a lot of built in opposition to anything that they see as harming the gas industry” (“Pennsylvania Environmental Group,” 2018). Leading industry groups lobby extensively for natural gas-friendly policies and educate elected officials as to the importance of competitive development policies that to do stray potential development due to burdensome environmental regulations (“Leading Industy Group,” 2019). Their reach is noted in the crafting of Act 13 as well.

*Evaluation: Inclusivity of Stakeholders*

Hudgins and Poole (2014) posit that political elites representing pro-fracking interests dominated the crafting of Pennsylvania’s Act 13, going as far as claiming the crafting of the regulation illustrates the “anti-democratic nature of the relationship between capital and the state on the one hand and society on the other” (Hudgins & Poole, 2014, p. 310). The governmental advisory commission that crafted Act 13 included a limited range of expertise. Of the 31 experts included in the commission, Governor Tom Corbett appointed one academic, previously funded by the drilling industry; ten governmental employees; 11 industry representatives, four of which resided outside of Pennsylvania; four environmental group members; and five civil society group members. Applied social scientists and public health

officials were excluded from the commission (Hudgins & Poole, 2014) despite public concerns of water resource contamination and threats to public health that may result from the drilling process (Hudgins & Poole, 2014; Rabe & Borick, 2013).

Various stakeholder groups raised concerns regarding the crafting of Act 13, as similarly stated by Hudgins and Poole (2014). An interview with a prominent Pennsylvanian environmental group revealed that during the process of the state congress-led stakeholder consultation, not all associations were privy to the full proposed bill. The individual reported that the environmental group was only shown the environmental provision proposals and not the entirety of the legislation; it was not until after the bill was "quickly proposed and passed" that parties were able to view additional sections of the legislation ("Pennsylvania Environmental Group," 2018). When other stakeholders were prompted about the crafting of Act 13, they did not necessarily share this sentiment. A member of the County Commissioners Association felt as though they did not need to be informed on areas such as setback requirements because "it does not concern them" ("PA County Commissioners Association," 2019). However, it was the environmental group's view that if the complete version was presented prior to its passing, the association would have advised differently because the group did not support state preemption sections ("Pennsylvania Environmental Group," 2018). A municipal economic and land development consultant agreed that the policy formation process was troublesome, going so far as to claim that "I'm not sure Act 13 was drafted properly. I think it was a reach too far for the industry when they made it. I don't think they left enough room for localities to adapt" ("Municipal Economic and Land Development Consultant," 2019). This viewpoint supports that of Rabe and Borick (2013) in that Act 13 did not leave much room local engagement and adaption potential.

When asked to identify key stakeholders during the policy formation, respondents provided an array of responses. However, only half mentioned public opinion and/or or local government input. Typical responses to this question yielded "definitely industry", government agencies such as the Department of Environmental Protection or the Department of Oil and Gas

Management, academia and environmental players. A member of the Office of Oil and Gas Management Office offered that public input was solicited in the PA bulletin, from their point of view the majority of public stakeholder involvement stemmed from regions with prominent levels of development ("Deparment of Oil and Gas Management," 2018). Additional clarification was provided as to how and why municipal input was received, outside of direct consultation from the County Commissioners Association. It was around initial rapid development that municipal input was received by "sophisticated" county conservation districts, or sub-jurisdictions tasked with managing environmental issues within their respective county. These districts, located within counties, are charged with overall promotion and protection of the safety and general welfare of constituents within counties, which in the case of natural gas development includes permitting. According to the interviewee, sophisticated districts were those that were capitalizing on gas development and experience in increased permitting ("Department of Conservation and Natural Resources," 2018). "Less sophisticated" areas quickly became overwhelmed with the permitting of wells. These areas are typically rural and have not had prior experience with high volumes of land use permitting, typically only seeing a couple of permit requests per year and were less likely to ask for assistance due to a lack of information on state requests/policies.

Increased permitting activity within sophisticated districts led them to ask county commissioners and congressional representatives for additional personnel and funding to tackle local concerns. Acknowledging that both sophisticated and unsophisticated district leaders do not have a lot of "cache", the needs of unsophisticated districts received less attention("Department of Conservation and Natural Resources," 2018). This was the only method by which local input was (indirectly) received with regards to funding needs, required infrastructure updates and strains on public services, for county government and its respective leaders are located "down the food chain a bit" ("Department of Conservation and Natural Resources," 2018).

Respondents were then explicitly asked about the level of municipal involvement in the policy formation process. A County Commissioner's Association member commented that due to strong relationships between the local government association and members of the senate committee tasked with researching potential policy impacts, the committee called on the association multiple times to review the piece of legislation ("PA County Commissioners Association," 2019). The Association led a number of hearings statewide to speak with local officials experiencing high levels of natural gas development within their jurisdiction to receive input, this later informed the commentary expressed during senate hearings.

*Evaluation: Information Distribution*

A member of the Department of Conservation and Natural Resources team attributes initial challenges experienced by counties to a general lack of knowledge of fracking practices. This was compounded by a rural desire for economic gains and unforeseen potential hardships associated with development. At the beginning of the initial boom, it was those who were located in shale plays with substantial development that accrued knowledge on fracking practices. Individuals in large population hubs with little to no prevalence of fracking operations, such as Pittsburg and Philadelphia, were "out of the know" ("Department of Conservation and Natural Resources," 2018; "Pennsylvania Environmental Group," 2018). According to a member of a leading industry group, this is problematic as the majority of the legislature resides within these population hubs ("Leading Industy Group," 2019) and is only seeing 12% of natural gas development (PA Department of Environmental Protection, 2019a). Urban populations are "deciding the fate of small rural areas who could benefit tremendously" from increased natural gas development ("Municipal Economic and Land Development Consultant," 2019).

The PennState University Extension program has provided a number of information sessions and research support for both individuals, county commissioners, and other state agencies including the state legislature. This has led to more informed farmers regarding leasing options ("Pennsylvania Farm Bureau," 2019). Other organizations have emerged in response to this

rapid development which have worked closely with organizations such as the Department of Community and Economic Development including the Tri-State Shale Coalition, an organization that brings together the governors of PA, OH and WV to align shale development strategies. Based on the analyses of Rabe and Borick (2013) and Hudgins and Poole (2014) and key informant viewpoints, it is difficult to support the notion that the Act 13 policy drafting process adequately weighed stakeholder perspectives. When explicitly asked about community involvement, the Department of Natural Resources representative agreed that municipal involvement in the process was selective and a PA Farm Bureau representative felt their advisory role was limited to solely providing input on local funding needs despite shared environmental concerns ("Department of Conservation and Natural Resources," 2018; "Pennsylvania Farm Bureau," 2019). This, coupled with omissions of municipal participation in the policy process from more than half of the stakeholders interviewed, calls strong attention to a weakness within the system. Power is distorted on multiple scales, which in turn inadequately weighs the viewpoints of all those impacted by natural gas development.

*Evaluation: Accountability*

While considerable lobbying efforts occur at the federal or state level, industry lobbying efforts have been documented at the local level. Environmental groups have voiced concerns regarding Pennsylvania's "weak ethics codes" that allow for local elected officials to vote on any zoning decisions, as long as they do not own the land, regardless of the revenue received by the industry due to individual lease holdings. This "black election money" obfuscates local decisions that in result, foster a sustainable natural gas industry ("Environmental Group," 2018) despite potential local concerns and leaves individuals with little democratic recourse.

Both of the environmental groups interviewed voiced concerns around state reporting ("Environmental Group," 2018; "Pennsylvania Environmental Group," 2018). The state of Pennsylvania does not have good baseline air quality data. The air monitoring program established under the Clean Air Act is geared towards point sources, therefore monitoring is occurring in places like Pittsburgh. Pittsburgh has a moratorium on drilling and therefore is not

experiencing as much or any of the direct impacts of natural gas drilling and production. The study completed by the PA DEP was “largely a joke, it was poorly designed” which has contributed to the poor tracking and air quality testing problem.

The following table outlines and synthesizes aforementioned debates surrounding Act 13’s implementation, providing an evaluation of the state’s polycentric approach to natural gas development.

*Table 3 Synthesis of findings.*

| Presence of Identifiers in Current Governing Framework | | | |
|---|---|---|---|
| **Criteria** | **Secondary Data Findings** | **Generalized stakeholder viewpoint from interviews** | **Evaluation** |
| *Original goals stated in Act 13* | Allows for policy adaptability with regard to changing environmental or human health standards, however criteria and methods of evaluation remain unclear | Majority of stakeholders support effective execution of policy, environmentalists have concerns regarding environmental standards | System strength |
| *Equity among users* | Community representatives from natural gas producing counties support current government/industry relationship, unequal state government representation from natural gas producing counties, not all funding supports natural gas producing counties' growth, restrictions on redistributed fund use, limited ability for local government regulation of the industry | Little mention of underrepresentation of natural gas producing areas in state legislature, majority feel compensation is adequate and are able to fund all needs despite funding restrictions | Inconclusive |
| *Inclusivity of stakeholders* | Lack of municipal involvement in policy formation process, inclusion of multiple environmental groups and trade associations policy during formation process | Lack of consensus on adequate stakeholder involvement | System weakness |
| *Information distribution* | Unable to access chemicals used during extraction process that may threaten human and/or environmental health, public misconceptions of fracking practices and local impacts implies educational and awareness issues | Educational institutions informing lease holders and government leaders, trade associations informing industry of best practices and policy updates, industry informing fracking dense county citizens, current attempts to increase awareness statewide, misconceptions of Act 13 regulations prior to the passing of the bill (ie influential stakeholders only shown portions of the bill) | System strength |
| *Accountability* | Unclear methods of environmental health evaluation | Ethical concerns with "black" local elections, claims of poor DEP air quality testing leading to underreporting of poor air quality | Inconclusive |

In addition to the themes identified prior to conducting the analysis, inductive coding led to the theme of non-traditional roles. These functions include the roles that groups/organizations have filled or served due to a gap in local and state governance. Categories identified as 'non-traditional' roles include services provided by higher education institutions, community involvement by industry individuals or representative groups and regulator-led industry group information sessions. The presence of these roles and overlapping responsibilities of these stakeholders in information dissemination and community involvement justifies our position that natural gas governance in Pennsylvania falls under a polycentric arrangement. These roles have been critical in the local understanding of natural gas extraction and its impacts. While there are systems weaknesses identified under the information sharing category, overall it is considered a strength given the lengths that third parties have gone through to educate the public and other organizations.

The four initial prongs for analysis: original policy stated goals, equity among users, inclusivity of stakeholders and information distribution were identified due to their importance in the functioning of a polycentric arrangement. Authors including Sovacool (2011 and Su et al. (2017) have similarly evaluated arrangements with respect to original policy goals and under this arrangement appears to strengthen the overall system due to goal flexibility. Equity among users and ability for governmental units to form their own rules is another aspect that is critical in the functioning of a governance system (Aligica & Tarko, 2012; E. Ostrom, 2010). Here, despite critical comments from acclaimed authors, actors feel as though they are not underrepresented at the state level and are able to spend distributed funds in the manner that they see fit despite restrictions. There was not however consensus on the inclusivity of stakeholders during the formation of Act 13; despite the inclusion of environmental and trade associations, local government representatives were largely excluded which may lead to inefficient outcomes as a result of continued poor coordination among stakeholders and an elimination of diverse opinions (Carlisle & Gruby, 2017). There are concerns with the method by which stakeholders were consulted during the policy formation process and other information distribution concerns surrounding the disclosure of proprietary chemicals used during the

fracking process, however this aspect is not entirely unique to the state of Pennsylvania with regard to disclosure requirements (Leiter, 2015). Although, it does present complications in effective rule setting if the nature of the regulated good, in this instance fracking chemicals, is not fully understood (Murtazashvili & Piano, 2018). The fifth prong for analysis that was inductively coded for is accountability. While not included in preexisting literature as a necessary component for evaluating polycentric governance arrangements, this emergent theme was deemed critical in the understanding of natural gas governance. Accountability concerns were flagged at the local level due to troublesome lobbying efforts and legislative loopholes and muddles information quality and distribution within the system, as well as complicates the evaluation based on policy goals. Accountability should continue to be emphasized as an important aspect for environmental governance due to its impact on other established methods for polycentric governance evaluation.

**CONCLUSION**

The goal of this analysis is to understand the Pennsylvania's current natural gas governing framework as well as to determine system strengths and weaknesses as a part of a greater institutional analysis. Despite an explicit intent of Act 13 to establish a polycentric natural gas governing framework, the system displays polycentric characteristics. These include power distributions across regulators, required collaboration between stakeholders, spontaneous development and inclusion of civic groups in information dissemination and best management practices, attempts by municipal leaders to craft model ordinances, and newly established collegiate programs aimed at increasing local industry employment. When analyzing Act 13 based on a wider scope of criteria that extend beyond the goals set forth by the regulation, system weaknesses emerge. Equity among users is not realized by those at lower levels of government implying a lack of inclusivity of stakeholders in planning and decision-making.

As it stands there is no one "correct" form of governance: There are conditions that better suit polycentricism for resource governance and attributes that contribute to governing success, aspects that are both incorporated into the understanding of Pennsylvania's natural gas

development strategy. However, it is challenging to thoroughly evaluate the PA governing system due to a lack of literature on polycentric governance performance and time since the initial natural gas boom.

Future work is needed to fully understand the complex relationships within this governing system to either corroborate the findings of Rabe and Borick (2013) and Hudgins and Poole (2014) or confirm the preliminary findings of system strengths as a part of this analysis. As Pennsylvania is not going to "put the genie back in the bottle" when it comes to natural gas development ("Environmental Group," 2018), evaluating the state's governance strategy is critical in the understanding of potential strategies that can lead to governing success and which weaknesses may have the ability to cripple the system.

**REFERENCES**


Aligica, P. D., & Tarko, V. (2012). Polycentricity: From Polanyi to Ostrom, and Beyond. *Governance*, *25*(2), 237–262. https://doi.org/10.1111/j.1468-0491.2011.01550.x

Arnold, G., & Holahan, R. (2014). The federalism of fracking: How the locus of policy-making authority affects civic engagement. *Publius*, *44*(2), 344–368. https://doi.org/10.1093/publius/pjt064

Brasier, K., Davis, L., Glenna, L., Kelsey, T., Mclaughlin, D., Schafft, K., … Rhubart, D. (2014). The Marcellus Shale Impacts Study: Chronicling Social and Economic Change in North Central and Southwest Pennsylvania. *The Center for Rural Pennsylvania*, (1), 1–65.

Burger, M. (2013). Fracking and Federalism Choice. *University of Pennsylvania Law Review*, *161*(150), 150–163. Retrieved from http://www.pennlawreview.com/responses/2-2013/Burger.pdf

Carlisle, K., & Gruby, R. L. (2017). Polycentric Systems of Governance: A Theoretical Model for the Commons. *Policy Studies Journal*, *00*(00). https://doi.org/10.1111/psj.12212

Center for Rural Pennsylvania. (2015). Demographics. Retrieved from http://www.rural.palegislature.us/demographics_about_rural_pa.html

Chen, J., Al-Wadei, M. H., Kennedy, R. C. M., & Terry, P. D. (2014). Hydraulic Fracturing: Paving the Way for a Sustainable Future? *Journal of Environmental and Public Health*, *2014*, 1–10. https://doi.org/10.1155/2014/656824

Christopherson, S., & Rightor, N. (2012). How shale gas extraction affects drilling localities : Lessons for regional and city policy makers. *Journal of Town & City Management*, *2*(4), 1–20.

Davis, C. (2014). Substate federalism and fracking policies: Does state regulatory authority trump local land use autonomy? *Environmental Science and Technology*, *48*(15), 8397–8403. https://doi.org/10.1021/es405095y

Davis, C. E. (2017). Shaping State Fracking Policies in the United States. *State and Local Government Review*, *49*(2). https://doi.org/10.1177/0160323X17712555

Deparment of Oil and Gas Management. (2018).

Department of Conservation and Natural Resources. (2018). Harrisburg.

Energy Information Administration. (2018a). Natural Gas. Retrieved from https://www.eia.gov/dnav/ng/hist/n9050us2a.htm

Energy Information Administration. (2018b). Natural Gas and the Environment. Retrieved September 4, 2018, from https://www.eia.gov/energyexplained/?page=natural_gas_environment

Environmental Group. (2018).

Epstein, G., Pittman, J., Alexander, S. M., Berdej, S., Dyck, T., Kreitmair, U., … Armitage, D. (2015). Institutional fit and the sustainability of social-ecological systems. *Current Opinion in Environmental Sustainability*, *14*, 34–40. https://doi.org/10.1016/j.cosust.2015.03.005

Goldthau, A. (2014). Rethinking the governance of energy infrastructure: Scale, decentralization and polycentrism. *Energy Research and Social Science*, *1*, 134–140. https://doi.org/10.1016/j.erss.2014.02.009

Guest, G., MacQueen, K. M., & Namey, E. E. (2012). Comparing Thematic Data. In *Applied Thematic Analysis* (pp. 161–186).

Hicks, W. D., & Weissert, C. (2018). Home Rule Be Damned: Exploring Policy Conflicts between

the Statehouse and City Hall. *PS - Political Science and Politics*, *51*(1), 26–37. https://doi.org/10.1017/S1049096517001421
Hudgins, A., & Poole, A. (2014). Framing Fracking: Private Property, Common Resources, and Regimes of Governance. *Journal of Political Ecology*, *21*, 303–319. https://doi.org/doi:10.2458/v21i1.21138
Jones, C., Hesterly, W. S., & Borgatti, S. P. (1997). A General Theory of Network Governance : Exchange Conditions and Social Mechanisms. *Academy of Management Review*, *22*(4), 911–945.
Leading Industy Group. (2019). Tempe, AZ.
Leiter, A. C. (2015). Fracking, Federalism, and Private Governance. *Harvard Environmental Law Review*, *1*(107), 30. https://doi.org/10.1533/9781845699789.5.663
McGinnis, M. D., & Ostrom, E. (2012). Reflections on Vincent Ostrom, Public Administration, and Polycentricity. *Public Administration Review*, 15–25. https://doi.org/10.111/j.1540-6210.2011.02488.x.Refl
Municipal Economic and Land Development Consultant. (2019). Tempe, AZ.
Murtazashvili, I., & Piano, E. E. (2018). Governance of shale gas development: Insights from the Bloomington school of institutional analysis. *Review of Austrian Economics*, 1–21. https://doi.org/10.1007/s11138-018-0424-5
Newig, J., & Fritsch, O. (2009). Environmental governance: Participatory, multi-level - And effective? *Environmental Policy and Governance*, *19*(3), 197–214. https://doi.org/10.1002/eet.509
Oil and Gas Act (2012).
Oil and Gas Conservation Law (1961).
Ostrom, E. (2001). *Vulnerability and Polycentric Governance Systems*. *Newsletter of the International Human Dimensions Programme on Global Environmental Change*.
Ostrom, E. (2008). Doing Institutional Analysis: Digging Deeper than Markets and Hierarchies. In *Handbook of New Institutional Economics*.
Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change*, *20*(4), 550–557. https://doi.org/10.1016/j.gloenvcha.2010.07.004
Ostrom, E., & Whitaker, G. (1973). Does Local Community Control of Police make a Difference ? Some Preliminary Findings. *American Journal of Political Science*, *17*(1), 48–76.
Ostrom, V., Tiebout, C. M., & Warren, R. (1961). The Organization of Government in Metropolitan Areas: A Theoretical Inquiry. *American Political Science Review*, *55*(04), 831–842. https://doi.org/10.1017/S0003055400125973
PA County Commissioners Association. (2019). Tempe.
PA Department of Community & Economic Development. (2018). *Home Rule in Pennsylvania*.
PA Department of Environmental Protection. (2019a). DEP Office of Oil and Gas Management Wells Drilled by County.
PA Department of Environmental Protection. (2019b). PA Oil and Gas Mapping. Retrieved from http://www.depgis.state.pa.us/PaOilAndGasMapping/OilGasWellsStrayGasMap.html?
Pennsylvania Environmental Group. (2018).
Pennsylvania Farm Bureau. (2019). Tempe, AZ.
Powers, E. C. (2011). Fracking and Federalism: Support for an Adaptive Approach that Avoids

the Tragedy of the Regulatory Commons. *Journal of Law and Policy*, *19*(913). https://doi.org/10.1533/9781845699789.5.663

Public Utility Commission. (2018).

Rabe, B. G., & Borick, C. (2013). Conventional politics for unconventional drilling? Lessons from Pennsylvania's early move into fracking policy development. *Review of Policy Research*, *30*(3), 321–340. https://doi.org/10.1111/ropr.12018

Rabe, B. G., & Hampton, R. L. (2015). *Taxing Fracking: The Politics of State Severance Taxes in the Shale Era*. *Center for Local, State, and Urban Policy Working Paper Series* (Vol. 34). https://doi.org/10.1111/ropr.12127

Robinson Township v Commonwealth of Pennsylvania (2012).

Solid Waste Management Act (1980). United States.

Sovacool, B. K. (2011). An international comparison of four polycentric approaches to climate and energy governance. *Energy Policy*, *39*(6), 3832–3844. https://doi.org/10.1016/j.enpol.2011.04.014

Su, S., Liu, Z., Xu, Y., Li, J., Pi, J., & Weng, M. (2017). China's megaregion policy: Performance evaluation framework, empirical findings and implications for spatial polycentric governance. *Land Use Policy*, *63*, 1–19. https://doi.org/10.1016/j.landusepol.2017.01.014

Trade Association. (2018). Harrisburg, PA.

United States Census Bureau. (2010). 2010 Census: Pennsylvania Profile. Retrieved from https://www2.census.gov/geo/maps/dc10_thematic/2010_Profile/2010_Profile_Map_Pennsylvania.pdf

Warner, B., & Shapiro, J. (2013). Fractured, fragmented federalism: A study in fracking regulatory policy. *Publius*, *43*(3), 474–496. https://doi.org/10.1093/publius/pjt014