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Local Approaches to Managing Oil and Gas Development

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Since the late 1990s, horizontal drilling and high volume hydraulic fracturing — commonly called "fracking" — have enabled recovery of oil and gas from previously uneconomic or inaccessible shales and other tight rock formations. Such tapping of "unconventional" oil and gas reserves has not only expanded production in areas historically rich in oil and gas, but also has allowed oil and gas extraction from completely new regions (UCS 2013).

County and municipal planners must decide how to respond to oil and gas development in their jurisdictions, balancing benefits against risks and impacts — a task complicated by the fact that the pace of development is faster than full scientific understanding about those risks and long-term impacts. Local government officials, including planners, often face debates about the science, fragmented public opinion, and divisive politics in the face of decision making.

This *PAS Memo* highlights regulatory, nonregulatory, and fiscal tools that may be available to planners and other local officials to assess, manage, and minimize the impacts and risks associated with oil and gas development. It also offers a brief summary of the benefits and costs of unconventional oil and gas development and describes why this area is so challenging for local governments to address. It describes approaches that local governments in eight states have used to address oil and gas development.

Because localities differ in physical features, priorities, and concerns, certain specific approaches may be more or less appropriate for individual communities. Moreover, because state-level frameworks limit what local governments can do legally, planners should consult additional resources, such as legal counsel or nearby local governments, to fully understand what tools are available to them in their specific state.

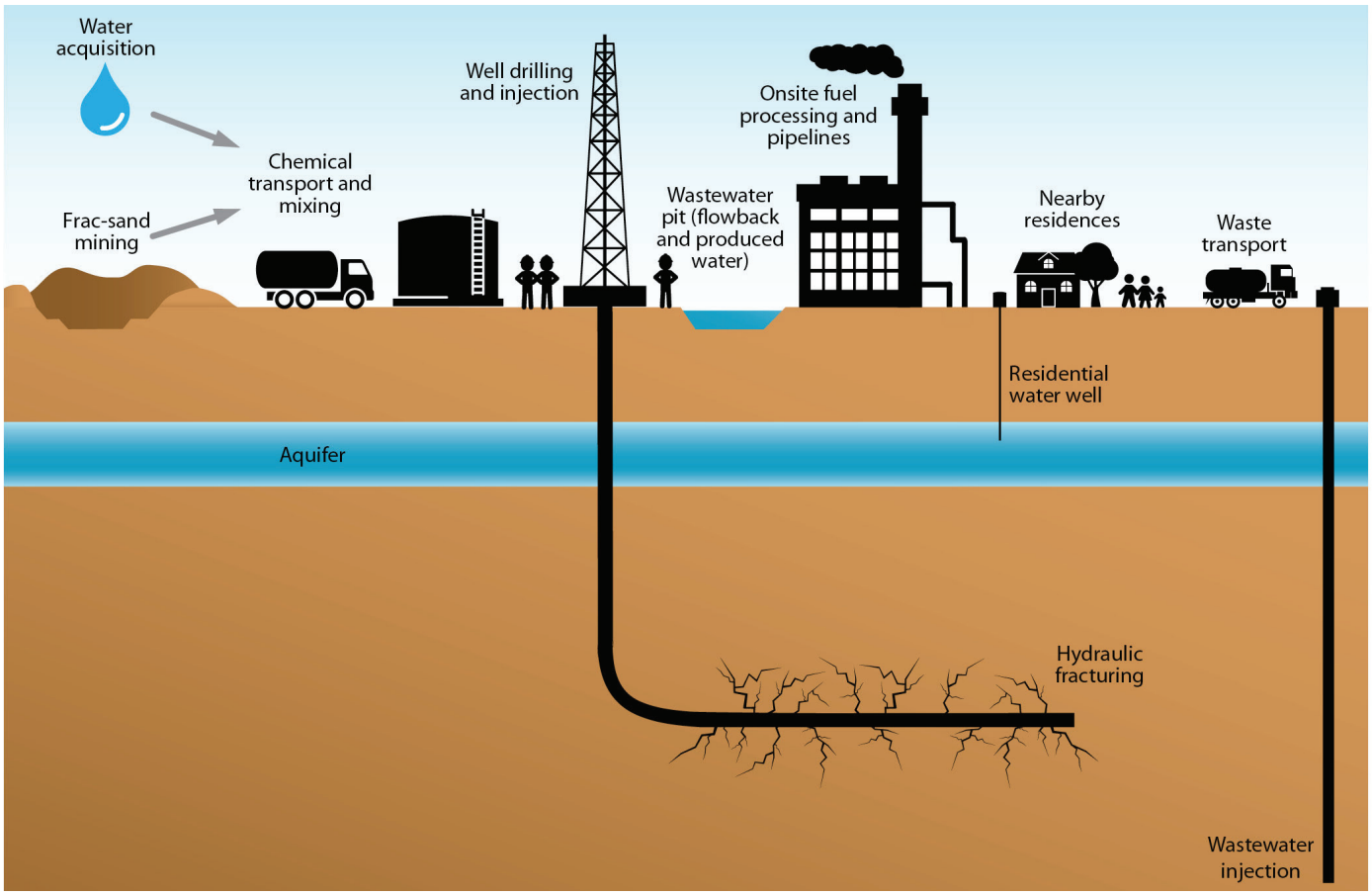
Unconventional Oil and Gas Development, Its Benefits, and Its Costs

Advances in technology such as hydraulic fracturing and horizontal drilling have enabled oil and gas extraction from sources previously deemed inaccessible or uneconomical. The process of developing an unconventional well begins when the operator conducts geological and geophysical exploration to locate a promising drill site; clears land to establish a gravel well pad typically three to five acres in size to accommodate the drilling rig as well as tanks, pumps, and trucks; and constructs other facilities such as access roads, pipelines, and equipment staging areas.

Next, the well is drilled downward to the shale oil or gas layer, usually 2,000 to 8,000 feet underground, and then drilled horizontally through that layer up to tens of thousands of feet to maximize exposure to the oil or natural gas. After the well is cased with cement, it is hydraulically fractured. Over the course of several days, hundreds of trucks at the well pad mix millions of gallons of fracking fluid (water, sand or ceramic "propping" agents that hold fractures open, and a tailored mixture of chemicals) and forcefully inject the fluid into the well, where it flows out through holes punched in the casing and fractures the surrounding rock, creating passageways that release the oil or gas trapped in that layer.

Following hydraulic fracturing, some of the fracking fluid returns to the surface through the well, along with brine and radioactive compounds naturally occurring in the rock or shale formation. This "produced water" or "flowback" is held in pits or tanks before being trucked off-site for disposal into deep injection wells or to wastewater treatment facilities before discharge or reuse in other hydraulic fracturing operations.

In the production phase, the released oil and gas is pumped out of the well and shipped to processing facilities either through pipeline infrastructure or by tanker trucks. The well pad is "reclaimed" to about half its previous size with the removal of the drilling and fracking equipment. A well can produce oil and gas for years but the productivity of unconventional wells can decline rapidly, by as much as two-thirds to three-quarters over their first few years. The productive life of some wells can be extended by hydraulically fracturing them again.



The steps and components of unconventional oil and gas development through horizontal drilling and high volume hydraulic fracturing ("fracking"). Illustration courtesy EPA.

When a well no longer produces commercially viable amounts of oil or gas, it is plugged and sealed with cement; any remaining equipment is removed; and the well pad, access roads, and any other disturbed land can be revegetated and reclaimed, if required by the local authorities.

The surge in unconventional oil and gas development in the United States can affect local communities in various ways. Positive and negative potential impacts are listed in the sidebar on page 3.

In addition to local benefits and costs, there are national and even global implications. Benefits include reduced dependence on foreign sources of energy for the U.S., economic stimulus resulting from lower energy costs, and reduced reliance on coal-fired power plants (thereby reducing pollution near coal mines and power plants and heat-trapping gas emissions from coal). National and global costs include the climate impacts resulting from a continued dependence on natural gas and other fossil fuels, particularly as cheaper oil and natural gas may retard investment and adoption of clean, renewable energy sources (UCS 2015).

Context and Challenges for Local Governments

Oil and gas development is regulated primarily by state governments. As states claim primary regulatory authority and have supremacy over local governments, states also decide how much regulatory discretion to allow at the local level.

Some states allow local control over some areas, while others minimize local discretion in favor of a uniform statewide regulatory regime. This article focuses on the experience of communities in eight states. Table 1 shows that states' regulatory authorities vary widely. Among these eight states, for example, communities in New Mexico and Texas may exercise some degree of local control within all four categories of authority, while local governments in West Virginia are preempted entirely from addressing oil and gas development in their codes and ordinances. Further, within each category of authority, the actual regulations that local governments can enact vary greatly from state to state. For example, some states that allow location-based land use regulations allow localities to use zoning or setback requirements, but most have specific limitations on the use of these tools.

Conflicts between local and state governments often are adjudicated by state courts. Extensive case law has been developed in many states regarding the balance between state and local authority, and planners are advised to consult attorneys familiar with this body of law for guidance about what authorities are available to local jurisdictions in their state.

Table 1. Examples of Regulatory Authority that Local Governments May Exercise

Regulatory Authority	*California*	*Colorado*	*New Mexico*	*Ohio*	*Pennsylvania*	*Texas*	*West Virginia*	*Wyoming*
Roadways	X	X	X	X	X	X		X
Location-Based Regulations	X	X	X		X	X		X
Nuisance and Safety Issues	X	X	X		X	X		X
Technical Regulations			X			X		

Table 1. Local governments have varying abilities to regulate different aspects of oil and gas development depending on their state's regulatory framework. Table by the authors.

In addition to state regulatory frameworks, each community has a unique culture, landscape, set of values, history, and economic context that animate its response and approach to oil and gas development. Some communities are more welcoming of industry and business while others prioritize strong environmental protection. History also shapes a community's perspective: a positive or negative history of oil and gas development, mining, or manufacturing can make residents either more comfortable or more wary. Concerns about property rights can also play out in complex ways — between neighbors, for example, when development activities have spillover impacts on adjacent property, and in "split estate" situations between the different owners of surface lands and the underlying mineral estate. Finally, the strength of the local economy, and the impact of oil and gas development on tourism and other established industries, can strongly influence constituents' responses. Of course, no community is homogenous and made up exclusively of like-minded stakeholders; it falls to planners and other local government officials to manage conflicting perspectives and interests and devise a policy that strikes the appropriate balance for each particular community.

Local Impacts

Unconventional oil and gas development can have both positive and negative effects on local communities.

Benefits

- Wealth Generation — Owners of mineral rights, property, housing, stores, restaurants, and other local supporting businesses may profit.
- Property Values — Property values may increase for mineral-rights owners and for local property owners due to local economic growth.
- Job Creation — Oil and gas development can create high-paying blue-collar and white-collar jobs. Locals may supplant outsiders over time as they train up and as outsiders put down roots.
- Economic Growth — Oil and gas industry can spark secondary growth in manufacturing and service sectors, but long-term economic returns can flag due to industry downturns and eventual depletion of oil and gas.
- Fiscal Benefits — Local governments may receive severance, property, and sales taxes, as well as payments and contributions from companies, allowing investment in services and infrastructure, debt retirement, and saving.

Costs and Risks

- Water — Stress on subsurface and surface water and quantity can be acute in areas of low rainfall or drought. Water quality can be affected by contamination from faulty well construction, underground methane migration, and leaks and spills of chemicals and drilling wastewater.
- Air, Odors, Toxic Gases, Noise, and Light — Localized air pollution and odors from gases, dust and exhaust from trucks and equipment, and noise and brilliant light may persist around the clock from drilling and attendant operations.
- Chemical Exposure — Accidents and spills of toxic materials and hazardous waste may occur on drilling sites or during transport.
- Socioeconomic — Local population may surge, resulting in increased rents and cost s of living, and changes in community character. Conflict between neighbors may arise around lease revenue and impacts.
- Property Values — Property values may decrease for residential properties near sites for drilling and well completion, at least for a while.
- Fiscal Costs — Costs for local jurisdictions can include damage to roads from trucking; increased risk of traffic accidents due to heavy truck traffic; and increased social, public safety, emergency service, infrastructure, and administrative costs.
- Seismic Risks — Earthquakes may occur in areas where fracking wastewater is disposed through injection wells, even in areas not known for seismic activity.

Furthermore, for competitive reasons, companies often work quickly and confidentially to secure leases in shale rock formations considered viable for oil and gas development. Thus, planners may not be aware of the full extent of activity in their jurisdiction until it is already intensive. In regions that do not have a history of oil and gas development or have not had it recently, planners have to scramble to get up to speed on a new, highly technical industry.

The task of assessing the local implications of oil and gas development is made more difficult by the lack of widely trusted information, with even basic terminology (such as the word "fracking") used divergently by different parties. In this context of strongly held, differing opinions, public discussion in many communities becomes dominated by conflict. Planners can find it challenging to determine which information sources to trust and which concerns to prioritize.

Based on the authors' research in the eight states listed in Table 1, the following information sources are considered to be most useful and trusted by planners and other local officials:

- Local governments with significant experience with oil and gas development
- Visits to drilling sites and affected communities
- Local oil and gas operators
- University extension programs
- University-published reports
- Municipal/county government associations
- Environmental and conservation organizations
- State government agencies

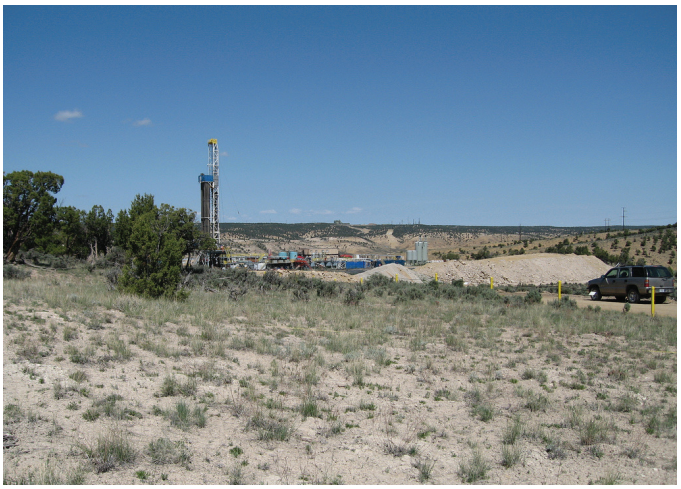
How Local Governments Have Responded

Local governments have employed a variety of creative regulatory, nonregulatory, and fiscal tools to manage and minimize the impacts and risks associated with oil and gas development.

Regulatory Approaches

Although the ability of local jurisdictions to regulate varies widely depending on the state, there are a number of local regulatory approaches communities can explore. The survey of regulatory approaches in this section is gleaned from states around the country and includes many that may not be available to local jurisdictions in some states. As noted above, planners should consult additional resources, such as legal counsel or nearby local governments, to fully understand what tools are available to them in their state.

Despite the legal complexity around oil and gas facilities, ultimately they are just another "use" of the land, as is the case for housing, schools, retail stores, or industrial plants. All other and preexisting provisions of a local jurisdiction's land-use code — and other exercises of the jurisdiction's police powers — also apply to oil and gas development. Given the complexity of regulating oil and gas development, however, many jurisdictions enact a standalone ordinance for this activity, thereby creating a separate chapter in their code of ordinances.



Fracking is a land use like any other and can be subjected to various local regulatory controls as allowed by state statute. Photo by USFWS Mountain-Prairie (CC BY 2.0).

Land-use approvals. Zoning ordinances constitute the most robust suite of regulatory tools for local governments to manage risk. Though local governments may not be able to prohibit oil and gas development from occurring in certain areas, they nevertheless have the authority to regulate it through zoning and land-use ordinances.

Many local jurisdictions treat oil and gas development as a conditional use or a use by review. This allows the local government to subject the oil or natural gas development to heightened scrutiny and make sure that it complies with a variety of safety, environmental, and other impact-mitigation regulations. As part of the permit application process, local governments can require detailed plans and maps of the intended development site and local area, information about likely impacts and intended mitigation strategies, evidence of bonding and insurance, contact information, and copies of required state permits.

Setbacks and sensitive area protections. In addition to discretionary reviews, local governments in many states can exercise some control over where oil and gas development occurs through establishing setbacks as well as special provisions for particular geographies.

Setback requirements commonly protect inhabited structures or infrastructure, with special attention paid to places such as schools, parks, childcare facilities, religious institutions, or healthcare facilities. Ordinances may also set special setbacks or buffers for sensitive environmental features requiring additional protections, such as drinking water resources (aquifers, public drinking water sources), surface water resources (rivers and streams, wetlands), the 100-year floodplain, or productive agricultural lands. Some local governments also define setbacks contextually: for example, setbacks may be greater in defined "high-density" areas than in "low-density" areas.

Information disclosure and communications requirements. As part of the development approval process, many

local governments require that companies provide decision makers, local emergency services officials, and local residents with information about the planned development and specific events, such as water resources use, flaring (burning off of natural gas from oil wells when gas collection equipment has not been installed), or site abandonment. Some jurisdictions require operators to notify residents 30 to 90 days in advance of exploration or drilling. Others also require operators to provide forums for engaging with the public and to be accessible in case an emergency or other need arises.

Surface water and groundwater protection. The potential for water contamination has been perhaps the highest-profile concern around unconventional oil and gas development. Though local governments in most states have limited regulatory authority over drilling because of state preemption in this area, they can still use a number of different regulations to address water usage and protections. These include enacting setbacks from water sources as discussed above, requiring water usage and disposal plans, limiting onsite vehicle and equipment cleaning, or requiring specifications for well construction details and installation practices that prevent groundwater pollution.

Local governments can also mandate that companies inform local residents before drilling so residents and local scientists can first test water to determine its baseline quality, or mandate that operators establish a predrilling plan that includes soil and water quality testing. Because so few communities have adequate pre-development groundwater and surface water monitoring data, establishing a water-testing regime early in the process can be vital in determining whether gas and oil development is the cause of suspected pollution found post-drilling.

Local governments can also develop regulations governing the storage and disposal of fracking liquids and wastes, which as noted above can contain chemicals and naturally occurring radioactive compounds. Regulations can address the design, location, and use of storage pits; the use of closed-loop storage (enclosed tanks as opposed to open pits); and the proper storage, treatment, and disposal of hazardous and nonhazardous wastes.

Public health and safety regulations. As with other industrial activities, local jurisdictions hosting oil and gas development need to take steps to make sure that they are prepared for accidents and incidents that can occur. Certain regulations can reduce the likelihood of spills and accidents at a drilling site and minimize their severity if they do occur.

Development approval conditions can address limiting site access through fencing, warning signage, and security; maintaining the site to prevent hazardous debris accumulation; and locating certain types of safety and fire equipment on the site. Additional development approval conditions could require operators to communicate necessary information to local first responders to facilitate a timely and effective emergency response (such as orienting emergency personnel to the site, providing information about chemicals used, and informing them in advance of riskier operations), and could specify how quickly operators must respond in the event of an incident.

Local jurisdictions can require nuisance mitigation measures, such as these padded sound barriers, to reduce the negative impacts of oil and gas development on the community. Photo © Trudy E. Bell.

Nuisance regulations. Oil and gas development activity, particularly in early construction, drilling, and completion phases, can have "nuisance" impacts on nearby residents. Local jurisdictions have implemented a variety of regulations to address these quality-of-life issues. These include noise mitigation measures to reduce noise from well pads and associated infrastructure; dust control measures such as watering roads and designating haul routes; light pollution controls to minimize glare and light trespass on neighboring properties; air quality and odor control measures that reduce or prevent hydrocarbon vapor emissions and minimize equipment exhaust impacts; vibration control measures that prohibit or limit the use of explosives or "thumper trucks" in geophysical explorations; and traffic control measures to mitigate the effects of heavy truck hauling associated with drilling sites.

Mitigating visual and landscape impacts. The presence of oil and gas infrastructure and equipment can damage the physical landscape and degrade attractiveness of the local scenery, particularly in rural areas. Regulations to mitigate these

visual and landscape impacts can address site structure and development, minimization of impacts to natural resources, and minimization of visual impacts.

Many jurisdictions include specific language in their ordinances encouraging certain practices and outcomes. These may include considering natural topography when siting facilities, using and sharing existing development infrastructure, consolidating multiple wells on one pad, siting equipment away from protected resources or sensitive areas, using landscaping or existing landforms to screen equipment and facilities, and requiring site reclamation and revegetation once drilling activity has ceased.

Mitigating road and traffic impacts. Impacts on roads and traffic are common in local communities. Trucks typically transport equipment, millions of gallons of water, chemicals, and proppants (material, usually silica sand, used to keep fractured wells open) to the well pad, and transport oil, natural gas, and fracking wastewater away from the drilling site. Each horizontal well can require some 1,000 truck trips (and six or more wells can be drilled per pad), causing deterioration of roadways, traffic congestion, air pollution and elevated risks of accidents and spills (NYSDEC 2015).

In anticipation, local jurisdictions can designate haul routes and limit allowed times for road use; prescribe access road and site construction standards to accommodate heavy traffic loads and volumes; mandate operational procedures, such as cleaning up mud and debris tracked onto local roads; and use diverse fiscal tools to protect themselves from the costs of repairing roads damaged by oil and gas development activity (described in "Fiscal Strategies and Tools," below).

Site restoration and reclamation requirements. Once an oil or natural gas well is successfully producing, production can last for years or even decades. There is some evidence that wells in shale rock deplete more rapidly than "conventional" wells, although improving technology continues to extend the life of these wells. Operators can also idle wells (as many have done in the current environment of low oil and gas prices) and then restart production at a later date. Once an operator abandons a drilling site, counties and municipalities can set maximum time limits for restoration activities, set standards for restoring the site to its pre-drilling condition, and require that a local inspector sign off before a site is considered restored. Development application requirements can include a reclamation plan in which the operator specifies the activities and timeframe for site restoration, as well as revegetation and restoration bonds to ensure plans are followed and reclamation activities are completed.

Insurance and bonding. Local jurisdictions commonly use insurance and bonding requirements to ensure completion of development activities such as infrastructure installations in new subdivisions or landscaping in new development projects, and these tools can also be used in regulating unconventional gas and oil development. Local ordinance provisions can require operators to post bonds and carry insurance to cover infrastructure repairs, especially for road damage; site restoration, as noted above; and various liabilities, including environmental pollution and workers compensation.

Bans and moratoria. Some municipalities and counties have enacted temporary moratoria to allow local governments time to study and understand local issues and anticipated impacts as well as residents' priorities and concerns about the risks posed by unconventional oil and gas development. Jurisdictions have used zoning, enacted ordinances, and amended town charters to enact bans. While state courts have generally struck down local bans as an infringement on the state government's regulatory authority, many have been more sympathetic to time-limited moratoria.

Non-Regulatory Approaches

Local jurisdictions also may use non-regulatory approaches to address residents' concerns and yield desired outcomes for communities. Notably, nonregulatory approaches can achieve results when local regulatory action is preempted by state regulation.

Comprehensive planning. The comprehensive plan encapsulates the visions and desires of local residents for the future growth and character of their communities. As oil and gas development often plays a major role in shaping and changing local jurisdictions, the comprehensive plan should address this activity and its associated potential effects on the economy, environment, and quality of life.

The planning process can provide an opportunity for planners to solicit, synthesize, and reflect back public opinion regarding unconventional oil and gas development. The document itself can be used to integrate planning efforts across a wide range of planning areas (economic development, natural resource protection, public safety, housing, etc.); strategically plan capital investments and guide development activity to maximize benefits and minimize impacts; and foster coordination between local jurisdictions and other levels of government around oil and gas development.

Community engagement. Local governments can help residents navigate concerns and challenges about unconventional oil and gas development by serving as a reliable source of information and a point of contact for concerns and complaints.

Planners can use websites, links to studies from local experts and universities, printed publications, and public meetings to provide information, field questions, and hear residents' concerns. They can also host discussions between community members, local scientists, and industry operators to understand residents' opinions, areas of agreement and disagreement, and areas of continuing confusion.

Local governments can also dedicate staff (including planners) to interface with all stakeholders and resolve problems as they arise, create local multistakeholder bodies to jointly

address concerns and complaints, and support discussions between community members and operators to encourage voluntary adoption of impact-mitigation measures.

Industry engagement. Many local governments benefit from building and maintaining strong working relationships with representatives from oil and gas operators, and vice versa. Establishing such relationships can help head off potential problems by keeping all parties informed about actions, consulting in advance of taking action, and communicating quickly and clearly as needed. Local government officials, including planners, can hold regular meetings with operators to share information; maintain open communication channels for problem solving; educate operators on local regulatory environment, expectations, and culture; and request that operators voluntarily adopt impact-mitigation measures.

Incentives. Some municipalities and counties offer incentives to oil and gas developers to adopt best practices to protect local health, safety, and well-being beyond what is required through regulation. Incentives include greater speed and certainty, and reduced fees, in permitting their operations. For example, some jurisdictions offer operators a choice between pursuing a standard or an expedited track through the conditional/special use review process. The expedited track is a voluntary process whereby operators can obtain an expedited review or a quicker approval if the proposed operation meets particular siting and other objective criteria to minimize impacts for the community.

Contractual mechanisms. Local governments may be able to sign legally binding agreements with oil and gas developers and with state regulatory officials to promote certain outcomes or to enhance their local authority. Negotiated agreements with operators can cover a variety of areas that may not be under local governments' regulatory authority, including placement of wells, mitigation of nuisance issues, enhanced public safety measures, additional environmental protections, and operational practices. Local governments may also be able to negotiate intergovernmental agreements with their state government to, for example, enhance local inspection authority or grant greater deference to local land use planning authority.

Research, monitoring, and data collection. Acknowledging current gaps in scientific knowledge about certain impacts of oil and gas development, some local jurisdictions have opted to support research, monitoring, and data collection to better answer outstanding questions, sometimes in partnerships with local universities and scientists. Such efforts can be especially useful for local decision makers because impacts can vary from place to place due to different geologies, prevailing air currents, proximity to development, and other factors. As noted above, this can help communities track and hold operators accountable for environmental degradation resulting from oil and gas development activity. Areas of research and monitoring can include air quality, groundwater and surface water quality, health assessments, infrastructure impacts, emergency services and response, and socioeconomic impacts.

Keeping state policy makers and regulators informed. Recognizing that state policy governing oil and gas development often shapes local outcomes, many local officials proactively provide information to state decision makers. Local governments can provide input to state legislators, commissions, and taskforces through hearings and during regulatory rule-making processes. They can provide input about public sentiment in their communities, their experiences with oil and gas operators, the effectiveness of their approaches to managing oil and gas development at the local level, and results from research and monitoring efforts.

Fiscal Strategies and Tools

Though planners are not usually directly involved with taxation and revenue management, the fiscal strategies and tools outlined here are important to understand for two related reasons. First, for many counties and municipalities, oil and gas development can strongly shape the nature of the local economy, the revenue streams available to them, and the expectations and burdens placed on local government from extraction activity. Second, planners often play a critical role in advising the local elected officials who ultimately make decisions about the government's resource needs and how to collect revenues to meet those needs.

Local governments can employ the following tools and strategies to manage or offset the costs and exposure to financial risk from oil and gas activity (Raimi and Newell 2014; Headwaters Economics 2012). As with regulatory tools, not all of these options are available in all states.

Tax revenues. Oil and gas development can lead to increased local revenues from three different tax sources:

- *Severance tax*. Localities receive a percentage of revenues from this state excise tax on natural resources or a similar impact fee. Even though localities lack control over the amount and timing of severance tax revenues, they can budget for anticipated revenues, taking into account the value of current collections and the time lag for receipt.
- *Property tax*. Property tax is one of the more stable, predictable forms of revenue related to oil and gas development that is available to, and controlled by, local governments. Even in states where oil and gas production property is exempt from property taxes, nonproduction property, such as oil and gas industrial facilities and corporate offices, is taxable.
- *Sales taxes*. As local economic activity resulting from oil and gas develop ment increases, so do sales tax collections. These tend to accrue the fastest during the most active periods of energy production. In addition to general sales taxes that apply to the sale of most goods and services, local jurisdictions may also have the option of levying a specific sales tax on oil and gas field services and equipment purchases.

These additional sources of revenue are often vital in helping local governments address increased costs and demands on local services and infrastructure resulting from the population growth that accompanies oil and gas development.

Lease payments, royalties, and earnings. Many local governments, particularly counties, have also earned revenues in the form of royalties, bonuses, and rents for oil and gas production on government-owned land. Such revenues may be available more quickly than tax revenues. In addition to fees, local governments have also earned revenue from selling or leasing goods, services, or assets for oil and gas development, such as water or water rights.

Fees. Local governments can impose a variety of fees on operators to help offset their own costs, including permit application fees, oversize/overweight road-use permit fees, land records fees, inspection fees, impact fees, and road maintenance fees.

In-kind and voluntary contributions. In some localities, oil and gas operators have funded equipment and training for fire companies and other emergency services; repaired and upgraded roads and bridges; provided money to schools, hospitals, and conservation efforts; and built and endowed facilities such as town parks, daycare centers, and economic development offices.

Road maintenance agreements. A key cost to local governments, counties in particular, is maintenance and repair of roadways subject to increased truck traffic from extraction activity. Road maintenance agreements have been negotiated by many communities to ensure that oil and gas operators cover these costs. The conditions around road maintenance agreements vary and, as noted above, in some cases they are required by state regulations or by the local jurisdiction as a condition of permitting, whereas they are voluntarily negotiated in other jurisdictions.

Best Practices and Recommendations for Planners

Based on the experiences of planners and other local officials from villages, towns, cities, and counties across the country, some best practices and action steps emerge as aids to local governments responding to unconventional oil and gas development.

Maintain Open Communication and Transparency. Local officials, particularly those in the departments of health, environment, and ecosystems management, are the first point of contact for many residents regarding concerns around the risks and impacts of unconventional oil and gas. Planners have an opportunity to collaborate with local colleagues to serve as honest brokers both to help the members of their community better understand how oil and gas development works and to raise the health and environmental concerns of the community to operators and contractors.

Local governments can negotiate road maintenance agreements with oil and gas operators to cover costs of heavy truck traffic on local roads. Tim Evanson (CC BY-SA 2.0)

Planners can relay information to community members and listen carefully to understand the diversity of concerns, confusions, disagreements, and priorities through community meetings, advisory groups, task forces, facilitated discussions, and polling. Residents may have grave concerns about fracking and what it will mean for them and their community. Their concerns are often amplified by worries about who benefits financially, the fragmented nature of the unconventional oil and gas industry, a lack of full disclosure of chemicals used, and discreet ways in which some companies secure leases.

Planners can engage the public early in the process, share best-available data and information, and maintain transparency when engaging with the industry in order to help alleviate residents' concerns about motivations and access. This open, two-way communication facilitated by planners and other officials can help lay the foundation for a balanced and candid discussion between the community and industry on the benefits, costs, and risks associated with development.

Match A Jurisdiction's Resources With the Scale and Pace of Development. Unconventional oil and gas development can move fast, and planners may need to respond quickly with the information and resources available to them at that time in order to manage its impacts. Local governments may need to hire staff or consultants to expand capacity or develop partnerships with neighboring jurisdictions, local universities, and scientists to collect data and leverage resources.

Local governments also can seek to slow the scale and pace of development by implementing a temporary moratorium or by deliberately slowing the local permitting process to allow time to collect scientific and economic data to help inform a policy response appropriate for their community, as described above.

Plan for the Discrete Phases of Development. In oil and gas development, the first phase consists of construction, drilling, and completion. It is relatively short-lived and labor-intensive, and has peak impact on communities in terms of population influx, noise, truck traffic, economic impact, and so forth. The second phase, production, is long-lived and features a small but steady labor force. The third phase, reclamation, is also often longer-term and features a small steady labor force. Planners can work with operators to understand what benefits and impacts their community will experience during each stage of development and use the tools outlined above to mitigate those impacts before development begins.

Account for the Differences Between Rural and Urban Contexts. Planners should carefully consider the context in which they work, as the incentives and impacts facing rural and urban areas from oil and gas development can be quite distinct. Larger rural landholders often stand to see greater financial benefit from leasing their mineral resources than property owners in urban areas. While production in rural areas can have landscape impacts, affect agricultural operations, and fragment wildlife habitats, urban residents near development sites can have greater concerns about nuisance impacts, safety, and health. Roadway damage and costs tend to be greater in rural areas while urban areas are more likely to incur costs to expand water and sewer infrastructure. Finally, while new and temporary residents may be more likely to live in towns and cities, population growth and the attendant socioeconomic impacts on government services can be especially costly in rural areas and for small towns. Planners would do best to keep these differences in mind as they anticipate and respond to the impacts of oil and gas development on their jurisdictions.

Pay Attention to Issues that Might Not Be Top-of-Mind for Constituents. While only a few issues may make their way in to the public discourse, there are often less-advocated issues that planners should pay attention to. For instance, water and air quality concerns may overwhelm the attention to more likely risks from heavy truck traffic, infrastructure strains, road damage, housing pressures, emergency services, and other socioeconomic impacts. Planners need to weigh risks that draw public worry as well as those that do not get sufficient media and public attention to ensure they tend to both obvious and less obvious impacts to the extents possible.

Create Diverse Revenue and Energy Streams to Plan for the Future. While oil and gas development can be a large revenue source for local governments, the revenues can also be volatile given energy price fluctuations and resulting boom-bust cycles typical of energy industries. Planners would be wise to work with their local elected officials to create a rainy day fund and budget ahead in terms of the severance tax revenues they receive and identify more reliable and immediate revenue sources, such as property and sales taxes. Nonrevenue tools, such as road maintenance agreements, bonding, and insurance, can also help reduce exposure to financial risk. Finally, investing in economic and energy diversification and accompanying training and recruitment opportunities can help when oil and gas prices decline, or when these resources are depleted and the oil companies and operators move out of the region.

A Path to Informed Decision Making

Local governments throughout the country face immense pressure from residents, industry, and state governments alike to forge a path forward on unconventional oil and gas development that balances economic benefits with public protections. With market prices for oil and natural gas, and consequently the pace of drilling and development, currently down, this moment provides an opportunity for planners to take stock of their jurisdiction's policies and explore where there may be different approaches that would serve their constituents well.

Although the priorities and concerns of each local jurisdiction vary, there are regulatory, nonregulatory, and financial tools that planners and other local officials can creatively employ to defer, avoid, and mitigate attendant risks and impacts. Residents, responsible industry actors, local scientists and experts, and neighboring local and state governments can have

an important role in demanding and helping planners make informed decisions on unconventional oil and gas development so as to promote and protect their communities.

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This article was adapted from a report by the same authors and previously jointly published by the Consensus Building Institute and the Union of Concerned Scientists. It is primarily based on information generated through interviews and workshops held with officials representing local governments in California, Colorado, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Texas, West Virginia and Wyoming. Twenty-one interviews were conducted and approximately 115 people participated in the workshops, representing approximately 80 local jurisdictions. The questionnaire used for the interviews is online at www.ucsusa.org/frackinglocalresponse. The agenda, presentations, and proceedings of the workshop are at www.cbuilding.org/project/local-responses-unconventional-oil- and-gas-development. In addition to these primary sources, the authors obtained detail and supporting material about the tools, strategies, and programs used by local governments from these jurisdictions' websites and directly from the interviewees. Information was also gathered from the publications cited in the References and Resources section below.

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