



## GOVERNING PUBLIC INFRASTRUCTURE IN OHIO'S SHALE PLAY: IMPACTS AND MANAGEMENT

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This paper is based on the research of the Shale Innovation Project at Ohio University. The Shale Innovation Project is an interdisciplinary collaboration between the Russ College of Engineering and Technology, the Voinovich School of Leadership and Public Affairs and the College of Arts and Sciences examining the impact of shale development on businesses and communities in Ohio's shale region. This project is generously supported by a three-year Innovation Strategy Award from the Ohio University Research Division.

### Summary of Key Findings

Recent increases in oil and gas drilling and production in Ohio have had significant impacts on public infrastructure in the eastern part of the state. The purpose of this paper is to present findings from interviews with seven public-office officials in Ohio's top oil and gas producing counties. Interviewees were asked to discuss both the impacts that their counties experienced with respect to oil and gas industry activity, as well as the strategies they employed to manage these impacts. From the interviews, several themes emerged about oil and gas activity's impact to public infrastructure in Appalachian Ohio. Table 1 provides a summary of these impacts. Table 2 provides a summary of strategies used or suggested to manage these impacts, as reported by the interviewees in this study.

Figure 1 – Marcellus and Utica Shale Plays in Ohio (Source: Ohio Environmental Protection Agency)



**Table 1 – Reported Public Infrastructure Impacts**

<u>Public Infrastructure System</u>	<u>Description of Reported Impacts</u>
<b>Roads</b>	Increased road damage, increased maintenance, increase in permit applications
<b>Schools</b>	Temporary transient worker population led to increased school enrollment but not an equivalent increase in school funding from property taxes (estimated higher per pupil school costs)
<b>Housing</b>	Increased rent, increased housing prices, increased homelessness, temporary “man-camps”
<b>Emergency Management Services</b>	Increased law enforcement, increased hazardous substance filings, changes to emergency response needs, increased training needs
<b>Water and Waste Systems</b>	New needs for water and sewer line extensions, increased use of public-private partnerships, concern over wastewater injection
<b>Public Office Staffing</b>	Increased staffing needs, increased workload for existing staff
<b>Positive Infrastructure Impacts</b>	Road Use Maintenance Agreements (RUMAs) improved road conditions, infrastructure expansion, positive fiscal benefits from tax revenue

**Table 2 – Reported Management Strategies for Public Infrastructure Impacts**

<u>Theme</u>	<u>Strategy</u>
<b>Anticipate the boom-and-bust cycle</b>	<p>Develop scalable, more efficient processes</p> <p>Reshuffle work responsibilities with existing staff, do not hire new staff if it can be avoided</p> <p>Do not rely on projected oil and gas tax or royalty revenue for public budgets</p>
<b>Partner with the industry early and often</b>	<p>Hold pre-planning strategy and operational meetings prior to the shale boom</p> <p>Consult with industry for advice on training needs</p> <p>Identify complementary public and private sector roles, and foster relationships between individuals holding those roles</p>
<b>Establish a fund, save, and invest in non-recurring needs</b>	<p>Carry a larger-than-usual general fund balance</p> <p>Establish a fund to invest in future community goals</p> <p>Invest in non-recurring infrastructure needs with future capacity in mind</p>
<b>Form collaborative regional alliances</b>	<p>The County Engineers Association of Ohio serves as a model for collaboration</p> <p>Emergency Management Assistance Team (EMAT) in development – collaborative multi-region operational team</p> <p>Proposed: Establish an “Eastern Ohio Infrastructure Alliance”</p>

## Introduction

Since 2012, Ohio’s oil and gas industry has experienced a substantial boom in production. Largely impacting Ohio’s eastern and southern Appalachian region, this increase in oil and gas industry activity has stimulated significant changes to communities in the state’s share of the Marcellus and Utica shale plays. Despite this boom in drilling and production, a more recent downturn in the industry’s upstream sector has raised concern for its sustainability, and more specifically, for the long-term impact that this volatility may have on the Appalachian Ohio region.

According to the Ohio Department of Natural Resources (ODNR), permits issued for oil and gas wells in Ohio’s Marcellus and Utica shale plays saw a sharp increase from 2009 to 2014. Since 2014, however, permits issuances have been declining. Table 3 shows statewide oil and gas well permit issuances by year (Ohio Department of Natural Resources<sub>2</sub>).

**Table 3 – Ohio Oil and Gas Well Permit Issuances by ODNR, 2009-2016**  
(Ohio Department of Natural Resources<sub>2</sub>)<sup>1</sup>

	2009 – 2011	2012	2013	2014	2015	2016
<b>Marcellus</b>	10	6	18	7	1	2
<b>Utica</b>	71 ('10-'11)	334	514	680	427	303

While the number of permits granted for oil and gas wells in Ohio has declined since 2014, production of oil and gas has increased steadily since 2011. Table 4 shows reported annual oil and gas production numbers from 2011 to 2015 in the State of Ohio (Ohio Department of Natural Resources<sub>1</sub>).

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<sup>1</sup> Note that permits granted do not guarantee drilling or production. Only a fraction of the number of permits granted result in producing wells.

**Table 4 – Ohio Oil and Gas Horizontal Shale Production, 2011 – 2015 (Ohio Department of Natural Resources<sup>1</sup>)**

	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
<b>Oil (Barrels)<sup>2</sup></b>	46,326	635,874	3,677,734	11,001,117	21,984,163
<b>Percent Increase from Previous Year</b>	-	1,272.61%	478.37%	199.13%	99.84%
<b>Gas (MCF)<sup>3</sup></b>	2,561,524	12,831,292	100,119,054	453,053,944	954,744,514
<b>Percent Increase from Previous Year</b>	-	400.92%	680.27%	352.52%	110.74%

Primarily impacting Appalachian Ohio, the increase in oil and gas industry activity has caused concern for the strain that it may have on public infrastructure in the region. Numerous studies have found that as oil and gas industries boom in a given locality, the strain placed on public infrastructure increases (Christopherson et al., 2011; Christopherson & Rightor, 2011; Randall, 2011; Saha & Muro, 2016; Small et al., 2014; Stewart et al., 2015). In a study on how shale gas extraction impacts drilling localities, Christopherson and Rightor (2011) found that “shale gas drilling relies heavily on a workforce that resides in Texas and Oklahoma and moves with the rigs from one shale play to another.” Since this population of workers is both large and temporary, its emergence places additional short-term strain on public services during drilling activity. Such strain includes increased road traffic, demand for emergency services, school enrollment, rent and prices of other goods, and an increased demand for local government services.

Randall (2011) echoed the finding that damage to local roads is a major concern for localities hosting oil and gas industry activity. Small et al. (2014), in a study on risks associated with shale gas

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<sup>2</sup> 1 Barrel = 42 liquid gallons

<sup>3</sup> MCF = Thousand cubic feet

development, stated “expected hazards include boom-bust economic cycles; increased housing costs; impacts on preexisting local industries; demands on community infrastructure; police and social services; uneven distribution of private benefits, costs, and externalities; and community conflict and mistrust.” Ohio University studies on housing and homelessness found that with an influx of shale workers, demand for affordable housing tends to rise. Further, due to limitations in availability of housing, as well as the temporary nature of transient worker populations, rents tend to rise as well. As a result, homelessness increases and a concern that a build-out of housing capacity may lead to a glut once transient populations leave discourages such investment (Stewart et al., 2015). Of additional concern is water infrastructure. According to the United States Geological Survey (USGS), some wells in Ohio’s shale plays used between 10,001 to 36,620 m<sup>3</sup>/well from 2011 to 2014 (Gallegos et al., 2015).<sup>4</sup>

It is important to also note that while strain on public infrastructure increases with oil and gas activity in a given locality, those localities tend to reap temporary positive fiscal benefits from the introduction of the industry. In a 2016 study on the fiscal impacts of oil and gas in major producing U.S. states, Raimi and Newell (2016) found that, on average, Ohio counties saw a “medium to large net positive” fiscal benefit from oil and gas industry activity, and municipalities saw a “roughly neutral to small net positive” benefit (Raimi & Newell, 2016). After covering the increases of public sector costs to manage shale activity, communities often invest these funds locally in the form of infrastructure upgrades and/or keeping larger fund balances. For interviewees in this study, shale-related tax and royalty revenue enabled infrastructure expansion that would likely not have happened without the introduction of industry activity.

To better understand these impacts at a regional level, this study focuses on how Ohio communities may mitigate the impacts and manage the effects that the shale activity is having on local infrastructure. It accomplishes this by asking the following questions: How can localities in Ohio’s Marcellus and Utica shale plays best manage these increased strains placed on public infrastructure

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<sup>4</sup> One m<sup>3</sup> of water is equal to 264.172 gallons.

while not overextending their resources? How can counties impacted by this activity govern with the bust in mind? The following sections attempt to answer these research questions.

## Methods

The author interviewed seven county-level public office officials in some of Ohio's top oil and gas producing counties (Belmont, Carroll, Guernsey, Harrison, Monroe, Noble, Washington) (Ohio Department of Natural Resources<sup>1</sup>) about both the impact of recent oil and gas industry activity on their public infrastructure, as well as the strategies they used to manage these impacts with the bust in mind. Titles of the interviewees include the following: County Commissioner, Economic Development Official, County Engineer, Port Authority Executive Director, Community Improvement Corporation Economic Development Director, County Engineer Deputy of Administration, and Emergency Management Agency Director.

For sake of anonymity, all interviewees will be referred to by an assigned code throughout the rest of the paper. By examining the responses from our interviewees, in conjunction with a review of how other major oil and gas producing states (and some international locations) have dealt with these issues, strategies to govern public infrastructure in Ohio's shale plays are presented below.

### "It was a paradigm change..." – Impacts in Eastern Ohio

From the data in this study, a host of localized impacts to public infrastructure in the region were identified. In addition to increased road damage and traffic, counties were forced to address issues related to their water and waste systems, increased strain on public schools, rising rent and housing prices, significantly longer emergency response durations, and increased strain on staffing for public departments. The heightened demand for this public infrastructure presented unprecedented challenges for a region that had no recent experience in handling such high levels of oil and gas activity, and as such, novel and creative ways of managing this demand had to be developed.



## **Roads**

For instance, one interviewee summarized the impact of emerging oil and gas industry activity on his department: “It was a paradigm change from...traditional county engineers bridge and highway work to dealing with this whole other avenue of industry and its major impact on our traveling public” (Interviewee F, 2017). When asked to describe the impact that oil and gas industry activity has had on public infrastructure in their counties, a majority of interviewees stated that the impact to roads was significant. In fact, every interviewee mentioned impacts to roads in one way or another. According to one interviewee, “a lot of our county roads were not constructed to handle the kind of traffic we’ve seen in the modern eras” (Interviewee C, 2017). According to another, “The impact, the heaviest impact, has been on the roads” (Interviewee E, 2017). According to Interviewee F, their office estimated an increase in road-related permit issuances from around 10 per year to thousands in a single year (Interviewee F, 2017).

## **Schools**

Public school funding in the State of Ohio is generated, in part, from property taxes (Ohio Department of Education, 2017). When oil and gas industry activity ramped-up in the study area, some interviewees cited school-related issues driven by the rise of a temporary, or transient, population. As workers from other regions in the nation moved with the industry to Ohio, some brought their children and enrolled them in public schools, but since a significant portion of the transient population did not purchase property or housing in the region, they did not contribute to school funding. This created a higher per pupil cost to local school districts in the region. As one interviewee stated, “...what’s happened with the schools is, the school has to take these children but there’s no additional taxes being paid because they’re not buying real estate” (Interviewee A, 2017).

## **Housing**

As mentioned earlier, previous Ohio University studies have found issues related to housing driven by increased oil and gas activity in the state. As transient populations rise in the region, housing prices and rents increase along with homelessness. And, while a possible solution seems to be found

in developing additional housing stock, that development is stifled by fear of a future glut in the market that may occur when transient populations leave the area (Stewart et al., 2015). These findings are echoed by interviewees in this study. As one interviewee states, "...with a massive boom like that you have a housing crunch" (Interviewee F, 2017). From another, "...when the influx happened about three years ago rental rates rose like crazy...It has since dropped back down a little bit, but it's still is never returned to those original levels" (Interviewee G, 2017). As a result, Ohio saw its own local version of "man camps" pop-ups, though not as extensive as the storied man-camps out West. From another interviewee, "You know, in terms of housing, you know, you've certainly seen a number of RV and camp sites sprout up" (Interviewee B, 2017).

### **Emergency Management Services**

According to Interviewee G, the region has "...seen significant increases in law enforcement, predominately theft [and] some drug use." Attributed primarily to the rise in population during the oil and gas boom, the same interviewee stated that local sheriff departments were taking "three-to-four times the calls they were taking before the industry moved in," and the need for ambulance services "probably more than doubled." In addition, this interviewee reported that extremely hazardous substance filings tripled, and less-severe hazardous substance filings saw a twenty-fold increase, estimating an increase from 10 to 30 and from 30 to 600 filings, respectively. In addition, the nature of emergency response shifted significantly in impacted counties. From the interviewee, "Response phase, for us, it typically only lasts no more than seventy-two hours...What we've discovered with the shale industry is that when something goes bad it may be for weeks...So, we're not used to that kind of sustained response in Ohio, and certainly not in our more rural counties" (Interviewee G, 2017). Overall, the impacts to emergency management services have manifested primarily in increased staffing needs, the need for updated training to handle oil-and-gas-related emergencies, and a reported uptick in events requiring emergency response.

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<sup>5</sup> "Man camps" is a term originally used to describe temporary lodgings set-up by North Dakota shale workers (Lyons, 2013).

## **Water and Waste Systems**

Of all public infrastructure discussed in this study, impacts to water and waste systems were considered the least problematic by the interviewees. While data shows that the primary means of oil and gas drilling used in Ohio's shale plays, hydraulic fracturing, requires a substantial amount of water (Gallegos et al., 2015), most interviewees stated that access to water and impacts to local water systems were not significant issues. One notable quote about the impact to sewage systems comes from Interviewee D, "As far as infrastructure, we have the excess capacity for sewage...our biggest problem is in the lines out to the areas where sewage is required" (Interviewee D, 2017). According to the same interviewee, private companies that needed access to water or sewage systems would often lay new water or sewer lines themselves, and cover the expenses of doing so. Also important to note is that while issues with wastewater from hydraulic fracturing operations were not discussed heavily in this study's interviews, significant concern does exist about the potential environmental impacts from wastewater injection wells in Ohio (Ohio University<sub>1</sub> & Ohio University<sub>2</sub>).

## **Staffing**

Among the most heavily discussed impacts to public infrastructure in this study was increased strain on public department staffing. As one interviewee stated, "...we didn't really hire out or have to hire necessarily to cover the things that were happening, but it would have been justified to do so" (Interviewee F, 2017). This sentiment was echoed by other interviewees, with another stating, "...what we've done is, basically, worked more hours" (Interviewee G, 2017). Increased oil and gas industry activity could correlate to an increased workload in the form of permits, emergency response, planning meetings, training, working with new industries, and the like, resulting in strain on the existing capacity of interviewees' offices. And, while hiring new staff may seem like an obvious solution at first glance, interviewees were aware of volatility in the oil and gas industry and chose not to do so.

### **Positive Infrastructure Impacts**

Among the negative impacts discussed above, the boom in oil and gas industry activity did result in positive infrastructure impacts as well. For example, almost all interviewees stated that county roads under the purview of a Road-Use Maintenance Agreement (RUMA) were left in better condition than they were before the introduction of the industry. Increases in tax revenue from the industry led to infrastructure expansion like water and sewer upgrades, railroad revitalization, and new police vehicles. And, a majority of interviewees stated that the industry was good to work with; private industry often paid up-front costs for infrastructure improvements that benefited both their own industry operations and the local community.

### **Management Strategies from the Marcellus and Utica**

The strategies employed by interviewees in this study to manage the boom in oil and gas industry activity can be grouped into four themes: anticipate the bust; partner with the industry early and often; establish a fund, save, and invest in non-recurring needs; and, form regional alliances. When managing the influx of oil and gas industry activity in their counties, all of the study's interviewees were very aware of the volatility of the industry and managed the impacts stated above accordingly.

#### **Anticipate the Bust**

Referring back to the impacts on public department staffing, most of the interviewees in the study decided not to hire new staff members, and instead, they shuffled work responsibilities within their current staff. One interviewee stated, "...our administrative team decided to shuffle responsibility. And, I think that was the appropriate call because of the boom and bust scenario" (Interviewee F, 2017). That same interviewee disclosed that their work responsibilities have traditionally been in assisting other staff members in the office with planning and supervising contractors, but when the oil and gas industry came to Ohio they needed to delegate those activities to another individual in the department. As they stated, at that point their job "...was almost solely 100% oil and gas work" (Interviewee F, 2017).

In order to manage the increased workload that came from the industry with existing staff, a plurality of interviewees developed more efficient work processes. Interviewee G, whose office also did not hire new staff, was in the process of developing a new fee structure for flood plain management permits at the time of the interview – a necessity due to the influx of activity in this arena. Interviewee F created a novel approach to managing RUMAs in their county. From the interviewee, “Some of my process development here was basically breaking the RUMA into three...you have a drilling RUMA. We have a pipeline RUMA. And, we have a facilities RUMA which we employ when there is a major facility being built” (Interviewee F, 2017). By doing this, the interviewee cited increases in efficiency, making their workload easier to manage. The interviewees also highlighted the importance of developing scalable, flexible processes. From one interviewee, “The key to it is process development. You have to come up with a process that is trackable. You know, creatable, trackable, and repeatable...You have to develop the mechanisms in which to deal with it, and that mechanism must be able to slide just like industry slides. You must be able to ramp it up, and you must be able to ramp it down” (Interviewee F, 2017).

Finally, a majority of interviewees highlighted the importance of not relying on industry-related tax revenue for public budgets. As Interviewee A stated, “...our budget is not reliant upon the industry...It’s just another facet of our economy that we hope continues to grow...but as far as our budget, it’s not affected at all” (Interviewee A, 2017). This sentiment was echoed by other interviewees as well, with many of them advising caution when committing to any financial obligations related to industry activity. While a study by Raimi and Newell (2016) found that Ohio counties did see significant positive fiscal impacts from industry activity, these funds were largely saved or used in non-recurring infrastructure needs (see the sub-section “Establish a Fund, Save, Invest in Non-Recurring Needs”).

### **Partner with the Industry Early and Often**

Noting many of the counties impacted by the oil and gas boom in Ohio had no recent experience in managing such high levels of activity in this industry, they had a sharp learning curve. As Interviewee G observed, “There’s a lot more training involved” (Interviewee G, 2017). Another stated, “...this

isn't something that has happened, at least in Ohio, ever...I didn't have the benefit of a mentor or a process to steal anything from and not reinvent the wheel" (Interviewee F, 2017).

To come up that learning curve, some interviewees held pre-planning meetings with both the public and private industry. These meetings facilitated discussions on strategy and operational planning. From one interviewee, "We started doing quarterly meetings about three and a half years ago...that meeting has been designed in order to bridge those gaps [between private industry and public departments]...and emergency management is coordinating those conversations, and taking that information and incorporating it in our emergency plans and our pre-planning" (Interviewee G, 2017). Another interviewee discussed how their department held meetings with the public in the county to develop a strategy for the impending oil and gas boom, "We chose to go with a, I'll call it a one-stop shop, where our townships had a meeting before oil and gas really hit, and they agreed to allow this office to represent them..." (Interviewee F, 2017).

Many of the interviewees also cited partnerships with the industry as one driver of their success in managing the oil and gas boom. From one interviewee, "...without the input from the industry, we may well have done a lot of things that really were not pertinent to what they really were going to encounter..." (Interviewee G, 2017). To accomplish this, Interviewee F suggests identifying an employee on the private industry side of the fence who has a complementary role, "...typically when there's road damage, you know, they have a representative. They should have a roads representative that is versed in road and bridge improvement. And, you know, that is the person that ends up being my co-worker on the other side of the fence...that partnership is really where the rubber meets the road" (Interviewee F, 2017). One public-private partnership that was deemed successful by a plurality of interviewees was the RUMA model. Given the success of this model in the region, stakeholders may consider expanding the model to other functional areas, such as waste management, water recycling, and facilities development.

### **Establish a Fund, Save, Invest in Non-Recurring Needs**

With the introduction of the industry came significant windfalls of tax and royalty revenue. New oil and gas businesses contributed to local tax bases, which county governments benefited from. As

new funds came in, many of the interviewees chose to do one or a combination of two things with these dollars: save and hold it in a fund, and/or invest it in non-recurring public needs. As Interviewee A stated, "...we received what we call up front bonus payment monies back in 2014 and 2015, monies that we used to build some new infrastructure, some new roads, and to pay down existing water and sewer debt" (Interviewee A, 2017). Another interviewee echoed this finding, stating, "...when the gas and oil industry was ramping up, I felt like as I watched expenditures, they were just one time, like I said, they were 'let's get new equipment. Things that we need that we've not ever been able to get.'" (Interviewee E, 2017). Along with investing in non-recurring infrastructure needs, Interviewee G noted that their county saved the dollars that came in, "...we decided to start, the commissioners decided to start carrying over a little larger general fund balance...So, they tried to keep a little more of a reserve" (Interviewee G, 2017). In addition, the same interviewee highlighted the decision to not invest in recurring needs, "...they predominately used the money to invest in infrastructure, rather than hiring personnel where you have ongoing costs annually...they wanted to make sure that they used those funds to improve infrastructure to the community that would do good long beyond just the oil and gas industry's boom period" (Interviewee G, 2017).

One use of industry-related funds which was not mentioned in the interviews, but is recommended by Saha and Muro (2016) at the Brookings Institution, a Washington, D.C.-based nonprofit public policy organization, is the establishment of a Permanent Trust Fund. A Permanent Trust Fund is a wealth retention tool that enables actors to take revenue from flows like severance taxes or royalties and invest it into capital markets. A Permanent Trust Fund could enable localities to capture wealth generated during industry boom periods for a variety of future uses – from infrastructure projects, workforce development, economic diversification efforts, etc. According to Saha and Muro (2016), Permanent Trust Funds have the potential to help localities both "cushion their economies from the volatility of future booms and busts," and "help finance the investments needed to catalyze economic diversification [and] promote economic inclusion..." Ultimately, capital access for counties impacted most by shale activity is an important consideration as the industry continues to be developed in the region. In addition to establishing a permanent trust fund,

other options include a state sovereign wealth fund, expansion of bond financing, or a green bond initiative for infrastructure needs.

### **Form Regional Alliances**

The County Engineers Association of Ohio (CEAO) is an organization dedicated to bringing together county engineers across the state to discuss issues, concerns, and best practices related to maintaining high-quality and safe roads within each county. Some of the interviewees we spoke to highlighted the role that this state-wide alliance played in preparing impacted counties for the introduction of the oil and gas industry to the state. From one interviewee, “...the...County Engineers Association has taken a proactive approach to the oil and gas business, and that’s where the road use agreement and so on has been put in place” (Interviewee D, 2017). This formal, statewide, association provided a forum for counties in the eastern part of the state to plan and discuss ways to manage the industry’s impacts to their public infrastructure. Regional collaboration with respect to these issues need not only be through formal settings, however. Since industry activity impacted more than just roadways, it was important that public departments had channels available through which they could discuss best practices for managing these impacts. One interviewee highlighted the importance of this, stating, “I’ve done my level best to provide as much information to other counties so that they don’t feel so out in left field like we did when it all happened” (Interviewee F, 2017). Another emphasized how a combination of regional collaboration in the public sector, along with partnership with private industry, enabled their region to make use of tools that would otherwise not have been available to them. From the interviewee, “We’ve also managed to create some regional alliances amongst several counties, and one of the vendors even provided a truck and a foam trailer, because we really didn’t have that capability within the counties” (Interviewee G, 2017). Through a memorandum of understanding, this privately-donated vehicle was shared with four other counties in the region.

Indeed, both formal and informal collaboration between counties in Appalachian Ohio may increase capacity for the region, as a whole, to manage impacts to public infrastructure. For example, Interviewee G discussed how their county was in the final stages of developing a “multi-region operational team” called an Emergency Management Assistance Team (EMAT). Modeled after the



Federal Emergency Management Agency's (FEMA) Incident Management Assistance Teams, this EMAT aims to increase capacity for responding to emergencies across counties in Appalachian Ohio (Interviewee G, 2017). Another interviewee suggested the following, "I would suggest to other public entities...that there be the creation of...an Eastern Ohio development or infrastructure alliance...that would meet on a semi-regular basis to address and to hear what other counties are doing" (Interviewee A, 2017). Keeping avenues open for impacted counties to work together in managing regional impacts may have potential to increase capacity and share lessons-learned.

### Lessons from Elsewhere

When it comes to managing impacts to public infrastructure from oil and gas activity regionally, a variety of suggestions have been presented. Ohio communities can also draw from numerous experiences across the country and around the globe for best practices, from case studies on protecting local roads in New York to examples in tax revenue investment set by North Dakota to innovative usage of funds in the country of Denmark.

#### **Preparing for and Managing Shale Activity – Lessons from the Literature**

In a December 2011 study on how shale gas extraction impacts communities, Christopherson and Rightor (2011) put forth three recommendations to policymakers in preparing for activity: establish baseline data on potentially impacted infrastructure (roads, water, rent, traffic, staffing, etc.), dedicate a revenue stream from production (i.e. from taxes, royalties, etc.), and budget for future costs. These suggestions are based on the authors' research in the Marcellus shale play, with a focus on northern Pennsylvania and southern New York.

A separate study from Cornell University focused primarily on the role of state severance taxes in the Marcellus shale play, with an eye toward how localities could cover the costs of industry activity while ensuring long-term economic sustainability. The primary researcher, Lepori, advises the following to cover public infrastructure costs: establish a tax that covers both short-term and long-term costs of activity, "distribute tax revenue predictably and fairly between state and local

governments,” “limit deductions and exemptions,” and set-up a Permanent Fund (Christopherson et al., 2011).

Regarding impacts to local roads, another Cornell University study examined shale activity in New York’s share of the Marcellus shale play. With the goal of developing a guide for managing industry-related road use and protecting local roadways, the primary researcher, Randall, suggests the following best practices: “conduct a comprehensive traffic impact study...to clearly define road structural classes,” “document baseline road conditions,” utilize RUMAs for all industry-utilized roads, “develop and implement a haul route management system to keep heavy trucks off the most vulnerable roads,” and “enforce load zoning (Randall, 2011).”

To manage increased tax and royalty revenues coming from industry-related activity, Raimi and Newell (2016) presented three relevant findings for localities impacted by shale development. First, “predictable, reliable revenue sources are beneficial for local governments with revenues that are closely tied to the oil and gas industry.” Second, “flexible funding mechanisms...can complement...more predictable revenues by supporting local governments experiencing unexpectedly high costs associated with oil and gas development.” And third, “collaboration with oil and gas operators...can substantially reduce the costs for local governments...”

### **Lessons from North Dakota**

A large portion of North Dakota includes both the Bakken Shale play and the Williston Basin, making it one of the top oil and gas producing states in the U.S (Energy Information Administration, 2015 & Energy Information Administration, 2016). Certainly, North Dakota has faced many of the same issues as Ohio when it comes to impacts to public infrastructure from oil and gas activity, and has taken some interesting measures to managing these impacts.

The Bank of North Dakota (BND) is a state-owned and state-run bank, with its only location in Bismarck, ND. The BND is the only institution of its kind in the continental United States. According to its website, the “Bank of North Dakota is an agile partner that creates financial solutions for current and emerging economic needs (Bank of North Dakota).” Included in its offerings, the BND

addresses local infrastructure needs with loan programs including the BND Infrastructure Loan Fund, a Community Water Loan, and School Construction Loans (Bank of North Dakota).

In addition to the BND, the State of North Dakota has established a number of funds which take dollars from oil and gas industry-related taxes and invests them in infrastructure projects. The North Dakota Legacy Fund does this at the discretion of the state legislature, and the North Dakota Oil and Gas Impact Grant Fund serves to provide financial assistance to localities in the state most heavily impacted by oil and gas industry development. The North Dakota Resources Trust Fund allocates dollars for water-related projects and energy conservation programs, by legislative appropriation (North Dakota State Treasurer, 2017). Following the recommendation from multiple academic sources, North Dakota captures tax revenue from industry activity and invests it into permanent funds, appropriating the funds to meet goals set by the state legislature.

### **Lessons from Denmark**

Another example of using industry-related revenue for infrastructure improvement comes from the country of Denmark. The Train Fund is a country-wide infrastructure improvement project aimed at modernizing Denmark's railway system. By capturing tax revenue from operations in the North Sea, The Train Fund is investing in its transportation system with two primary goals: electrify the railway and meet the "1 Hour Model" goal<sup>6</sup>. Denmark hopes to complete both the electrification goal and the "1 Hour Model" goal by the mid-2020s (Transportministeriet, 2014). As an example in capturing and recycling wealth from industry-related tax revenue, Denmark's Train Fund presents insight into how oil and gas activity may be leveraged to meet other long-term development goals.

### **Conclusion**

Certainly, the impacts to counties in Ohio most affected by oil and gas industry activity have been substantial. Though, while shale development is relatively new, Appalachian Ohio is a region with a

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<sup>6</sup> The "1 Hour Model" is a goal to reduce travel time between Denmark's five largest cities to no more than one hour (Transportministeriet, 2014).

long history of extractive industry. As one of our interviewees highlighted, “...eastern Ohio has a long history of volatile minerals...” (Interviewee A, 2017). From timber to coal to steel, eastern Ohio has much experience in managing similar boom-and-bust cycles. The increase in shale industry activity presents a window of opportunity for the region if managed strategically. If not managed properly, however, this opportunity may prove to be only another fleeting boom and bust.

A word of caution comes from Christopherson and Rightor (2011) who state, “Regions hosting natural resource development industries have historically been characterized as afflicted by a ‘resource curse’ because, while the natural resource extraction boom brings jobs and population growth for a few years, it also...‘crowds out’ other industries.” A plurality of interviewees in our study expressed confidence that the oil and gas industry is around to stay in eastern Ohio. “...regardless of the volatility of the industry...these entities are here to stay” (Interviewee A, 2017). “I think you could certainly argue that the bulk of the revenue has yet to be realized, especially when you look at, say, taxes based on production...My request to people at the state and federal level would be that, you know, to take into account what’s very likely to occur, you know, sort of the build out of the petro-chemical industry over the next five to ten years...” (Interviewee B, 2017) If that is indeed the case, the region (and other localities hosting shale activity) may benefit from the lessons presented by our interviewees, as well as recommendations available from other studies. Policy options include the following: anticipate and plan for the bust, develop efficiency in public office work processes, leverage short-term financial and development benefits for long-term sustainability, establish a fund, and invest in non-recurring needs.

## Acknowledgements

The author wishes to thank all the individuals who were interviewed as a part of this study, which will help inform others managing similar issues, and provide the lessons to help secure a more sustainable future for Ohio and beyond.

## Appendix

### Public Infrastructure Interview Questions

1. Please state your name, your title, the county in which you work, and your role in the county.
2. Please describe the impact that oil and gas production in your county has had on demands for public infrastructure development?
  - a. By public infrastructure I mean any of the following: roads, railroads, public housing, schools, waste facilities, water facilities, demand for local government services, fire department services, city hall services, community building services, EMS services, jail/prison services, court/judicial services, and staffing for any other public departments.
3. In what ways has your county managed and financed public infrastructure development resulting from oil and gas production?
  - a. To what extent has financing depended on capital financing?
  - b. To what extent has financing depended on debt financing?
4. Has your county established any public-private partnerships with the oil and gas industry to manage public infrastructure development? Please elaborate.
5. What type of measures has your county taken to mitigate or protect itself from the risk of a future downturn in the oil and gas industry, with regard to public infrastructure development? Please elaborate.
6. Are there other counties in Ohio or the region that are managing similar issues in an innovative and/or successful way that you are aware of? Please elaborate.
7. Is there anything that I did not ask you that I should have? Is there anything else that you think is important to tell me? If so, what?

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