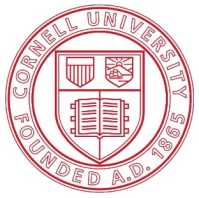
Marcellus Hydro-Fracturing: What Does it Mean for Economic Development?

April 7, 2011

Susan Christopherson
Cornell University
smc23@cornell.edu



Marcellus Shale is One Play in a National Natural Gas Boom

Environmental & Public Health Questions are Critical

What Can An Economic Development Analysis Add to the Picture?

- What are the cumulative impacts of drilling activity during the drilling phase? What are the potential public costs?

- What local and regional impacts are likely with a capital-intensive resource extraction industry

- What is known about the long-term consequences for economic development in resource extraction economies?

There Are Limits to Our Knowledge

- There are significant uncertainties, both environmentally and economically.

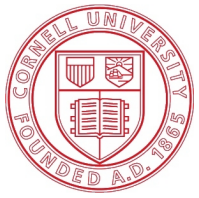
- Environmental and public health studies have been done in selected locales in Shale Plays but results are not considered policy relevant outside the sample area. Multiple location research is needed.

- Research on economic consequences is limited largely to the effect of resource industries on regional economies.

The Limits of Input-Output-Based Economic Impact Studies

- These are models. Numbers are projections not "real" numbers.
- They tell us nothing about costs.
- It is critical to understand the assumptions that underpin the input-output models used in EIR studies.
- What is assumed about where and in what time frame drilling will take place? What is assumed about drilling expenditures or land owner royalties.

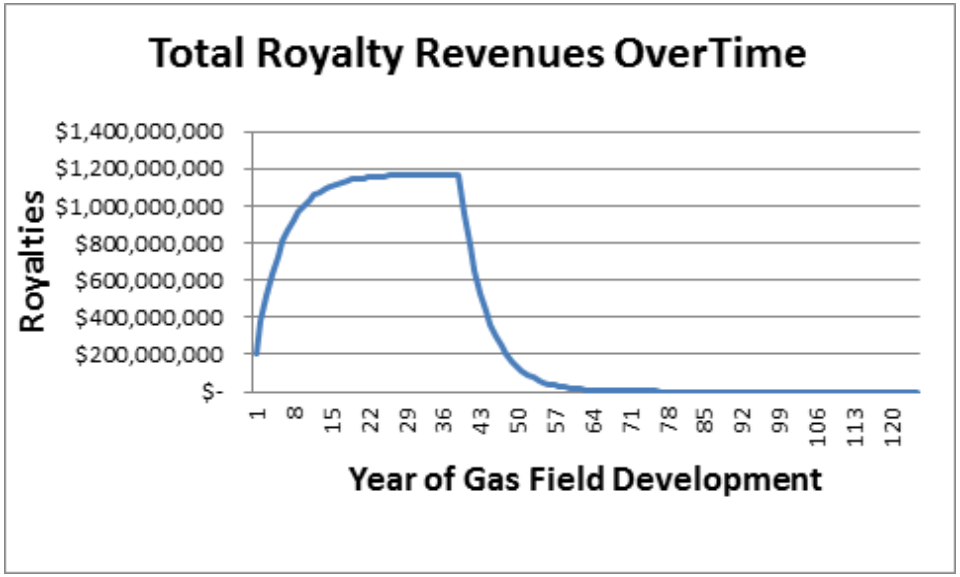
How Do We Get A Grip on the Questions of Costs to Communities and Long-Term Implications?



We Need to Understand What Drives the Pace and Scale of Drilling!

Pace refers to the time frame within which gas extraction takes place.

Scale refers to the number of wells drilled in a gas play annually.



Source: Kelsey 2011

Well Development Phases

Phase I (months per well, years for entire region)

- Construct access roads, well pad, local collection pipeline
- Drill & fracture well
- Construct supporting facilities and services

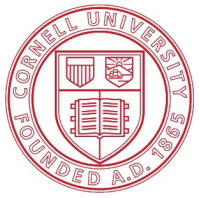
Phase II (years or decades)

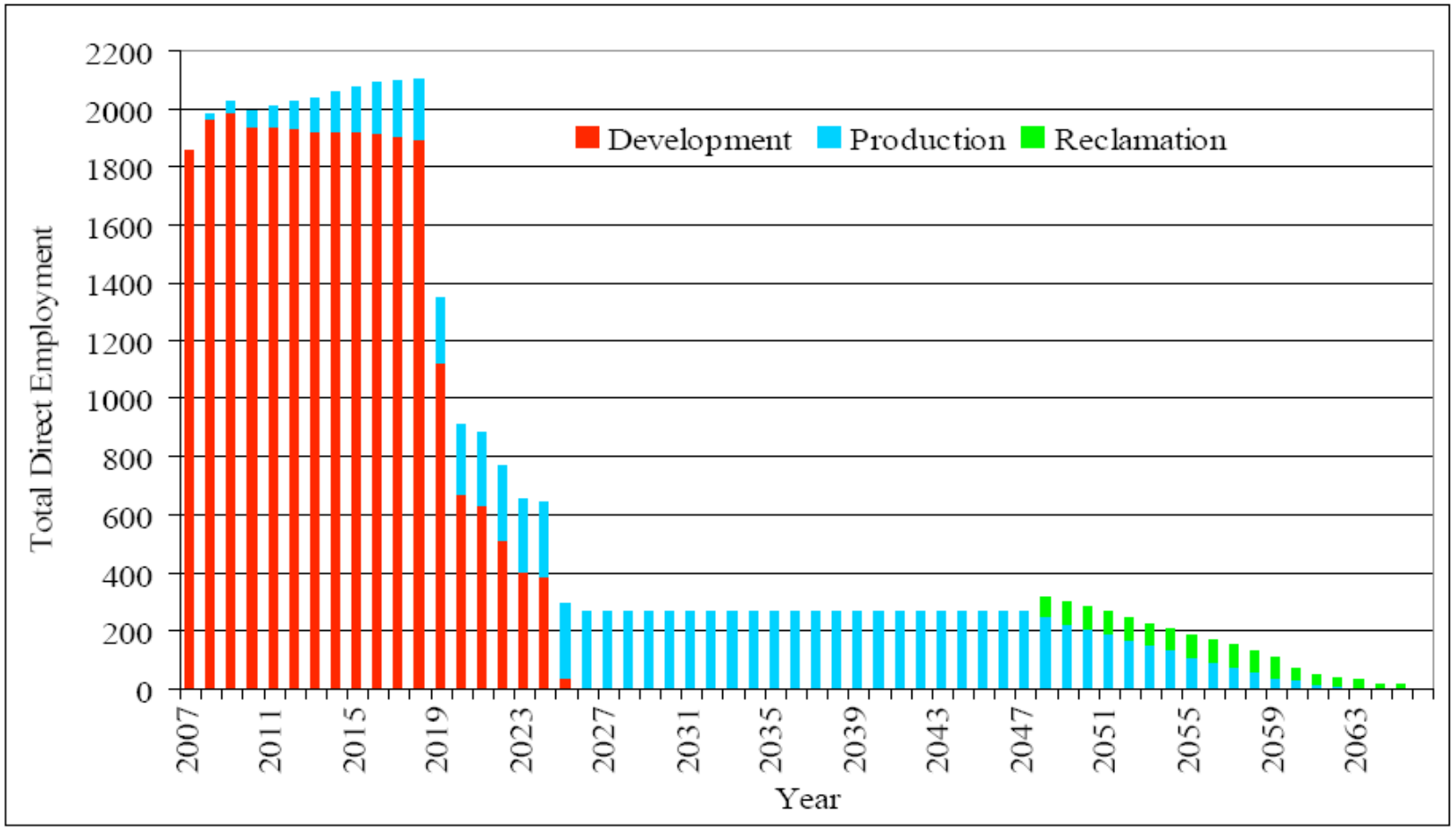
- Truck water from well site, monitor natural gas production
- Refracture well if necessary
- Reclaim some disturbance

Phase III Remove surface equipment, plug well

- Restore landscape

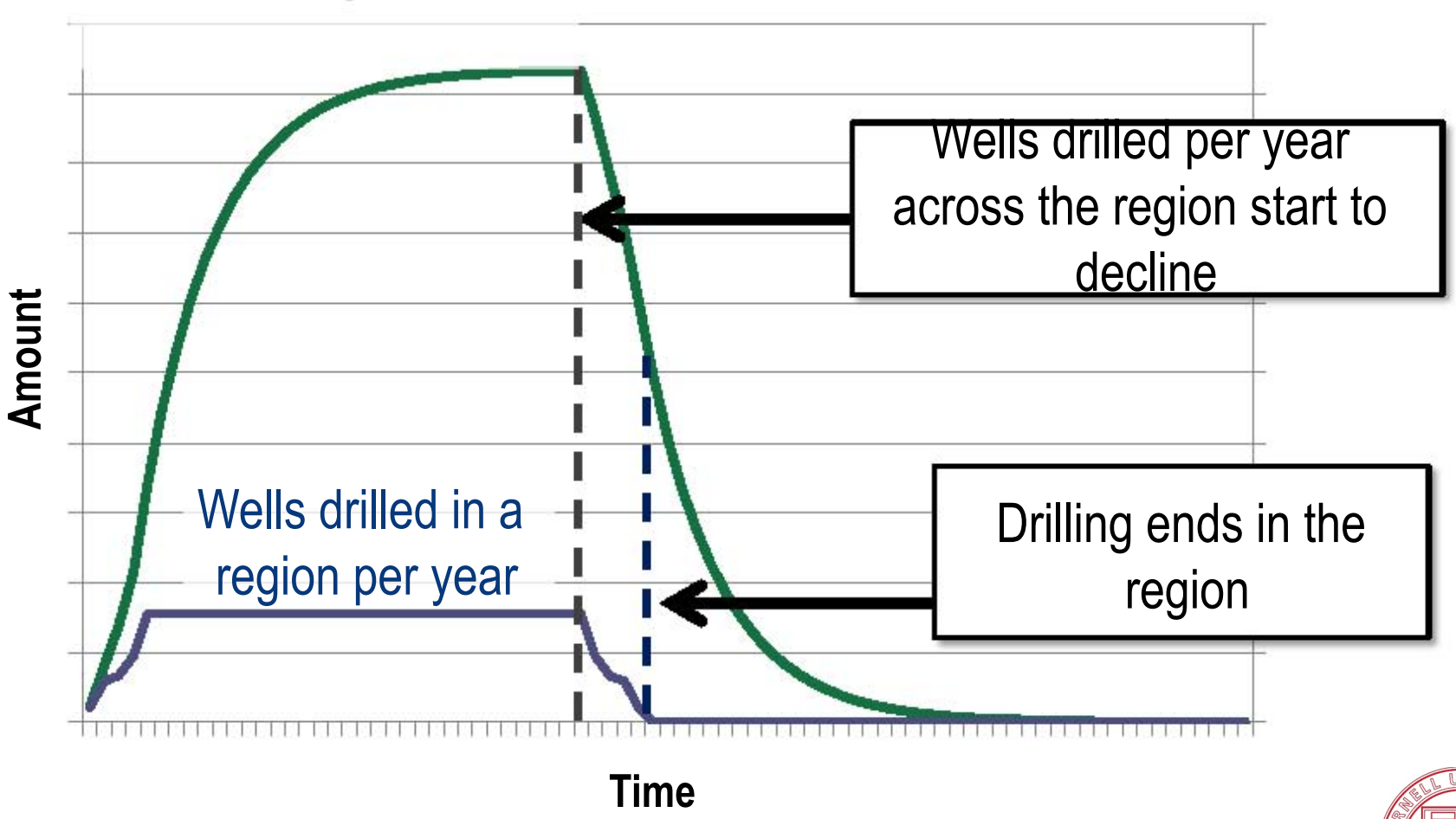
(Based on Jacquet, 2011)





Sample Workforce Flow through the drilling phases (ERG/ Jacquet)

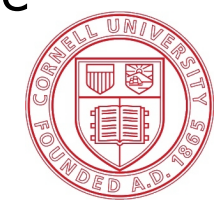
An Illustration of the Boom-Bust Cycle in Royalties, Business Income, Tax Revenues, and Jobs



Adapted from Tim Kelsey (2011), "Annual Royalties in a Community".

What Factors May Affect the Pace and Scale of Marcellus Shale Drilling?

- Transport costs - may accelerate Marcellus Shale over other gas shale plays because of its access to major gas markets
- Current tax policy - may accelerate drilling in PA and NY. They are among the few states without a severance tax (though NY has a property tax on gas).
- Speculative investment including hedging
- Competition among and access to capital by natural gas companies
- Rig availability
- Regulatory requirements and capacity
- A decline in other sources - conventional drilling or Barnett Shale production



Why are Pace and Scale Important?

- A faster pace and more wells drilled in a locality increases costs to the community.

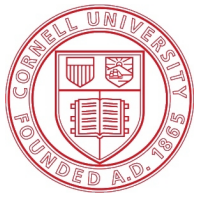
- The pace and scale of drilling will determine the duration of the drilling-based "boom" and the timing of the "bust".

What Does Evidence from Other Shale Plays Tell Us to Anticipate?

- Possibly volatile, short-term (seven-ten year) drilling phase moving from one locality to another in a region.

- A longer-term regional industrial infrastructure that supports and services the natural gas industry and gets product to market.

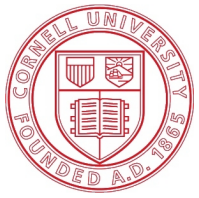
What Do We Know About Cumulative Impacts? Why We Need to See Beyond the Well Pad



Case Studies Tell Us the Local Costs of Shale Gas Drilling include:

- Accelerated road maintenance
- Traffic congestion from trucks
  (An estimated 890 to 1,340 truck trips per well site)
- Higher public safety costs
- Increased demand for health and education services
- Increased demand on public administrative services
  (e.g. planning and zoning, permitting, assessments, housing assistance)
- New service requirements, such as emergency response capacity and environmental monitoring and remediation.

The Faster the Pace, the Higher the Cumulative Costs



How Will Local Costs Be Paid?

Local residents may have to absorb whatever costs are not covered through state tax policy, local taxes and fees, or local agreements

An illustration: SR 3020 in Towanda Township, Bradford County, Pennsylvania after a high volume of overweight drilling trucks and a Northeast winter

(Photo: PennDOT Engineering District 4-0)

Unexpected Patterns/ Unanticipated Consequences

"Despite the influx of workers in the natural gas industry, the population of Bradford County, as measured by the U.S. Census, actually dropped slightly from 2000 to 2010."

From a reader:

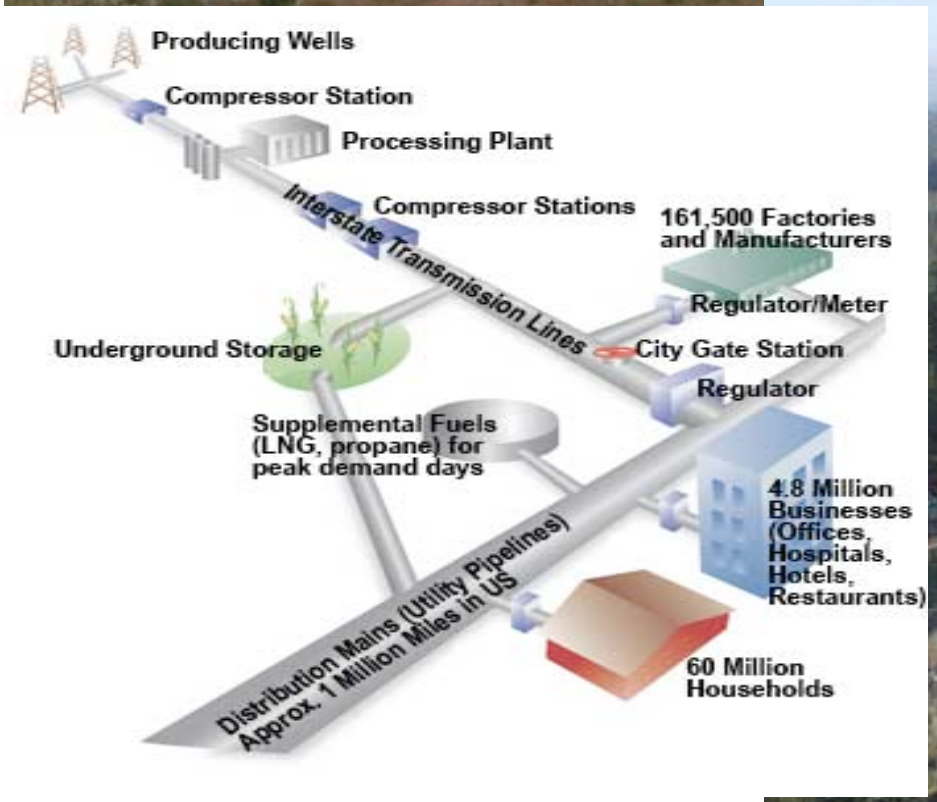
"I say good for the people who finally have a decent paying job, good for the people who are seeing an influx in business, and good for those who saw the opportunity of a move if so desired. Just remember, there are still those of us remaining who had nothing to do with any of this. We deal with the traffic, destruction, fear of contamination everyday. Some of us deal with it twofold. We dealt with the windmills and gas industry at the same time. We benefit nothing from any of it. We get no opportunity for natural gas and are still forced to pay premium prices for propane. We get no electricity benefit from the windmills and are still forced to pay Tri County's ridiculous rates. Our trucks are taking a beating every day we have to drive to work. But are forced to deal with it just the same."

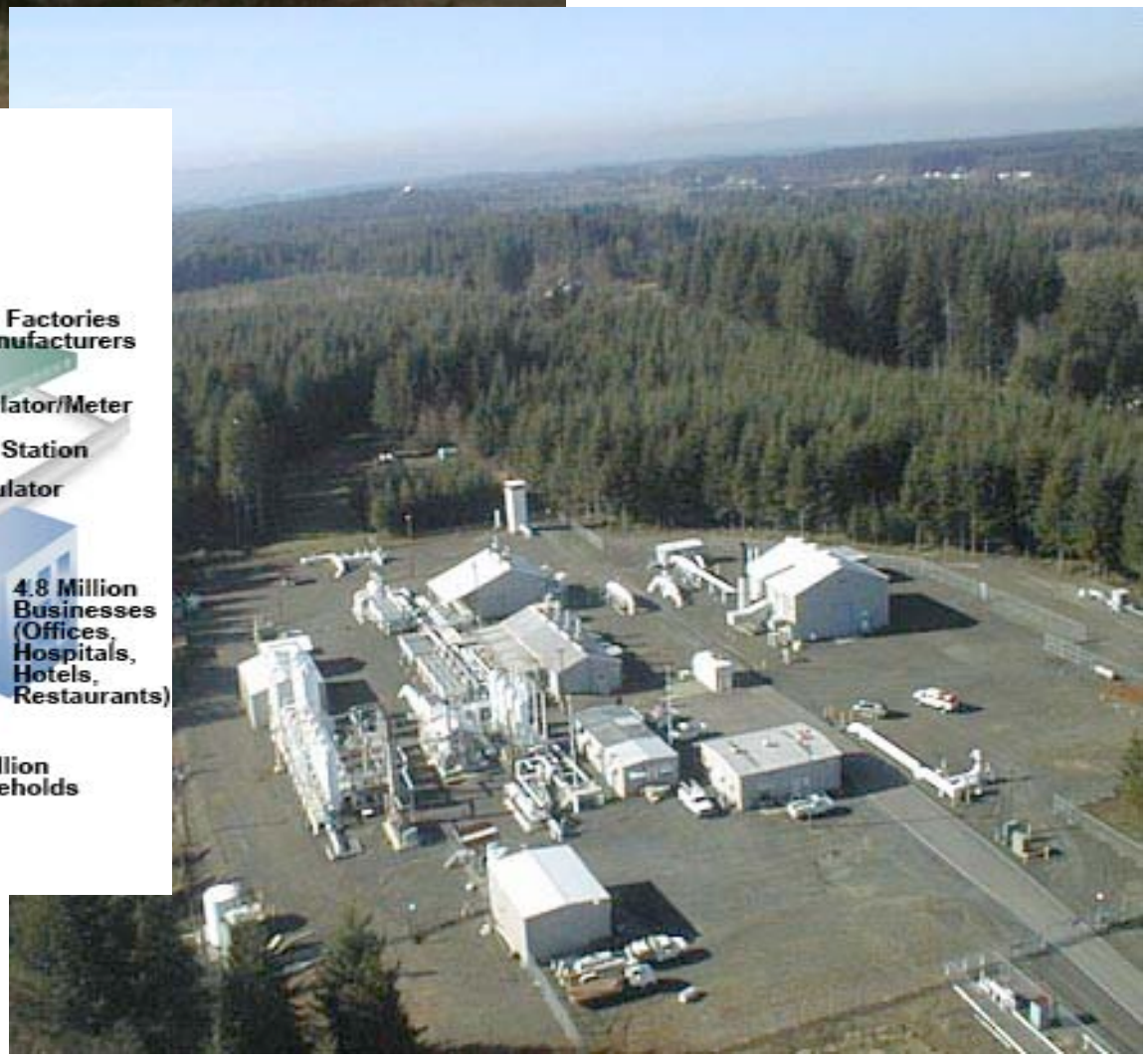
What Are the Issues in Your Communities?

What economic issue is most talked about in your community or discussed in local news reporting?

Regional Impacts: Why We Need to See Beyond the Well Pad

A Regional Industrial Landscape





What Could We See in a Drilling Region?

- "Man Camps"
- Water extraction sites
- Compressor plants
- Pipelines
- Staging sites
- Rail spurs
- Gas storage sites and facilities
- Processing facilities for "produced" water or injection wells
- Trucks, trucks, trucks

What About the Long-Term Economic Development Effects of Gas Drilling?

Economic Development is measured by:

- population growth
- income growth
- economic diversity

Why Do Rural Regions Dependent On Natural Resource Extraction Frequently Have Poor Development Outcomes?

- Volatile revenue leads to poor government planning and lack of accountability. Yet, demands on government rise.
- "Crowding out" -- the expectation of wealth from the resource works against economic diversification, and increases the cost of doing business for other industries.
- Housing and labor costs rise.
- After the initial "ramp-up" construction phase, there are few jobs and income inequality increases.

Cautionary Trends from New York and Pennsylvania Gas Drilling Counties

In New York, when compared to adjacent counties or all of non-metropolitan New York, counties with significant natural gas drilling (1994-2009) are characterized by:

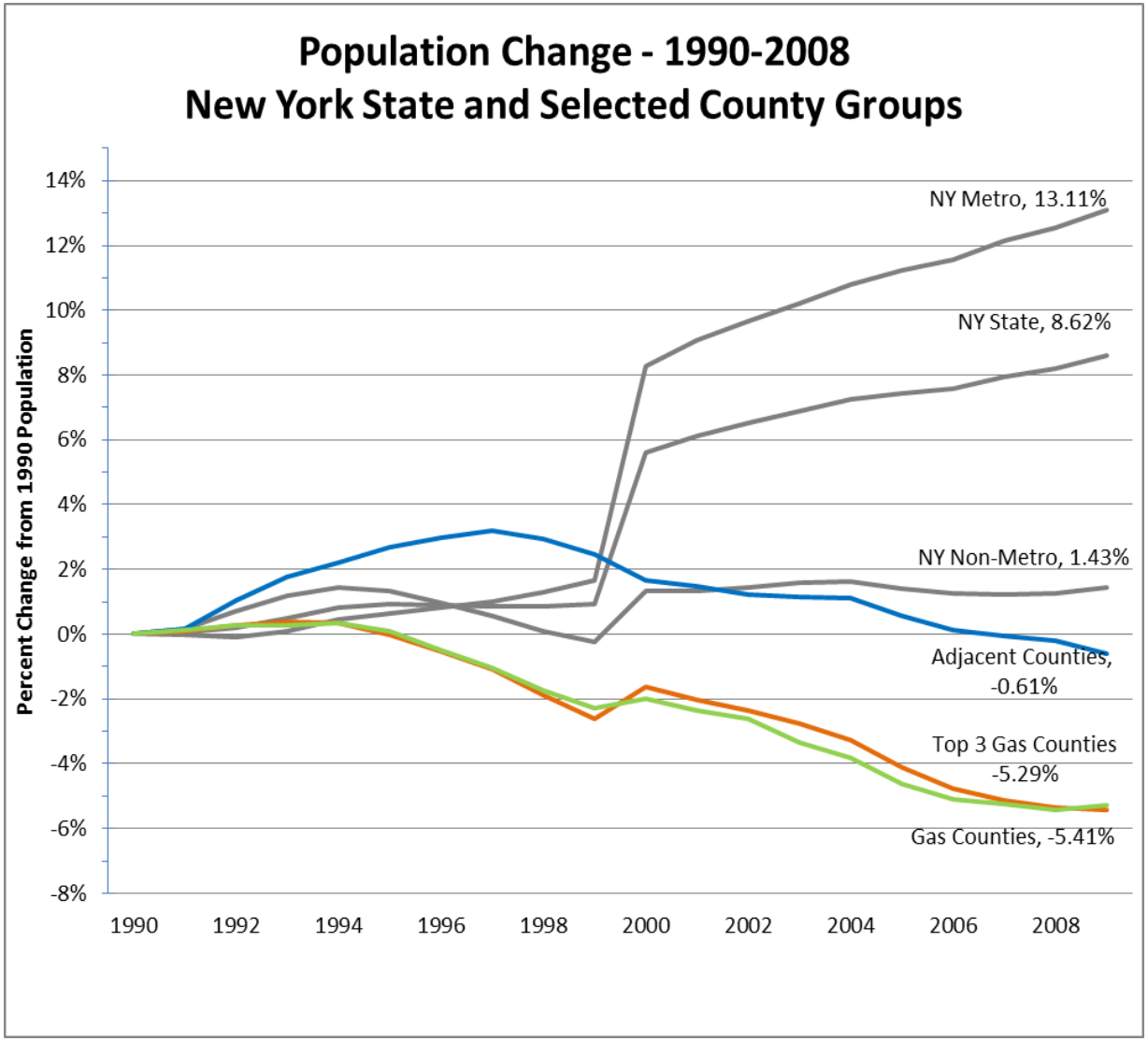
1. Population loss
2. Smaller increases in real personal income

In Pennsylvania, counties with conventional gas production (1991-2005) show similar trends.

Population Decline

New York

Gas-producing counties have been losing population faster than adjacent counties and much faster than upstate NY as a whole.



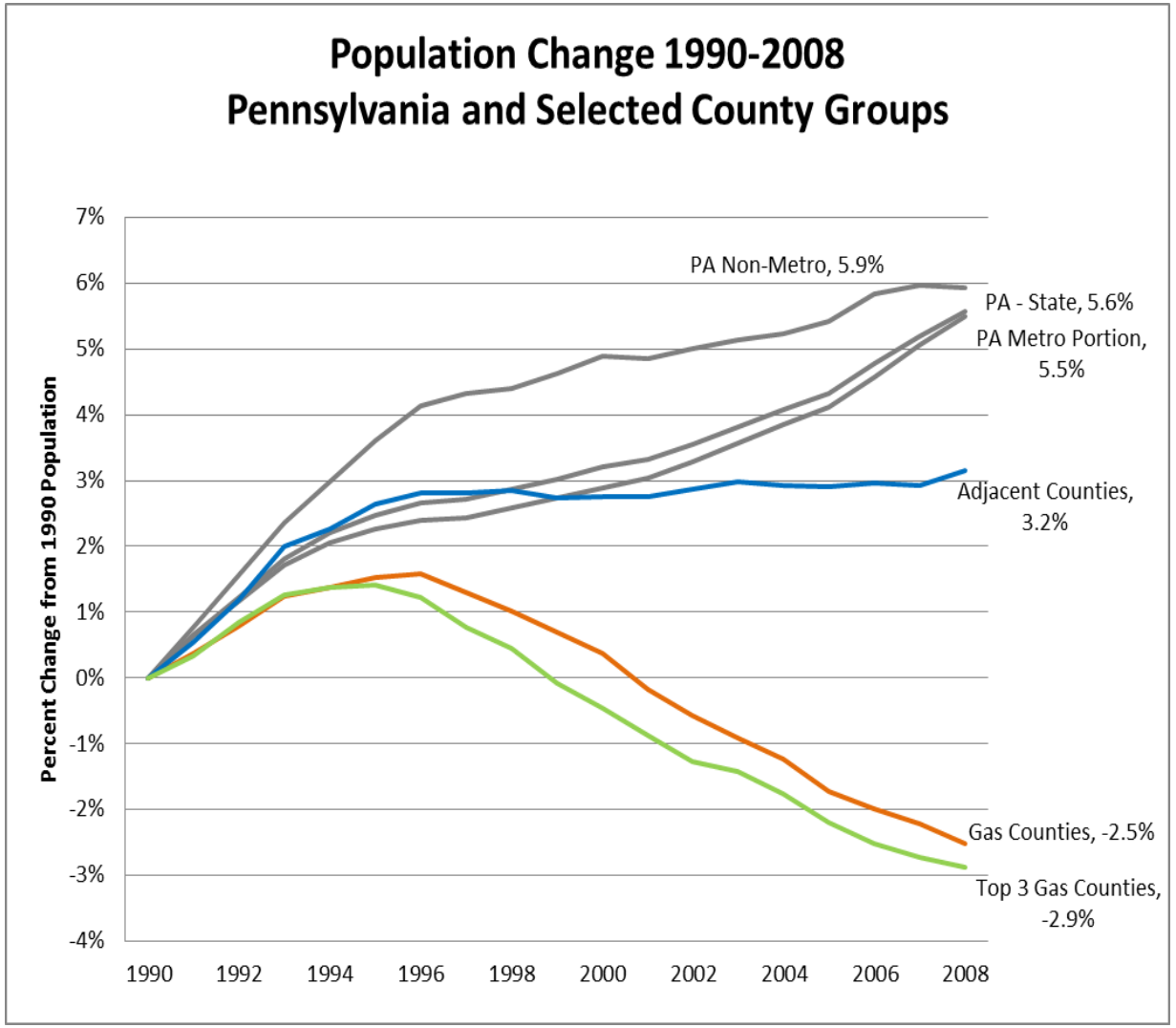
Source: Census Annual Population Estimates

Population Decline

Pennsylvania

Gas Counties in Pennsylvania began losing population in the mid-90's, whereas population in adjacent comparison counties leveled off but did not decline.

The top 3 gas producing counties lost an even higher proportion of their population.



Source: Census Annual Population Estimates

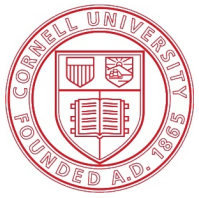
Evidence from the Western States

When compared with peer counties, 26 counties in Western States that have at least 7% of their total jobs in resource extraction industries show:

- Less economic diversity
- Less ability to attract investment in non-extraction industries, such as retirement communities and tourism

They modestly outperformed their peer counties in growth in earnings per job and per capita income.

What Can We Learn from Other Shale Plays?



What Do Public Officials from Shale Drilling Communities Say is Important?

Regarding Citizen Information and Involvement:

- Efforts to educate the public and engage the industry.
- Enlisting the local bar association to help landowners understand lease agreements.
- Registering and monitoring landmen operating in the region.
- Involving local real estate companies and state and federal agencies in dealing with the new demand for housing.
- Mediating disputes over housing issues, and providing assistance for displaced renters.
- Transparency regarding permits, incidents, and infrastructure.

What Do Public Officials from Shale Drilling Communities Tell Us is Important?

In the Drilling Phase:

- Creating a local Gas Drilling Review Committee to mediate disputes over wells, pipelines, and truck traffic.
- Establishing consistent standards for drill site and infrastructure facility setbacks, the use of fracture ponds, and deadlines for landscaping drill sites.
- Limiting the hours of drilling operations.
- Mitigation of noise, dust, and mud.
- Monitoring and enforcement of new regulations.

How Should We Deal With a Non-Renewable Resource?

- Slow it down to minimize cumulative impacts.
- Be transparent to minimize public anxiety and enable citizen input.
- Plan across governments to minimize negative impacts from industrial infrastructure.
- Be proactive in planning for ways to use this resource for regional economic development.

The Project

Funders

We are grateful for the generous support of:

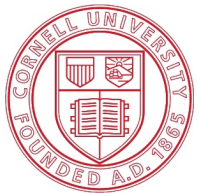
The Park Foundation

The Heinz Endowments

The Cornell Center for a Sustainable Future

The Project Team

- Susan Riha
- Kieran Donaghy
- Rod Howe
- David Kay
- Ned Rightor
- Isaac Argentineau
- Javier Perez Burgos
- Jeffrey Jacquet
- Tom Knipe
- Viv Li
- Jack Lowe
- Lydia Morken
- Brian Rahm
- CJ Randall
- Andy Rumbach
- Sam Scoppettone



Marcellus Hydro-Fracturing: What Does it Mean for Economic Development?

For further information on our work, see
www.greenchoices.cornell.edu

Susan Christopherson
Department of City and Regional Planning
Cornell University