

OHIO STATE UNIVERSITY EXTENSION

# Building Sustainable Communities in Ohio's Shale Region:

Leveraging Manufacturing Clusters and  
Local Assets with Strategic Planning



**2015 Eastern Ohio 25 County Regional Report**  
Community and Energy Series Technical Report 16-01



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

[energizeohio.osu.edu](http://energizeohio.osu.edu)

# Acknowledgments

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# EDA Shale Energy Grant

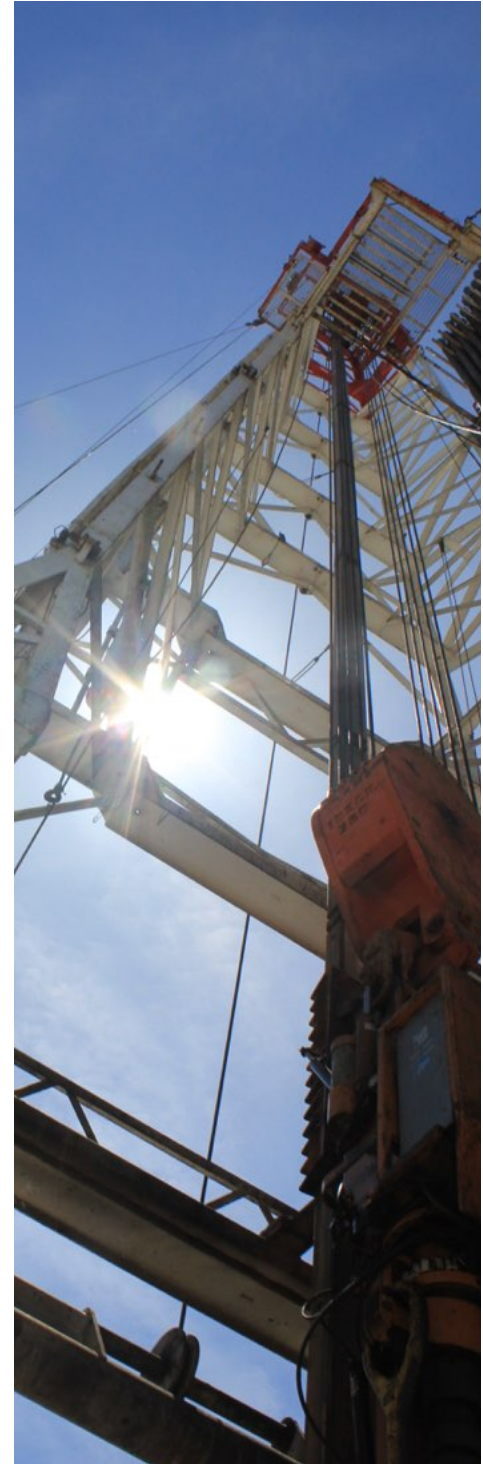
## *Project Background and Overview*

This Economic Development Administration (EDA) grant funded project is a collaborative initiative between Ohio State University Extension, Eastgate Regional Council of Governments, Northeast Ohio Four County Regional Planning and Development Organization, Ohio Mid-Eastern Governments Association, and the Buckeye Hills-Hocking Valley Regional Development District (Image 1). The project is designed to connect the four regional economic development stakeholders with economic research related to the current oil and gas boom in Ohio to inform the development of long term planning strategies that support long-term economic viability and community sustainability.

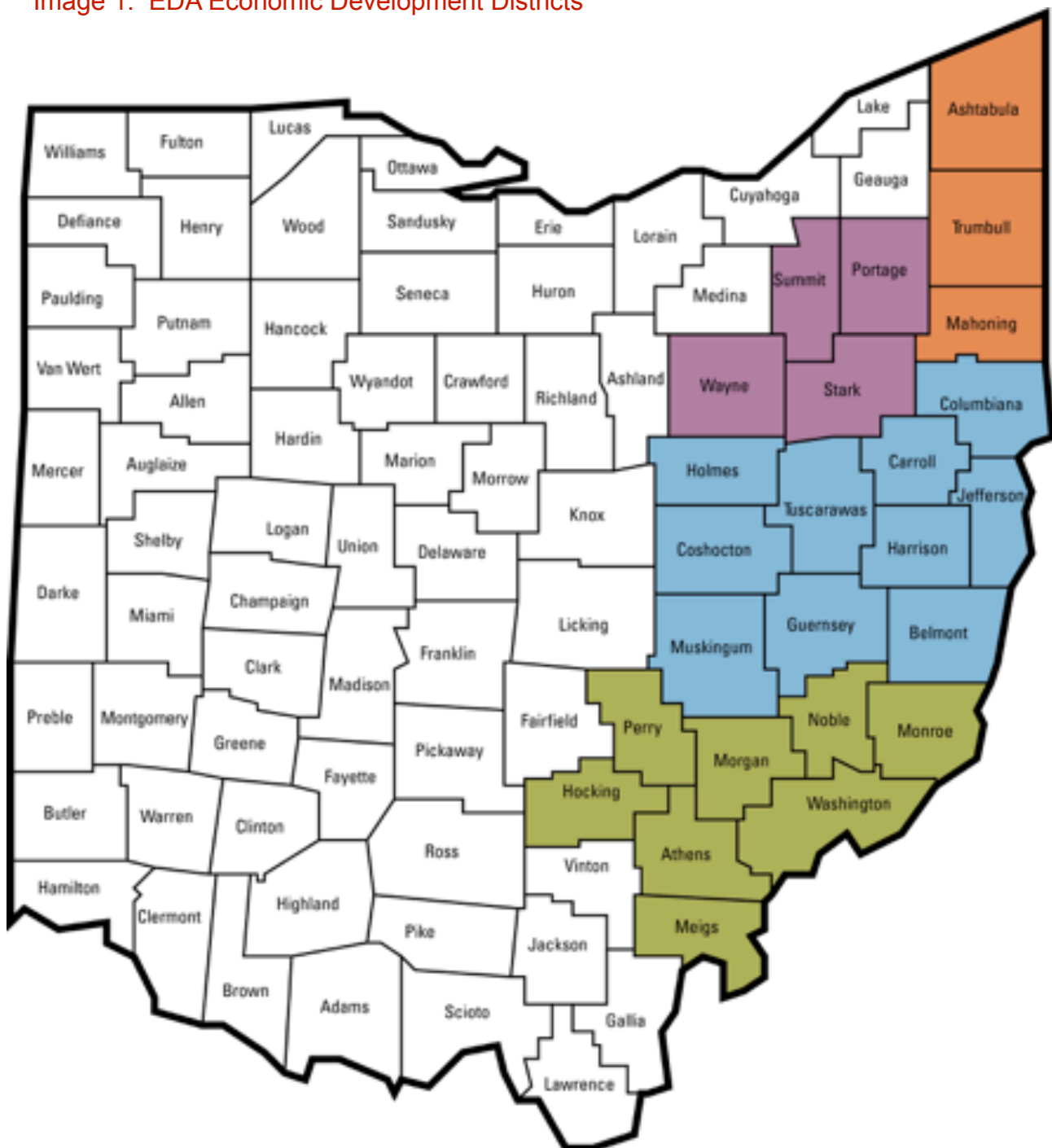
To achieve these goals, the project partners are focusing on the following objectives:

- 1) Developing a collaborative multi-disciplinary team of researchers and community stakeholders
- 2) Conducting research based on private and public data sources to measure change
- 3) Developing a replicable sustainable strategic shale energy planning process
- 4) Establishing implementation strategies

The primary objective of this research project is to promote long-term community sustainability and economic diversity. This can be accomplished by countering the permanent reduction of non-renewable natural resource (extraction) by proactively developing a sustainable plan to increase human capital, environmental capital, and infrastructure or built capital. This project will demonstrate a model, which leverages the advancement of innovation, entrepreneurship, cluster development, and sustainable strategic planning to promote economic diversity and viability.



## Image 1: EDA Economic Development Districts

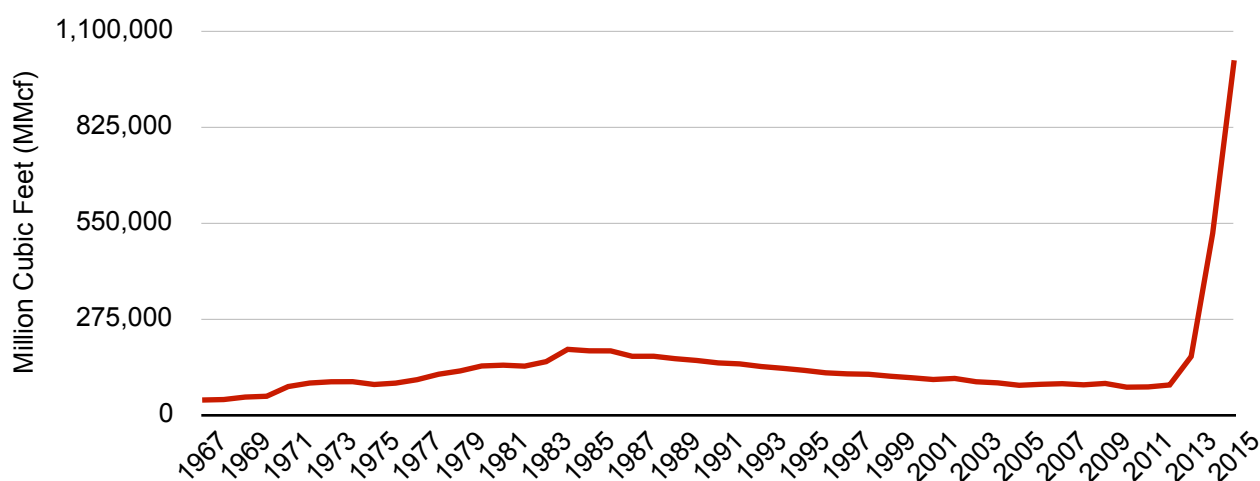


- Eastgate Regional Council of Government
  - Northeast Ohio Four County Regional Planning and Development Organization
  - Ohio Mid-Eastern Governments Association
  - Buckeye Hills-Hocking Valley Regional Development District

# Ohio Oil and Gas Production

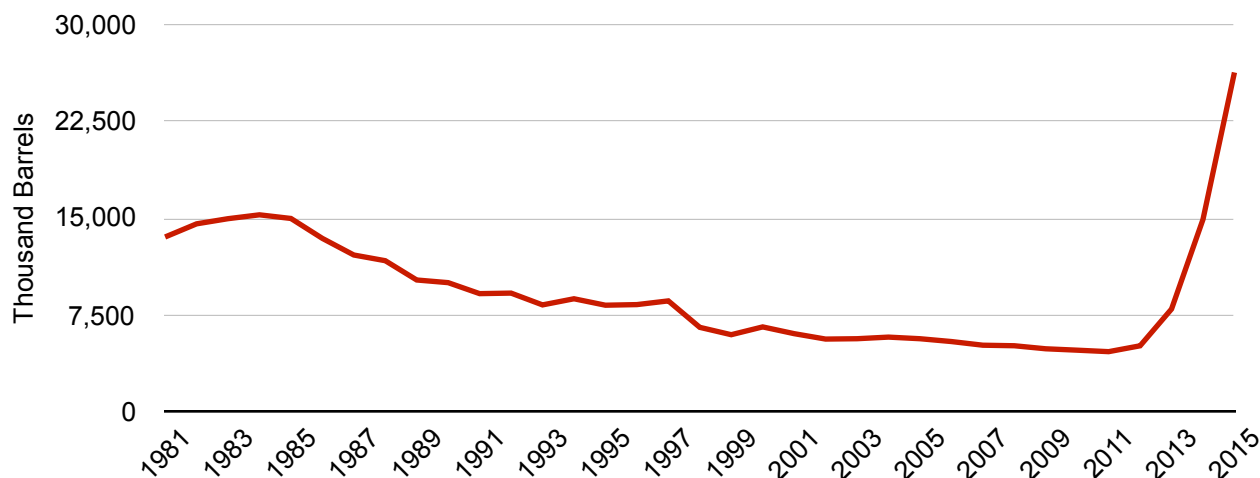
Oil and gas development in Ohio has been primarily concentrated on a narrow strip in eastern Ohio extending from Carroll County to Noble County. As wells were drilled, the region also experienced rapid development of midstream processing and fractionation plants designed to clean and remove the “wet” components from the rich gas found in the region. As these plants come on line, it is likely that more wells will be drilled and a network of pipelines will be installed throughout the region and across the state to move the product from the wellhead, to midstream operations, and ultimately the end use consumers. In 2014 and 2015, the state reported significant increases in the production of both crude oil and natural gas (Chart 1 and Chart 2).

Chart 1: Ohio Natural Gas Annual Gross Withdrawals



Source: U.S. DOE Energy Information Administration, 2/29/2016

Chart 2: Ohio Annual Field Production of Crude Oil



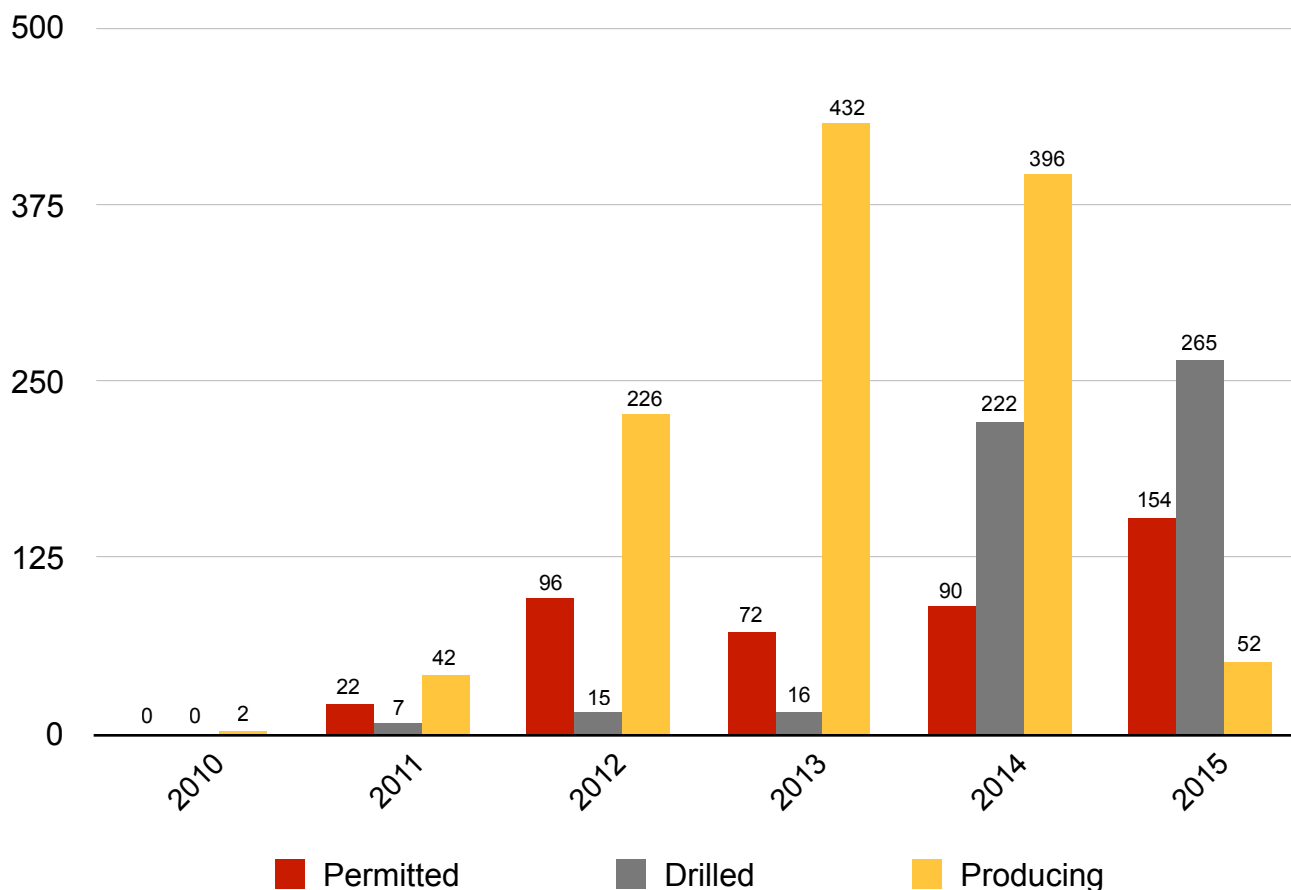
Source: U.S. DOE Energy Information Administration, 2/29/2016

# Utica/Point Pleasant Shale

## Development Overview

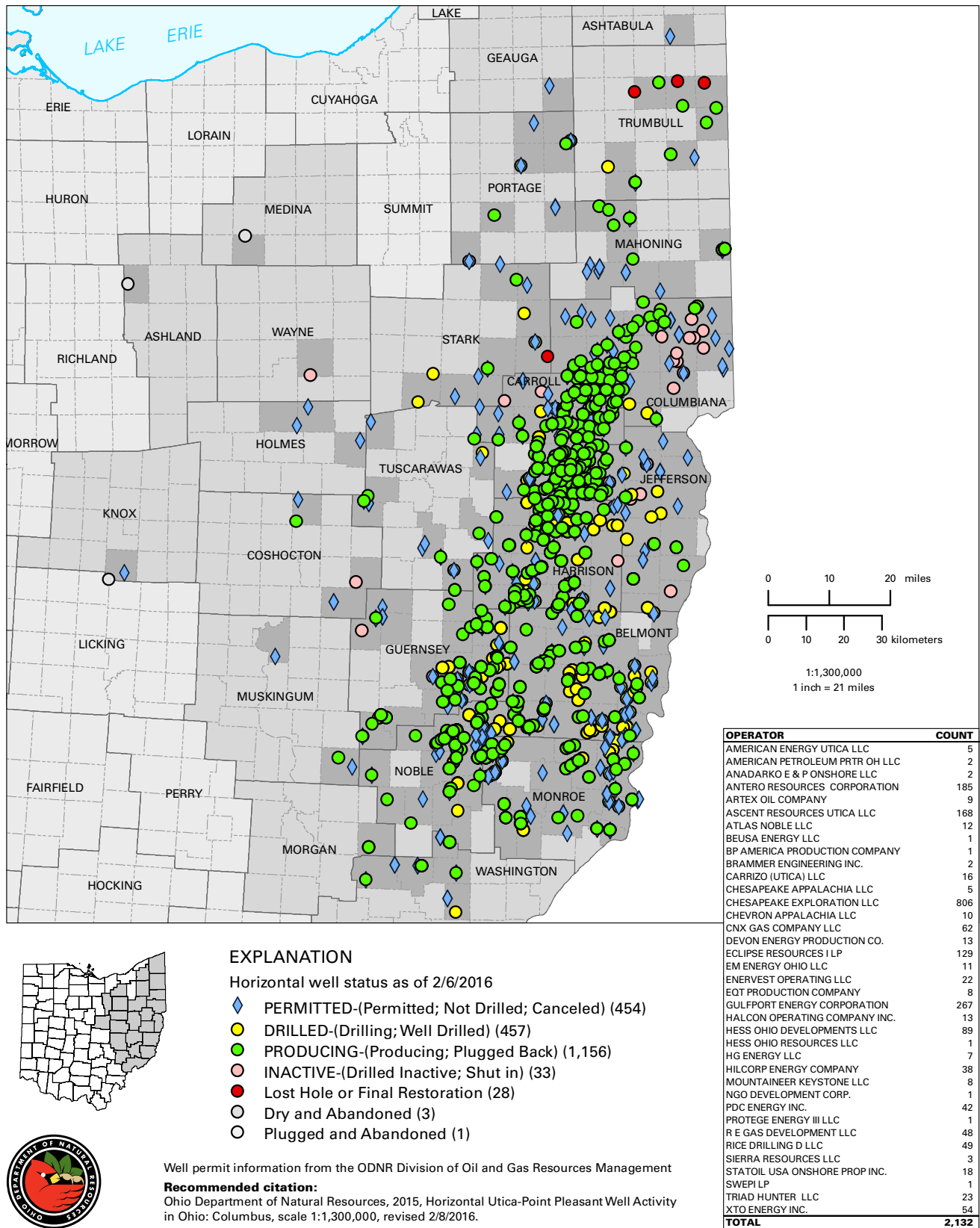
Starting in 2010, Ohio began to experience an increase in shale activity including well permits, drilling activity, and producing wells in the Utica/Point Pleasant formation. Chart 3 below summarizes the number of permits issued, wells drilled, and operating wells in the Utica/Point Pleasant by year. The total number of horizontal permits has increased from zero in 2010 to more than 2,133 in February 2016. Between 2010 and 2016 there has been a total of 1,678 horizontal wells drilled in Ohio. In 2013, Ohio experienced the highest annual number of producing horizontal wells with a total of 432 wells. By February 2016 the cumulative total of producing horizontal wells in Ohio reached 1,150.

Chart 3: Status of Utica/Point Pleasant Shale Wells by Year



Source: Ohio Department of Natural Resources, 2015, Horizontal Utica-Point Pleasant Well Activity in Ohio: Cumulative Permitting Activity Through 2/6/2016.

Image 2: Horizontal Utica - Pt. Pleasant Well Activity in Ohio



## Demographic

Demographics for Table 1 below were obtained from STATS America for the 25 county region, the 4 respective regions (Buckeye, Eastgate, NEFCO, and OMEGA), and each county making up the 25 county region. Demographics researched included population, per capita income, poverty rate, and unemployment rate (Table 1).

Table 1: Ohio and Regional Demographic

County	Population		Per Capita Personal Income		Poverty Rate		Labor Force		Unemployment Rate (Seasonally Adjusted)	
	2014	2010	2014	2010	2014	2010	2014	2010	2014	2010 (Sept)
Ohio	11,570,808	11,536,503	41,049	38,799	0.159	0.098	5,765,704	5,340,860	0.074	0.105
25 County Region	2,575,298	2,594,677	38,193	27,294			1,124,012	1,305,298	0.054	0.104
Buckeye Region	257,465	260,084	32,128	21,957			111,992	119,930	0.061	0.113
Eastgate Region	537,554	550,627	36,717	26,869			246,243	269,642	0.059	0.13
NEFCO Region	1,195,098	1,193,306	41,685	30,118			608,411	628,889	0.05	0.105
OMEGA Region	585,181	590,660	35,086	24,369			271,749	281,776	0.055	0.119

Source: Stats America, March, 2016





## Demographic Trends

- In 2014, the 25 County Region total population of 2,575,298 was about 22.2% of the State of Ohio's total population (11,507,808).
- The NEFCO Region had the largest population at 1,195,098, followed by Omega (585,181) and Eastgate (537,554). The Buckeye Region had the least population at 257,465, which made up only 10% of the total population in the 25 county region in 2014.
- While the State of Ohio's population increased slightly between 2010 and 2014, the 25 County Region showed a slight decrease in terms of total population. Of the 4 Regions, only the NEFCO Region showed a slight increase in population. In terms of actual population numbers, the Eastgate Region lost the most population (from 550,627 in 2010 to 537,554 in 2014).
- While the per capita income in Ohio was \$41,049 in 2014, the 25 County Region had a per capita income of \$38,193, which was almost \$3,000 less than the State of Ohio's. Of the four regions, the NEFCO was the only region above the State of Ohio's per capita income. In 2014, the NEFCO Region had a per capita income of \$41,685, almost \$700 above the State of Ohio's per capita income. The Buckeye Region had the lowest per capita income in 2014 at \$32,198, almost \$9,000 less than the State of Ohio's.
- While the State of Ohio had a labor force of 5,765,704 in 2014, the 25 County Region had 1,124,012, which made up almost 20% of the total labor force in Ohio. While the labor force in Ohio actually increased between 2009 and 2014, the 25 County Region saw a decrease. For example, in the Eastgate Region, the labor force shrank by over 16,000 people between 2009 and 2014.
- The Unemployment Rate in the State of Ohio in 2014 was 7.4%. The 25 County Region had an unemployment rate of 5.4% during the same time frame. In fact, all 4 Regions were below that State Of Ohio's unemployment rate with the lowest found in the NEFCO region (5.0%), followed closely by OMEGA (5.5%) and Eastgate (5.9%).



# Economic Impact Analysis



## Methodology

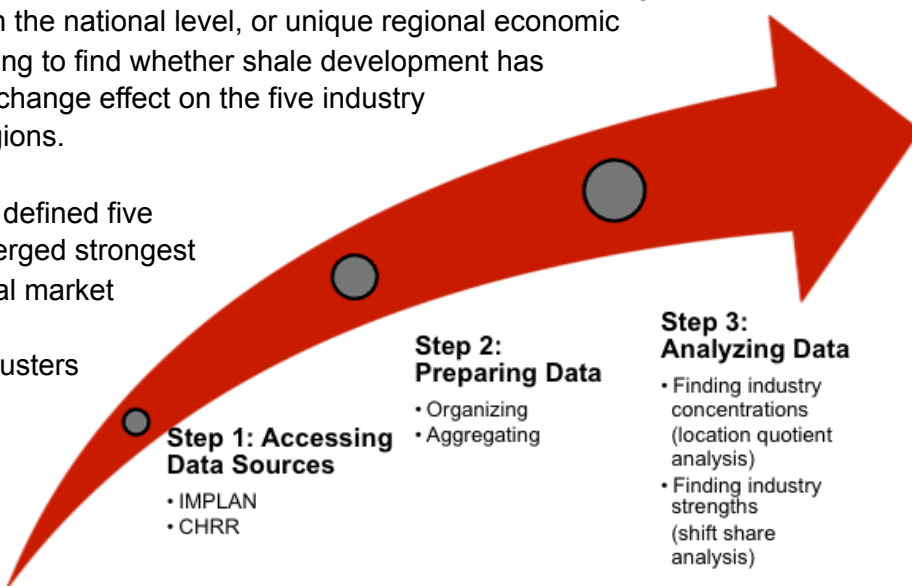
The research focused on the economy. It was a quantitative longitudinal study to track employment levels over time, measuring changes in the economy using employer enterprise data from the Quarterly Census of Employment and Wages (QCEW). This data was accessed through the Ohio Longitudinal Data Archive (OLDA), managed at the Ohio State University's Center for Human Resource Research (CHRR).

The QCEW data was aggregated for the top five industry clusters by change in employment for each region. The data was aggregated to the cluster level (with each cluster including many sectors), to ensure confidentiality to avoid disclosing the identity of employers.

Researchers focused on identifying the manufacturing sectors and occupations that are most impacted by the shale gas industry. The longitudinal approach, to track cluster changes over time, determined whether certain clusters increased, decreased or stayed relatively the same. Researchers conducted a Location Quotient (LQ) and Shift Share analyses to measure the relative concentration and strength in manufacturing sectors.

Shift Share is comprised of three components: 1) national share, 2) industrial mix, and 3) regional shift. While LQ measures the relative concentration of an industry, shift share explains the reason for the concentration, whether it is due to national economic growth, growth of the industry cluster on the national level, or unique regional economic changes. This analysis is seeking to find whether shale development has had a positive or negative jobs change effect on the five industry clusters within the four EDD regions.

Further aggregation of the data defined five manufacturing clusters that emerged strongest as a result of regional or national market confluences related to shale development. The five broad clusters were: 1) machinery, 2) metals, 3) chemicals, 4) energy, and 5) wood. The specific steps to assess, prepare and analyze the data are illustrated in the model on the right.



## Occupational Clusters and Trends (OES)

Occupational clusters were explored using an online resource, StatsAmerica. For the 25 county region and each of the four subsequent economic development districts, the occupational concentration were highest in Metals Manufacturing and Chemicals and Chemical-Based Products. Despite the shale development in eastern Ohio, the energy concentration was the lowest in every region with the exception of the Buckeye Hills-Hocking Valley Region where the energy cluster ranked third with a concentration of 1.4 representing 4,353 jobs.

Table 2: Industry Cluster Employment Location Quotient (2012)

Area/Cluster	Concentration (LQ)	Employment
<b>25-County Region</b>		
Metals Manufacturing	4.18	34,114
Chemicals and Chemical-Based Products	2.04	28,274
Machinery Manufacturing	1.63	9,767
Wood and Forest Manufacturing	1.31	11,762
Energy	0.88	38,281
<b>NEFCO</b>		
Metals Manufacturing	3.66	19,971
Chemicals and Chemical-Based Products	2.11	15,308
Machinery Manufacturing	1.63	5,292
Wood and Forest Manufacturing	1.03	4,826
Energy	0.73	18,277
<b>Eastgate</b>		
Metals Manufacturing	4.9	6,529
Chemicals and Chemical-Based Products	1.33	3,796
Machinery Manufacturing	1.3	1,656
Wood and Forest Manufacturing	0.96	1,772
Energy	0.59	5,270
<b>OMEGA</b>		
Metals Manufacturing	5.1	6,547
Chemicals and Chemical-Based Products	2.27	6,301
Wood and Forest Manufacturing	2.46	4,422
Machinery Manufacturing	2.25	2,419
Energy	1.19	10,381
<b>Buckeye Hills-Hocking Valley</b>		
Metals Manufacturing	3.63	1,067
Chemicals and Chemical-Based Products	2.91	2,869
Energy	1.4	4,353
Wood and Forest Manufacturing	1.16	742
Machinery Manufacturing	1.01	400

# Total 25 County EDA Region

## Location Quotient

Location quotients, as mentioned earlier, show the strength and concentration of industry sectors relative to the U.S. economy based on employment. While all five clusters showed a strong LQ of over one, the Machinery Manufacturing cluster had the highest percent change in the 25 county region of 53%. Even though the Chemicals and Chemical Based Products and Energy clusters showed a negative change, these clusters in the 25 county region were extremely strong relative to the U.S. with LQ's much greater than one.

Location quotient, simply referred to as LQ, shows local or regional strengths based on employment.

Table 3: Total 25 County Region Manufacturing Clusters by Location Quotient

Cluster Description	2010 LQ	2014 LQ	% Change
Metals Manufacturing	3.33	3.43	0.03
Chemicals & Chemical Based Products	2.56	2.38	-0.07
Machinery Manufacturing	1.25	1.92	0.53
Energy	1.71	1.61	-0.06
Forest and Wood Products	1.42	1.48	0.04

Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive





## Shift Share

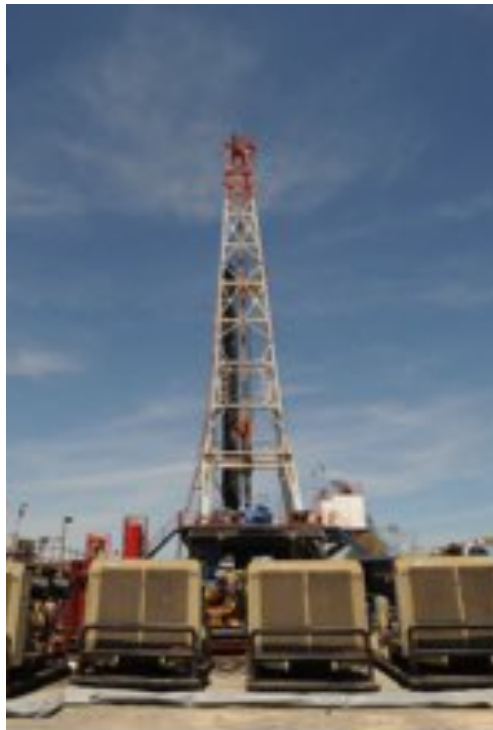
Table 4 shows the results of the shift share analysis for the 25-county region. Significant job growth took place in all five clusters, clusters that account for the majority of manufacturing jobs in the region between 2010-2014. The cluster with the largest increase in jobs during this period was the Machinery Manufacturing cluster. This cluster is comprised of NAICS category 333, a broad group which includes agriculture, construction, mining, and commercial and industrial machinery. The group also includes HVAC machinery, and engine, turbine and power equipment machinery manufacturing. With the region's strong concentration in manufacturing jobs, this cluster is comprised of important processes used in manufacturing, such as welding and assembling parts, skills that support a growing manufacturing base. With over 90% of the job creation in the five clusters occurring as a result of regional factors, researchers conclude that much of the positive changes, although potentially short term, took place due to some unique competitive advantage, such as shale development. As seen in Table 5, the regional effect was positive for all five clusters within the 25-county region, even as industry mix factors in three of the clusters are negative.

Shift share is an analytical tool used to determine how much job growth can be attributed to regional factors.

Table 4: Total 25 County Region Manufacturing Clusters by Shift Share Analysis

Cluster Description	National Share	Industry Mix	Regional Shift	Total Change (2010 - 2014)
Machinery Manufacturing	1,544	308	26,562	28,413
Chemicals & Chemical Based Products	823	-77	14,220	15,043
Energy	1,051	-343	6,832	7,540
Metals Manufacturing	2,404	-39	21,978	24,343
Forest and Wood Products	31	27	5,782	5,840
Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive				

# Buckeye Hills-Hocking Valley



## *Location Quotient*

Table 5 below illustrates the change in LQ between 2010 and 2014 for the Buckeye Hills-Hocking Valley region. All five clusters showed a very strong percent change of LQ between 2010 and 2014. Four of the clusters that experienced growth consist of LQ's that are well above one, indicating the region was extremely strong relative to the U.S. economy. The remaining cluster, Machinery Manufacturing had the highest percent change in the region of 307%. Although Machinery Manufacturing recorded the highest percent change, in 2010 the LQ was only 0.11 indicating this was a new emerging cluster in the region.

Table 5: Buckeye Hills-Hocking Valley Manufacturing Clusters by Location Quotient

Cluster Description	2010 LQ	2014 LQ	% Change
Energy	1.03	2.74	1.66
Chemicals & Chemical Based Products	0.77	2.28	1.94
Metals Manufacturing	0.42	1.22	1.91
Forest and Wood Products	0.87	1.19	0.37
Machinery Manufacturing	0.11	0.45	3.07
Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive			

### Shift Share

Table 6 shows the results of the shift share analysis. While the LQ analysis shows concentration of clusters in a region, shift share delineates whether the concentration is due to regional or national economic changes, or due to fluctuations in the industry itself.

Table 5 lists the five industry clusters for the Buckeye-Hills-Hocking Valley region and clearly demonstrates that all five clusters have expanded employment and that the growth of all five was due largely to regional changes in the economy. For instance, of the 547 jobs created in the Machinery Manufacturing cluster between

2010-2014, the vast majority, 530, were created as a result of regional changes and only 22 were attributed to the national share. Industry-wide, there was actually a negative impact of 5 jobs, an indication that between 2010-2014, the industry was contracting somewhat. Of the five industry clusters being analyzed, Chemicals and Chemical-Based Products showed the most significant change, with a total change of 1,478 jobs. Almost all of the positive change growth in this cluster can be attributed to regional shift. Energy was the only cluster that was growing, in small part, due to national share and industry mix factors, with 102 and 107 jobs attributable to these two measures, respectively.

Shift share has three components: 1) industrial mix, 2) national growth effect, and 3) regional growth effect.

Industrial mix effect represents the share of job growth that is due to growth of the industry at the national level.

Table 6: Buckeye Hills-Hocking Valley  
Manufacturing Clusters by Shift Share Analysis

Cluster Description	National Share	Industry Mix	Regional Shift	Total Change (2010 - 2014)
Machinery Manufacturing	22	-5	530	547
Chemicals & Chemical Based Products	40	-47	1,484	1,478
Energy	102	107	1,036	1,245
Metals Manufacturing	49	-12	753	789
Forest and Wood Products	3	3	164	169

Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive

# Eastgate Regional Council of Government

## Location Quotient

Table 7 below illustrates the change in LQ between 2010 and 2014 for the Eastgate Regional Council of Government region. This was the only region to experience a negative percentage of change from 2010 to 2014 in three of the five clusters. While the Chemicals and Chemical Based Products cluster experienced a negative change of 32%, this cluster still recorded a strong LQ of 1.67 in 2014. In addition the Eastgate region posted the highest LQ for the Metals Manufacturing cluster and the Machinery Manufacturing cluster when compared to the other three economic development districts. Perhaps the greatest positive change was in the Machinery Manufacturing cluster which experienced the largest percentage change of 169% posting an LQ of 3.12 in 2014.

The LQ calculation is a division problem, finding whether the percentage of total employment in a particular sector exceeds the state or national percentage in that same sector.

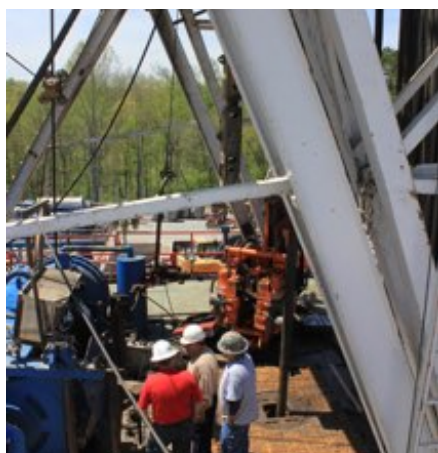


Table 7: Eastgate Regional Council of Government  
Manufacturing Clusters by Location Quotient

Cluster Description	2010 LQ	2014 LQ	% Change
Metals Manufacturing	3.68	4.25	0.15
Machinery Manufacturing	1.16	3.12	1.69
Chemicals & Chemical Based Products	2.45	1.67	-0.32
Forest and Wood Products	0.99	0.71	-0.28
Energy	0.49	0.41	-0.17

Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive





National growth effect explains how much of the regional growth is due to overall national economic growth.

### Shift Share

As shown in Table 8 below, of all four EDD regions, the Eastgate region had the greatest positive effect in the Machinery Equipment Manufacturing cluster with a total change of 11,550 jobs. Over 95% of the jobs in this cluster were attributable to regional factors. Growth in the national economy was a positive factor in all five clusters, but more so in the Machinery and Metals Manufacturing clusters. Metals Manufacturing, a historically strong cluster for this region and comprised of iron and steel mills, steel and aluminum product manufacturing and nonferrous metal processing, also experienced significant job growth between 2010-2014. Both the Wood Products and Energy clusters have a much lesser economic profile in Eastgate than the Machinery, Metals and Chemicals and Chemical-Based Products clusters.

Table 8: Eastgate Regional Council of Government  
Manufacturing Clusters by Shift Share Analysis

Cluster Description	National Share	Industry Mix	Regional Shift	Total Change (2010 - 2014)
Machinery Manufacturing	274	2	11,273	11,550
Chemicals & Chemical Based Products	151	85	1,538	1,604
Energy	58	1	359	419
Metals Manufacturing	510	1	6,809	7,320
Forest and Wood Products	4	5	423	432
Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive				

# Northeast Ohio Four County Regional Planning and Development

## *Location Quotient*

Table 9 below illustrates the change in LQ between 2010 and 2014 for the Northeast Ohio Four County Regional Planning and Development Organization region. It appears this region experienced steady and consistent growth anchored by the Metals Manufacturing and Chemicals and Chemical Based Products clusters. While it was the only region that did not have a cluster enjoy a percentage growth change of more than 100%, all five of the clusters analyzed yielded an LQ greater than one in 2014. Furthermore, even though the Chemicals and Chemical Based Products cluster indicated a negative change of 11%, this cluster still had an LQ of 2.54 which was extremely strong relative to the U.S. economy.

**Do-it-yourself LQ calculators are available on the internet, on the Bureau of Labor Statistics website, or StatsAmerica ([www.statsamerica.org](http://www.statsamerica.org)), which is a service of the Indiana Business Research Center.**

Table 9: Northeast Ohio Four County Regional Planning and Development Organization Manufacturing Clusters by Location Quotient

Cluster Description	2010 LQ	2014 LQ	% Change
Metals Manufacturing	3.07	3.73	0.22
Chemicals & Chemical Based Products	2.84	2.54	-0.11
Machinery Manufacturing	1.49	1.57	0.05
Energy	1.28	1.55	0.21
Forest and Wood Products	1.01	1.09	0.08
Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive			

## Shift Share

Table 10 shows the top five clusters and total employment change for the NEFCO region. As with the Eastgate region, NEFCO saw the greatest change in jobs within the Machinery and Metals clusters, although significant positive change could be seen in all five. Only the Energy cluster showed a negative industry mix relative to overall effect including both the national economic growth and regional factors. The industrial mix effect represents the share of the regional industry growth explained by the growth of the industry nationwide. With a net positive change of 15,903 jobs during the four year period between 2010-2014, NEFCO's top cluster was Metals Manufacturing. Occupations in the metalworking machinery manufacturing cluster,

If regional growth is not due to either national trends in the industry or the economy as a whole, then the growth can be explained as a result of some unique competitive advantage that the region possesses; the regional growth effect.



according to the Bureau of Labor Statistics, are projected to decline by 10,600 jobs, or by 5.8%, between 2014-2024. This region, in addition to the Eastgate region, may have a sufficient concentration necessary to leverage growth in this cluster despite national growth projections.

Table 10: Northeast Ohio Four County Regional Planning and Development Organization Manufacturing Clusters by Shift Share Analysis

Cluster Description	National Share	Industry Mix	Regional Shift	Total Change (2010 - 2014)
Machinery Manufacturing	957	305	9,176	10,438
Chemicals & Chemical Based Products	475	64	7,815	8,354
Energy	409	-140	4,378	4,648
Metals Manufacturing	1,151	49	14,702	15,903
Forest and Wood Products	12	7	2,368	2,387

Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive

# Ohio Mid-Eastern Governments Association

## Location Quotient

Table 9 below illustrates the change in LQ between 2010 and 2014 for the Ohio Mid-Eastern Governments Association region. Of the four regions analyzed, the Ohio Mid-Eastern Governments Association region appears to have experienced the most significant growth between 2010 and 2014. In fact, four of the five clusters recorded a percentage of change increase of 120% or greater. In addition the region also posted the highest LQ for the Energy (3.71), Chemicals and Chemical Based Products (3.37), and Forest and Wood Products (3.66) clusters when compared to the other three economic development districts.



Table 11: Ohio Mid-Eastern Governments Association  
Manufacturing Clusters by Location Quotient

Cluster Description	2010 LQ	2014 LQ	% Change
Energy	1.24	3.71	1.99
Forest and Wood Products	1.54	3.66	1.38
Metals Manufacturing	1.77	3.43	0.93
Chemicals & Chemical Based Products	1.33	3.37	1.53
Machinery Manufacturing	0.73	1.61	1.2

Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive



## Shift Share

The OMEGA region experienced positive job change in all five clusters somewhat equally, i.e., not one cluster stood out as being that much more significant than another. That said, the Energy cluster, as would be expected, showed a more significant employment increase than other EDD regions due to the concentration of shale gas drilling and extraction in the OMEGA region. As most of the shale activity took place in this region during the 2010-2014 time period, it would be expected that job growth in the Energy cluster would also be stronger relative to the other regions. In fact, almost all of the job growth in energy, 3,924, was due to unique regional factors, most likely shale development. Forest and Wood products also experienced a significant regional shift component in OMEGA, more so than in the other four regions, with almost all of the job growth due to regional factors.

The Forest and Wood cluster is comprised of establishments that make all types of wood products, including wood processing used in the construction of shale extraction pads located throughout the region.

Shift share highlights the uniqueness of a regional economy based on job growth in an industry, but does not indicate why the industry is competitive – that is determined by local leaders and analysts who have knowledge of local conditions.



Table 12: Ohio Mid-Eastern Governments Association  
Manufacturing Clusters by Shift Share Analysis

Cluster Description	National Share	Industry Mix	Regional Shift	Total Change (2010 - 2014)
Machinery Manufacturing	292	28	2,644	2,965
Chemicals & Chemical Based Products	156	-59	4,667	4,764
Energy	279	-97	3,924	4,107
Metals Manufacturing	468	-18	3,640	4,089
Forest and Wood Products	12	13	2,788	2,813
Source: Quarterly Census of Employment and Wages, accessed from the Ohio Longitudinal Data Archive				

# Implications

This analysis defines and demonstrates growing clusters and emerging manufacturing linkages that can be related to shale development. These linkages and potential new development activities appear to be more pronounced in the Machinery and Metals Manufacturing clusters. These two clusters together accounted for over 52,000 net new jobs within the 25-county region between 2010-2014. These two clusters were #1 and #2 in total employment change during this period, representing almost half of the total job growth. The shift share analysis indicated that over 95% of the growth was due to the regional shift or unique regional economic changes. Researchers recommend further development or attraction of new or expansion of existing businesses that help to grow regional cluster strengths. Initial strategies may include:

- Detailed mapping of the Metals and Machinery Manufacturing clusters for the 25-county region to identify common inputs and technologies. Mapping will identify potential cluster gaps or opportunities.
- Developing a bank of information and resources for the clusters to provide access to specialized market, technical and competitive information to encourage growth of businesses within the clusters.
- Identifying investments by government that can be made to incentivize additional growth and sustainability. Investments may include specialized infrastructure or educational programs, or access to potential employees trained through local programs.
- Monitoring major investments and developments in the midstream processing (i.e. natural gas processing, fractionation plants, and ethane cracker plants) that could influence the future supply chain of many Ohio manufactures.



# Attachment A:

Shale Energy Development: Economic Impact Analysis

# Shale Energy Development: Economic Impact Analysis

## Location Quotient and Shift Share Report

April 2018

### 25 County Metals Cluster

Row Labels	Metals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
331100	Iron and Steel Mills and Ferroalloy Mfg	353	-368	-1,253	-1,267	3.60	2.85	2.09	-21%
331200	Steel Product Mfg From Purchased Steel	461	-155	-496	-190	7.57	5.97	6.66	-21%
331300	Alumina and Aluminum Production and Processing	291	-17	-377	-103	4.74	3.94	4.08	-17%
331400	Nonferrous Metal (except Aluminum) Production and Processing	223	-111	-47	65	3.37	2.50	3.28	-26%
331500	Foundries	375	-22	441	794	2.95	3.51	3.30	19%
332100	Forging and Stamping	251	20	-359	-89	2.51	2.49	2.13	-1%
332200	Cutlery and Handtool Mfg	124	-195	124	53	2.70	3.03	3.02	12%
332300	Architectural and Structural Metals Mfg	528	116	105	749	1.40	1.50	1.42	7%
332400	Boiler, Tank, and Shipping Container Mfg	402	-53	-518	-169	4.08	3.93	3.51	-4%
332500	Hardware Mfg	48	-43	-189	-184	1.74	1.36	0.95	-22%
332600	Spring and Wire Product Mfg	34	-22	-117	-106	0.70	0.57	0.43	-19%
332700	Machine Shops; Turned Product; and Screw, Nut, and Bolt Mfg	518	272	80	869	1.47	1.55	1.49	5%
332800	Coating, Engraving, Heat Treating, and Allied Activities	243	92	-97	238	1.75	1.74	1.68	-1%
332900	Other Fabricated Metal Product Mfg	968	-65	-2,822	-1,919	3.41	2.93	2.35	-14%
<b>Subtotal</b>	<b>Metals Cluster Subtotals</b>	<b>4,820</b>	<b>-553</b>	<b>-5,526</b>	<b>-1,259</b>	<b>2.55</b>	<b>2.39</b>	<b>2.21</b>	<b>-6%</b>

### 25 County Energy Cluster

Row Labels	Energy Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
211000	Oil and Gas Extraction	1,460	714	-4,429	-2,256	5.83	5.96	3.86	2%
212100	Coal Mining	377	-543	-923	-1,088	2.94	3.55	2.41	21%
212300	Nonmetallic Mineral Mining and Quarrying	221	-195	-225	-199	1.51	1.78	1.29	18%
213100	Support Activities for Mining	589	1,514	-218	1,886	1.37	2.03	2.04	48%
221100	Electric Power Generation, Trans and Dist	697	-759	-973	-1,034	1.09	0.92	0.88	-16%
221200	Natural Gas Distribution	205	-185	-131	-110	1.17	1.11	1.06	-5%
221300	Water, Sewage and Other Systems	62	-50	189	201	0.82	1.14	1.23	39%
<b>Subtotal</b>	<b>Energy Cluster Subtotal</b>	<b>3,612</b>	<b>496</b>	<b>-6,709</b>	<b>-2,601</b>	<b>1.96</b>	<b>2.23</b>	<b>1.76</b>	<b>14%</b>



## 25 County Machinery Cluster

Row Labels	Machinery Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
333100	Agriculture, Construction, and Mining Machinery Mfg	249	-134	164	279	0.77	0.74	1.15	-5%
333200	Industrial Machinery Mfg	268	-5	711	974	1.69	2.47	1.95	46%
333300	Commercial and Service Industry Machinery Mfg	48	-58	-79	-89	0.32	0.24	0.26	-25%
333400	Ventilation, Heating, Air Conditioning, and Commercial Refrigeration Equipment Mfg	92	-80	121	132	0.45	0.56	0.53	24%
333500	Metalworking Machinery Mfg	758	124	-84	798	3.07	3.08	2.89	0%
333600	Engine, Turbine, and Power Transmission Equipment Mfg	91	-29	294	356	0.63	0.95	0.76	50%
333900	Other General Purpose Machinery Mfg	503	45	-307	241	1.39	1.32	1.34	-5%
335110	Electric Lighting Equipment Mfg	99	-72	-225	-198	1.33	0.92	0.88	-31%
335210	Household Appliance Mfg	93	-46	-97	-50	1.00	0.91	0.42	-9%
335311	Electrical Equipment Mfg	247	-174	103	176	1.14	1.20	1.29	6%
335911	Other Electrical Equipment and Component Mfg	90	-23	79	146	0.47	0.56	0.50	18%
336111	Motor Vehicle Mfg	715	775	-2,244	-754	2.86	1.97	1.79	-31%
336211	Motor Vehicle Body and Trailer Mfg	278	461	795	1,534	1.63	2.39	2.44	46%
336310	Motor Vehicle Parts Mfg	851	1,295	-1,673	473	1.28	1.09	1.23	-14%
336411	Aerospace Product and Parts Mfg	163	-141	256	277	0.21	0.27	0.29	27%
336510	Railroad Rolling Stock Mfg	8	17	107	132	0.27	0.74	0.51	174%
336611	Ship and Boat Building	4	-2	0	2	0.02	0.02	0.05	2%
336991	Other Transportation Equipment Mfg	4	-3	38	38	0.07	0.19	0.28	185%
Subtotal	Machinery Cluster Subtotal	4,559	1,950	-2,043	4,467	1.06	1.10	1.11	4%

## 25 County Wood Cluster

Row Labels	Wood Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
321100	Sawmills and Wood Preservation	46	81	100	227	1.34	1.23	1.51	-8%
321200	Veneer, Plywood, and Engineered Wood Product Mfg	22	70	34	126	0.82	0.89	0.89	9%
321900	Other Wood Product Mfg	179	311	520	1,011	2.14	2.29	2.45	7%
322100	Pulp, Paper, and Paperboard Mills	17	-56	-32	-71	0.36	0.42	0.34	17%
322200	Converted Paper Product Mfg	143	-295	-406	-559	1.20	1.16	1.08	-3%
337100	Household and Institutional Furniture and Kitchen Cabinet Mfg	103	72	809	984	1.07	1.28	1.45	20%
337200	Office Furniture (including Fixtures) Mfg	35	48	-4	79	0.85	1.16	0.87	36%
337900	Other Furniture Related Product Mfg	5	-4	-28	-27	0.34	0.32	0.27	-4%
Subtotal	Wood Cluster Subtotal	551	226	993	1,770	1.18	1.29	1.34	9%

## 25 County Chemicals Cluster

Row Labels	Chemicals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
325100	Basic Chemical Mfg	153	-40	-80	33	1.57	1.75	1.51	11%
325200	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Mfg	134	-101	336	369	2.17	2.50	2.52	15%
325300	Pesticide, Fertilizer, and Other Agricultural Chemical Mfg	22	-26	150	146	0.91	0.41	1.33	-55%
325400	Pharmaceutical and Medicine Mfg	8	-7	227	228	0.04	0.09	0.12	131%
325500	Paint, Coating, and Adhesive Mfg	51	11	47	109	1.32	1.43	1.39	8%
325600	Soap, Cleaning Compound, and Toilet Preparation Mfg	138	-16	-484	-362	2.01	1.63	1.55	-19%
325900	Other Chemical Product and Preparation Mfg	70	-101	-127	-157	1.24	1.21	1.08	-2%
326100	Plastics Product Mfg	707	586	-611	682	2.07	2.11	1.96	2%
326200	Rubber Product Mfg	299	181	389	869	3.67	3.83	3.94	5%
327100	Clay Product and Refractory Mfg	201	-276	-552	-627	7.30	7.76	5.88	6%
327200	Glass and Glass Product Mfg	55	-9	-86	-40	1.01	0.90	0.90	-11%
327300	Cement and Concrete Product Mfg	75	6	170	251	0.61	0.86	0.70	40%
327400	Lime and Gypsum Product Mfg	3	-1	41	43	0.40	0.67	0.71	68%
327900	Other Nonmetallic Mineral Product Mfg	40	56	-34	62	0.89	0.91	0.84	2%
Subtotal	Chemicals Cluster Subtotal	1,956	263	-613	1,606	1.61	1.66	1.58	3%

## Eastgate Regional Council of Government - Metals Cluster

Row Labels	Metals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
331100	Iron and Steel Mills and Ferroalloy Mfg	156	-163	-986	-992	7.79	7.04	1.90	-0.76
331200	Steel Product Mfg From Purchased Steel	129	-43	316	402	10.40	12.51	12.73	0.22
331300	Alumina and Aluminum Production and Processing	141	-8	88	220	11.20	12.79	12.30	0.10
331400	Nonferrous Metal (except Aluminum) Production and Processing	151	-75	-197	-122	11.12	7.53	9.69	-0.13
331500	Foundries	71	-4	-35	32	2.73	3.82	2.54	-0.07
332100	Forging and Stamping	74	6	-177	-97	3.61	3.83	2.72	-0.25
332200	Cutlery and Handtool Mfg	7	-12	17	13	0.78	1.00	1.00	0.28
332300	Architectural and Structural Metals Mfg	121	27	-254	-106	1.57	1.65	1.31	-0.17
332400	Boiler, Tank, and Shipping Container Mfg	78	-10	34	102	3.89	3.66	3.98	0.02
332500	Hardware Mfg	4	-3	-32	-32	0.66	-	0.00	-1.00
332600	Spring and Wire Product Mfg	13	-8	-61	-57	1.30	0.84	0.61	-0.53
332700	Machine Shops; Turned Product; and Screw, Nut, and Bolt Mfg	74	39	-87	25	1.02	0.96	0.89	-0.14
332800	Coating, Engraving, Heat Treating, and Allied Activities	56	21	79	157	1.99	2.52	2.32	0.16
332900	Other Fabricated Metal Product Mfg	33	-2	240	270	0.56	0.97	0.99	0.77
Subtotal	Metals Cluster Subtotals	1,108	-237	-1,056	-185	2.87	2.96	2.53	-0.12

## Eastgate Regional Council of Government - Energy Cluster

Row Labels	Energy Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
211000	Oil and Gas Extraction	21	215	-829	-594	4.36	4.76	2.04	-0.53
212100	Coal Mining	1	-23	4	-18	0.41	0.73	0.33	-0.20
212300	Nonmetallic Mineral Mining and Quarrying	1	2	-22	-19	0.49	0.97	0.39	-0.21
213100	Support Activities for Mining	6	17	-126	-103	0.79	0.68	0.39	-0.51
221100	Electric Power Generation, Transmission and Distribution	7	-16	-140	-150	0.57	0.54	0.40	-0.30
221200	Natural Gas Distribution	3	6	-48	-38	0.93	0.84	0.76	-0.18
221300	Water, Sewage and Other Systems	3	6	60	69	1.81	1.67	2.50	0.38
Subtotal	Energy Cluster Subtotals	42	-8	-272	-259	1.21	1.30	0.74	-0.39

## Eastgate Regional Council of Government - Machinery Cluster

Row Labels	Machinery Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
333100	Agriculture, Construction, and Mining Machinery Mfg	5.67	-3	17	20	0.09	0.08	0.11	0.27
333200	Industrial Machinery Mfg	43.27	-1	-65	-23	1.34	1.34	1.13	-0.16
333300	Commercial and Service Industry Machinery Mfg	6.16	-7	-1	-2	0.20	0.26	0.21	0.02
333400	Ventilation, Heating, Air Conditioning, and Commercial Refrigeration Equipment Mfg	21.39	-19	-20	-17	0.51	0.65	0.45	-0.12
333500	Metalworking Machinery Mfg	210.99	35	-44	202	4.19	4.47	4.16	-0.01
333900	Other General Purpose Machinery Mfg	137.26	12	-281	-131	1.86	1.45	1.38	-0.26
335110	Electric Lighting Equipment Mfg	51.53	-38	-125	-111	3.38	1.88	2.24	-0.34
335210	Household Appliance Mfg	10.70	-5	-71	-66	0.56	-	0.00	-1.00
335311	Electrical Equipment Mfg	61.42	-43	278	296	1.38	1.96	2.34	0.69
335911	Other Electrical Equipment and Component Mfg	10.70	-3	-74	-66	0.28	-	0.00	-1.00
336111	Motor Vehicle Mfg	673.64	731	-1,997	-593	13.18	10.06	9.42	-0.28
336211	Motor Vehicle Body and Trailer Mfg	18.96	31	225	275	0.54	0.74	1.41	1.59
336310	Motor Vehicle Parts Mfg	182.14	277	-295	164	1.34	0.85	1.21	-0.10
336510	Railroad Rolling Stock Mfg	7.78	16	12	36	1.26	2.81	1.67	0.32
336611	Ship and Boat Building	4.05	-2	40	42	0.10	0.07	0.25	1.54
Subtotal	Machinery Cluster Subtotals	1,445.65	981	-2,401	26	1.64	1.44	1.49	-0.09

### Eastgate Regional Council of Government - Wood Cluster

Row Labels	Wood Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
321100	Sawmills and Wood Preservation	2.50	4	34	41	0.35	0.25	0.56	0.59
321200	Veneer, Plywood, and Engineered Wood Product Mfg	2.67	8	22	33	0.48	0.52	0.68	0.42
321900	Other Wood Product Mfg	37.83	66	114	217	2.20	2.41	2.68	0.22
322200	Converted Paper Product Mfg	24.31	-50	-133	-159	1.00	1.09	0.77	-0.23
337100	Household and Institutional Furniture and Kitchen Cabinet Mfg	12.03	8	34	54	0.61	0.66	0.73	0.20
337200	Office Furniture (including Fixtures) Mfg	2.03	3	13	18	0.24	0.43	0.32	0.35
337900	Other Furniture Related Product Mfg	1.69	-1	0	-	0.55	0.61	0.59	0.08
Subtotal	Wood Cluster Subtotals	83.07	38	83	204	0.87	0.96	0.98	0.12

### Eastgate Regional Council of Government - Chemicals Cluster

Row Labels	Chemicals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
325100	Basic Chemical Mfg	48.75	-13	26	62	2.45	3.04	2.69	0.09
325200	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Mfg	0.61	0	70	70	0.05	0.20	0.43	7.80
325300	Pesticide, Fertilizer, and Other Agricultural Chemical Mfg	1.84	-2	-14	-14	0.37	0.21	0.07	-0.80
325500	Paint, Coating, and Adhesive Mfg	0.82	0	9	10	0.10	0.19	0.19	0.84
325600	Soap, Cleaning Compound, and Toilet Preparation Mfg	1.29	0	-13	-12	0.09	0.03	0.03	-0.63
325900	Other Chemical Product and Preparation Mfg	8.10	-12	-28	-32	0.70	0.79	0.53	-0.25
326100	Plastics Product Mfg	139.23	115	-171	84	2.00	2.16	1.98	-0.01
326200	Rubber Product Mfg	32.68	20	49	102	1.96	1.86	2.24	0.14
327100	Clay Product and Refractory Mfg	28.32	-39	-103	-114	5.03	4.65	3.84	-0.24
327200	Glass and Glass Product Mfg	12.12	-2	-105	-95	1.08	0.60	0.51	-0.53
327300	Cement and Concrete Product Mfg	12.53	1	-7	7	0.50	1.30	0.54	0.07
327900	Other Nonmetallic Mineral Product Mfg	2.52	4	27	33	0.27	0.48	0.49	0.77
Subtotal	Chemical Cluster Subtotals	288.82	72	-260	101	1.16	1.30	1.15	-0.01

## Northeast Ohio Four County Regional Planning and Development Organization - Metals Cluster

Row Labels	Metals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
331100	Iron and Steel Mills and Ferroalloy Mfg	72.97	-76	191	188	1.46	1.39	1.72	0.18
331200	Steel Product Mfg From Purchased Steel	170.21	-57	-253	-140	5.48	4.14	4.29	-0.22
331300	Alumina and Aluminum Production and Processing	45.53	-3	22	65	1.45	1.09	1.52	0.04
331400	Nonferrous Metal (except Aluminum) Production and Processing	22.53	-11	236	247	0.67	0.84	1.41	1.11
331500	Foundries	219.83	-13	190	397	3.40	3.77	3.50	0.03
332100	Forging and Stamping	114.41	9	-128	-5	2.24	2.23	1.92	-0.15
332200	Cutlery and Handtool Mfg	106.24	-167	68	7	4.52	4.85	4.67	0.03
332300	Architectural and Structural Metals Mfg	180.02	39	371	590	0.93	1.17	1.16	0.24
332400	Boiler, Tank, and Shipping Container Mfg	274.70	-36	-618	-380	5.46	4.75	3.92	-0.28
332500	Hardware Mfg	44.36	-40	-183	-179	3.16	2.36	1.71	-0.46
332600	Spring and Wire Product Mfg	10.27	-7	-23	-20	0.42	0.49	0.31	-0.27
332700	Machine Shops; Turned Product; and Screw, Nut, and Bolt Mfg	334.59	175	178	688	1.86	2.10	1.85	-0.01
332800	Coating, Engraving, Heat Treating, and Allied Activities	138.23	52	63	254	1.96	2.01	2.01	0.03
332900	Other Fabricated Metal Product Mfg	799.93	-54	-2,824	-2,078	5.52	4.41	3.33	-0.40
Subtotal	Metals Cluster Subtotals	2,533.81	-188	-2,712	-366	2.63	2.50	2.24	-0.15

## Northeast Ohio Four County Regional Planning and Development Organization - Energy Cluster

Row Labels	Energy Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
211111	Oil and Gas Extraction	43.09	448	-1,229	-738	3.65	3.63	2.15	-0.41
212100	Coal Mining	0.79	-18	-14	-31	0.13	0.23	0.06	-0.56
212300	Nonmetallic Mineral Mining and Quarrying	4.07	6	-41	-31	0.59	0.77	0.50	-0.14
213100	Support Activities for Mining	16.75	43	271	331	0.83	1.00	0.67	-0.19
221100	Electric Power Generation, Transmission and Distribution	15.21	-36	-6	-27	0.50	0.56	0.49	-0.03
221200	Natural Gas Distribution	11.51	24	-222	-186	1.40	1.13	1.03	-0.27
221300	Water, Sewage and Other Systems	1.41	3	8	13	0.39	0.77	0.43	0.09
Subtotal	Energy Cluster Subtotals	92.84	470	-1,232	-669	1.07	1.20	0.81	-0.24



## Northeast Ohio Four County Regional Planning and Development Organization - Machinery Cluster

Row Labels	Machinery Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
333100	Agriculture, Construction, and Mining Machinery Mfg	139.85	-75	480	545	0.85	0.68	1.08	0.27
333200	Industrial Machinery Mfg	185.39	-3	374	556	2.30	3.84	3.03	0.32
333300	Commercial and Service Industry Machinery Mfg	18.96	-23	-52	-56	0.25	0.16	0.13	-0.46
333400	Ventilation, Heating, Air Conditioning, and Commercial Refrigeration Equipment Mfg	45.37	-40	25	31	0.44	0.41	0.47	0.08
333500	Metalworking Machinery Mfg	374.50	61	-242	194	2.98	3.10	2.67	-0.10
333600	Engine, Turbine, and Power Transmission Equipment Mfg	21.71	-7	-11	4	0.30	0.78	0.27	-0.09
333900	Other General Purpose Machinery Mfg	264.63	24	252	541	1.44	1.53	1.62	0.13
335110	Electric Lighting Equipment Mfg	28.52	-21	-17	-9	0.75	0.60	0.70	-0.07
335210	Household Appliance Mfg	30.79	-15	-170	-155	0.65	0.08	0.12	-0.82
335311	Electrical Equipment Mfg	160.43	-113	-114	-67	1.45	1.44	1.24	-0.15
335911	Other Electrical Equipment and Component Mfg	72.44	-18	23	77	0.75	0.92	0.80	0.06
336111	Motor Vehicle Mfg	2.43	3	-20	-15	0.02	-	0.00	-1.00
336211	Motor Vehicle Body and Trailer Mfg	225.41	373	701	1,300	2.59	3.31	3.74	0.44
336310	Motor Vehicle Parts Mfg	526.34	801	-322	1,006	1.55	1.38	1.54	-0.01
336411	Aerospace Product and Parts Mfg	162.54	-141	310	331	0.41	0.52	0.52	0.28
336510	Railroad Rolling Stock Mfg	0.32	1	33	34	0.02	0.18	0.28	12.10
336611	Ship and Boat Building	0.32	0	-2	-2	0.00	0.02	0.00	-1.00
336991	Other Transportation Equipment Mfg	0.16	0	43	43	0.01	0.12	0.27	43.48
Subtotal	Machinery Cluster Subtotals	2,260.11	806	1,292	4,358	1.03	1.16	1.17	0.13

## Northeast Ohio Four County Regional Planning and Development Organization - Wood Cluster

Row Labels	Wood Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
321100	Sawmills and Wood Preservation	4	6	41	51	0.21	0.37	0.30	0.43
321200	Veneer, Plywood, and Engineered Wood Product Mfg	11	34	54	99	0.78	0.94	0.98	0.25
321900	Other Wood Product Mfg	42	74	393	509	0.99	1.09	1.41	0.42
322100	Pulp, Paper, and Paperboard Mills	11	-36	-85	-110	0.46	0.47	0.27	-0.40
322200	Converted Paper Product Mfg	75	-156	-65	-146	1.24	1.20	1.17	-0.05
337100	Household and Institutional Furniture and Kitchen Cabinet Mfg	30	21	147	198	0.61	0.58	0.76	0.25
337200	Office Furniture (including Fixtures) Mfg	24	33	-199	-142	1.14	1.44	0.80	-0.29
337900	Other Furniture Related Product Mfg	3	-2	-15	-14	0.35	0.38	0.28	-0.19
Subtotal	Wood Cluster Subtotals	200	-26	271	445	0.84	0.90	0.90	0.07

## Northeast Ohio Four County Regional Planning and Development - Chemicals Cluster

Row Labels	Chemicals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
325100	Basic Chemical Mfg	56.31	-15	-102	-60	1.14	1.09	1.02	-0.10
325200	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Mfg	62.98	-48	183	198	2.00	2.56	2.35	0.17
325300	Pesticide, Fertilizer, and Other Agricultural Chemical Mfg	8.58	-10	82	81	0.69	0.41	0.46	-0.33
325400	Pharmaceutical and Medicine Mfg	2.66	-2	103	103	0.03	0.05	0.10	2.70
325500	Paint, Coating, and Adhesive Mfg	41.06	9	123	173	2.10	2.18	2.62	0.25
325600	Soap, Cleaning Compound, and Toilet Preparation Mfg	99.68	-11	-139	-51	2.85	2.58	2.65	-0.07
325900	Other Chemical Product and Preparation Mfg	47.05	-67	-68	-88	1.63	1.64	1.41	-0.14
326100	Plastics Product Mfg	422.40	350	-465	308	2.43	2.41	2.34	-0.04
326200	Rubber Product Mfg	149.11	91	208	448	3.59	4.10	3.91	0.09
327100	Clay Product and Refractory Mfg	34.79	-48	-144	-157	2.47	2.33	1.74	-0.30
327200	Glass and Glass Product Mfg	7.08	-1	-3	3	0.25	0.05	0.25	0.00
327300	Cement and Concrete Product Mfg	31.93	3	205	240	0.51	0.68	0.78	0.51
327400	Lime and Gypsum Product Mfg	0.54	0	15	15	0.13	0.04	0.33	1.66
327900	Other Nonmetallic Mineral Product Mfg	23.90	34	-1	57	1.04	1.20	1.09	0.05
Subtotal	Chemical Cluster Subtotals	988.06	284	-2	1,270	1.59	1.64	1.61	0.01

## Ohio Mid-Eastern Governments Association - Metals Cluster

Row Labels	Metals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
331100	Iron and Steel Mills and Ferroalloy Mfg	1	-1	210	210	0.08	1.93	1.27	2376%
331200	Steel Product Mfg From Purchased Steel	17	-6	627	638	2.28	9.34	6.80	309%
331300	Alumina and Aluminum Production and Processing	0	0	460	460	0.02	8.84	3.85	56630%
331400	Nonferrous Metal (except Aluminum) Production and Processing	69	-34	-327	-293	8.51	7.64	2.40	-10%
331500	Foundries	70	-4	320	386	4.53	5.06	3.98	12%
332100	Forging and Stamping	19	1	312	332	1.52	1.56	2.48	3%
332200	Cutlery and Handtool Mfg	3	-5	101	99	0.54	3.07	1.65	467%
332300	Architectural and Structural Metals Mfg	61	13	1,505	1,579	1.32	4.89	2.77	270%
332400	Boiler, Tank, and Shipping Container Mfg	7	-1	454	460	0.54	4.23	2.71	677%
332500	Hardware Mfg	0	0	25	25	0.03	2.59	0.53	7344%
332600	Spring and Wire Product Mfg	6	-4	10	12	1.02	0.27	0.72	-73%
332700	Machine Shops; Turned Product; and Screw, Nut, and Bolt Mfg	35	19	449	503	0.83	1.70	1.11	105%
332800	Coating, Engraving, Heat Treating, and Allied Activities	35	13	-149	-101	2.07	1.57	0.70	-24%
332900	Other Fabricated Metal Product Mfg	85	-6	163	242	2.46	2.21	1.75	-10%
Subtotal	Metals Cluster Subtotals	408	-14	4,158	4,552	1.77	3.43	2.17	93%

## Ohio Mid-Eastern Governments Association - Energy Cluster

Row Labels	Energy Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
211000	Oil and Gas Extraction (20,21)	3	30	6,527	6,560	1.01	2.56	18.90	1764%
212100	Coal Mining (22)	10	-243	764	531	7.35	21.04	11.80	61%
212300	Nonmetallic Mineral Mining and Quarrying (30-36)	4	5	891	900	2.38	6.03	6.30	164%
213100	Support Activities for Mining (37-40)	5	12	5,191	5,208	0.97	4.21	9.99	934%
221100	Electric Power Generation, Trans and Dist (41-49)	2	-5	3,117	3,114	0.32	0.86	4.29	1230%
221200	Natural Gas Distribution (50)	0	1	1,137	1,138	0.12	0.12	5.18	4155%
221300	Water, Sewage and Other Systems (51)	1	3	505	509	1.35	4.17	6.03	347%
Subtotal	Energy Cluster Subtotal	25	-	17,935	17,960	1.24	3.71	8.62	594%

## Ohio Mid-Eastern Governments Association - Machinery Cluster

Row Labels	Machinery Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
333100	Agriculture, Construction, and Mining Machinery Mfg	19	-10	753	762	0.49	2.02	2.09	308%
333200	Industrial Machinery Mfg	31	-1	-85	-55	1.60	1.43	0.61	-11%
333300	Commercial and Service Industry Machinery Mfg	23	-27	-9	-14	1.23	0.88	0.71	-29%
333400	Ventilation, Heating, Air Conditioning, and Commercial Refrigeration Equipment Mfg	32	-28	-45	-41	1.29	1.87	0.62	45%
333500	Metalworking Machinery Mfg	155	25	-120	60	5.15	5.69	2.84	10%
333600	Engine, Turbine, and Power Transmission Equipment Mfg	0	0	495	495	0.01	4.23	2.55	45701%
333900	Other General Purpose Machinery Mfg	45	4	75	124	1.01	1.92	0.77	90%
335110	Electric Lighting Equipment Mfg	0	0	33	33	0.02	0.02	0.36	1%
335210	Household Appliance Mfg	0	0	15	15	0.01	0.03	0.13	99%
335311	Electrical Equipment Mfg	9	-7	8	11	0.35	0.02	0.25	-93%
335911	Other Electrical Equipment and Component Mfg	0	0	103	103	0.01	0.87	0.40	12285%
336111	Motor Vehicle Mfg	0	0	-1	-1	0.01	0.00	-	-17%
336211	Motor Vehicle Body and Trailer Mfg	1	2	455	458	0.05	1.88	1.57	3345%
336310	Motor Vehicle Parts Mfg	22	33	771	826	0.27	1.68	0.84	526%
336411	Aerospace Product and Parts Mfg	0	0	7	7	0.00	0.00	0.01	-1%
336510	Railroad Rolling Stock Mfg	2	3	3	8	0.44	0.26	0.33	-40%
336611	Ship and Boat Building	2	-1	-13	-12	0.08	0.01	-	-92%
336991	Other Transportation Equipment Mfg	0	0	16	16	0.03	0.42	0.26	1564%
Subtotal	Machinery Cluster Subtotal	341	-6	2,461	2,795	0.65	1.39	0.80	114%

## Ohio Mid-Eastern Governments Association - Wood Cluster

Row Labels	Wood Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
321100	Sawmills and Wood Preservation	5	9	686	700	1.18	4.91	4.55	316%
321200	Veneer, Plywood, and Engineered Wood Product Mfg	0	1	183	184	0.05	2.09	1.26	3994%
321900	Other Wood Product Mfg	30	52	1,550	1,631	2.90	7.22	5.34	149%
322100	Pulp, Paper, and Paperboard Mills	2	-8	153	148	0.40	0.38	1.02	-5%
322200	Converted Paper Product Mfg	20	-42	99	77	1.38	1.50	1.04	8%
337100	Household and Institutional Furniture and Kitchen Cabinet Mfg	26	18	1,399	1,444	2.24	5.81	4.28	160%
337200	Office Furniture (including Fixtures) Mfg	4	5	220	228	0.72	1.78	1.48	148%
337900	Other Furniture Related Product Mfg	0	0	3	3	0.05	0.10	0.07	113%
Subtotal	Wood Cluster Subtotal	87	35	4,293	4,415	1.54	3.66	2.87	138%

## Ohio Mid-Eastern Governments Association - Chemicals Cluster

Row Labels	Chemicals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
325100	Basic Chemical Mfg	22	-6	246	262	1.82	3.59	1.88	3%
325200	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Mfg	12	-9	53	56	1.57	2.60	1.21	-23%
325300	Pesticide, Fertilizer, and Other Agricultural Chemical Mfg	0	0	254	254	0.02	0.85	3.49	15222%
325400	Pharmaceutical and Medicine Mfg	0	0	66	66	0.00	0.06	0.12	3857%
325500	Paint, Coating, and Adhesive Mfg	2	1	10	13	0.50	1.36	0.38	-24%
325600	Soap, Cleaning Compound, and Toilet Preparation Mfg	4	0	169	172	0.47	3.37	1.05	122%
325900	Other Chemical Product and Preparation Mfg	2	-3	153	152	0.27	3.41	1.08	306%
326100	Plastics Product Mfg	33	27	1,484	1,544	0.79	2.41	1.76	121%
326200	Rubber Product Mfg	55	33	1,082	1,170	5.52	13.15	7.26	31%
327100	Clay Product and Refractory Mfg	38	-53	781	767	11.41	21.66	16.43	44%
327200	Glass and Glass Product Mfg	7	-1	338	344	1.03	6.89	2.55	148%
327300	Cement and Concrete Product Mfg	18	2	44	64	1.24	1.73	0.85	-32%
327400	Lime and Gypsum Product Mfg	0	0	30	30	0.13	0.93	1.19	810%
327900	Other Nonmetallic Mineral Product Mfg	4	6	-10	-	0.76	0.90	0.39	-49%
Subtotal	Chemicals Cluster Subtotal	197	-3	4,700	4,894	1.33	3.37	1.99	50%

## Buckeye Hills-Hocking Valley Regional Development District - Metals Cluster

Row Labels	Metals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
331100	Iron and Steel Mills and Ferroalloy Mfg	27	-28	148	147	5.19	10.26	8.81	98%
331200	Steel Product Mfg From Purchased Steel	0	0	147	147	0.04	3.95	5.10	10964%
331300	Alumina and Aluminum Production and Processing	0	0	51	51	0.04	2.21	1.72	6140%
331400	Nonferrous Metal (except Aluminum) Production and Processing	0	0	74	74	0.03	0.10	2.42	194%
331500	Foundries	5	0	52	57	0.70	0.42	1.57	-41%
332100	Forging and Stamping	0	0	56	56	0.04	0.04	1.16	-9%
332200	Cutlery and Handtool Mfg	0	0	-1	-1	0.05	0.05	-	8%
332300	Architectural and Structural Metals Mfg	7	1	40	48	0.32	0.36	0.54	13%
332400	Boiler, Tank, and Shipping Container Mfg	0	0	13	13	0.04	2.27	0.31	5050%
332500	Hardware Mfg	0	0	-1	-1	0.08	0.09	-	8%
332600	Spring and Wire Product Mfg	0	0	-1	-1	0.05	0.05	-	0%
332700	Machine Shops; Turned Product; and Screw, Nut, and Bolt Mfg	2	1	262	266	0.12	1.37	1.56	1013%
332800	Coating, Engraving, Heat Treating, and Allied Activities	0	0	41	41	0.02	0.01	0.59	-11%
332900	Other Fabricated Metal Product Mfg	0	0	81	81	0.01	0.02	0.59	174%
Subtotal	Metals Cluster Subtotals	42	-26	962	978	0.42	1.22	1.44	191%

## Buckeye Hills-Hocking Valley Regional Development District - Energy Cluster

Row Labels	Energy Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
211000	Oil and Gas Extraction	36	18	1,257	1,311	2.69	4.03	11.01	50%
212100	Coal Mining	4	-6	181	179	0.63	9.56	5.02	1408%
212300	Nonmetallic Mineral Mining and Quarrying	8	-7	341	342	0.97	1.43	5.41	48%
213100	Support Activities for Mining	43	111	470	624	1.87	4.15	4.13	122%
221100	Electric Power Generation, Trans and Dist	0	0	297	297	0.01	0.12	1.00	1217%
221200	Natural Gas Distribution	1	-1	122	122	0.10	0.12	1.47	19%
221300	Water, Sewage and Other Systems	10	-8	21	23	2.39	4.57	2.19	91%
Subtotal	Energy Cluster Subtotal	102	107	2,689	2,898	1.03	2.74	3.96	166%



## Buckeye Hills-Hocking Valley Regional Development District - Machinery Cluster

Row Labels	Machinery Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
333100	Agriculture, Construction, and Mining Machinery Mfg	2	-1	71	72	0.09	0.63	0.42	575%
333200	Industrial Machinery Mfg	6	0	-3	2	0.65	0.64	0.85	-1%
333300	Commercial and Service Industry Machinery Mfg	1	-1	-2	-2	0.08	0.04	-	-45%
333400	Ventilation, Heating, Air Conditioning, and Commercial Refrigeration Equipment Mfg	3	-3	29	29	0.27	0.72	1.22	168%
333500	Metalworking Machinery Mfg	3	1	-19	-15	0.23	0.04	0.33	-82%
333600	Engine, Turbine, and Power Transmission Equipment Mfg	0	0	309	309	0.02	6.10	0.75	28986%
333900	Other General Purpose Machinery Mfg	2	0	16	18	0.11	0.23	0.32	113%
335110	Electric Lighting Equipment Mfg	0	0	0	-	0.04	0.04	-	4%
335210	Household Appliance Mfg	0	0	11	11	0.03	0.40	6.56	1126%
335311	Electrical Equipment Mfg	6	-4	33	35	0.49	0.94	1.29	93%
335911	Other Electrical Equipment and Component Mfg	2	-1	-2	-	0.24	0.23	-	-4%
336111	Motor Vehicle Mfg	0	0	0	-	0.01	0.01	-	-15%
336211	Motor Vehicle Body and Trailer Mfg	0	0	6	6	0.02	0.10	-	452%
336310	Motor Vehicle Parts Mfg	0	0	82	82	0.00	0.30	1.39	6548%
336411	Aerospace Product and Parts Mfg	0	0	0	-	0.00	0.00	0.05	2%
336510	Railroad Rolling Stock Mfg	0	0	0	-	0.10	0.08	-	-23%
336611	Ship and Boat Building	0	0	0	-	0.01	0.01	-	-3%
336991	Other Transportation Equipment Mfg	0	0	0	-	0.06	0.06	-	7%
Subtotal	Machinery Cluster Subtotal	26	-8	529	547	0.11	0.45	0.64	307%

## Buckeye Hills-Hocking Valley Regional Development District - Wood Cluster

Row Labels	Wood Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
321100	Sawmills and Wood Preservation	4	7	63	74	2.13	2.62	2.38	23%
321200	Veneer, Plywood, and Engineered Wood Product Mfg	0	1	-1	1	0.32	0.33	0.21	4%
321900	Other Wood Product Mfg	5	9	156	170	1.15	1.67	1.71	46%
322100	Pulp, Paper, and Paperboard Mills	0	0	-1	-1	0.02	0.02	-	10%
322200	Converted Paper Product Mfg	9	-19	1	-9	1.47	1.82	1.03	24%
337100	Household and Institutional Furniture and Kitchen Cabinet Mfg	1	1	85	87	0.20	0.37	0.59	89%
337200	Office Furniture (including Fixtures) Mfg	2	2	62	66	0.71	1.35	1.25	91%
337900	Other Furniture Related Product Mfg	0	0	-1	-1	0.05	0.06	-	10%
Subtotal	Wood Cluster Subtotal	22	0	365	387	0.87	1.19	1.02	37%

## Buckeye Hills-Hocking Valley Regional Development District - Chemicals Cluster

Row Labels	Chemicals Cluster Sector Descriptions	National Share	Industry Mix	Regional Share	Total Change	LQ 2010	LQ 2014	LQ 2016	% Change
325100	Basic Chemical Mfg	0	0	151	151	0.01	1.41	1.27	10672%
325200	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Mfg	0	0	901	901	0.02	17.87	12.24	86808%
325300	Pesticide, Fertilizer, and Other Agricultural Chemical Mfg	0	0	-1	-1	0.05	0.02	-	-57%
325400	Pharmaceutical and Medicine Mfg	0	0	133	133	0.01	1.14	0.59	17081%
325500	Paint, Coating, and Adhesive Mfg	1	0	-2	-1	0.36	0.51	0.20	40%
325600	Soap, Cleaning Compound, and Toilet Preparation Mfg	1	0	-1	-	0.30	0.02	0.19	-94%
325900	Other Chemical Product and Preparation Mfg	0	0	6	6	0.02	0.02	0.11	5%
326100	Plastics Product Mfg	3	3	340	346	0.17	0.82	0.87	377%
326200	Rubber Product Mfg	1	0	49	50	0.14	1.71	0.56	1121%
327100	Clay Product and Refractory Mfg	34	-47	-145	-158	23.09	27.09	10.89	17%
327200	Glass and Glass Product Mfg	2	0	97	99	0.83	1.09	1.98	31%
327300	Cement and Concrete Product Mfg	4	0	46	51	0.66	0.64	0.74	-3%
327400	Lime and Gypsum Product Mfg	2	-1	12	13	3.88	3.63	3.73	-6%
327900	Other Nonmetallic Mineral Product Mfg	2	3	77	82	0.82	1.83	1.80	124%
Subtotal	Chemicals Cluster Subtotal	51	-42	1,664	1,672	0.77	2.28	1.58	194%



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