Agenda Item No. 6.0

Chicago Metropolitan Agency for Planning

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MEMORANDUM

To: **Planning Coordinating Committee**

Date: **June 3, 2009**

From: **Bob Dean, Principal Regional Planner**

Re: **Regional Snapshot Reports**

Regional Snapshot reports are presented to the Planning Coordinating Committee at two points: once when initial findings have been developed, and again when a draft report is ready to be released publicly.

The Regional Snapshot report on **industry clusters** was presented to the committee in November. Industry clusters are groups of industries which are geographically concentrated or similar in nature, and that make use of related buyers, suppliers, infrastructure, and workforce. The report identifies some potential industry clusters in the region which could be important elements of the future economy. Next steps in this analysis will include going into more depth on the identified clusters and also addressing the issue at smaller geographies; this report is meant to introduce the topic and provide a basis for this future work.

The Regional Snapshot report on **air quality** was presented to the committee in January. The report describes air quality conditions and trends within the region, focusing on pollutants that are required to be addressed in long-range transportation plans. It explores the regulatory framework governing air quality as well as voluntary actions taken by groups within the region, and also discusses sources of air pollution.

As with all Regional Snapshot reports, these are not meant to set policy or produce recommendations for immediate action, but to inform the approach of the *GO TO 2040* plan to these complex topics.

ACTION REQUESTED: Approval to release the Regional Snapshots on industry clusters and air quality.

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About this Snapshot

The changing economy of the Chicago metropolitan region provides both opportunities and challenges. Declining manufacturing employment has left many cities and neighborhoods in transition. With fortunes tied to the former heavy industries, the region has felt the impact enormously. While the new economy -- finance, health care, and other service based fields -- has helped the region to recover, a tremendous challenge remains: identifying the region's strong revenue generators in this new economic climate. This Regional Snapshot examines an identified group of industries, referred to as "industry clusters," that contribute to prosperity in northeastern Illinois. Please note that industry *clusters* are different than industry *sectors*, which are the broad categories used to define business types.

An industry cluster analysis identifies industries that are geographically concentrated or of a similar nature, and that make use of related buyers, suppliers, infrastructure and workforce. By identifying industry clusters, business recruitment, attraction and development efforts will be able to focus on companies that complement existing businesses. This report identifies several industry clusters that have a strong presence in the region and potential for future development.

This Regional Snapshot is not designed to make specific, implementable recommendations, but rather to highlight important data about the region's economy and identify some prominent industry clusters in the region. As with all Regional Snapshots, it is also meant to inspire discussion between CMAP, its partners, and other stakeholders concerning the most effective approaches to addressing economic development in the region. This document is a summary of a more detailed technical report that is available online: http://www.cmap.illinois.gov/uploadedFiles/publications/snapshot_series/IndustryClustersTechnicalReport.pdf.

With its *GO TO 2040* regional comprehensive plan to be issued in 2010, the Chicago Metropolitan Agency for Planning (CMAP) will articulate a vision of regional prosperity looking toward 2040 and beyond, with clear strategies to implement that vision. CMAP is publishing a series of Regional Snapshot reports that cover major topics that need to be addressed in the *GO TO 2040* plan. These reports are designed to establish links between CMAP's policy areas, to gather background data, and to initiate discussion on major regional issues early in the planning process.

Regional Profile

The northeastern Illinois region is the economic engine of the state. Employment figures from the Illinois Department of Employment Security shows that northeastern Illinois contains approximately two thirds of all jobs in the state. Over a seven year period the region gained jobs with Kane, Kendall, McHenry, and Will counties reporting gains over 20%.

Area	2000	2007	% Change
Cook	2,344,422	2,506,529	6.9%
DuPage	524,025	589,545	12.5%
Kane	165,760	206,450	24.5%
Kendall	13,110	21,673	65.3%
Lake	264,402	323,999	22.5%
McHenry	74,530	99,986	34.2%
Will	118,186	185,672	57.1%
Region-wide	3,504,435	3,933,854	12.3%

Figure 1: Illinois Department of Employment Security (IDES), Illinois at Work

Overall the economy is diverse, though trends indicate an economy that is increasingly service oriented, particularly in professional and financial services. The region is constantly touted as the nation's freight hub, with six Class I railroads converging to eighteen intermodal yards, two international airports and several interstate highways.

Despite its strengths, the region faces many challenges which include developing a skilled workforce that can adapt to the changes demanded by today's integrated global economy; modernizing and increasing the capacity of the transportation network in order to efficiently move and process the increasing number of trucks, trains, and people across the region; fostering an overall climate of innovation; driving stronger collaboration across all sectors through public/private partnership; and discovering a unique economic identity to drive its global competitive advantage.

The following graph shows the composition of the region's economic base in 2007 in terms of industry sectors, which represent general categories of economic activity. A sector is comprised of industries and firms that do similar work, make similar products, or provide similar services. Based on traditional industry sector definitions, the Professional and Business Services sector provides the most jobs. Health and Education, Retail Trade, Government, and Manufacturing round out the top five leading industry sectors. Overall the region's economy has a fairly balanced spread across industry sectors. This reflects the diverse character of the region and can help provide resilience during national economic downturns.

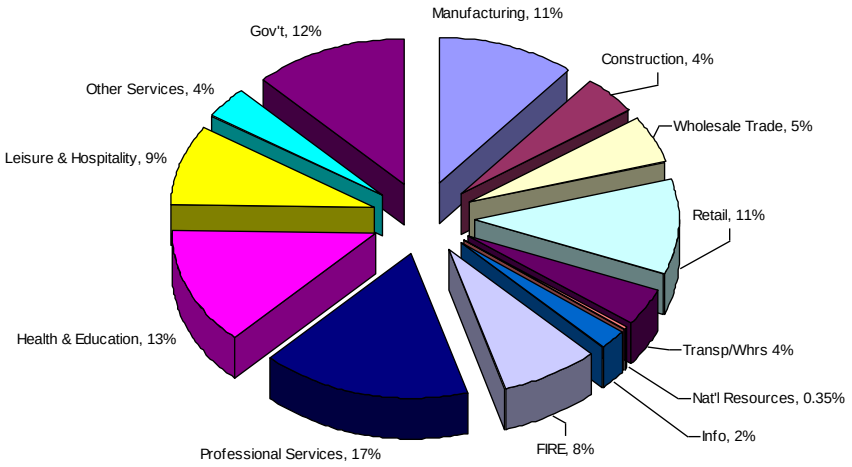


Figure 3: Source: Illinois Department of Employment Security (IDES) -- 2007

The ongoing recession has had serious negative economic impacts for the region, and the unemployment rate rose to over 9% by 2009. Over the last year the majority of job losses have been within Construction (9,000 jobs lost), Financial Services (4,500), Manufacturing (4,000), and Professional and Business Services (3,000). *GO TO 2040*, as a long-range plan, can provide little in the way of immediate relief to these dire economic conditions. However, from a long-range perspective, it is essential to plan for future economic prosperity by identifying growth industries and providing support and solutions in the regional planning process that sustain and retain them.

Gross Regional Product in 2008 for northeastern Illinois was $372 billion dollars in 2008 (chained 2000 dollars) according to estimates in the beginning of the year. Over 50 percent of the value of goods and services produced and used locally and exported from the region are derived through three major sectors -- Finance, Insurance, Real Estate (FIRE), Professional and Business Services and Manufacturing.

Northeast Illinois Gross Regional Product, 2008		
Industry	**GRP (2000 $)**	**Share of Total**
Finance, Insurance, Real Estate (FIRE)	93,992,662,087	25.30%
Professional and Business Services	62,708,030,612	16.88%
Manufacturing	44,452,904,279	11.96%
Wholesale Trade	27,997,948,424	7.54%
Retail	23,257,139,410	6.26%
Government	22,247,413,343	5.99%
Information	22,272,759,898	5.99%
Health Services	21,667,870,753	5.83%
Transportation and Warehousing	14,425,816,677	3.88%
Leisure and Hospitality	11,356,050,414	3.06%
Construction	9,801,431,569	2.64%
Other Services	7,608,998,178	2.05%
Natural Resources	5,966,256,951	1.61%
Education	3,806,610,529	1.02%
Total	371,561,893,125	100.00%

Figure 4: Source on Gross Regional Product: Moody's Economy.com

According to the U.S. Department of Commerce, in 2007, the Chicago region was the sixth largest export market in the U.S. with export sales totaling over $30 billion dollars of goods. The leading products exported were heavily from the manufacturing industry – chemicals was the largest good at 21 percent of the total, while other major exports included computer and electronics products, machinery (except electrical) and transportation equipment.

Comparative Analysis

A comparative analysis was conducted to identify how the region's sectors and industry clusters have performed over a seven year period when compared to the United States. Three benchmarks are used to identify sectors and clusters in this report that may have a competitive advantage: a high employment concentration (referred to as a location quotient); high wage levels; and fast employment growth in the region. A detailed analysis of sectors, industries and clusters can be found in the technical document available online: http://www.cmap.illinois.gov/uploadedFiles/publications/snapshot_series/IndustryClusterrsTechnicalReport.pdf .

Sector Analysis

The bubble chart to the right provides information on the region's sector growth and concentration during the study period. Conclusions include:

- Compared to the nation, the region has a strong concentration in Professional and Business Services; Finance, Insurance and Real Estate (FIRE); Wholesale Trade; and Transportation and Warehousing.

- As described on the previous page, Professional and Business Services; Manufacturing; Health Care; and Leisure and Accommodation are the sectors employing the most people within the region. The fastest growing sectors in the region are Leisure and Accommodation; Health Care; and Education. Each of these sectors employs a fairly large number of people, and their growth is expected to continue.

- Manufacturing, Information, and Natural Resources shed a combined total of 141,725 jobs over the study period. The Manufacturing sector continues to employ many people, and the regional economy continues to adjust to job losses in this sector. It should be noted that regional GRP from manufacturing remains high, as described on the previous page; this is due to high productivity per worker and technological improvements. Employment decline in manufacturing is in line with national and international trends. It remains to be seen how these jobs and this sector will re-emerge with a renewed focus on green energy and specialized manufacturing.

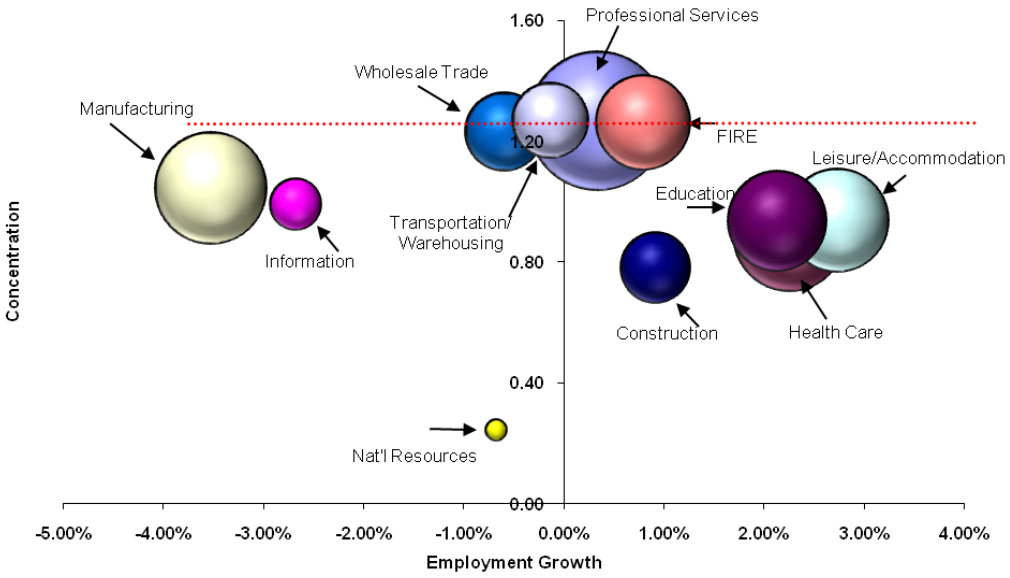


Figure 5: Source: CMAP and IDES -- 2007

Interpreting the chart:

- The size of the bubble indicates the employment size (number of jobs).
- The horizontal axis indicates the employment change over the seven year period. Growth to the right of the graph is positive.
- The vertical axis indicates the concentration of that industry relative to the nation. A concentration of 1.25 or higher indicates that the industry is much more heavily concentrated in the region than in the nation.
- The retail trade sector is not included in the bubble chart, as this sector is highly localized and not generally a subject of cluster analyses.

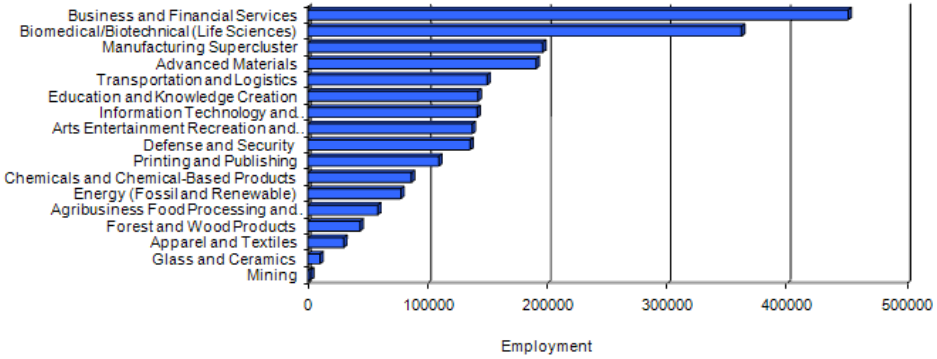
Cluster Analysis

Industry clusters are different than the traditional industry sectors that were detailed above. Clusters are interdependent firms that are linked through the buyer-supplier relationship, share common resources and technologies, depend on similar labor pool and institutions, and rely on special infrastructure. Industries and firms in clusters draw a productive advantage in being geographically located near these resources – and each other -- because it can help develop innovative products, build knowledge creation, and enhance cooperation and competition among firms. Cluster studies have been a focus in economic development efforts throughout the United States because of their ability to help a region understand its economy, build relationships among firms and identify strategies that can develop clusters as part of a long-term planning effort.

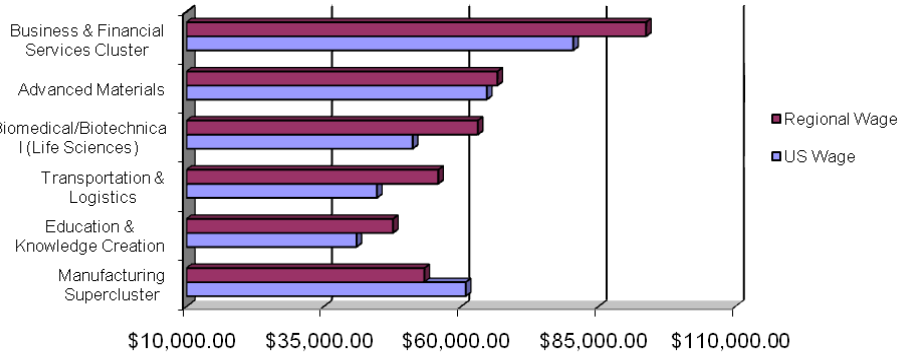
Clusters can differ depending on policy or development efforts. One example is North Carolina's "Research Triangle", where three educational institutions became the pillars of a planned science park that is home to scientists, researchers, and technicians. A second example, "Silicon Valley" in California, is home to a cluster of high-tech firms, manufacturers, and engineers, and has long been a leader in technological innovation. Finally, a recent strategic plan for the state of Florida targeted several clusters ranging from life sciences to clean energy in efforts to diversify its economic base.

A wide variety of methodologies can be used to identify clusters. For the purpose of this analysis efforts were made to use a methodology that encompasses a broad value-chain of interconnected industries otherwise known as "benchmark" clusters. These clusters can reveal important trends about the structure of the region's economy and serve as a tool to develop a more in-depth cluster based economic development strategy. The seventeen clusters used for this analysis were developed by the Center for Regional Development at Purdue University under the auspices of the Economic Development Administration and cover a diverse range of specializations. An explanation of the methodology and supporting documents can be found in the technical document.

The top figure on the following page highlights the seventeen clusters and their employment levels in 2007. The top employing clusters include Business and Financial Services and Biomedical/Biotechnical (Life Sciences), which lead the group with employment over 350,000, while both Manufacturing and Advanced Materials have employment over 190,000.



The figure below highlights the average wages of the top six clusters and shows how they compare to the average wage in those clusters for the United States. Five of the clusters offer a higher annual wage when compared to the average annual wage for these clusters in the nation. The manufacturing cluster in the region falls short of the national average by roughly $5,000.



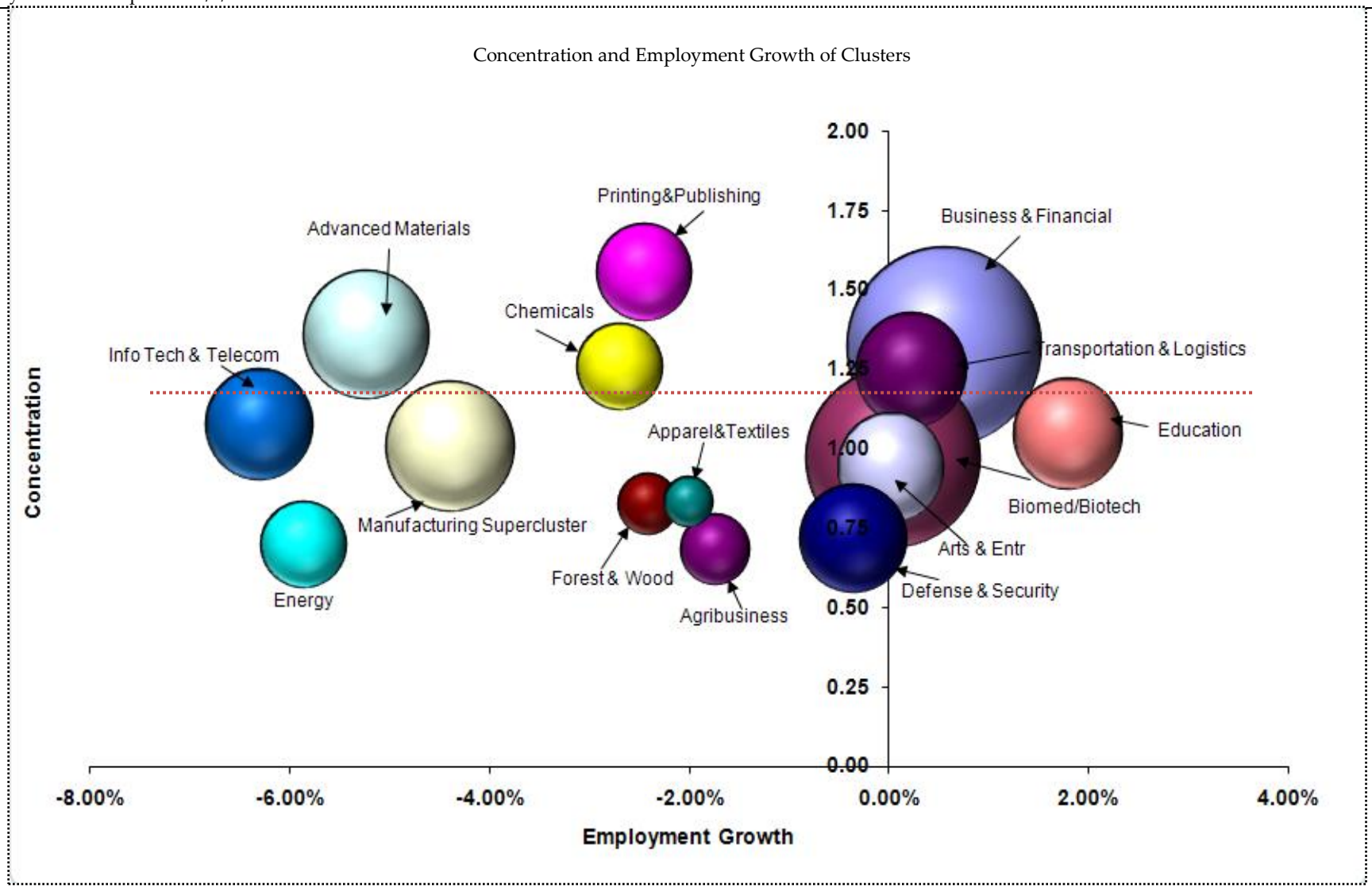


Figure 5: Source: CMAP, IDES, PCRD – 2007

Interpreting the chart:

- The size of the bubble indicates the employment size (number of jobs).
- The horizontal axis indicates the employment change over the seven year period. Growth to the right of the graph is positive.
- The vertical axis indicates the concentration of that industry relative to the nation. A concentration of 1.25 or higher indicates that the industry is much more heavily concentrated in the region than in the nation.

The chart on the previous page provides information on the region's cluster growth and concentration during the study period. Some further discussion of clusters with relatively high concentrations, growth rates, or size is below.

- The Business and Financial Cluster is strongly concentrated in the region (1.32), it is the largest cluster in terms of employment (450,709) and it offers the highest average wage ($93,680). The recent consolidation of the commodities markets and the growth of financial and professional services have made the region a hub for highly skilled knowledge workers. Furthermore, the strength of this and other clusters (i.e., Biomedical/Biotechnical) has led to a growth in software and computer related companies in this region that develop software and electronics that help businesses run more efficiently.

- The Biomedical/Biotechnical Cluster (Life Sciences) cluster is the second largest in terms of employment (361,732) and offers a competitive wage ($63,000). Although the cluster is not heavily concentrated, it has grown in recent years. The region is home to six research and technology parks, world renowned research hospitals, as well as medical and pharmaceutical companies. As an example of the health and life sciences aspect of this cluster, the Workforce Boards of Metropolitan Chicago highlighted the growing need for trained nurses and medical technicians in the report *Health Care Workforce – Turning Crisis into Opportunity* as part of an approach to workforce development.

- The Advanced Materials Cluster has seen average employment decline over the study period, but it is heavily concentrated in the region (1.36) and is the fourth largest cluster (190,315). Further, it is composed of industries that pay a competitive wage ($66,000) above the national average. Research indicates that there has been a shift to niche manufacturing as well as a focus on the "green" economy. Agencies and companies are developing and discovering how the existing industrial base can adapted to green technology, green manufacturing, and renewable energy products, such as parts for wind or solar energy production, using advanced manufacturing. Many companies have moved away from traditional production line manufacturing and use more innovative design and engineering for specialized products that fit specific demands. Overall, manufacturing is adapting to an evolving supply chain and global market and will have an effect on Advanced Materials and Manufacturing Clusters.

- Transportation and Logistics has been growing in concentration (1.25), and is the fifth largest cluster in terms of overall employment (150,000), and pays a wage above the US average ($55,800). The region's transportation network allows easy access to both coasts as well as the global supply chain.

- The Education Cluster and Arts and Entertainment Cluster, although they do not reach the benchmark concentration of 1.25 (their concentrations are 1.05 and 0.94, respectively), have experienced slight employment growth during the seven year study period. The Arts and Entertainment cluster grew 0.03% while the Education Cluster saw growth of 1.80%. Since the region has a strong presence of educational institutions and a multitude of arts, cultural, and sporting amenities, these clusters have potential to experience further growth and increasing concentration.

- The Printing & Publishing Cluster and Chemicals Cluster are heavily concentrated in the region (1.56 and 1.26, respectively). Like their manufacturing counterparts, these clusters have seen employment decline over the seven-year study period and have smaller overall employment (less than 110,000). However, as highlighted earlier, chemical products are one of the largest exports from this region. Further analysis can explore the components and needs of these clusters.

- Several clusters either (a) are concentrated but do not reach the 1.25 benchmark or (b) have experienced a consistent decline in employment. Two examples are the Information Technology and Telecommunications Cluster and the Energy Cluster. Some of this could be due to shifts in the national and global economy during the time frame of this study. However, a renewed interest in the "green" economy, which includes clean energy and the use of energy efficient materials, processes, and products, may cause future growth in these clusters.

Further Discussion

The clusters identified in this preliminary analysis can be used as a basic foundation for the economic approach of the *GO TO 2040* plan. Clusters depend on interaction and collaboration between companies, education and research institutions, and all levels of government. Based on size and concentration, likely clusters for regional focus include Professional and Business Services, Advanced Materials, and Transportation & Logistics. Others that may be relevant clusters as a result of growing concentration and employment growth include Biomedical/Biotech Cluster, Education Cluster, and Arts and Entertainment Cluster. Further research and analysis into these benchmark clusters can help clarify and contribute to the development of unique clusters in this region.

This report provides a basic analysis of clusters within the region, but additional work is needed before individual clusters can be selected for further focus. The next steps in this work are described on the following page.

The *GO TO 2040* plan includes a scenario evaluation process that will guide the plan's recommendations. Each scenario describes a specific economic future for the region, as well as policies and investments that support that future. The scenario evaluation process will include technical analysis and public involvement, and is meant to explore the positives and negatives of these alternative futures. The results of this evaluation are expected to assist in identifying industry clusters that should be the focus of the region's efforts.

Next Steps

Several next steps in this analysis are proposed below. The first step is to develop a methodology to identify and target detailed clusters, track them over time, and forecast future growth. Targeting specific clusters and tracking them can help determine if they are emerging clusters, established or maturing clusters or declining clusters. Such an analysis can assist to identify the most appropriate clusters for a regional focus and develop an effective approach to support their growth and development.

A second step involves addressing clusters at smaller geographies. Different parts of the region have specialized in different types of industries, leading to the formation of a variety of clusters. Identifying clusters at the county level or at even smaller geographies can help to understand what the needs of each cluster are, informing the development of strategies to support them.

Another helpful tool in the cluster development strategy is an asset map. An asset map can provide an inventory of firms connected to a particular cluster and identify its educational, research, and workforce requirements as well as possible infrastructure needs. It can also highlight networks and partnerships that foster and encourage cluster development in the region, helping to develop an economic development strategy. CMAP will then be able to target clusters, project future growth and recognize cluster life cycles which in turn will contribute to policy and investment strategies designed to build the region's workforce and diverse economic base.

About CMAP

The Chicago Metropolitan Agency for Planning (CMAP) was created to integrate planning for land use and transportation in the seven counties of northeastern Illinois: Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will. By state and federal law, CMAP is responsible for producing the region's official, integrated plan for land use and transportation. The *GO TO 2040* planning campaign will develop and implement strategies to address projected growth in population and employment and their serious implications for transportation, housing, economic development, open space, the environment, and natural resources. See www.cmap.illinois.gov for more information.

About this Snapshot…

Understanding regional air quality is important, as it affects our health, economy, and environment. The seven-county metropolitan Chicago region is in "nonattainment" with federal standards, meaning that air pollution levels do not meet Clean Air Act standards intended to protect human health. Recent years have seen improvement, however, and numerous partners across the region and the state have done much good work to quantify and improve air quality. One role of this snapshot is to compile that quantitative information on a regional scale and to describe those efforts.

This report will contribute to the *GO TO 2040* comprehensive regional plan for metropolitan Chicago, which will identify needed policies, strategies, and investments for our region. As a part of the *GO TO 2040* planning process, a Regional Vision was adopted, representing a set of shared values expressed through a comprehensive public participation process. Because air quality is specifically identified in the Regional Vision as an important aspect of protecting the environment, understanding its causes and effects a regional level is essential to the *GO TO 2040* plan.

Air quality will also be used as an indicator to understand how the *GO TO 2040* plan's development scenarios will impact the environment. Various transportation options, patterns of development, and other policies and strategies will have differing impacts on the health and prosperity of the region. CMAP and its partners will evaluate these differences by using several indicators – one of which is air quality --to fully understand their impacts on the region.

Please note that this report does not directly address greenhouse gas emissions, including carbon dioxide. CMAP has other work underway to address this important issue.

In addition to this report, a more detailed technical document on air quality is available online at:
http://www.cmap.illinois.gov/uploadedFiles/publications/snapshot_series/AirQualityTechnicalReport.pdf

Why Air Quality Matters

The quality of the air is arguably one of the most important components of life. Air pollution can hinder normal activity and cause severe health impairment; it can damage trees, crops, and other plants and animals; it can impact water quality and obstruct vistas. Regulations governing air quality play a role in where industries locate, how much energy is used, how we travel and how our transportation systems grow. Air quality is integrated into daily life. It also exemplifies an issue that crosses jurisdictional boundaries, both on a local scale within the northeastern Illinois region, as well as a larger scale with our neighboring states and countries.

As important as it is, air quality is not easily measured or predicted – it represents a complex interaction between natural climate and weather patterns and human actions. Therefore, the goal of this snapshot report is to understand the current conditions of air quality in northeastern Illinois, including exploring related impacts and regulations, and potential next steps for promoting air quality improvement.

Standards

Northeastern Illinois is in nonattainment for two air pollutants – ground-level ozone, also known as smog, and fine particulate matter ($PM_{2.5}$), such as soot. If a region is in nonattainment, it means that it doesn't meet National Ambient Air Quality Standards, standards set by the Clean Air Act to help mitigate air pollution. The following are the standards for these two pollutants.

Ozone

The standard for ozone is 0.075 parts per million (ppm). This is measured on an 8-hour average. If an ozone monitor records an 8-hour average value above 0.075 ppm, it is considered an exceedance. But this is different than a violation. A monitor is not considered in violation until the 3-year average of 4th highest daily maximum is above the standard.

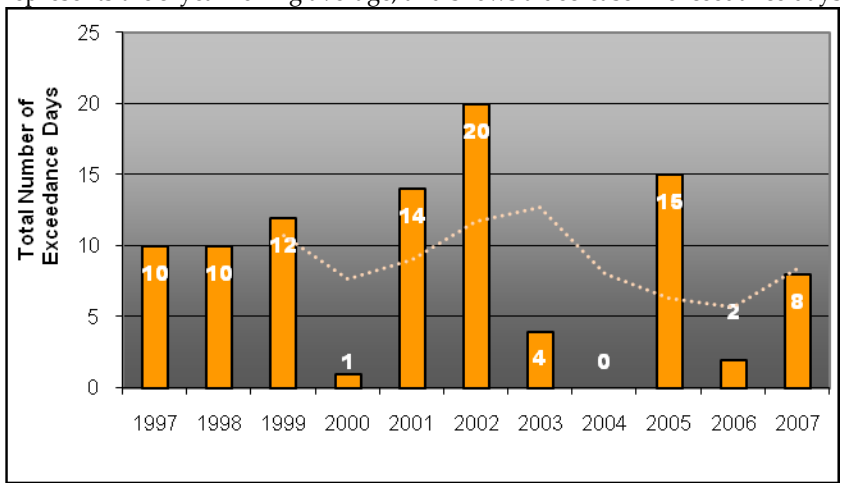
$PM_{2.5}$

There are two standards for $PM_{2.5}$, an annual standard and a daily standard. A monitor must not exceed a mean of 15 $\mu g/m^3$ annually, or 35 $\mu g/m^3$ daily, otherwise it is in violation.

IEPA and US EPA monitor ozone and $PM_{2.5}$ for the purposes of meeting the standards, and are focused on violations as the measurement to track progress. But in order to also get a picture of "every-day" conditions, not just when violations occur, this snapshot reviews the data in a variety of ways, including exceedances (not all of which constitute a violation) and averaged data across all regional air quality monitors.

Ozone

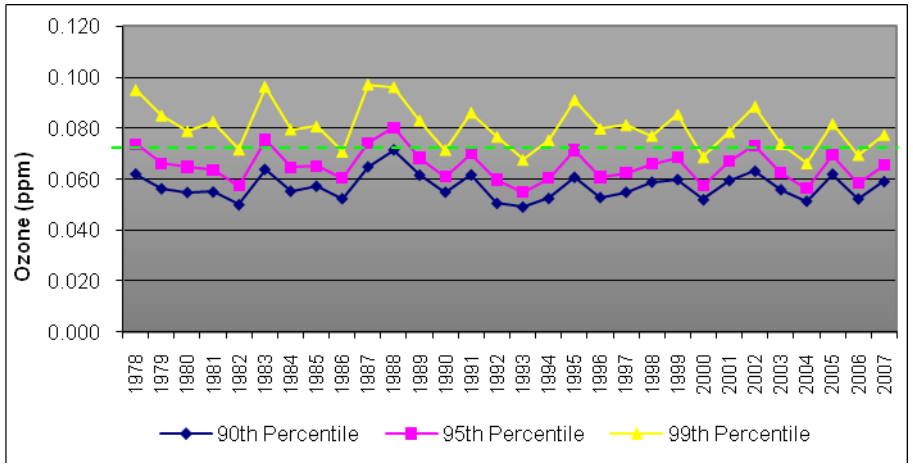
To understand "every-day" ozone levels, data from all monitors across the region was analyzed. Figure 1 represents the total number of exceedances across all monitors in the region per year. An exceedance doesn't necessarily constitute a violation (according to the federal standards), but this gives a rough idea of regional ozone. The dotted line represents the 3-year rolling average, and shows a decrease in exceedance days over time.



Source: U.S. Environmental Protection Agency Air Quality System Database

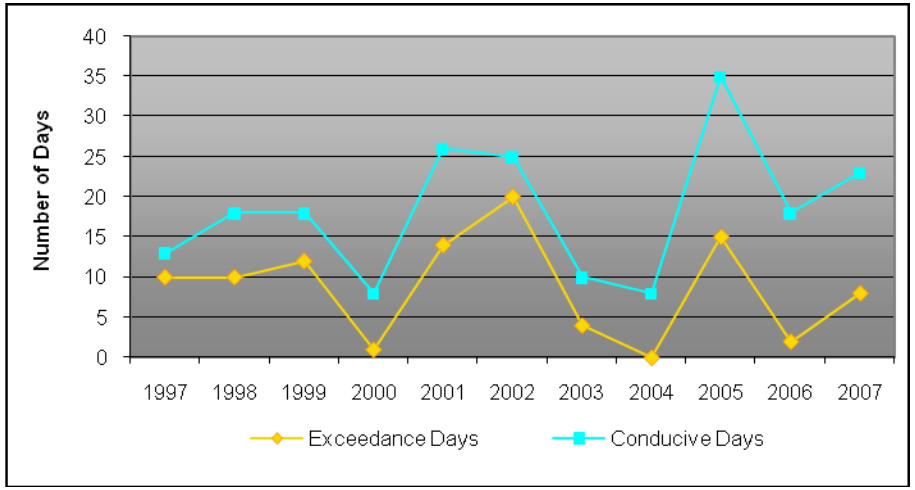
Although helpful, exceedance data only shows the number of times a monitor exceeded the standard; it doesn't reveal ozone pollution on a day-to-day basis. To do this, all the ozone levels from all the region's monitors were averaged, going back to 1978. However, a simple average has some key flaws, most important of which is that ozone formation is affected by different photochemical processes during different weather conditions. But trying to understand these complex processes is a research issue beyond the scope of this snapshot.

Therefore, rather than use the mean ozone level of all the region's monitors, data was analyzed for three higher ozone levels – the 90th, 95th, and 99th percentiles – of all the monitors. These percentiles represent the worst 20, 10, and 2 days per year respectively for this region. This data is shown in Figure 3. It reveals that the worst 2 days each year, the 99th percentile, are usually above the standard, underscoring the region's nonattainment status. But perhaps a more interesting story is that the regional average's worst 10 days per year are in the range of values considered when the 8-hour ozone standard was most recently updated, and the worst 20 days per year periodically reach that range. (The dashed green line represents 0.075 ppm, the standard.)



Source: U.S. Environmental Protection Agency Air Quality System Database

It is important to point out that ozone levels are highly related to weather. IEPA tracks "ozone conducive days" – days when weather patterns favor the chemical reaction that creates ozone from emissions. Conducive days are very sunny and warm, with light winds, and a lack of precipitation. Perhaps more than any other variable, the number of conducive days plays a key role in excessive ozone levels, as evidenced in Figure 3, where the two values are clearly highly correlated. Although climate change will affect weather patterns, it is uncertain if the number of conducive days will change.

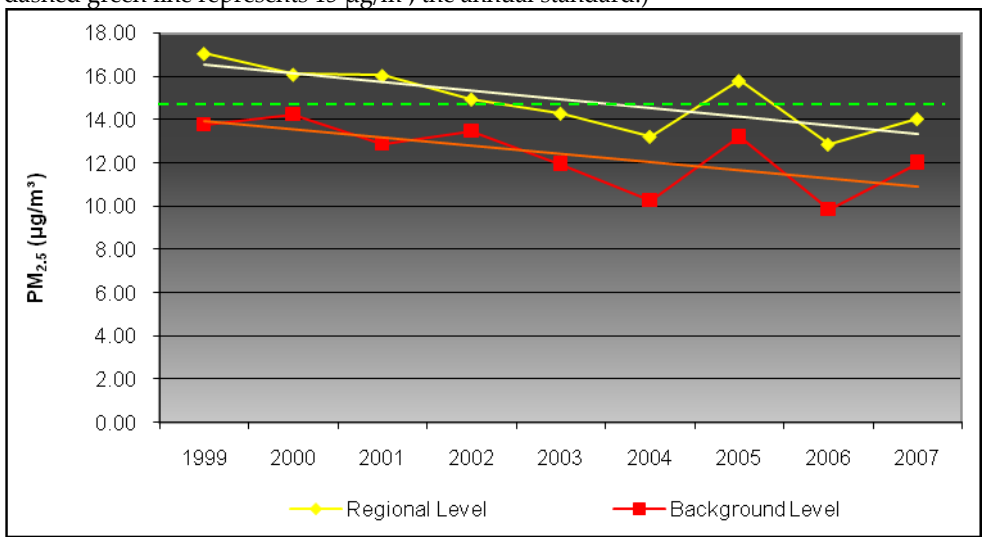


Source: Illinois Environmental Protection Agency and U.S. EPA Air Quality System Database

Particulate Matter ($PM_{2.5}$)

To understand $PM_{2.5}$ levels, data from all the monitors across the region was analyzed. There is an annual standard (mean of 15 µg/m³) as well as a daily standard (35 µg/m³) for $PM_{2.5}$. But $PM_{2.5}$ has only been monitored for the last ten years, with the standard just going into effect in 2005. Furthermore, data on daily exceedances is limited because the region was well below the daily standard until it was dramatically lowered in 2006. For 2007, when the new, lower standard went into effect, the data showed that each monitor exceeded the daily $PM_{2.5}$ standard about 3 days, on average.

The annual concentration of $PM_{2.5}$, averaged across all regional monitors, is plotted in Figure 4, along with a plot line of the background level of $PM_{2.5}$. The background level is measured by a monitor in southwestern Will County, and helps discern what pollution is blowing in from outside the region, rather than generated here. This graph shows a clear downward trend, indicating that the annual average $PM_{2.5}$ levels are improving. (The dashed green line represents 15 µg/m³, the annual standard.)



Source: U.S. Environmental Protection Agency Air Quality System Database

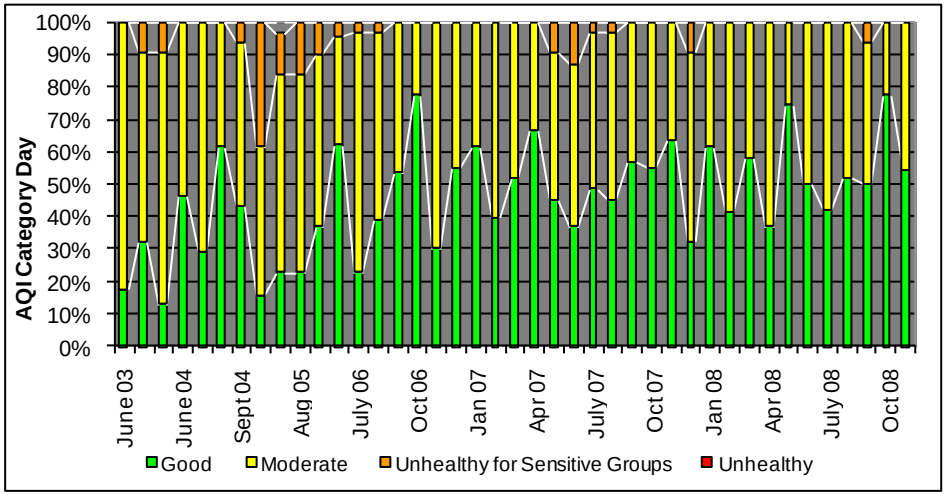
Air Quality Index

Because of the challenges with averaging regional air quality data, another avenue for understanding the region's "every-day" air quality is looking at the Air Quality Index (AQI). The AQI is a national index for reporting daily air quality in a color-coded, user-friendly way. Although the data has been transformed into an index, it provides a picture of the number of days which meet both standards for ozone and $PM_{2.5}$, on a regional scale. The AQI is currently estimated every day of the year.

Color	Category	AQI Value	Meaning	Ozone 8-hr (ppm)	$PM_{2.5}$ 24-hr (µg/m³)
	Good	0-50	Air quality is considered satisfactory, air pollution poses little or no risk	0.000-0.059	0.0-15.4
	Moderate	51-100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution	0.060-0.075	15.5-35.5
	Unhealthy for Sensitive Groups	101-150	Members of sensitive groups may experience health effects; the general public is not likely to be affected	0.076-0.095	35.5-55.4
	Unhealthy	151-200	Everyone may begin to experience health effects; member of sensitive groups may experience more serious health effects	0.096-0.115	55.5-140.4
	Very Unhealthy	201-300	Health alert; everyone may experience serious health effects	0.116-0.374	140.5-210.4
	Hazardous	301-500	Health warning of emergency conditions; entire population likely to be affected	0.375+	210.5+

Source: U.S. EPA, www.airnow.gov

From available data, the majority of days in northeastern Illinois fall within this "good" and "moderate" range. These days have an AQI within federal standards. When analyzed over time, AQI can be tracked, shown in Figure 6. This reveals an increasing number of "good" days.



Source: U.S. EPA, www.airnow.gov

Sources

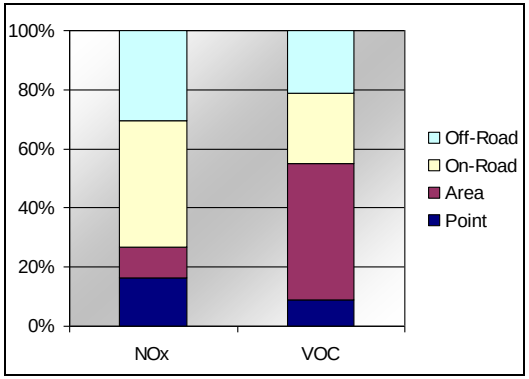
Although some emissions occur naturally, excessive levels are caused by interactions between human actions and weather conditions. The emissions caused by human sources are separated into point, area, and mobile sources.

- Point sources are large, stationary emitters, such as power plants, chemical producers, manufacturing plants, or petroleum refineries.
- Area sources are small, stationary emitters, usually located in urban areas with other emitters that combine to form collectively significant emissions. Examples include gas stations, dry cleaners, motor vehicle refinishing shops, and households using consumer products.
- Mobile sources are those emitters which move under their own power. This typically means on-road transportation sources such as motor vehicles (cars, trucks, and buses); but a large portion of mobile source air pollution is generated by off-road sources such as gas-powered lawn and farm equipment, construction and industrial equipment, boats, planes, and trains.

IEPA measures these emission sources every few years, splitting mobile sources into on-road and off-road.

Ozone Precursors

Ozone is created from precursors, nitrogen oxides (NOx) and volatile organic compounds (VOC). Figure 7 shows how much of each precursor is caused by these four emission sources.

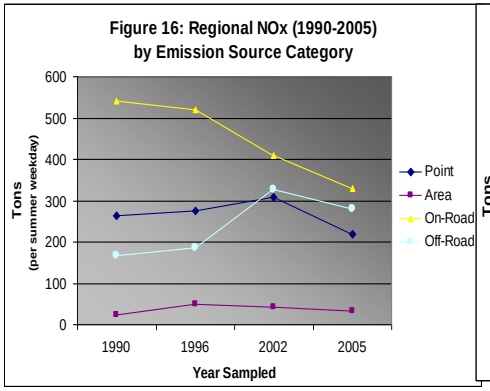


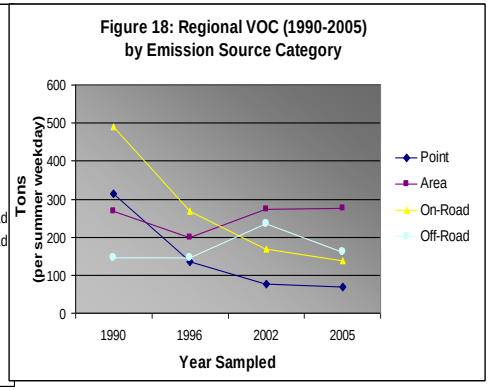
Source: Illinois Environmental Protection Agency

Trends

The change in NOx and VOC emitted by these sources over time is portrayed in Figures 8 and 9. Figure 8 reveals how there has been a small decrease in total NOx over time, and also how the on-road and point sources have shown the most improvement. Similarly, Figure 9 shows how total VOC has also declined, mostly due to the significant decrease in on-road and point source emissions.

Source: Illinois Environmental Protection Agency

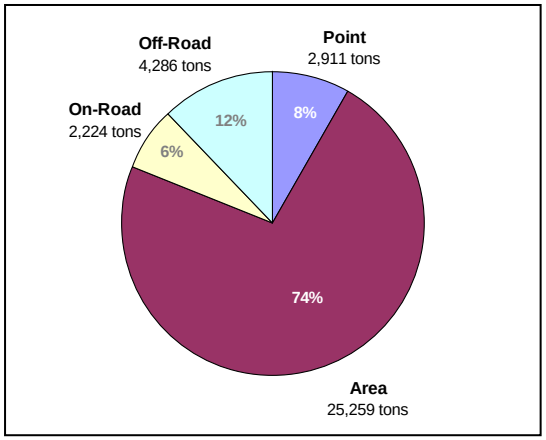




Particulate Matter ($PM_{2.5}$)

IEPA also evaluated the sources of particulate matter pollution in 2005, shown in Figure 10. The vast majority of $PM_{2.5}$ pollution is attributed to area sources. Of this, more than half (approximately 14,438 tons) is due to road construction.

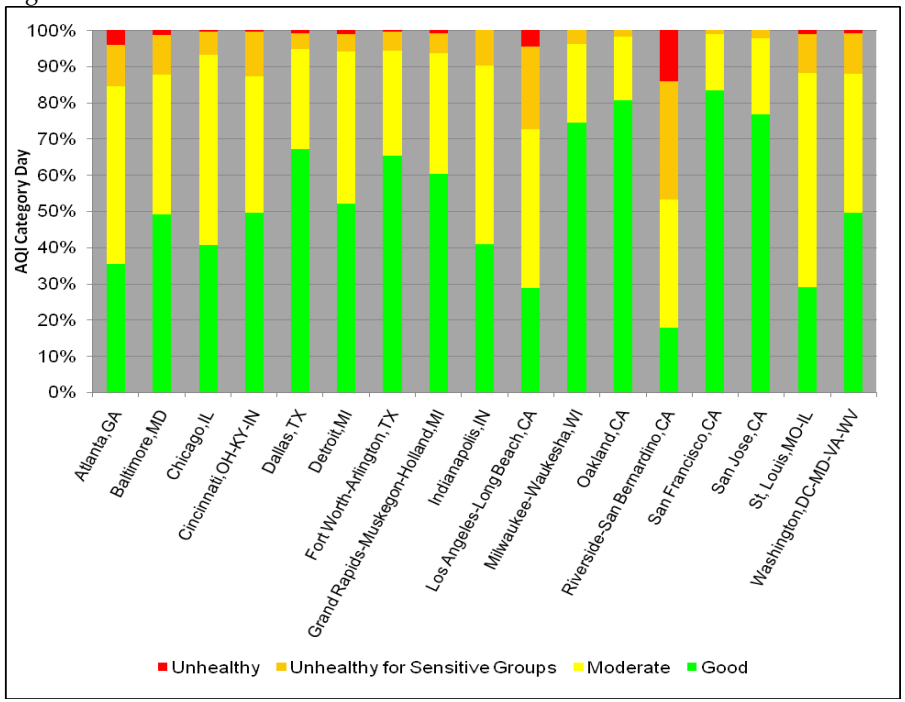
Because $PM_{2.5}$ hasn't been tracked as long as ozone, IEPA does not yet have any trend data from which to compare these 2005 $PM_{2.5}$ emissions. This data also only includes what is generated in the region, and does not take into consideration particulate pollution blown in from outside the region. But it reveals that even though the transportation sector have shown decreasing VOC and NOx emissions over time, road construction is still a major contributor to air pollution in our region.



Source: Illinois Environmental Protection Agency

How Does Northeastern Illinois Stack Up?

Air quality is regulated and studied on several larger scales. In addition to the local monitoring done to ensure regions are meeting the regulations of the Clean Air Act, the US EPA tracks air quality at the national scale, and compiles AQI data for metropolitan regions. Although this metric does not take into consideration several variables, such as the unique climate, geography, or land use features in each metropolitan region, it is a way to compare northeastern Illinois on a national stage. Figure 11 is a comparison of the AQI category days for the metropolitan Chicago region with selected metropolitan regions across the nation.



Source: Air Quality Index Report, U.S. EPA Air Data, 2007

LADCO

Even for large regions such as northeastern Illinois, the effects of air pollution are not isolated. Weather conditions, particularly wind speed and direction, can transport air pollution from region to region, state to state, and country to country. The Lake Michigan Air Directors Consortium (LADCO) is made up of the states of Illinois, Indiana, Michigan, Wisconsin, and Ohio, and provides technical input on air quality issues in the larger region to the group. This coalition helps nonattainment areas in the larger region work together to meet regulations and improve air quality beyond their borders.

Current Regulations

Air quality is a heavily regulated issue. The IEPA and the US EPA are involved in setting standards and monitoring and tracking conditions. The main legislation related to air quality are the Clean Air Act and SAFETEA-LU (the current transportation authorization act), although there are several others that impact air quality in more minor ways. Details about all the regulations relevant to air quality can be found in the technical report.

Clean Air Act

The single most significant piece of federal legislation regarding air quality is the Clean Air Act. Under the Clean Air Act, the US EPA has the authority to place limits (NAAQS) on air pollution and emissions throughout the nation; states are not allowed to have weaker pollution controls than those set for the whole country.

If regions do not meet the standards set by the US EPA, the states containing them must have plans for reducing air pollution. These state implementation plans (SIPs) explain how the state will take measures to achieve those standards. The law recognizes that states are better equipped to implement the regulations because pollution control problems often require specific understanding of local geography, development patterns, and industries as well as the authority to mandate air pollution controls. But the SIPs must be approved by the US EPA, and if found unacceptable, the US EPA can impose sanctions, or take over enforcement in that state.

A SIP is a collection of the regulations, programs, and policies that a state will use in each air quality control region within that state. Various SIP requirements and procedures are triggered depending on the degree of nonattainment of the federal standards. In addition, the SIP includes modeling to demonstrate that the efforts the state has adopted will improve air quality to the level of the federal standards by the federally-specified attainment date. This modeling is known as the attainment demonstration. If the state has achieved the standards, then an analysis referred to as a "Maintenance Plan" demonstrates that it will continue to do so.

In addition to setting acceptable standards and monitoring, the Clean Air Act authorizes additional regulatory actions. Some of these additional regulations and programs include:

- *Emission Standards for Vehicles* – the Clean Air Act sets levels of acceptable exhaust emissions from all mobile sources. They are divided into standards for on-road vehicles and nonroad vehicles (and equipment); with standards for both new and existing emitters.
- *Fuel Regulations* – As a counterpart to regulating vehicle and engine emissions, fuel regulations set limits on lead and sulfur in gasoline and diesel fuel, and encourage the use of alternative and renewable fuels.

- *Permit Programs* – stationary sources are subject to permitting, when they are first constructed, if they make any modifications, and regularly, in order to continue operations.
- *Inspection/Maintenance* – administered in the region by the IEPA, these programs ensure that emission control systems in vehicles are working properly.
- *Air Toxics Rules* – emission sources of hazardous air pollutants (different than criteria pollutants like ozone and $PM_{2.5}$) are required to use "maximum achievable control technology" to control emissions of air toxics.

SAFETEA-LU

SAFETEA-LU (Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users) is the main source of funding and programming for improvements to the country's surface transportation infrastructure, and incorporates opportunities to mitigate the impacts of mobile source air pollution.

The Congestion Mitigation and Air Quality Improvement Program (CMAQ), for example, provides funding in nonattainment areas for projects and programs that reduce transportation-related emissions or congestion. CMAP administers these funds for northeastern Illinois.

CMAP also has the responsibility to ensure that federally-funded transportation activities are consistent with air quality goals. This is called "conformity" – and ensures that transportation activities do not worsen air quality or interfere with the purpose of the SIP.

The transportation plan and the transportation improvement program (TIP) guide long- and short-term transportation investments. A regional emissions analysis is performed to demonstrate the consistency of the transportation plan and TIP with the SIP motor vehicle emissions budgets. This analysis forms the basis for the conformity determination, measuring the emissions impact of the plan's and TIP's projects, and weighing that against the budgets established in the SIP.

Other Regulations

There are several other regulations which impact air quality, including the Clean Air Interstate Rule, which is a relatively recently federal rule to regulate air pollution that travels from one region to another; Federal Energy Policy, which regulates fuel economy; and local enforcement and permitting of emitters, as done by the City of Chicago and Cook County.

Current Local/Voluntary Efforts

Although heavily regulated and monitored, air pollution is a persistent issue that is also addressed by voluntary efforts. There are non-government organizations dedicated to working for cleaner air, as well as government-sponsored air quality programs targeting private business and citizens. Some of the most significant of these are listed here:

- *Commuter Choice* – funded by US EPA and US Department of Transportation, this is a website (www.commuterchoice.com) and service dedicated to linking employees and employers with transportation providers.
- *ENERGY STAR* – managed by the US EPA, this is a voluntary labeling program designed to identify and promote energy-efficient products to reduce emissions.
- *Clean Air Markets* – managed by the US EPA, this is a series of market-based regulatory programs designed to cost-effectively lower emissions through the operation and evaluation of "cap and trade" and similar programs.
- *Fuel Economy and Green Vehicle Guides* – produced by the US EPA and the US Department of Energy, these guides help consumers choose the most fuel-efficient vehicle for their needs.
- *Diesel Emission Reduction Program/National Clean Diesel Campaign* – this US EPA program promotes diesel emission reduction strategies by offering incentives and grants to help fund retrofitting projects.
- *Illinois Green Fleets* – a voluntary program in which Illinois businesses, organizations, and local governments gain recognition for having "green," domestic, renewable fuel vehicles in their fleets.
- *Illinois Clean School Bus and Clean Diesel Grant Program* – IEPA developed this program, similar to the National Clean Diesel Campaign, to help schools retrofit existing diesel-powered buses.
- *Training* – Lake Michigan Air Directors Consortium, US EPA Region 5, and IEPA work to offer training on "maximum achievable control technology" standards, the levels of control for sources of hazardous air pollutants.
- *Partners for Clean Air* – regional coalition of businesses, transportation organization, health advocacy groups, and local governments in northeastern Illinois and northwestern Indiana, which pledge to reduce air pollution voluntarily, and offer public education and outreach on air quality.
- *Chicago Area Clean Cities Coalition* – a voluntary organization dedicated to encouraging the use of clean fuel and clean vehicle technologies, part of a national Clean Cities Campaign, sponsored by US Department of Energy.
- *Clean Air Counts* – a public-private initiative to voluntary improve air quality in the region, managed by the Metropolitan Mayors Caucus.
- *Chicago Climate Exchange* – a self-regulatory cap and trade exchange for emissions in North America, which requires member to voluntarily sign a legally binding contract to meet annual emission reduction targets.

Little Village Environmental Justice Organization (LVEJO)
LVEJO is a community-based organization in the Chicago neighborhoods of Little Village and Pilsen. One of the most densely-populated areas in the region, the neighborhoods are also home to two coal-fired power plants, as well as other stationary source emitters. LVEJO has worked on several campaigns related to air quality. They have organized residents to demand enforcement by local polluters, negotiating "good neighbor agreements," partnered with local universities for research, and used the press to motivate City officials.

Clean Air Counts
Clean Air Counts is a public-private initiative, managed by the Metropolitan Mayors Caucus, to voluntarily achieve specific reductions of air pollutants and energy use. The strategies include incentives to encourage participants to make a commitment to reduce emissions, as well as agree to annual reporting of their strategies. The program also has a large education component, helping communities understand and assess the impact of air quality improvement policies.

Other Regions
In a brief survey of what other regional agencies are doing to promote cleaner air, the following ideas were included, many of which are currently underway in northeastern Illinois:

- Grassroots efforts by community organizations, supported by partners such as CMAP or universities;
- Land use planning to promote density, as well as transit usage, walking, and bicycling;
- Vehicle scrappage programs to get older, more polluting vehicles off the roads;
- Education about current programs to voluntarily retrofit older engines; and
- Leveraging air quality benefits in awarding contracts.

About CMAP

The Chicago Metropolitan Agency for Planning (CMAP) was created to integrate planning for land use and transportation in the seven counties of northeastern Illinois: Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will. By state and federal law, CMAP is responsible for producing the region's official, integrated plan for land use and transportation. The *GO TO 2040* planning campaign will develop and implement strategies to address projected growth in population and employment and their serious implications for transportation, housing, economic development, open space, the environment, and natural resources. See www.cmap.illinois.gov for more information.

Conclusions

This snapshot report looks at air quality through a regional lens, in an attempt to understand current conditions, sources, regulations, and efforts specific to northeastern Illinois. Conclusions include:

- The region has made progress in improving air quality. But as Federal standards are strengthened, there will continue to be work to be done. In addition, as the region is predicted to grow, the region will need to consider new and innovative solutions to improve air quality.
- As the climate changes, air quality may be impacted. Ozone is highly correlated to weather conditions, and shifts in weather patterns may influence regional ozone. Although air quality regulations currently focus on specific pollutants, not greenhouse gas emissions, there is increasing interest in mitigating climate change by including these emissions as well. A separate CMAP snapshot report addresses our region's greenhouse gas emissions and energy use.
- Historically, controls implemented nationally, such as vehicle emissions and fuel standards, have provided much of the improvements in air quality. The state and local programs and regulations currently in place work. But greater reductions from area sources and off-road mobile sources may be required, especially with a new, stricter ozone standard in place. So new efforts may be needed, focusing on these sources – some of which are still related to transportation, like road construction.
- The overall reduction in ozone throughout the region continues, but the multi-state nature of the problem means that areas up- and downwind of the region must also be considered.
- In comparison to ozone, particulate matter is still a relatively new air quality concern in the region, and monitor data is limited. At this point, data show slightly declining levels of $PM_{2.5}$, but source data also points to area sources as the largest contributor.
- For public understanding of regional air quality, the AQI may be the best method for tracking progress. With daily measurements and designations based on federal standards, it is an excellent resource for assessing air quality (both $PM_{2.5}$ and ozone) throughout the region.

The *GO TO 2040* plan will use air quality as one of a set of indicators to track its progress toward achieving the goals set out in the Regional Vision and evaluate potential recommendations made in the plan.