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Sustainability

CMAP Regional Snapshot

D R A F T



Toward sustainability...

Cities and countries around the world have embarked on sustainability initiatives, and the planning literature is full of references to sustainability. But what is it, and how would we know if we are achieving it?

The Regional Snapshot on Sustainability is not the final word but rather the northeastern Illinois region's start toward answering those two questions. The Chicago Metropolitan Agency for Planning (CMAP) is developing the region's first comprehensive plan. Scheduled for completion in 2010, the Regional Comprehensive Plan (<http://cmap.illinois.gov/plan>)— referred to below as the Plan — will articulate a vision of regional prosperity for the year 2040, along with clear strategies to implement that vision.

One purpose of this report is to develop a definition of sustainability that CMAP can use in its core regional planning work. Therefore, it focuses on the application of sustainability to land use and transportation planning, yet also recognizes that it has an important role in economic development, the natural environment, housing, and human services. While there are a number of policy issues and performance indicators that could be discussed in this report, it focuses on those two key elements. For example, this report identifies education and workforce development as critical issues that must be addressed for the region to be sustainable, but does not make specific recommendations for action.

CMAP's Regional Snapshots are not designed to "make policy." Instead, this report and subsequent ones should inspire discussion between CMAP, its partners, and other stakeholders concerning the implications of sustainability.

Besides developing a definition of the term for use in the context of regional planning, this snapshot proposes specific indicators to measure sustainability. Ultimately, the region needs a set of indicators that measures how well alternative future scenarios developed as part of the Plan would meet metropolitan Chicago's vision for the future. This set of indicators is expected to be adopted by the CMAP Board in Fall 2008.

Defining sustainability

The term sustainability is generally used in one of three ways:

1. Sustainability requires that any public policy or investment meet certain environmental, economic, and social equity goals.
2. Sustainability meets the needs of the present without compromising the future.
3. Sustainability regards the total wealth of society as capital that should be preserved or increased, including natural capital, human capital, and man-made capital in addition to financial wealth.

Each of these expresses a different facet of sustainability. For the 2040 Regional Comprehensive Plan, CMAP and the region need a definition that combines these important concepts. This definition is made up of four general principles:

1. Protect environment and improve natural resources for future generations.	2. Improve economic performance and quality of life for individuals.
3. Preserve the value of human and man-made capital for future generations.	4. Ensure a fair distribution of life-quality.

The following sections will examine these principles in some detail.

Please note that this snapshot is a summary of the longer technical report at <http://www.cmap.illinois.gov/snapshot.aspx>.

Principle 1 | Protect environment and improve natural resources for future generations

Our natural environment provides the materials for every product we use and consume. It also absorbs all the wastes that society produces. It provides recreation and, to many of us, solace and even spiritual renewal. At the same time, it is made up of a stunningly diverse set of animals and plants that need to be protected. To be sustainable, decisions must protect and improve the natural environment and its resources.

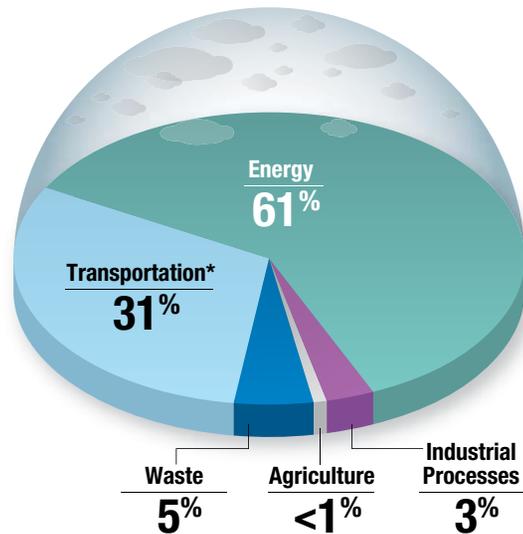
An effective way to measure the region's effect on the environment and natural resources is through an "ecological footprint" measure, which converts the resources needed to support an economy into a global measure of acres of land needed per person. Because the Chicago region is part of the global economy, activities that take place in the region have environmental impacts far beyond the region's boundaries, and must be considered when addressing sustainability.

This doesn't mean that local environmental conditions are unimportant. Water and air quality and biodiversity are useful measures of the region's environmental health, and CMAP intends to address these in the Plan. For water quality, it should address both direct discharges as well as non-point source pollution, the diffuse water pollution that washes off impervious surfaces such as parking lots and roadways. In the Plan, CMAP also intends to approach air quality more broadly than required by the Clean Air Act, which only specifies that CMAP address the transportation system's impact on air.

To promote sustainability, our region must consider the full environmental impacts of investments and decisions. For example, infrastructure improvements can induce new development, and therefore, these broader effects should be considered in the environmental-impact assessment of any proposed infrastructure. Also, because regional development tends to cause localized natural resource damage, the Plan should include a method of comparing damage to different natural communities and a means of dealing with "offsets" — improvements made in one natural area to compensate for damage in another.

Greenhouse gas emissions, 2000

for 6 county region (excluding Kendall); total of 104.6 million metric tons of CO₂ equivalents



*excludes aviation
Source: Center for Neighborhood Technology

Principle 2 | Improve economic performance and quality of life for individuals

To be sustainable, the region needs economic development that creates employment, increases incomes, and improves people's lives. Sustainable economic development goes beyond growth in Gross Regional Product to focus on the effect of economic development on the quality of people's lives in the region.

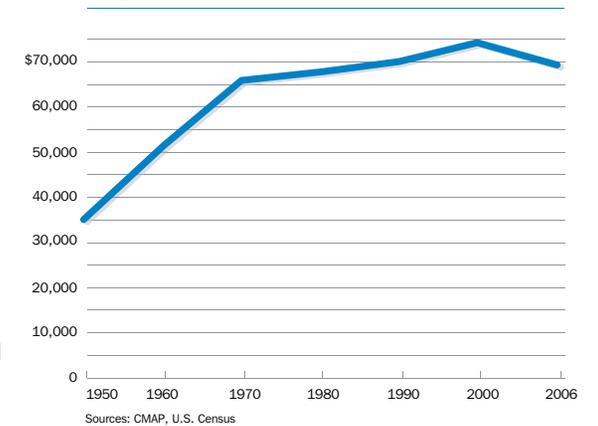
Economic development can be sustainable through proper infrastructure investments, particularly in projects that create jobs, raise incomes, or increase quality of life. In particular, transportation investment is a significant driver of economic productivity, which is important to long-term prosperity. In considering major capital investments, the Plan should evaluate their impacts on economic development.

Also, non-infrastructure investments should be considered on the basis of potential contributions to economic sustainability. For instance, congestion may be reduced by better managing current transportation systems or by providing workforce development that lets people live nearer to where they work.

The region also needs to ensure that appropriate incentives are in place to promote good economic development practices. Economic development decisions are often driven by fiscal imperatives, in which jurisdictions seek development to generate tax revenues. While this is understandable due to the reliance of local governments on tax revenue, it does not always lead to land-use patterns that are regionally desirable. For the Plan to effectively address economic development, it must address how tax policies influence development decisions.

Quality of life is a major factor that -- like sustainability, itself -- is an elusive concept that can be difficult to measure. But because this is such an important goal, the Plan will seek to develop indicators to measure whether certain policies or investments are beneficial or harmful to regional quality of life.

Median Family Income in the Chicago Region, 1950-2006, constant 2006 dollars



Principle 3 | Preserve the value of human and man-made capital for future generations

Human capital is the knowledge, skill, and other abilities of metropolitan Chicago's residents. Man-made capital is everything of value that knowledge, skill, and other abilities can produce, such as public and private infrastructure. To create a sustainable region, we must invest wisely in these types of capital.

Because of CMAP's role in programming transportation funds, a major form of man-made capital to address in the Plan is the existing and planned transportation system, although housing, other building stock, utilities, and other infrastructure are also important. To be sustainable, current decisions about infrastructure should contribute to the system's future value. Yet the future value of a transportation facility — even though maintained in a good state of repair — could be significantly less than its present value if it doesn't fit the needs of future generations. Therefore, the Plan should prioritize reinvestment in elements of the transportation system that are expected to be of highest benefit to future generations.

The use of life-cycle costing, which measures the full cost of constructing and maintaining a facility over its designed life, will allow CMAP to address the sustainability of man-made capital in the Plan. This technique makes the future maintenance costs of different design alternatives more evident, and it helps ensure that maintenance and operations costs are considered in the initial design of infrastructure. Also, using life-cycle costs highlights the importance of ongoing maintenance and operations and makes these considerations an important part of investing funds in capital projects.



Photo: Friends of Bloomingdale Trail

Infrastructure such as Chicago's El must be maintained to preserve its value. Other infrastructure may be more valuable if it is used for another purpose, such as the planned reuse of the Bloomingdale freight line (shown above) for a trail in Chicago.

Future generations can be expected to benefit from development patterns that provide multiple transportation options, as opposed to development patterns that support only automobile travel. For this reason, the Plan should focus on strategies that promote efficient urban form that allows transportation choice.

In addition to man-made capital, the preservation of human capital is also critical to sustainability. This is outside CMAP's primary focus on integrating land use and transportation planning. But because of the importance of addressing human capital in building a sustainable region, the Plan should also consider issues such as education, health, and social services.

Principle 4 | Ensure a fair distribution of life-quality

For the region to be sustainable, equity must be addressed. One such approach is known as "vertical equity," which states that an equitable decision will improve prospects of the most disadvantaged residents of a region. On the other hand, "horizontal equity" means not favoring any group or area over another, but trying to share benefits and costs equally. The Plan must effectively address both vertical and horizontal equity.

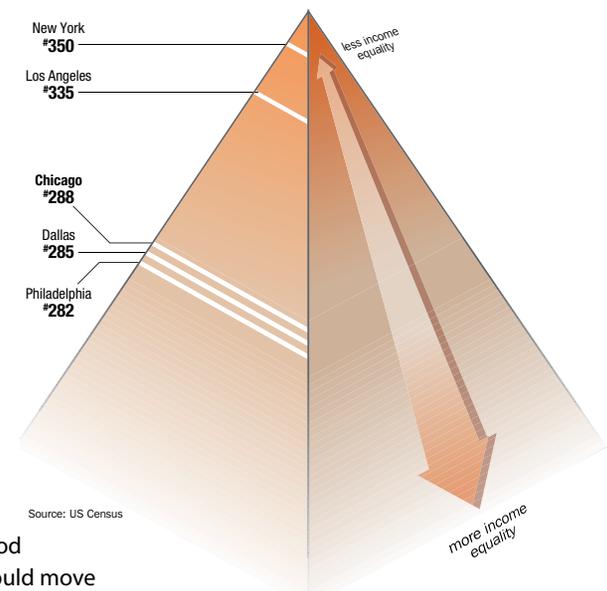
Previous transportation planning efforts in northeastern Illinois have explicitly considered the impact of transportation improvements on low-income and minority communities. This allows different investment scenarios to be evaluated by how they impact transportation service in low-income and under-served areas. Because this approach is appropriate to a sustainable concept of equity, it should be continued and improved. Such analysis of society's most disadvantaged people should include the disabled, youth, and elderly. Also, equity should be judged not just in terms of transportation access, but in terms of housing affordability, access to employment, and other measures.

Another good indicator of equity is to compare the earnings or wealth of high-income households with those of low-income households. This is arguably the strongest factor in determining the ability of households to achieve desired goals.

A similar comparison between high-income and low-income local governments is also useful, because the fiscal health of municipal government is a strong determinant of its ability to meet the needs of citizens and provide good quality of life. The Plan should move the region toward sustainability by emphasizing policies and investments that lead to more equity among households and among local governments by improving the circumstances of lower-income groups.

Income Equality in U.S. Metro Areas, 2006

Rankings of 360 metropolitan areas by value of Gini coefficient



Sustainability indicators and tradeoffs

The region needs a set of sustainability indicators to predict the relative effectiveness of alternative future scenarios developed as part of the Plan. Because the Plan will include recommendations to implement some policies or investments but not others, it will require choices between the four general sustainability principles. The separate components of sustainability should be treated equally, but tradeoffs are unavoidably involved both across multiple principles and within a single principle. It is difficult to lay out a clear decision-making rule for tradeoffs in advance, but for a scenario to be sustainable, it will have each indicator showing no change or an improvement relative to the baseline scenario.

Principle	Sample Indicator	Units
1	Ground surface hardening	Percent impervious by watershed
	Regional natural resource damage	Group of several indicators
	[Habitat fragmentation TBD]	[TBD]
	Greenhouse gas emissions	MMTCO ₂ e
	Environmental Footprint	Acres per person
	Petroleum consumption	Millions of gallons per year
	[Air quality TBD]	[TBD]
	Total energy use	Trillions of British Thermal Units
	Water use	Use/yield ratio; millions of gallons /day
2	Total factor productivity (stratify by target ind.)	Percent change from baseline
	Wage growth (stratify by target industry)	Percent change from baseline
	Employment growth (stratify by target ind.)	Percent change from baseline
	Aggregate fiscal capacity	Equalized assessed value + taxable sales (\$)
	Trip length	Miles, minutes (work vs. all trips)
	Hours of delay	Hours per year
	Availability of transportation modes	Percent of total trips
3	Roadway conditions	Miles by condition
	Bridge conditions	Number by condition
	Condition of transit assets	USDOT rating index
4	Gini for income distribution	0 to 1 scale, no units
	Fiscal disparity indicator	0 to 1 scale, no units
	Access to transit	Percent of total trips
	Access to jobs	Percent jobs within given commute distance
	Trip length	Miles, minutes

The following table summarizes potential indicators of sustainability that should be considered in development of the Plan. These indicators have been chosen to represent potential measures relative to the principles described previously. More work will be conducted before finalizing the indicators.

Principle 1 = Protect environment and improve natural resources for future generations
 Principle 2 = Improve economic performance and quality of life for individuals
 Principle 3 = Preserve the value of human and man-made capital for future generations
 Principle 4 = Ensure a fair distribution of life-quality
 TBD = To be determined.

Brief Rationale	Direction
Impervious surface root cause of water quality decline with urbanization	Down
Regional growth patterns can damage or limit damage to local environment	Down
Habitat fragmentation is chief contributor to biodiversity decline	[TBD]
Reflects need to mitigate climate change	Down
Measures change in regional pro rata share of global carrying capacity	Down
Reflects need to reduce dependence on non-renewable fuel	Down
Reflects need to go beyond conformity requirements	[TBD]
Measures energy efficiency of scenarios	Down
Indicates whether growth occurs in water-rich or water-poor areas	Optimized
Roughly indicates sustainability by equation with efficiency of production	Up
Reflects fundamental economic development objective	Up
Reflects fundamental economic development objective	Up
Indicates total improvement to fiscal base of local government	Up
Measures quality of life effect from transportation improvements	Down
Measures quality of life effect from transportation improvements	Down
Measures quality of life effect from transportation improvements	Up
Measures outcome of preserving manufactured capital	Down
Measures outcome of preserving manufactured capital	Down
Measures outcome of preserving manufactured capital	Up
Reflects level of equality in household income distribution	Down
Reflects level of equality in tax base among municipalities	Down
Measures equity in distribution of transportation benefits	Up
Measures equity in distribution of transportation benefits	Up
Measures equity in distribution of transportation benefits	Down

Cross-Cutting Issues

The discussion of sustainability must also address “cross-cutting” topics that do not fit neatly into the four sustainability principles, including climate change, resource use and renewability, water supply, and adaptive governance.

Climate Change

Scientists have linked the past century’s steep rise in greenhouse gases to global warming. In coming decades, climate change is expected to have serious results related to the natural environment, public health, the economy, and other areas. The Plan should address this challenge by seeking to reduce greenhouse gas emissions and by considering the reduction of greenhouse gases to be an important indicator of regional sustainability.

Resource Use and Renewability

Most studies estimate that the year of peak oil production will occur sometime in the next several decades. If current practices continue, the years following the peak would see a decline in oil production, a rise in its cost, and ensuing economic impacts. The region could buffer itself from these consequences by early adoption of alternative technologies and by reducing automobile dependence. The Plan should consider strategies to decrease fossil fuel use, minimize total energy use, and encourage a shift to renewable energy sources.

Water Supply

Regional water supply is the subject of a current CMAP special study (<http://dev.cmap.illinois.gov/watersupply/default.aspx>), the results of which will be an important part of the Plan. Water supply relates to sustainability on many levels, with direct impacts on environmental health, economic development, and equity. The Plan should address water supply primarily through strategies that direct growth to areas of higher relative water availability and promote water conservation.

Adaptive Governance

In making the transition toward sustainability, our region needs the capacity to mount local responses to future challenges, such as climate change, and to learn from the experiences of other localities. This requires “adaptive governance” that helps the region and its communities prepare for an uncertain future. CMAP should take a lead role in developing a program to continually keep local officials up to date on the latest strategies for achieving sustainability.

For further discussion...

The purpose of this Regional Snapshot report is to generate discussion on the concept of sustainability. We hope you, the reader, will actively participate in that debate as part of CMAP’s planning process. Our goal is to provide many such opportunities for discussion in coming months as the Regional Comprehensive Plan moves toward completion in 2010.

In the course of those discussions and as residents of the region, we might ask ourselves:

- Does the snapshot’s definition of sustainability work?
- Are the proposed indicators effective at measuring the complex issue of sustainability? Should other or additional indicators be used?
- How can CMAP deal with tradeoffs between sustainability principles when prioritizing actions or investments in the Plan or in its other work?
- Beyond the focus on infrastructure in this Snapshot, how else can the region address sustainability? What other organizations or groups should address these other sustainability-related issues?

About CMAP, the Regional Comprehensive Plan, and the Snapshot Series

The Chicago Metropolitan Agency for Planning (CMAP) was formed in 2005 to approach planning in northeastern Illinois comprehensively and collaboratively. The agency and its partners are removing barriers to cooperation across geographical boundaries, and across subject areas like land use, transportation, natural resources, and economic development. By understanding how these issues and our communities’ futures are inter-related, CMAP wants to change the way planning is conducted in northeastern Illinois.

State and federal law require CMAP to produce by 2010 an integrated plan for land use and transportation. By going beyond these requirements to also address issues such as housing, economic development, and human services — and by involving many partners throughout the process — CMAP will create a Regional Comprehensive Plan that guides investments and development to 2040 and beyond.

In developing the Plan, CMAP will regularly release Regional Snapshot reports on major planning issues. The snapshots’ purpose is to establish links between CMAP’s policy areas, to gather background data, and to initiate public discussions of major regional issues early in the planning process.



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