



Framework for Measuring Sustainable Regional Development for the Twin Cities Region

Final Report

CTS 10-04

**Prepared for The McKnight Foundation
by the Center for Urban and Regional Affairs
and the Center for Transportation Studies**

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16. Abstract (Limit: 250 words) Patterns of growth and development impact our environmental, social, economic, and cultural quality of life. In order to take steps toward sustainable development that will have a positive impact on these effects, this project, sponsored by the McKnight Foundation, identified a framework for an indicator system to measure sustainable regional development in the Twin Cities metropolitan region. The proposed framework includes a set of sustainability principles, indicators, measures, and accompanying data sources. It is anticipated that the McKnight Foundation will use this sustainability framework for internal organizational purposes with the possibility of the system being considered by other local geographies in the future. This framework could also serve as a tool to compare sustainability between the Twin Cities seven-county region and other comparable regions. The report provides a summary of the research, presents a final recommended set of performance measures for the indicators, makes recommendations for the selection of tier 1 and tier 2 indicators, and recommends a plan for next steps.			
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Research Team

Study principal investigators

Edward Goetz, Center for Urban and Regional Affairs
Laurie McGinnis, Center for Transportation Studies

Research manager

Kaydee Kirk, Humphrey Institute of Public Affairs

Research faculty

Jason Cao, Humphrey Institute of Public Affairs
Yingling Fan, Humphrey Institute of Public Affairs
Carissa Schively Slotterback, Humphrey Institute of Public Affairs

Research assistants

Jennifer Day, Humphrey Institute of Public Affairs
Andrew Senn, Humphrey Institute of Public Affairs
Jody Tableporter, Humphrey Institute of Public Affairs

Study coordinators

Joe Barbeau, Center for Transportation Studies
Linda Preisen, Center for Transportation Studies

Editor

Fran Howard, Freelance Editor (for Center for Transportation Studies)

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Prepared by

Kaydee Kirk
Jody Tableporter
Andrew Senn
Jennifer Day
Jason Cao
Yingling Fan
Carissa Schively Slotterback
Edward Goetz

Center for Urban and Regional Affairs
University of Minnesota

Laurie McGinnis

Center for Transportation Studies
University of Minnesota

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University of Minnesota
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Minneapolis, Minnesota 55455

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I. Introduction

This report serves as the final report related to the Sustainable Regional Development (SRD) project sponsored by The McKnight Foundation. The purpose of the project is to identify a framework for an indicator system to measure sustainable regional development in the Twin Cities metropolitan region over the long term. The proposed framework includes a set of sustainability principles, indicators, measures, and accompanying data sources.

It is anticipated that McKnight will use this sustainability framework for internal organizational purposes with the possibility of the system being considered by other local geographies in the future. This framework could also serve as a tool to compare sustainability between the Twin Cities seven-county region and other comparable regions.

This report provides a summary of the research and previous reports, presents a final recommended set of performance measures for the indicators, and makes recommendations for the selection of tier 1 and tier 2 indicators, and recommends a plan for next steps. The content of the report includes a background summary of the project; the final proposed principles; the list of detailed indicators, measures and data sources; a matrix illustrating each indicator's relationship to the principles; tier 1 and tier 2 indicators; findings and analysis; conclusion and next steps.

II. Background

Phase 1

The first phase proposed six high-level sustainability principles, largely inspired by the [HUD-DOT-EPA Interagency Partnership for Sustainable Communities](#), to serve as the foundation for measuring sustainable regional development and guide regional alignment of goals and grant-making for McKnight. The HUD-DOT-EPA partnership is a model that recognizes that sustainable communities require the coordination of environmental strategy, transportation planning, and housing policy through an interagency federal partnership with the work of state and local partners.

In addition to proposing principles, 10 best practice sustainability indicator systems from other cities and regions were surveyed (Appendix A). Analysis during this phase focused on identifying a range of major indicator categories (frequently referred to as "goals"), with some effort to review sub-categories and specific indicators within these categories. In general, the initial data pointed to 11 commonly used major indicator categories across the systems: public health, education, culture, social capital, economy, safety net, energy, environment, land use, transportation, and housing.

Phase 2

The second phase focused on the refinement of the six principles and the presentation of a potential list of indicators, measures, and data sources based largely on input from participants at the October 26 Focus Group and from Advisory Group feedback. Also presented was a list of sample integrated indicators from the 10 best practice sustainability indicator systems that were researched. In addition, a "long list" of indicators and measures was identified through input from the Research Team and the Advisory Group.

October 26 Focus Group Workshop

The Focus Group Workshop was instrumental in drawing deeper connections and integration between and among the principles and major indicator categories. The Focus Group was also key in shaping the direction of the project. The aims of the event were to: (1) assemble stakeholders with a vested interest in regional sustainability, including government, private, and non-profit entities, (2) review the proposed principles, and (3) tap into the extensive participant knowledge regarding potential indicators, measures, and data sources.

Much of the event was focused on small groups organized around the six principles. Attendees were, to the extent possible, assigned to groups based on their primary interest area. Group discussions were facilitated by project staff, with the intent of identifying potential indicator areas, measures, and data sources related to the assigned principle. Participants were encouraged to identify measures and data sources in key indicator areas and discuss potential integration across principles, but were not limited to these tasks.

Phase 3

The third and final phase focused on revising measures to ensure they are clear, specific, and as detailed as possible. Data sources for the indicators and measures have also been identified and have been evaluated with respect to criteria such as availability, quality, frequency of collection, reliability, and validity. The relationships between indicators and principles have also been analyzed.

III. Final Proposed Principles

Advisory Group members suggested final modifications to the principles to sharpen and clarify descriptive text, as well as to reorder the principles, clustering related principles together. In addition, the principles no longer are numbered since the Advisory Group thought this might imply priority for particular principles.

The Research Team incorporated the key modifications to arrive at the final recommended set of sustainability principles as presented below. In addition, the comprehensive proposed indicator system with principles and indicators can be found in Appendix B.

- **Provide more transportation choices.** Address carbon reduction, air quality, oil dependency, and public health issues by developing safe, equitable, reliable and economical transportation choices.
- **Protect natural resources.** Protect land, water, atmosphere, and the interrelationships across the many natural resources they contain. Protect intact ecological and hydrological systems and ensure that our natural capital provides the energy, food, raw materials, waste absorption/filtering, and enjoyment critical to a vital economy and quality of life.
- **Promote equitable, affordable housing.** Promote a full range of housing choices that accommodates changing conditions. Meet diverse needs by providing location- and energy-efficient housing choices for people of all ages, incomes, races, and ethnicities, thereby increasing accessibility and mobility and lowering the combined cost of housing and transportation.

- **Value communities and neighborhoods.** Target government funding toward existing communities – through strategies such as transit-oriented, mixed-use development, and land recycling – to increase community revitalization, promote walkable areas, increase public health, and improve the efficiency of public works investments. Safeguard intact relationships between communities and neighborhoods and the natural resources, open space and agricultural landscapes.
- **Enhance economic competitiveness and create positive fiscal impacts.** Improve economic competitiveness and create net positive fiscal impacts through reliable and timely access to employment centers, educational opportunities, services, and other basic needs by workers, as well as expanded business access to markets.
- **Coordinate and leverage government policies and investment.** Align government policies and funding to remove barriers to collaboration, to leverage funding and to increase the accountability and effectiveness of all levels of government – local, regional, state, and federal – to plan for future growth.

IV. Indicators, Measures, and Data Sources

Table 1 presents a detailed list of the final proposed indicators, measures, and data sources. There are a total of 38 indicators and measures, many of which are integrated. The content was derived from input from the Focus Group, the Advisory Group, and the work of the Research Team. One new indicator related to public safety was added from a suggestion made at the December 17 Advisory Group meeting. In general, indicators were selected based on the extent that they:

- bridge together one or more of the principles, thus demonstrating integration,
- focus on actual outcomes rather than actions,
- have shown to be rooted in evidenced-based practice,
- exhibit innovation,
- provide a relevant measure at the regional level,
- present a holistic view of region’s sustainable development, and
- have the ability to succinctly illustrate key underlying trends.

For each selected indicator, the Research Team refined and clarified the measures and identified specific data source(s) relating to each indicator (see Table 1 and Appendix C). Research on data sources focused on the quality, reliability and validity of the data through the following questions:

- What organization or person collects the data?
- What is the location, address, or Website, or who is contact person, etc.?
- What approach is used for reporting/displaying data (e.g. Excel, GIS, Access, Web-based, paper)?
- Since what date/year has the data been collected? Was there an end date?
- Scale: What is the spatial scale of data (e.g. regional, community, neighborhood)?
- Availability: What is the frequency of measurement (how often is data updated)?

A detailed, comprehensive spreadsheet of the data source research can be found in Appendix C.

Table 1: Final Proposed Indicators, Measures and Data Sources

	Indicator	Measure	Data Sources
1	Proximity of Affordable Housing to Public Services and Facilities	<p>Percent of affordable housing* units in high and moderate "opportunity places". An "opportunity place" is measured by the number of schools, high-quality schools**, libraries, job-training facilities, health-care facilities, parks and trails within 1/2 or 1 mile.</p> <p>* Percent of households paying no more than 30% of income for housing. ** Schools with a poverty rate of less than 40%. Add the number of free and reduced-price lunch students and divide by the total number of students.</p>	<ul style="list-style-type: none"> • Housing affordability – U.S. Census, American Community Survey • School locations – MetroGIS (public and private schools), MN Geospatial Information Center • School quality – National Center for Education Statistics, MN Dept. of Education • Library locations – MELSA • Job training locations – Dept. of Employment and Economic Development (DEED) • Health care facilities – MetroGIS (hospitals), MN Dept. of Health, Met Council • Parks & trails – MetroGIS • Institute on Race and Poverty’s Twin Cities Opportunity Index could be consulted.
2	Job Accessibility	<p>This location-based regional indicator can be measured by different travel mode (auto and transit), and by different income groups.</p> $A_i = \sum_j O_j C_{ij}^2$ <p>, where A and O are job accessibility and job opportunity at zone i, C is the travel time by a mode from zone i to zone j. Job opportunity can be differentiated by different income groups.</p>	<ul style="list-style-type: none"> • Travel time derived from Met Council travel demand forecasting model • Job opportunity - Census or Longitudinal Employment and Household Dynamics (LEHD) • David Levinson’s access to destinations report
3	Accessibility to Non-Work Opportunities	<p>This location-based regional indicator can be measured for different types of opportunities, by different travel mode (auto and transit), and by different income groups. The formula is the same as that of job accessibility. High-priority opportunities include healthy food, retail, health care, parks, trails, and amenities.</p>	<ul style="list-style-type: none"> • Travel time derived from Met Council travel demand forecasting model • MetroGIS www.datafinder.org/ • U.S. Census – The Economic Census
4	Access to Transit	<ul style="list-style-type: none"> • Percent of housing units within ¼ (and ½) miles of transit stop/station (including local bus, express bus, and rail) • Percent of housing units within ¼ (and ½) miles of high-frequency transit stop/station (including local bus, express bus, and rail) 	<ul style="list-style-type: none"> • MetroGIS • U.S. Census • Met Council

	Indicator	Measure	Data Sources
5	Jobs-Housing Balance and Spatial Mismatch	<p>Jobs-people dissimilarity index calculated at the subarea (<i>i</i>) level. Subareas could be census blocks, block groups, and tracts.</p> $Dissimilarity\ index = \frac{1}{2} \sum_i \left \frac{Pop_i}{POP} - \frac{Emp_i}{EMP} \right * 100$ <p>The dissimilarity index ranges between 0 (perfect balance) and 100 (perfect imbalance) and can be interpreted as the percentage of the populations that would have to move across block groups to yield perfect balance.</p> <p>Citation: Stoll, M. A. (2005). <i>Job sprawl and the spatial mismatch between Blacks and jobs</i>. From www.brookings.edu/reports/2005/02metropolitanpolicy_stoll.aspx.</p>	<ul style="list-style-type: none"> • Census Longitudinal Employment and Household Dynamics (LEHD) Database
6	Early Childhood	% and location of low-income children enrolled in early childhood programs	<ul style="list-style-type: none"> • MN Dept of Education • U.S. Census
7	Education and Labor Force Skill Mismatch	<p>Skill mismatch index calculated at the sub-area level.</p> $SMI_{sector} = \sum_{j=1}^3 (S_j - M_{ij})^2$ <p>Where <i>j</i> = Skill level (1=High, 2=Semi, 3=Low). <i>S_j</i> = Percent of subarea population with skill level <i>j</i>. <i>M_{ij}</i> = Percent of workers in industry <i>i</i> with skill level <i>j</i>.</p> <p>The SMI describes the difference between the industry skill “demand” minus the county skill “supply”. Industry skill demand was defined as the average proportion of high, semi and low skilled workers within an industry. County skill supply was determined using educational attainment data.</p> <p>Citation: Peters, D. J. (2009). <i>Manufacturing in Missouri: Skills-Mismatch</i>, Missouri Economic Research and Information Center.</p>	<ul style="list-style-type: none"> • Skill demand data come from the Bureau of Labor Statistics Occupational Employment Statistics • Skill supply data come from the MN Office of Higher Education and the U.S. Census Bureau.
8	Green Jobs	# green jobs (e.g. renewable energy, green products, green services, environmental conservation)	<ul style="list-style-type: none"> • Cities are still in process of creating a method to track green jobs, as there is currently no concrete definition. • Green Cities Green Jobs: www.stpaul.gov/DocumentView.aspx?DID=5757

	Indicator	Measure	Data Sources
9	Housing and Transportation Affordability	% annual household income spent on housing and transportation costs (by income, poverty status, etc.) Index provided by Brookings Institute Report Affordability Index = <u>Housing Costs + Transportation Costs</u>	<ul style="list-style-type: none"> • Maps provided by http://htaindex.cnt.org/ for Twin Cities • Income: http://www.brookings.edu/metro/umi/20060127_afindex.pdf • U.S. Census Bureau
10	Housing Mix	# of housing types within "X" geographic distance (e.g. rental, ownership, single family, multifamily, densities, tenure)	<ul style="list-style-type: none"> • MetroGIS/Census-based and/or • Urban Land Institute (ULI) MN Housing Initiative data (from Excensus)
11	Infrastructure Preservation	% funding spent on maintenance of existing infrastructure versus construction of new infrastructure (e.g. highway and bridges)	<ul style="list-style-type: none"> • Office of the State Auditor: \$ for infrastructure preservation and new construction in city and county budgets • MN Dept. of Transportation (Mn/DOT): State Infrastructure Investment Plan, \$ for infrastructure preservation and new construction
12	Land Consumption	Scale-adjusted land consumption index. The percentage that the actual land consumption rate deviates from the estimated land consumption rate is a scale-adjusted land consumption measure. Citation: Fan, Y. (2009). <i>Urban Form and Family-Engaged Active Leisure: Impact Assessment Using the Census Data and Nighttime Lights Satellite Images</i> – report forthcoming	<ul style="list-style-type: none"> • U.S. Census • Nighttime City Lights Satellite Imagery from the National Geophysical Data Center (NGDC)
13	Infill Development and Redevelopment	% and location of brownfield and grayfield acres developed as a percentage of total acres developed	<ul style="list-style-type: none"> • MN Pollution Control Agency (MPCA) • Met Council
14	Land Use Mix	Entropy index (Shannon Index) calculated through the following formula: $Entropy = \{-\sum_k [(p_i)(\ln p_i)]\}/(\ln k)$ Used to examine the distribution pattern of different land uses within a neighborhood, the index spells out that p_i = proportions of each of the complementary land use types such as single-family residential, multi-family residential, commercial, public institutional, and park uses, and k = the number of land uses. The index ranges between 0 (no mix) to 1 (balanced mix). Citation: Cervero, R. and K. Kockelman (1997). "Travel demand and the 3Ds: Density, diversity, and design." <i>Transportation Research Part D: Transport and Environment</i> 2(3): 199-219.	<ul style="list-style-type: none"> • Land Parcel Dataset from MetroGIS

	Indicator	Measure	Data Sources
15	Walkability	<p>This is measured at the local level. A composite measure based on residential density, land use mix, intersection density, and retail floor area ratio.</p> <p>Walkability Index: http://www.b-sustainable.org/built-environment/walkability-index</p> <p>Walkability = [(2 x z-intersection density) + (z-net residential density) + (z-retail floor area ratio) + (z-land use mix)]</p>	<ul style="list-style-type: none"> MetroGIS: datafinder.org
16	Impervious Surface	<p>Impervious intensity measured by % of impervious surface within each 20 meters X 20 meters grid. (Map in relation to water bodies, including impaired and unimpaired waters, see indicator # 28.)</p>	<ul style="list-style-type: none"> Remote sensing data from <i>Geospatial Analysis Lab at the University of Minnesota</i> (land.umn.edu)
17	Employment Density	<p>% total jobs located in areas with density >X</p>	<ul style="list-style-type: none"> Dept. of Employment and Economic Development (DEED) Census Longitudinal Employment and Household Dynamics (LEHD) Database Brookings job sprawl study
18	Composite Sprawl Index	<p>A composite index derived from a list of urban form measures using factor analysis to capture the multi-dimensional nature of urban form. The urban form measures incorporated in this index include compactness, continuity, centrality, and proximity, which thereby could also be referred as the 3C+P measurement of sprawl.</p> <p>Citation: Fan, Y. (2009). <i>Urban Form and Family-Engaged Active Leisure: Impact Assessment Using the Census Data and Nighttime Lights Satellite Images.</i> – report forthcoming</p>	<ul style="list-style-type: none"> Census data MetroGIS
19	Vehicle Miles Traveled (VMT) per Capita	<p>Total # miles of travel by all vehicles on all Twin Cities region roadways within a given time period. Per capita VMT is the total VMT divided by population.</p>	<ul style="list-style-type: none"> U.S. Census Travel Behavior Inventory (TBI) MN Dept. of Transportation (Mn/DOT)
20	Transportation Reliability	<p>Congestion cost per capita Travel time index % of daily traffic in congested conditions</p>	<ul style="list-style-type: none"> Texas Transportation Institute, Urban Mobility Report

	Indicator	Measure	Data Sources
21	Transportation Safety	Crash rate by type (fatality, injury A, B, C, and property damage) severity level	<ul style="list-style-type: none"> Metro district of MN Dept. of Transportation (Mn/DOT)
22	Commute Mode Choice	Share of autos and non-autos (bus, LRT, walk, bike, carpool) in commute trips	<ul style="list-style-type: none"> U.S. Census, American Community Survey Travel Behavior Inventory of Met Council
23	Carbon Footprint	Amount of carbon dioxide produced by electricity use, agriculture, waste management, fossil fuel industry and industrial non-fuel use processes, presented as regional total and by source	<ul style="list-style-type: none"> U.S. Energy Information Administration Minnesota Pollution Control Agency U.S. Department of Agriculture Forest Service p. 15 of www.mnclimatechange.us/ewebeditpro/items/O3F20492.pdf for a list of data sources
24	Urban Greenness	<p>Normalized Difference Vegetation Index (NDVI) can be used to determine the density of green on a patch of land through observation of the distinct colors (wavelengths) of visible and near-infrared sunlight reflected by the plants or vegetation. $NDVI = (NIR - VIS) / (NIR + VIS)$, indicating that near-infrared radiation minus visible radiation divided by near-infrared radiation plus visible radiation. Calculations of NDVI for a given pixel result in a number that ranges from minus one (-1) to plus one (+1). Values below zero mean no vegetation and values close to +1 indicate the highest possible density of greenness.</p> <p>Citation: www.landcover.org</p>	<ul style="list-style-type: none"> Remote sensing data on 250 m MODIS Normalized Difference Vegetation Index from the Global Land Cover Facility at the University of Maryland www.landcover.org
25	Protection of Significant Ecological Areas	% and location of Regionally Significant Ecological Areas (RSEA) acres under permanent protection (e.g. permanent easement, park)	<ul style="list-style-type: none"> RSEA – DNR Data Deli Parks – Met Council, cities, counties Easements – MN Land Trust, DNR Data Deli, MN Board of Water & Soil Resources (BWSR) (various state funded easements - http://www.bwsr.state.mn.us/easements/rim/index.html)
26	Surface Water Quality - Rivers	Water Quality Index for River Water Quality (for three major river systems – Mississippi, Minnesota, St. Croix – includes dissolved oxygen, fecal coliform, pH, biochemical oxygen demand (five-day), temperature change, total phosphate, nitrate, turbidity, total solids) – based on National Sanitation Foundation Water Quality Index, can be aggregated across three rivers, by river, or site specific monitoring location	<ul style="list-style-type: none"> Met Council – see http://bcn.boulder.co.us/basin/watershed/wqi_nsf.html for method used to calculate index

	Indicator	Measure	Data Sources
27	Surface Water Quality - Lakes	Water Quality Index for Lake Water Quality (for 200 lakes in metro area – includes phosphorus, chlorophyll, and transparency – can be aggregated across all lakes or pick certain indicator lakes, index measured on A-F scale, could present as % or # of lakes in each grade category)	<ul style="list-style-type: none"> Met Council (data is based on volunteer monitoring)
28	Impaired Waters	# and location of impaired water bodies (fail to meet one or more water quality standards)	<ul style="list-style-type: none"> MN Pollution Control Agency (MPCA): http://www.pca.state.mn.us/water/tmdl/
29	Ground Water	% of groundwater pollutants for which health risk limits are exceeded annually (including, but not limited to, phosphorus, ammonia nitrogen, organic plus ammonia nitrogen, organic carbon, manganese, sulfate, bromide, chloride, boron, calcium, iron, magnesium, potassium, sodium, nitrate nitrogen, chloride, and volatile organic compounds)	<ul style="list-style-type: none"> Pollutants – MN Pollution Control Agency (MPCA) Health risk limits – MN Dept. of Health
30	Air Quality	Trend in number of days annually with good, moderate, and poor air quality (using the Air Quality Index), positive trend is more “good” days and fewer “poor” days (Indicator may be able to be mapped)	<ul style="list-style-type: none"> Environmental Protection Agency MN Pollution Control Agency (MPCA) Transit for Livable Communities (TLC) and MN Center for Environmental Advocacy (MCEA) report: www.tlcminnesota.org/pdf/Transportation%20Performance%20Report%202009%20FINAL.pdf
31	Exposure to Pollutants from Major Roadways	% of households (by income and tenure) and uses occupied by children (e.g. schools, daycare centers, parks) within 500 meters of major roadway (40,000 + average daily traffic (ADT))	<ul style="list-style-type: none"> Roadway classifications – Mn/DOT, Met Council Household income and tenure (Census) Parks – Met Council, cities, counties School location – Admin Minnesota
32	Proximity to Contaminated Sites	% of households (by income and tenure) within 500 meters of contaminated site	<ul style="list-style-type: none"> Household income and tenure (Census) Contaminated sites – MN Pollution Control Agency What’s In My Neighborhood – http://www.pca.state.mn.us/wimn/index.cfm – if Superfund sites not included then see EPA MetroGIS using Census data
33	Children’s Lead Exposure	% of children living in homes with lead, based on requested tests, or examine the indicators for high risk – living in poverty, housing that was built pre 1978 with families with young children	<ul style="list-style-type: none"> MN Dept. of Health U.S. Census
34	Asthma Prevalence	Hospitalization rates by age and zip code	<ul style="list-style-type: none"> MN Dept. of Health Center for Disease Control and Prevention
35	Diabetes Rate	Percentage and location of people who are diagnosed with Type II diabetes by race/ethnicity and age	<ul style="list-style-type: none"> MN Dept. of Health Center for Disease Control and Prevention

	Indicator	Measure	Data Sources
36	Civic Engagement	% and location of eligible voters voting in off-year elections	<ul style="list-style-type: none"> Office of the Minnesota Secretary of State, compiled by Twin Cities Compass
37	Civic Engagement	<p>Community Vitality Index: Measurement of social capital, economic potential and community amenities to quantify relative potential of neighborhoods and geographic communities in a metropolitan region</p> <p>http://www.mcc.org/web/datainfo/cvi/tech_methodology.asp</p>	<ul style="list-style-type: none"> Metro Chicago Information Center: www.mcc.org U.S. Census Office of the Minnesota Secretary of State Metro GIS DEED Federal Financial Institutions Examination Council (FFIEC) Commercial Business Database
38	Public Safety	<p>Crime rate per 100,000 residents, Twin Cities seven-county region and U.S.</p> <p>Crime rate includes Part I offenses, both violent and property crime. "Violent crime" includes murder, forcible rape, robbery, and aggravated assault. "Property crime" generally includes burglary, larceny (theft), motor vehicle theft, and arson. However, crimes of arson are excluded from all U.S. property crime and overall crime figures due to insufficient data. Therefore, the seven-county region's overall crime rates shown in Twin Cities Compass graphs also exclude arson for comparability.</p>	<ul style="list-style-type: none"> Twin Cities Compass Minnesota Department of Public Safety Federal Bureau of Investigation

V. Analysis

Comparison of Indicator Systems

As previously noted, to complement and more fully develop the six principles set forth for the Twin Cities project, the Research Team conducted a thorough examination of 10 best practices in sustainability indicator systems by researching a geographically and institutionally diverse cross-section of indicator systems. The systems directly relate to sustainability and operate in a variety of regions and cities across the U.S. and, in some cases, in other countries. Best practices were selected based on their connection to sustainability, sustainable regional development, and smart growth and whether or not systems exhibited a comprehensive view of sustainability. Although there are numerous other indicator systems, many associated with related areas of livability, quality-of-life, and health, given the timeframe and resources for this project, the focus remains specific to sustainability indicator systems used in a defined geographic area, currently or in the recent past. Indicator systems selected were identified from key Web sites that provided a comprehensive list of sustainability indicator systems that currently operate in various cities and regions.¹

A “long list” of indicators was developed with the assumption that the indicators would be narrowed to a “short list”. Based on a review of the 10 best practice sustainability indicator systems this project surveyed, however, the current list of 38 indicators appears to be on par with the number of indicators included in other similar indicator systems (Table 2).

Whereas the average number of *principles* in the 10 best practice indicator systems is seven, the proposed Twin Cities system has six. The average number of *indicators* in other systems is 39 and the Twin Cities system stands at 38. Finally, the average number of *measures* is higher at 68, whereas the Twin Cities has 38. If the Boston outlier in Table 2 is removed from the equation, the average number of measures in the other indicator systems drops to 47 and becomes more comparable to the proposed Twin Cities sustainability indicator system presented here.

Moreover, the proposed Twin Cities system has a significant number of integrated indicators as compared to more common single focus indicators. In this way, the integration component distinguishes the system from some of the other existing sustainability indicator systems surveyed.

However, as discussed in the following section, 13 of the 38 indicators have been selected as tier 1 key indicators of sustainability based on the established criteria, thus creating a short list of priority indicators. Tier 1 indicators best exemplify the criteria suggested by the Advisory Group to be designated as priority indicators. Criteria are as follows:

- Move forward the principles in an important way
- More than one primary relationship, signifying integration
- Meaningful on an annual basis
- Understandable
- Availability and quality of data

¹ [The International Institute for Sustainable Development](#), [Sustainable Measures organization](#), and [the City of Portland “Signs of Sustainability” Project Scoping Report](#)

Table 2: Other Indicator Systems

System	# Principles*	# Indicators*	# Measures*
Boston Indicator Project	10	79	255
Santa Monica Sustainable City Progress Report	8	58	83
UK Government Sustainable Development	4	44	52
Calgary State of Our City Report	6	37	46
Minneapolis Sustainability Program	3	25	43
Sustainable Seattle	13	91	91
Olympia Indicator Project	6	13	17
Twin Cities Compass	9	31	31**
Sightline Institute’s Cascadia Scorecard	7	7	8
Lincoln Smart Growth Polices Report	5	9	51
Average	7	39	68

	# Principles	# Indicators	# Measures
Sustainable Regional Development Indicator System for the Twin Cities Region			
Total	6	38	38

* Each system has different names for their levels of categories.

** A total of 141 measures were identified; 31 were categorized as “key measures”, 110 were categorized as “more measures”.

Relationships between Indicators and Principles

Principles are the organizing end of policy and action, whereas indicators help measure performance on the various principles. Table 3 presents a comprehensive matrix illustrating the primary and secondary relationships between the 38 indicators and their respective principles.

- A primary relationship, denoted by a filled circle symbol, means that the indicator has direct bearing on the principle.
- A secondary relationship, denoted by an open circle symbol, means the indicator provides a secondary benefit to the principle.
- Indicators have been designated as tier 1 or tier 2. A tier 1 indicator is one that best meets the criteria established for being selected as a priority indicator, detailed below.

Table 4 and Figures 1-3 follow with a summary of the primary and secondary relationships. These present a picture of the integrated nature of the system and an analysis of the balance and alignment of the system.

All Relationships

There are a total of 106 relationships across the matrix. Of those, the greatest number, 32 relationships or 30%, relate to the “value communities and neighborhoods” principle. The “coordinate and leverage government policies and investment” principle has the least number of relationships with 11 relationships or 11%.

It is evident that “value communities and neighborhoods” is a key value within this sustainability indicator system. The remaining principles are relatively equally distributed and represented among the indicators.

Primary Relationships

There are a total of 48 *primary* relationships shown in the matrix. The greatest number, 12 relationships or 25%, fall under “protect natural resources”. Two additional principles are also well represented with 10 relationships each or about 20%: “provide more transportation choices” and “value communities and neighborhoods”. The “promote equitable, affordable housing” and “coordinate and leverage government policies and investment” principles each have the least number of relationships with four, or 8%.

Natural resources stands out as having the greatest number of indicators that have the most direct bearing on it, closely followed by the transportation and value communities principles. Conversely, the table and figures also show that the indicators have the least direct bearing on the affordable housing and government policies principles.

Secondary Relationships

A total of 58 *secondary* relationships are represented across the matrix. “Value communities and neighborhoods” has the highest number of relationships in this subcategory with 22 relationships or 38%. “Promote equitable, affordable housing” also stands out as being more significant in secondary relationships with 13, or 23%. The other remaining principles are represented to a lesser, though relatively equal, extent with respect to their number of secondary relationships.

Among the secondary relationships, “value communities and neighborhoods” receives a significant secondary benefit since this principle has the greatest number of secondary relationships. This compares to all the other principles that are not nearly as highly represented in terms of benefiting from secondary relationships as compared to “value communities and neighborhoods”. It is noteworthy, though, that while the affordable housing principle is one of the least represented in primary relationships, it is significantly represented in secondary relationships.

Tier 1 and Tier 2 Indicators

The indicators have also been given designation as to whether they are tier 1 or tier 2 indicators (Table 3). The Research Team identified a total of 13 tier 1 indicators that best exemplify criteria suggested by the Advisory Group for designating priority indicators. The team together evaluated the indicators one by one based on the criteria, while keeping in mind a sense of balance and comprehensiveness, to the extent possible, of the tier 1 list to include indicators representing various types of sustainability. The specific criteria for the tiers that guided the selection include the following:

- Move forward the principles in an important way
- More than one primary relationship, signifying integration
- Meaningful on an annual basis
- Understandable
- Availability and quality of data

Table 3: Relationships between Indicators and Principles

● = Primary relationship. A primary relationship indicates that the indicator has direct bearing on the principle (e.g. Commute mode choice and "Provide more transportation choices").

○ = Secondary relationship. A secondary relationship benefits from the primary relationship (e.g. Protection of significant ecological areas and "Value communities & neighborhoods").

Tier 1 indicators (highlighted in light green) are indicators that best exemplify the criteria established for priority indicators.

Principles

<i>Indicators (tier 1 highlighted)</i>		Provide more transportation choices	Protect natural resources	Promote equitable, affordable housing	Value communities & neighborhoods	Enhance economic competitiveness & create positive fiscal impacts	Coordinate & leverage gov't policies & investment
1	Proximity of Affrd. Hsg. to Public Svcs./Facilities	○		●	○	○	○
2	Job Accessibility	●		○	○	●	
3	Accessibility to Non-Work Opportunities	●		○	○	○	○
4	Access to Transit	●		○	○	○	○
5	Jobs-Housing Balance and Spatial Mismatch			●	○	●	
6	Early Childhood - Low Income Enrolled				○	●	
7	Education and Labor Force Skill Mismatch					●	○
8	Green Jobs		●			●	○
9	Housing and Transportation Affordability	●		●	○	○	
10	Housing Mix			●	○		
11	Infrastructure Preservation	●	○		○	○	●
12	Land Consumption		●	○	○		
13	Infill Development and Redevelopment		●	○	●		○
14	Land Use Mix		○	○	●		
15	Walkability	○		○	●	○	
16	Impervious Surface		●		○		
17	Employment Density			○	○	●	
18	Composite Sprawl Index	○	○		●		
19	Vehicle Miles Traveled per Capita	●	○				
20	Transportation Reliability	●	○			●	
21	Transportation Safety	●					
22	Commute Mode Choice	●					
23	Carbon Footprint	●	●	○	○		●
24	Urban Greenness		●		○		
25	Protection of Significant Ecological Areas		●		○		
26	Surface Water Quality - Rivers		●		○		
27	Surface Water Quality - Lakes		●		○		
28	Impaired Waters		●		○		
29	Ground Water		●		○		
30	Air Quality	○	●		○		
31	Exposure to Pollutants from Major Roadways	○		○	●		
32	Proximity to Contaminated Sites			○	●		

Principles

Indicators cont. (tier 1 highlighted)		Provide more transportation choices	Protect natural resources	Promote equitable, affordable housing	Value communities & neighborhoods	Enhance economic competitiveness & create positive fiscal impacts	Coordinate & leverage gov't policies & investment
33	Children's Lead Exposure			o	•		
34	Asthma Prevalence			o	•		
35	Diabetes Rate				•		
36	Civic Engagement - % Voting				o		•
37	Civic Engagement - Community Vitality Index				o		•
38	Public Safety - Crime Rate				•	•	o

Table 4: Primary and Secondary Relationships between Indicators and Principles

	Provide more transportation choices	Protect natural resources	Promote equitable, affordable housing	Value communities & neighborhoods	Enhance economic competitiveness & create positive fiscal impacts	Coordinate & leverage gov't policies & investment	Total
Primary relationships	10	12	4	10	8	4	48
Secondary relationships	5	5	13	22	6	7	58
Total	15	17	17	32	14	11	106

Figure 1

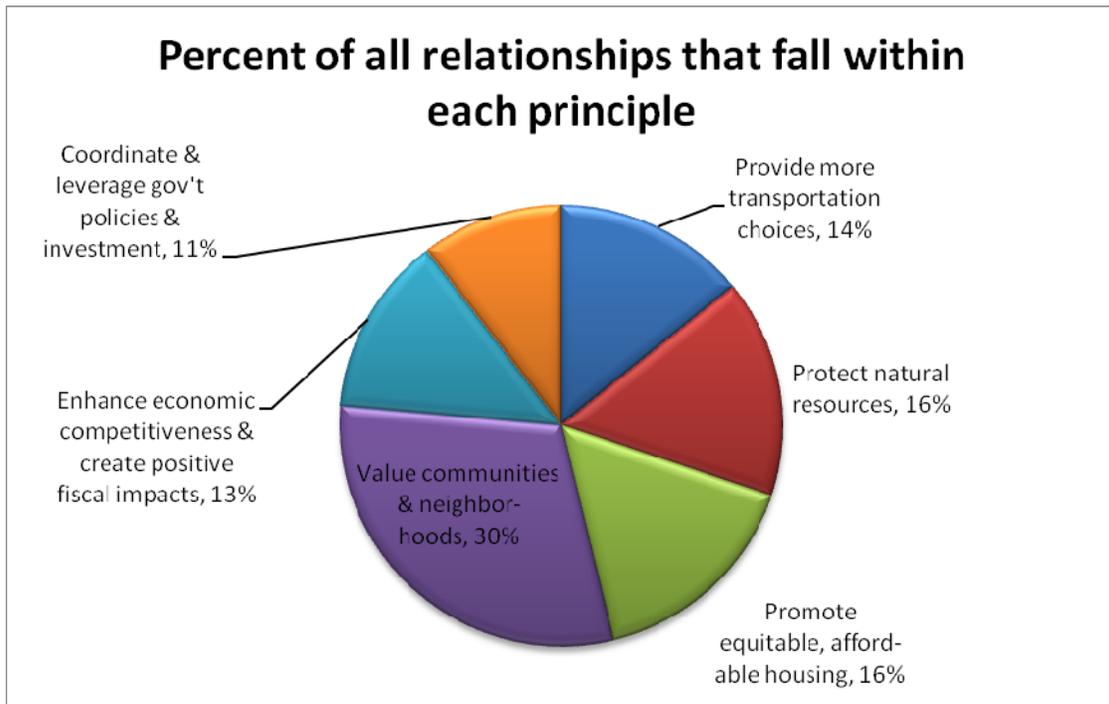


Figure 2

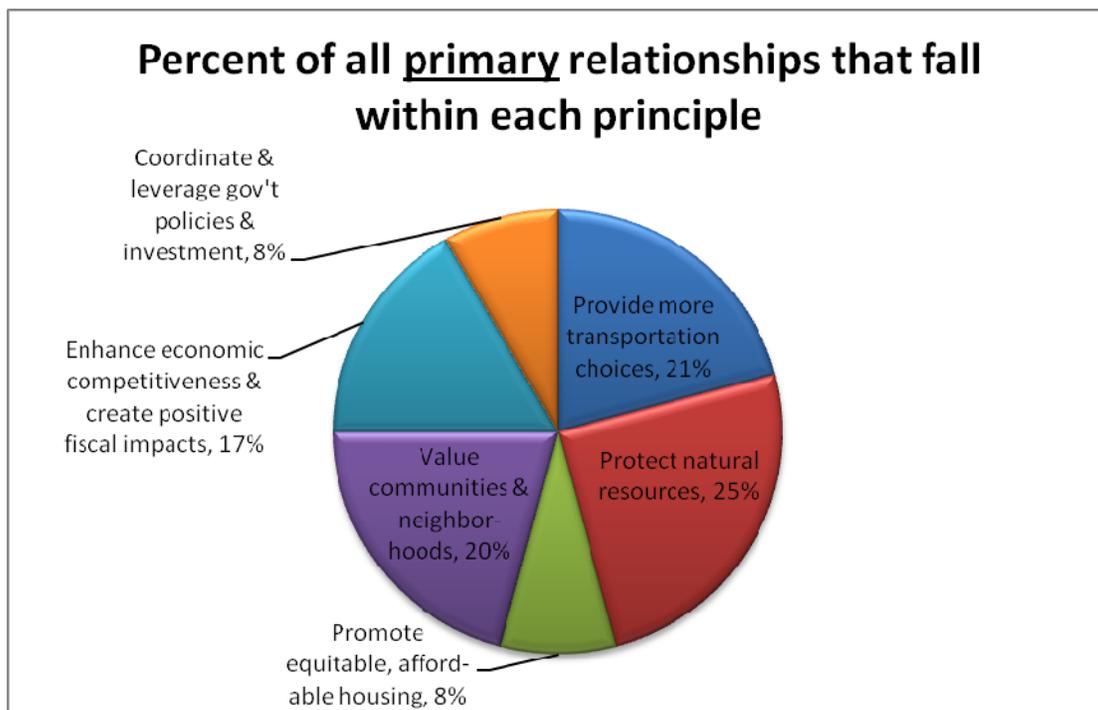
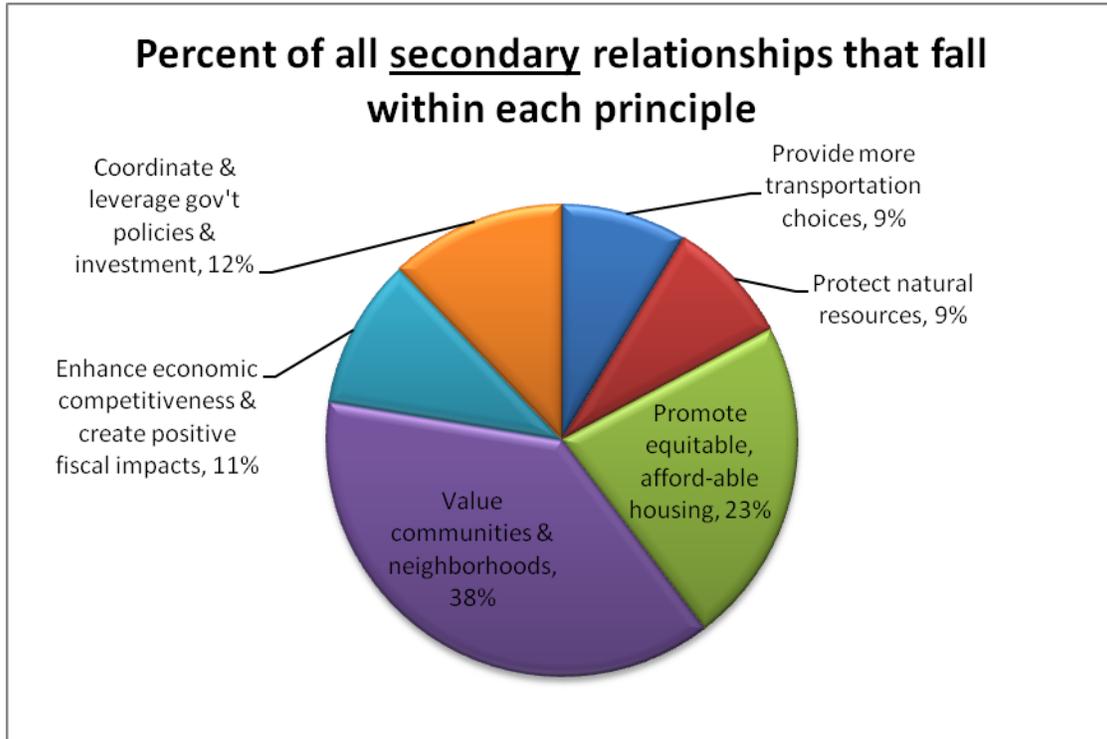


Figure 3



VI. Conclusion

In sum, these tables and figures provide a big-picture view of the proposed sustainability indicator system for the Twin Cities region. Overall, the principle with the greatest number of related indicators is “value communities and neighborhoods”, especially with respect to secondary relationships, whereas the principle “coordinate and leverage government policies and investment” is on the lower end having the fewest number of related indicators; though the remaining principles have a relatively similar number of relationships and are within the same range. Discussion among the Advisory Group and Focus Group anticipated that “coordinate and leverage government policies and investment” would likely be the most difficult principle in terms of its fit with indicators since this principle is more directly related to systems and policy and arguably less concrete and tangible. Aside from “value communities and neighborhoods”, the representation of the indicator relationships with the principles across the system appears to be relatively balanced, equally represented, and in alignment overall.

VII. Next Steps

Given the integrated, innovative nature of the proposed sustainability indicators, their measurement often involves significant data manipulation and analysis efforts. It is recommended that McKnight begin immediate implementation of the proposed indicator system in the seven-county Twin Cities metropolitan area. Additionally, such implementation should be continued and expanded, including analysis of historical trends and spatial distribution of disparities across the metropolitan region, to ensure a comprehensive and thorough monitoring of the regional development process in the Twin Cities. A preferred option is to move forward with a well-planned, phased implementation approach. For example, McKnight may begin tracking the 13 tier 1 indicators as opposed to the full list of 38 indicators.

Additionally, while the proposed sustainability indicator system integrates extensive contributions from both the Research Team and Advisory Group, as well as various inputs generated from the Focus Group and expert interviews, further validation and calibration of the indicator system may be warranted given the complexities of defining sustainability, livability, and other related concepts. McKnight may utilize various survey approaches such as the multi-round Delphi survey approach and online polls to refine the indicator system. Such survey efforts may be undertaken in parallel or immediately after a pilot implementation of the proposed system. Results from pilot testing of the system should be given equal importance to the survey results.

Appendix A: Sustainability Indicator Systems

	System Name	Organization	Target Geographic Area	Scale of Analysis
1	Report: Smart Growth Polices: An Evaluation of Programs and Outcomes	Lincoln Institute of Land Policy, MA think-tank	Applicable to regions	Region
2	Twin Cities Compass	Wilder Research, nonprofit focused on health and human services	Twin Cities, MN	Region
3	Minneapolis Sustainability Program	City of Minneapolis	Minneapolis, MN	City
4	The Indicator Project	Sustain South Sound, nonprofit focused on quality of life	Olympia, WA	County
5	B-Sustainable	Sustainable Seattle, nonprofit focused on long-term quality of life	Seattle, WA	Region
6	Sustainable City Progress Report	Office of Sustainability and the Environment, City of Santa Monica	Santa Monica, CA	City
7	The Boston Indicator Project	City of Boston	Boston, MA	Region
8	UK Government Sustainable Development Indicators 2007	UK Department for Environment, Food and Regional Affairs	Applicable to regions	Region
9	Cascadia Scorecard	Sightline Institute nonprofit think-tank based in Seattle	Cascadia, Pacific Northwest	Region
10	State of Our City Report	Sustainable Calgary, grassroots volunteer organization	Calgary, Alberta, Canada	City

Appendix B: Proposed Twin Cities Sustainability Indicator System

A primary relationship indicates that the indicator has direct bearing on the principle. A secondary relationship is one that benefits from the primary relationship. Green highlighted indicators denote tier 1 indicators of the system.

Principle: Provide more transportation choices. Address carbon reduction, air quality, oil dependency, and public health issues by developing safe, equitable, reliable, and economical transportation choices.

Indicators

A) Primary relationships with principle

2	Job Accessibility
3	Accessibility to Non-Work Opportunities
4	Access to Transit
9	Housing and Transportation Affordability
11	Infrastructure Preservation
19	Vehicle Miles Traveled per Capita
20	Transportation Reliability
21	Transportation Safety
22	Commute Mode Choice
23	Carbon Footprint

B) Secondary relationships with principle

1	Proximity of Afford. Hsg. to Public Services/Facilities
15	Walkability
18	Composite Sprawl Index
30	Air Quality
31	Exposure to Pollutants from Major Roadways

Principle: Protect natural resources. Protect land, water, atmosphere, and the interrelationships across the many natural resources they contain. Protect intact ecological and hydrological systems and ensure that our natural capital provides the energy, food, raw materials, waste absorption/filtering, and enjoyment critical to a vital economy and quality of life.

Indicators

A) Primary relationships with principle

8	Green Jobs
12	Land Consumption
13	Infill Development and Redevelopment
16	Impervious Surface
23	Carbon Footprint
24	Urban Greenness
25	Protection of Significant Ecological Areas
26	Surface Water Quality - Rivers
27	Surface Water Quality - Lakes
28	Impaired Waters
29	Ground Water
30	Air Quality

B) Secondary relationships with principle

11	Infrastructure Preservation
14	Land Use Mix
18	Composite Sprawl Index
19	Vehicle Miles Traveled per Capita
20	Transportation Reliability

Principle: Promote equitable, affordable housing. Promote a full range of housing choices that accommodates changing conditions. Meet diverse needs by providing location- and energy-efficient housing choices for people of all ages, incomes, races, and ethnicities, thereby increasing accessibility and mobility and lowering the combined cost of housing and transportation.

Indicators

A) Primary relationships with principle

1	Proximity of Afford. Hsg. to Public Services/Facilities
5	Jobs-Housing Balance and Spatial Mismatch
9	Housing and Transportation Affordability
10	Housing Mix

B) Secondary relationships with principle

2	Job Accessibility
3	Accessibility to Non-Work Opportunities
4	Access to Transit
12	Land Consumption
13	Infill Development and Redevelopment
14	Land Use Mix
15	Walkability
17	Employment Density
23	Carbon Footprint
31	Exposure to Pollutants from Major Roadways
32	Proximity to Contaminated Sites
33	Children's Lead Exposure
34	Asthma Prevalence

Principle: Value communities and neighborhoods. Target government funding toward existing communities – through strategies such as transit-oriented, mixed-use development, and land recycling – to increase community revitalization, promote walkable areas, increase public health, and improve the efficiency of public works investments. Safeguard intact relationships between communities and neighborhoods and the natural resources, open space, and agricultural landscapes.

Indicators

A) Primary relationships with principle

13	Infill Development and Redevelopment
14	Land Use Mix
15	Walkability
18	Composite Sprawl Index
31	Exposure to Pollutants from Major Roadways
32	Proximity to Contaminated Sites
33	Children's Lead Exposure
34	Asthma Prevalence
35	Diabetes Rate
38	Public Safety - Crime Rate

B) Secondary relationships with principle

1	Proximity of Afford. Hsg. to Public Services/Facilities
2	Job Accessibility
3	Accessibility to Non-Work Opportunities
4	Access to Transit
5	Jobs-Housing Balance and Spatial Mismatch
9	Housing and Transportation Affordability
11	Infrastructure Preservation
13	Infill Development and Redevelopment
14	Land Use Mix
15	Walkability
16	Impervious Surface
17	Employment Density
19	Vehicle Miles Traveled per Capita
22	Commute Mode Choice
23	Carbon Footprint
24	Urban Greenness
25	Protection of Significant Ecological Areas
26	Surface Water Quality - Rivers
27	Surface Water Quality - Lakes
35	Diabetes Rate
36	Civic Engagement - % Voting
37	Civic Engagement - Community Vitality Index

Principle: Enhance economic competitiveness and create positive fiscal

impacts. Improve economic competitiveness and create net positive fiscal impacts through reliable and timely access to employment centers, educational opportunities, services, and other basic needs by workers, as well as expanded business access to markets.

Indicators

A) Primary relationships with principle

2	Job Accessibility
5	Jobs-Housing Balance and Spatial Mismatch
6	Early Childhood - Low Income Enrolled
7	Education and Labor Force Skill Mismatch
8	Green Jobs
17	Employment Density
20	Transportation Reliability
38	Public Safety - Crime Rate

B) Secondary relationships with principle

1	Proximity of Afford. Hsg. to Public Services/Facilities
3	Accessibility to Non-Work Opportunities
4	Access to Transit
9	Housing and Transportation Affordability
11	Infrastructure Preservation
15	Walkability

Principle: Coordinate and leverage government policies and investment.

Align government policies and funding to remove barriers to collaboration, to leverage funding, and to increase the accountability and effectiveness of all levels of government – local, regional, state, and federal – to plan for future growth.

Indicators

A) Primary relationships with principle

11	Infrastructure Preservation
23	Carbon Footprint
36	Civic Engagement - % Voting
37	Civic Engagement - Community Vitality Index

B) Secondary relationships with principle

1	Proximity of Afford. Hsg. to Public Services/Facilities
3	Accessibility to Non-Work Opportunities
4	Access to Transit
7	Education and Labor Force Skill Mismatch
8	Green Jobs
13	Infill Development and Redevelopment
38	Public Safety - Crime Rate

Appendix C: Detailed Data Sources Research

#	INDICATOR	DATA SOURCE	1 - What organization or contact person collects the data?	2 - What is the location, address, and/or Web site(s), etc.?	3 - What approach is used for reporting/ displaying data (e.g. Excel, GIS, Access, web-based, paper)?	4 - Since what date/year has the data been collected? Was there an end date?	5 - Scale: What is the spatial scale of data (e.g. regional, community, neighborhood)?	6 - Availability: What is the frequency of measurement (how often is data updated)?
1	Proximity of Affordable Housing to Public Services and Facilities	Housing affordability: % households paying no more than 30% of income for housing	U.S. Census Bureau, American Community Survey	www.census.gov/acs/www/index.html	Web: Excel and comma delimited (CSV) downloads	Data since 1996. On-going.	1 year est. published for selected geographic areas with pop. 65,000 +. 3 year = 20,000 +. For SRD in Twin Cities seven-county metro, use "county" level. Use decennial census for more detailed geographies.	ACS: 1 year and 3 year estimates. Census is every 10 years.
		School quality	MN Dept. of Education (MDE)	http://education.state.mn.us/MDE/Data/index.html	Excel	Data since 1997 available online	school, school district, county and state levels	Every year. Consistent good source of data.
		School quality (<40% poverty)	National Council for Education Statistics (NCES)	http://nces.ed.gov/	Excel	1991	school, school district, county and state levels	annually
		School locations	Metro GIS (public and private schools)	http://www.datafinder.org/metadata/tlg_landmarks.htm	GIS	1988	county	annual
		School locations	Admin Minnesota	http://www.mnplan.state.mn.us/maps/SchoolDistricts/	Web-based	2001	school district	annual
		Library locations	Metropolitan Library Service Agency (MELSA)	http://www.melsa.org/locations.cfm?	GIS	1969	county	current
		Library locations	Metro Libraries	http://www.metrolibraries.net/MNWeb/librarysites.php	GIS	1979	metro region	current

#	INDICATOR	DATA SOURCE	1-Who collects?	2-Location, website	3 -Report approach	4 – Dates collected	5 – Scale	6 - Availability
		Job training locations	MN Dept. of Employment and Economic Development (DEED)	http://www.positivelyminnesota.com/JobSeekers/WorkForce_Centers/See_All_WorkForce_Center_Locations/index.aspx	GIS	1947	state	current
		Health care facilities	Metro GIS - hospitals. (Other: MN Dept. of Health)	http://www.datafinder.org/metadata/tlg_landmarks.htm	GIS	1988	county	annually
		Health care facilities	Minnesota Department of Health	http://www.health.state.mn.us/divs/fpc/directory/providersselect.cfm	GIS		county	current
		Parks & trails	Metro GIS	http://www.datafinder.org/metadata/tlg_landmarks.htm	GIS	1988	county	current
		Parks locations	Metropolitan Council	http://www.metrocouncil.org/parks/map/parksmap.htm	Web-based GIS		region	quarterly
2	Job Accessibility	Travel Demand Forecasting Model	Metropolitan Council - specifically Mark Filipi	Mark Filipi - MTS Technical Planning Services Manager, 651-602-1725	raw data - database, likely displayed in a map or report	1990, 2000	regional	every 10 years
		Longitudinal Employer-Household Dynamics	U.S. Census	http://lehd.did.census.gov/led/	Map or text (pdf, xls, or html)	annually from 2002 to 2006	cities/towns, counties, metropolitan/micropolitan areas (CBSA), county subdivisions, zip code (ZCTA), workforce investment areas (WIA), census tracts, traffic analysis zones (TAZ)	quarterly update: annual snap-shot

#	INDICATOR	DATA SOURCE	1-Who collects?	2-Location, website	3 -Report approach	4 – Dates collected	5 – Scale	6 - Availability
3	Accessibility to Non-Work Opportunities	Travel Demand Forecasting Model	Metropolitan Council - specifically Mark Filipi	Mark Filipi - MTS technical planning services manager, 651-602-1725	Raw data - database, likely displayed in a map or report	1990, 2000	regional	every 10 years
		Park and recreational amenities MetroGIS	MetroGIS	http://www.datafinder.org/catalog/index.asp	Map or dataset	2007	regional	as needed
		Land use - parks and greenspace	MetroGIS	http://www.datafinder.org/catalog/index.asp	Map or dataset	2005	regional	every 5 years
		U.S. Census - Economic Census	U.S. Census	http://www.census.gov/econ/census07/	Map or dataset	2007	metropolitan statistical area (MSA)	every 5 years
4	Access to Transit	MetroGIS transit datasource	MetroGIS	http://www.datafinder.org/catalog/index.asp	Map or dataset	unknown	regional	regularly updated, last update 5/30/09
5	Jobs-Housing Balance and Spatial Mismatch	Population data	Census Longitudinal Employment and Household Dynamics (LEHD)	http://www.lehd.did.census.gov/led	GIS	2002	block-group level	annual
		Employment data	Census Longitudinal Employment and Household Dynamics (LEHD)	http://www.lehd.did.census.gov/led	GIS	2002	block-group level	annual
6	Early Childhood	Population data	U.S. Census	http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenul=datasets_2&_lang=en	Map or dataset	Since 1900s	school district	annual estimates
		Education data	U.S. Census	http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenul=datasets_2&_lang=en	Map or dataset	Since 1900s	school district	annual estimates

#	INDICATOR	DATA SOURCE	1-Who collects?	2-Location, website	3 -Report approach	4 - Dates collected	5 - Scale	6 - Availability
		Education data	MN Dept of Education	# Director Cathy Wagner # mde.data-downloads@state.mn.us	Database			
7	Education and Labor Force Skill Mismatch	Skill demand	Bureau of Labor Statistics occupational employment statistics	http://www.bls.gov/oes/2008/may/oes_3346_0.htm	GIS	available online since 1999	metropolitan statistical area	annual through 2008
		Skill supply	MN Office of Higher Education; Census 2000	http://www.ohe.state.mn.us/mPg.cfm?pageID=1873&1534-D83A_1933715A=fa74cd787916d55082518bce9374e393ac102681	GIS	census = since 1900s	county-level data	every 10 years; soon annual
8	Green Jobs	Bureau of Labor Statistics	Bureau of Labor Statistics	http://www.bls.gov/data/	Database	since 1800s	metropolitan statistical area	quarterly and annual
		Employment data	Census Longitudinal Employment and Household Dynamics (LEHD)	http://www.lehd.did.census.gov/led	GIS	2002	block-group level	annual
9	Housing and Transportation Affordability	H&T Affordability Index	U.S. Census Bureau (2000 data)	http://htaindex.cnt.org/mapping_tool.php?theme_menu=0	GIS	started in 2004	block-group level data	ACS survey changing data collection - could be five year rolling averages starting in 2010
10	Housing Mix	MetroGIS using census and cities' data	MetroGIS	www.datafinder.org/metadata/metrogis_regional_parcel.htm	GIS	census -- started in 2002	parcel data	census = quarterly update; annual snapshot

#	INDICATOR	DATA SOURCE	1-Who collects?	2-Location, website	3 -Report approach	4 - Dates collected	5 - Scale	6 - Availability
		Urban Land Institute (ULI) MN Housing Initiative data	Urban Land Institute	http://minnesota.uli.org/-/media/DC/Minnesota/Minnesota%20Docs/Housing_Initiative%202009_Aug.ashx		ULI – started in 2004		Urban Land Institute (ULI)= annual
11	Infrastructure Preservation	City budgets, \$ for infrastructure preservation and new construction	Office of the State Auditor	http://www.osa.state.mn.us/Reports/gid/2009/ciBudget/ciBudget_09_report.pdf	PDF report	1995	city	annual
		County budgets, \$ for infrastructure preservation and new construction	Office of the State Auditor	http://www.osa.state.mn.us/Reports/gid/2009/co_Budget/coBudget_09_report.pdf	PDF report	1995	county	annual
		State Infrastructure Investment Plan, \$ for infrastructure preservation and new construction	Minnesota Department of Transportation	http://www.dot.state.mn.us/planning/stateplan/Final%20Plan%20Documents/Highway%20Investment%20Plans/District/PDF/Metro%20District%20Highway%20Investment%20Plan.pdf	PDF report		metro region	
12	Land Consumption	Nighttime city lights satellite imagery	National Geophysical Data Center (NGDC)	http://www.ngdc.noaa.gov/dmsp/global_composites_v2.html	GIS	since 1992	an approximately 1km ² grid-level data	annual from 1992 to 2003
		Population data	U.S. Census Bureau (2000 data)	www.factfinder.census.gov	GIS	Census = since 1900s	block-group level data	every 10 years
13	Infill Development and Redevelopment	Future survey of developed communities	Met Council	N/A	N/A	N/A	N/A	N/A

#	INDICATOR	DATA SOURCE	1-Who collects?	2-Location, website	3 -Report approach	4 – Dates collected	5 – Scale	6 - Availability
		Platt monitoring data	Met Council	Lisa Barajas, Planner, Local Planning Assistance, 651-602-1895 Phyllis Hanson, Manager, Local Planning Assistance, 651-602-1566	raw data - database, likely displayed in a map or report	since 2001, with varying levels of participation	city	annual
		Contaminated sites	MN Pollution Control Agency database	http://www.pca.state.mn.us/wimn/index.cfm	Map or text (pdf, xls, or html)	since the 1980s	address	daily
14	Land Use Mix	MetroGIS parcel data	MetroGIS	www.datafinder.org	GIS	1984, 1990, 1997 2000, 2005		
15	Walkability	MetroGIS street centerline data	MetroGIS	http://www.datafinder.org/metadata/tlg_roads.htm#full	Web-based report and map	annual	parcel	annual since 1997
		MetroGIS land use data	MetroGIS	http://www.datafinder.org/metadata/landuse_2005.htm	Web-based report and map	2005	parcel	every 5 years
16	Impervious Surface	Landsat data	UMN Geospatial Analysis Lab	http://land.umn.edu/	GIS	1986, 1991, 1998, 2002, 2007	TCMA - 15 counties	1986, 1991, 1998, 2002, 2007
17	Employment Density	% jobs and population density	Census LEHD	http://www.lehd.did.census.gov/led	GIS	2002	block-group level	annual
18	Composite Sprawl Index	Compactness	U.S. Census Bureau (2000 data)	http://www.census.gov/geo/www/maps/st_profile.htm	TIGER geographic database	every 10 years, including 2000	persons per square mile	updated every 10 years; soon annual
		Continuity	MetroGIS using census and property parcel data	www.datafinder.org/metadata/census_2000_tlg.htm and www.factfinder.census.gov (go to Dataset, Census 2000, File 1)	ArcMap	census = since 1900s; property parcel data started x	block-group level data and parcel data	every 10 years (soon to be annual) and quarterly

#	INDICATOR	DATA SOURCE	1-Who collects?	2-Location, website	3 -Report approach	4 - Dates collected	5 - Scale	6 - Availability
		Centrality	MetroGIS using census data	www.datafinder.org/metadata/census_2000_tlg.htm and www.factfinder.census.gov (go to Dataset, Census 2000, File 1)	ArcMap	2002	block-group data	annual update
		Proximity	MetroGIS using census data	www.datafinder.org/metadata/census_2000_tlg.htm and www.datafinder.org/metadata_tlg_landmarks.htm	ArcMap	2002	block-group data and "points of interest"	annual update and when points of interest change
19	Vehicle Miles Traveled (VMT) per Capita	MN Dept. of Transportation VMT	MN Dept. of Transportation	http://www.dot.state.mn.us/roadway/data/reports/vmt.html	Web-based report	annual from 2001 to 2008	county/city/route	annual
		Annual population estimates	U.S. Census Factfinder	http://factfinder.census.gov/home/saff/main.html?_lang=en	Web-based report	annual since last census (2000)	state/city/county/zip	annual
20	Transportation Reliability	Urban mobility report	Texas Transportation Institute	http://mobility.tamu.edu/ums/congestion_data/tables/minneapolis.pdf	Web-based report	annual from 1982 to 2007	"Urban Area" - metropolitan statistical area	annual
21	Transportation Safety	State crash data	MN Dept. of Transportation	http://www.dps.state.mn.us/ots/crashdata/crash_facts.asp	Web-based report	annual from 1999 to 2008	State of Minnesota	annual
22	Commute Mode Choice	Metropolitan Council travel behavior inventory	Metropolitan Council	http://www.metrocouncil.org/planning/transportation/TBI_2000.htm	Web-based report	1990 and 2000	seven-county metro/13 county metro	every 10 years
23	Carbon Footprint	Energy sources and production	U.S. Energy Information Administration	http://www.eia.doe.gov/emeu/states/state.html?q_state_a=mn&q_state=MINNESOTA	Web-based	1960	state	annual

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		Pollutant measurements	Minnesota Pollution Control Agency	http://www.pca.state.mn.us/data/edaAir/emissions.cfm	Web-based	1999	county	3-years
		Carbon online estimator	U.S. Department of Agriculture Forest Service	http://www.nrs.fs.fed.us/niacs/tools/	Web-based		county	current
24	Urban Greenness	Normalized Difference Vegetation Index (NDVI)	Land Cover (www.landcover.org)	http://glcfapp.umiacs.umd.edu:8080/esdi/index.jsp?productID=19	GeoTIFF from using MODIS data	2001	250 m or larger	16 day updates
25	Protection of Significant Ecological Areas	Regionally Significant Ecological Areas	Minnesota Department of Natural Resources	http://www.dnr.state.mn.us/rsea/metro_methods.html	Web-based	2003	seven-county region	every 5 years
26	Surface Water Quality - Rivers	Water quality - river monitoring	Metropolitan Council	http://www.metrocouncil.org/environment/RiversLakes/rivers/index.htm	Web-based, paper	1927	upper and lower Mississippi, St Croix, and Minnesota Rivers in metro region	annual
27	Surface Water Quality - Lakes	Water quality - lakes monitoring	Metropolitan Council	http://www.metrocouncil.org/environment/RiversLakes/Lakes/index.htm	Web-based, paper	1980	192 lakes tested in metro region	annual
28	Impaired Waters	List of impaired waters	Minnesota Pollution Control Agency	http://www.pca.state.mn.us/water/tmdl/tmdl-303dist.html	Web-based	1998	state, river basin	bi-annual
29	Groundwater	Publications on the state of groundwater for the metro region	Minnesota Pollution Control Agency	http://www.pca.state.mn.us/water/groundwater/index.html#programs	Web-based	1992	state, watersheds	regularly updated

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		Report on ground water quality for metro region	Minnesota Pollution Control Agency and Metropolitan Council	http://www.pca.state.mn.us/water/groundwater/gwmap/rpt-metroists-02.pdf	PDF	2002	Twin Cities metro	2002
30	Air Quality	Annual summaries of air pollution data	Environmental Protection Agency	http://www.epa.gov/air/data/index.html	Web-based	1957	county	annual
31	Exposure to Pollutants from Major Roadways	Major roadway identification	Minnesota Department of Transportation	http://dotapp7.dot.state.mn.us/website/mndot-basemap/viewer.htm	Web-based GIS		state roads	weekly
		Population data	U.S. Census	http://factfinder.census.gov/home/saff/main.html?_lang=en	Web-based		region	decennially
		Parks locations	Metropolitan Council	http://www.metrocouncil.org/parks/map/parksmap.htm	Web-based GIS		region	quarterly
		School locations	Admin Minnesota	http://www.mnplan.state.mn.us/maps/SchoolDistricts/	Web-based	2001	state	annual
32	Proximity to Contaminated Sites	Contaminated sites	Minnesota Pollution Control Agency	http://pca-gis02.pca.state.mn.us/wimn2/index.html	Web-based	1996	state	current
		Population data	U.S. Census	http://factfinder.census.gov/home/saff/main.html?_lang=en	Web-based		region	decennially
		Contaminated sites	Minnesota Pollution Control Agency database	http://www.pca.state.mn.us/wimn/index.cfm	Map or text (pdf, xls, or html)	since the 1980s	address	daily

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33	Children's Lead Exposure	MN Dept of Health	Option 1: Positive test results for those requesting tests	erik.zabel@state.mn.us (state epidemiologist)	http://www.health.state.mn.us/divs/eh/lead/reports/index.html	1995	county-level data	annual
			Option 2: map 2 primary indicators for high risk areas:					
		MN Dept of Health	(1) % children living in poverty	www.factfinder.census.gov (2000 Census, Summary File 3)	GIS	census = since 1900s	block-group data	updated every 10 years; soon annual
			(2) % housing <1978	www.factfinder.census.gov (2000 Census, Summary File 3)	GIS	census = since 1900s	block-group data	updated every 10 years; soon annual
			(3) # young children living in county	www.factfinder.census.gov (2000 Census, Summary File 1)	GIS	census = since 1900s	block-group data	updated every 10 years; soon annual
34	Asthma Prevalence	Asthma data	Center for Disease Control and Prevention	http://apps.nccd.cdc.gov/BRFSS-SMART/SeIMMSAPrevData.asp	Web-based	2002	metropolitan statistical area	annual
		Asthma project	Hospitalization rates by age by zip code	MN Dept of Health	www.wendy.brunner@state.mn.us	1998	hospitalization data = zip code level	annual
35	Diabetes Rate	Diabetes rates	Center for Disease Control and Prevention	http://apps.nccd.cdc.gov/BRFSS-SMART/SeIMMSAPrevData.asp	Web-based	2002	metropolitan statistical area	annual
		Diabetes type II rates (approx 90%)	Minnesota Department of Health	http://www.health.state.mn.us/diabetes/diabetesinminnesota/toc.html	Web-based	2003	state, region	revised 2008
36	Civic Engagement - % voting in off year elections	Voting Turnout	Minnesota Secretary of State, compiled by Twin Cities Compass	http://www.tccompass.org/civicengagement/key_measures.php?km=VoterTurnout	Web-based	1998	seven-county region	bi-annual

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37	Civic Engagement - Community Vitality Index	Population data	U.S. Census Bureau (2000 data)	www.factfinder.census.gov	Map or dataset	census = since 1900s	block-group level data	every 10 years
		School locations	Metro GIS (public and private schools)	http://www.datafinder.org/metadata/tlg_landmarks.htm	GIS	1988	county	annual
		Voting turnout	Minnesota Secretary of State, compiled by Twin Cities Compass	http://www.tccompass.org/civicengagement/key_measures.php?km=VoterTurnout	Web-based	1998	seven-county region	bi-annually
		U.S. Census - Economic Census	U.S. Census	http://www.census.gov/econ/census07/	Map or dataset	2007		every five years
		Library locations	Metro libraries	http://www.metrolibraries.net/MNWeb/librarysites.php	GIS	1979	metro region	current
		Health-care facilities	Metro GIS - hospitals. (Other: MN Dept. of Health)	http://www.datafinder.org/metadata/tlg_landmarks.htm	GIS	1988	county	annual
		Job-training locations	MN Dept. of Employment and Economic Development	http://www.positivelyminnesota.com/JobSeekers/WorkForceCenters/See_All_WorkForce_Center_Locations/index.aspx	GIS	1947	state	current
		Community Reinvestment Act (CRA) Data	<i>Federal Financial Institutions Examination Council (FFIEC)</i>	http://www.ffiec.gov/CRA/craproducts.htm	Web-based	1996	metropolitan statistical area	annual

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		Home Mortgage Disclosure Act data	<i>Federal Financial Institutions Examination Council (FFIEC)</i>	http://www.ffiec.gov/hmda/orderform.htm	CD Rom	2004	metropolitan statistical area	annual
38	Public Safety	Minnesota annual crime report	Minnesota Department of Public Safety	http://www.bca.state.mn.us/CJIS/Documents/Page-15-02.html	PDF report	1936, 1972 (computer), 1994 (online)	county	annual