MINNESOTA PLANNING ENVIRONMENTAL QUALITY BOARD

SMART SIGNALS

An assessment of progress indicators

MARCH 2000

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Minnesota Planning is charged with developing a long-range plan for the state, stimulating public participation in Minnesota's future and coordinating public policy among state agencies, the Legislature and other units of government.

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On request, *Smart Signals: An Assessment of Progress Indicators* will be made available in alternate format, such as Braille, large print or audio tape. For TTY, contact Minnesota Relay Service at 800-627-3529 and ask for Minnesota Planning.

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Smart Signals: An assessment of Progress Indicators

Introduction

The Economics for Lasting Progress project was approved by the Legislative Commission on Minnesota Resources with the charge of "determining if our current measures of economic activity provide accurate and sufficient information for decision-makers to support policies that promote the long-term prosperity in Minnesota." In addition, the project had the tasks of investigating the viability of the "genuine progress indicator" as an alternative to the gross domestic product and gross state product and developing a Minnesota-specific measure of progress for use by state policy-makers and citizens.

To accomplish these tasks, the following activities were undertaken:

An extensive review of the literature on measures of economic, environmental and community well-being was conducted. The review focused on assessing methodological differences as well as issues of concern for a broad array of indicators of progress. It also identified characteristics of effective indicators and examined the most commonly used indicators in Minnesota. This review provided the foundation for the subsequent phases of the study.

A Minnesota-specific version of the genuine progress indicator was developed. The genuine progress indicator is a national measure of well-being developed by Redefining Progress, a California-based economic policy think tank. One of the objectives of the Economics for Lasting Progress project was to determine the usefulness of this indicator for measuring well-being for Minnesota. This was accomplished by first applying the same methodology from the national GPI with Minnesota data to get a Minnesota-specific GPI, followed by an in-depth critique of the genuine progress indicator.

A vision for Minnesota's long-term economic prosperity was created. The critique of the genuine progress indicator and the assessment of current Minnesota measures of progress led to the decision that a new indicator of economic prosperity was needed for Minnesota. Developing this indicator began with creating a vision for a prosperous Minnesota economy, based on a broad definition of the economy that includes environmental and social factors. This vision, discussed in the *Describing a Healthy Economy* section of this paper, is comprised of five goals and 22 desirable outcomes.

The "Minnesota progress indicator" was developed as a new indicator of economic prosperity in Minnesota. The MPI is an aggregation of 42 economic, environmental and community measures that provide citizens and policy-makers with a more realistic and comprehensive view of the state's well-being. These 42 measures were selected for their ability to examine the state's progress in relation to the goals and outcomes developed in the vision for long-term prosperity, outlined in the *Describing a Healthy Economy* section of this paper. This paper outlines the efforts and findings that were made in each of these activities.

Literature review and background on indicators

An indicator is something that points to a problem or condition. Its purpose is to show you how well a system is working. If there is a problem, an indicator can help you determine what direction to take to solve the problem. - Maureen Hart

Recent interest in sustainable development issues at the local, state and national levels as well as concerns over the misuse of economic indicators as measures of development have led to a growing body of literature on indicators. It is necessary to develop effective measures that facilitate monitoring of progress and help identify the means to enhance progress. While a lot of work has gone into developing indicators, many of the currently used indicators of well-being are in the

preliminary stage and need further refinement. The purpose of this literature review is to explore some of the landmarks in the development of well-being indicators including the methodologies and examples of different types of indicators in use. The literature reviews focus on international, national and state economic, environmental, and social indicators used to measure the overall well-being, development and progress of people[1].

Through the literature review, a wide variety of indicators with different methodology and attributes were examined. While some indicators examine historical trends in well-being, others adopt a snapshot approach; some are predictive while others are retrospective and range in scope from local, state, regional and national to global levels. In terms of methodology, two broad philosophical categories can be discerned. The first concerns whether indicators should be aggregated or not; and the second is about whether indicators should be kept in their physical units or whether they should be monetized or converted to a universally comparable unit.

The development and use of indicators for measuring progress raise many concerns, including methodological issues and types of indicators.

Methodological issues

An important methodological issue concerning indicators is whether the measurement should be done with only one indicator or a combination of indicators. In other words should a group of individual indicators be aggregated into one composite figure to gauge the well-being of a nation or state or should the individual indicators be used?

Each approach has benefits and disadvantages. The main benefit of an aggregated indicator is that a single index is more comprehensible and typically draws more attention from the public. However, the questionable assumptions made in calculating composite indicators often attract criticisms. Since nonaggregated indicators are kept in their own units, the measures maintain their reliability and acceptability. The possibility of reporting on a large number of indicators under this approach means that they may not attract the attention of the media and the public.

Related to this issue is the debate over whether indicators should be reported in their physical units or converted into a standard unit such as dollars or percentages. The need to convert the indicators into a common unit of measurement is greatest with aggregated indicators. With nonaggregated indicators, however, the units of measurement are kept in their most typical units, such as pounds of carbon or acres of trees, rather than a monetary figure.

For some variables that go into composite indicators such as personal consumption spending, there is no question that the dollar is the most appropriate unit of measurement. However, one of the main arguments against converting indicators to monetary units concerns the inherent assumption that manufactured and natural capitals are substitutes. Thus, an increase in pollution (a monetary cost) could be offset by an increase in personal consumption (a monetary benefit). Indicators measured in physical units on the other hand do not make the same substitution assumption.

In sum, there is no perfect methodology for developing effective indicators. All approaches have their advantages and disadvantages. Therefore, the choice between aggregated or nonaggregated methods, or physical or standard units depends on the purpose of the indicator and the audience involved.

Indicator types

Economic indicators have predominately been used to measure and make decisions about development. While social and environmental indicators exist, economic indicators such as gross domestic product, consumer price index, Dow Jones average, and the unemployment rate typically receive the greatest attention.

The result of this economic emphasis is that policy decisions are based more on economic conditions than on a combination of economic, social and environmental factors. It has been said that “Accounting drives policy and thus it’s no accident that the social and environmental realms that have suffered such erosion in recent decades are precisely those that our systems of national accounting fail to address."[2]

The literature identifies three categories of indicators based on their composition: national and state accounting indicators; aggregate indicators that use national account figures as a base; and other economic, environmental, and social indicators.

National and state accounting indicators

National and state accounting indicators such as the gross domestic product and gross national product have been used by economists for over 50 years to measure economic progress within countries and between countries or states.

Perhaps the most famous indicator is the gross domestic product, defined as the total production of a country. It can be measured as the monetary value of all goods and services produced, the sum expenditure of all goods and services consumed, or by adding the aggregate income received as wages, salaries, corporate profits, proprietary income, and rent in the process of producing a nation’s output.

The state equivalent to the GDP is the gross state product. It is derived as the sum of the gross state product originating in all industries in the State.”[3] Stated another way, “GSP is a measure, at market prices, of the value of all final goods and services produced within the borders of the state during a particular time period.”[4]

Although the GDP and GSP are used extensively to measure economic activity in nations and states, both have the serious problems, discussed later in this paper, as indicators of the overall development of a nation or a state.

The consumer price index is the principal source of information concerning trends in consumer prices and inflation in the United States. The Bureau of Labor Statistics obtains monthly price information on thousands of goods and services in the United States. These prices are then used to generate indices on a variety of categories such as medical care and energy. The most commonly used consumer price index is the CPI-U, with the “U” standing for "All urban consumers." This index measures most typical goods and services purchased by the American consumer. Consumer price indices are used extensively in economic policy decisions, such as in computing the annual cost-of-living increase for Social Security.

Various indices exist for different consumption sectors. The Bureau of Labor Statistics also compiles indices for various geographical regions, such as states and large metropolitan areas.

The main problem with the national and state accounting indicators is that too often the results are used to measure the overall well-being of a country or a state. Given the fact that the GDP, GSP and CPI are strictly economic measures, it seems irrational to use them for measuring anything but economic conditions. When an indicator is used to make decisions about issues that the indicator does not measure, the results are likely to be misguided. An often-cited example involves the application of the GDP to noneconomic decisions such as the social well-being of a country.

For decades, nations have used the GDP to guide not only economic but also social and environmental policies. The literature on indicators is laden with criticisms of the misuse of GNP and GDP.

“It is obvious to all that the welfare of a nation, i.e., the quality of life it provides, depends on a number of factors that are not captured by GDP or any other national account indicator. Suffice it to mention personal freedom, law and order, health, and educational facilities and of course the state of the environment, all of which are important

factors that are omitted. Thus GDP alone is unable to tell us very much about the trend in welfare in a country over time or about welfare differences between countries."[5]

"GNP is not only a passive mismeasure but also an actively distorting influence on the very reality that it aims only to reflect. GNP is an index of throughput, not welfare. Throughput is positively correlated with welfare in a world of infinite sources and sinks, but in a finite world with fully employed carrying capacity, throughput is a cost. To design national policies to maximize GNP is just not smart. It is practically equivalent to maximizing depletion and pollution."[6]

"Robert Repetto states, "A country could exhaust its mineral resources, cut down its forests, pollute its acquires and hunt its wildlife and fisheries to extinction without affecting its measured income.' In fact, environmental degradation can actually boost GNP growth."[7]

The misuse of GDP as a measure of welfare and as a basis for noneconomic decisions illustrates the necessity to use indicators properly. Indicators are beneficial tools for measuring progress, comparing entities, and so on their misuse, however, is likely to result in poor decision-making.

To integrate or not to integrate? As a response to the criticisms of the narrow scope of the gross domestic product and the misuse of the indicator as a broader measure of progress, the concepts of satellite accounts and converting environmental and social factors into monetary units for inclusion in the GDP have been considered. Each of these modifications has their own limitations.

Converting to monetary units. As already indicated, amending the GDP by including environmental and social factors requires assigning monetary value to all indicators and involves many controversial assumptions. It has been said that "If environmental destruction is measured in monetary terms, as something to be subtracted from the gross national product, then a low level of 'the new GNP' growth could signify either a high level of economic growth with a high cost of environmental destruction, or simply a low level of economic growth."[8]

In response to this dilemma, Robert Repetto and others state, "A problem with maintaining accounts in physical units (thus keeping environmental and social considerations separate from the GDP) is that they do not enable economic policy-makers and planners to understand the impact of economic policies on a nation's natural resources and thereby to integrate resource and environmental considerations into economic decisions."[9]

Satellite accounts. Related to the above argument is the use of satellite accounts by many European countries, Canada and the United Nations. The United Nation's Integrated System of Environmental and Economic Accounting has become the model for many countries. This system "is designed to provide a satellite account to serve as an adjunct to—but not a modification of—the current national income accounts (GNP/GDP). This approach is highly complex, however, involving disaggragating the standard accounts to highlight environmental relationships, linking physical and monetary accounting, imputing environmental costs, and extending the definition of production in the SNA."[10]

The rationale for using satellite accounts as opposed to integrating environmental measures into the GDP is that certain environmental factors cannot be measured with as much confidence and accuracy as the components of the GDP. However, the common reason for not using satellite accounts is the idea that these accounts will receive minimal attention and consideration for decision-making, as compared to a new "Green GDP" or another measure that incorporates economic, environmental, and social factors.

In addition, Clifford W. Cobb and John B. Cobb, Jr., argue, "The use of satellite accounts ignores the importance of recording the relationship

between market and non-market accounts. To the extent that aspects of welfare can be expressed in the common denominator of money, we believe they should be included in a composite indicator, rather than being relegated to satellite accounts."[11]

Aggregate indicators that use national accounts as a base

Given the drawbacks in the use of traditional national accounting indicators as comprehensive measures of progress, the following indicators are attempts at creating a more accurate measure of well-being. Many of these indicators combine social and environmental factors with one or more national account figures.

Measure of economic welfare. The "measure of economic welfare," developed by Bill Nordhaus and James Tobin, was meant to be not only a measure of welfare but also to determine the correlation between the gross national product and economic welfare.

The "measure of economic welfare" is applied as follows: The first step is to breakdown the gross national product into consumption, investment and intermediate goods (which removes most government spending and redefines certain consumption as intermediate rather than final expenditures).[12] This leaves a figure similar to the net national product[13]. Since some expenditures are regrettable necessities rather than contributions to welfare, they were subtracted. Among others, the cost of commuting to work, police services, sanitation services, road maintenance and national defense were placed in this category. Next, imputations for capital services, leisure and nonmarket (i.e. household) work were added to the measure of welfare.[14] Finally, an imputed value of urban disamenities is subtracted by using a regression analysis that determines an estimate of the wage differential necessary to attract people to live in more densely populated areas.[15]

Nordhaus and Tobin concluded that between 1929 and 1965, the MEW paralleled the growth of net national product and other conventional measures of output such as GNP, which led them to suggest that NNP could serve as a reasonable approximation of a measure of welfare. However, when critics examined for time frames other than the full period of 1929 to 1965, especially between 1947 and 1965, the strong correlation did not hold, and thus they concluded that the GNP and NNP are not good measures of welfare.[16]

Economic aspects of welfare. Another measure of welfare similar to the measure of economic welfare is the "economic aspects of welfare" measure developed by Xenophon Zolatas. The EAW differs from the MEW by focusing on the current flow of goods and services and by largely ignoring capital accumulation and the issue of sustainability. On some more specific points, the EAW deviates from the MEW by deducting half of the cost of advertising (this assumes that only half of it provides a valuable information service to consumers), half the cost of air and water pollution control, the full costs of solid waste pollution control, deducts the estimated costs of air pollution, and half of the per capita growth in real public and private health care costs.[17] In addition, Zolatas also includes a figure for natural resource depletion.

The growth rates for both the EAW and MEW were found to be similar despite the methodological differences outlined above. When comparing the EAW with GNP following World War II, there remained a gap similar to that between the MEW and GNP, but it was slightly smaller.[18]

Index of sustainable economic. Clifford W. Cobb and John B. Cobb, Jr. developed the "Index of sustainable economic welfare" (ISEW).[19] The ISEW includes a broad range of social, economic, and environmental measures into an aggregated monetary figure used for comparison with the GNP (or GDP). They explain that their interest in developing the ISEW was not only to show how our nation has fared since 1950 in terms of economic welfare but also to establish an index that can be kept current in the years ahead.[20]

While this index does an excellent job in bringing together a wide variety of welfare measures for an index, some have criticized the assumptions made to convert some of the measures to monetary units.

Genuine progress indicator. One of the most recent attempts at measuring the well-being of a nation is the "genuine progress indicator"[21]. Developed by Redefining Progress, this indicator follows a similar methodological structure as the ISEW with changes primarily in the variables that are included and the approaches on converting some of those variables to monetary units. The GPI is discussed in more detail later this report.

Other economic, environmental, and social indicators

The last category of indicators is not based on national account figures, yet they bring forward many factors that the typical national accounting indicators do not include and are thus good supplements to national accounting data in measuring the overall well-being of a state or country.

Human development index. Developed by the United Nations in 1990 and calculated annually, the human development index (HDI) is one of the most prominent social well-being indicators. [22]

"The HDI integrates a wide range of welfare statistics such as life expectancy, educational attainment, GDP (reduced by factors such as poverty levels) and deprivation. The index is worked out by taking the global maxima and minima for each measure, and using the position of each country along that base as the measure of development."[23] The index also incorporates per capita income in terms of purchasing power parity, which helps solve the comparability issue of income disparity between countries.

Wealth index. In 1995, the World Bank developed the wealth index, which includes four kinds of national assets to determine the real wealth of nations. The four measures of wealth that the index uses are natural capital (natural environmental resources), produced assets (factories, infrastructure, financial assets), human resources (educated, healthy, productive people), and social capital (families, communities, institutions). [24]

What is interesting about this index is that the national rankings that are developed attribute at least 60 percent of the wealth of nations to human and social resources, 20 percent to the assets of nature and about 20 percent or less attributed to produced assets, those assets-on economists and national policies have focused almost exclusive attention.[25]

Index of social progress. The index of social progress[26]consists of 36 social indicators divided into 10 subindexes: education, health status, women's status, defense effort, economic, demographic, geographic, political participation, cultural diversity, and welfare effort. In calculating this aggregated index, the raw score values of the indicator were transformed from variable units of measurement (e.g., rates per 1,000 dollars, grams, percents, ratios, and so on) into standardized units of measurement (z-scores). In addition to the normal unweighted version of the 1983 index, a weighted-index that places more emphasis on some indicators when compiling the sole index figure.

Index of social health. The index of social health, published by the Fordham Institute, is an aggregated index that uses sixteen indicators from all stages of life (childhood to old age) in the areas of health, employment, income, education, and security. "The Index seeks to reflect the reality that social indicators, and the conditions they represent, do not occur in isolation, nor is their impact confined solely to the individuals represented in each category."[27] Between 1970 and 1992, the study period, the index steadily declined for the U.S.

The sixteen indicators are divided into four stages of life. The indicators for children are infant mortality, child abuse and children in poverty.

Teen suicide, drug abuse and high school dropouts are the youth indicators. The adult indicators are unemployment, average weekly earnings, health-insurance coverage, poverty among those over 65 and out-of-pocket health costs for those over 65. The indicators for all ages are homicides, alcohol-related highway deaths, food stamp coverage, access to affordable housing and the gap between the rich and poor. These indicators are converted into a single figure with a range from zero to100.

Oregon Shines II. Developed originally in 1989 as Oregon Shines, Oregon Shines II, published in January 1997, is the latest indicator measure for Oregon. Oregon Shines II has 92 benchmarks (indicators) organized into seven areas of focus: performance, education, civic involvement, social support, public safety, community development and environment.

The 92 benchmarks are not aggregated into a single figure; rather, they are maintained as individual indicators in their standard units of measurements. Oregon Shines II uses targets in the years 2000 and 2010 and historical trend data for years 1980 and 1990-1996 to measure progress toward those goals. Unlike most of the previously mentioned indicators, this indicator is focused on setting a goal and examining Oregon's progress toward that goal.

What measures should be included in an indicator?

While the combination of environmental and social factors with economic factors allows for a more comprehensive look at well-being of a society, indicators are mostly selected by experts and scarcely include what the citizens perceive as important. This is especially true of indicator projects that cover large regions, which makes it impossible to solicit local ideas about what is important and worth measuring.

Regardless of the welfare measure being developed, whether it is a "green national product" or a measure similar to the genuine progress indicator, one of the controversial issues is what factors should be included in the index. Clifford W. Cobb and John B. Cobb, Jr., begin to answer the question by stating, "In principle, it (a green national product) would be created by adding up the 'goods' and subtracting the 'bads', giving us a picture of our net condition."[28] Thus, one must determine what "good" and "bad" factors should be included. For indicators that do not measure national or state accounts, the selection of factors is even more arbitrary. It is important to recognize that regardless of the type of indicator, the measure selected for an indicator has an enormous influence on what story the indicator will tell.

Commonly used indicators in Minnesota

Minnesota decision-makers have several indicators including gross state product, median income, unemployment rate and a variety of health and education statistics that are used in decision-making. In addition to these common measures often reported in the media, Minnesotans also rely on a variety of program-specific indicators to evaluate state and community-based programs that influence their well–being. These indicators range from scholastic aptitude test scores to poverty rates to miles of road.

While these indicators provide useful information on specific issues, they do not provide a complete economic, social and environmental picture, which is typically, much more informative and useful for decision-making. Median income, often used to measure economic well-being, suffers from this limitation, as Hart explains: "Although median income is a common measure of economic well-being, it is a poor indicator of a sustainable community because it does not link the economic part of the community with the social or environmental parts of that community. A better measure of a sustainable community would make a link between the economic sphere and the social or environmental. For example, one

measure would be the percent of the median income needed to pay for the basic needs of a person living in the community. This links the economic with the social sphere."[29]

Developing effective sustainable development indicators

The literature review has shown that there is neither a universally accepted nor foolproof method for developing an indicator. Since each method has advantages and disadvantages, what is considered an appropriate methodology depends on the purpose of the indicator and the target population. While economic indicators have been used extensively in decision making, they do not measure the overall well-being of society. Finally, despite recent attempts to incorporate environmental and social indicators with economic indicators to provide a more comprehensive view of well-being, the selection of indicators and the articulation of goals and outcomes of societies are mostly done by experts and bureaucrats with little citizen input. In situations where citizens participated in identifying outcomes, goals and indicators (such as Oregon Shines, Minnesota Milestones), the projects have not provided a single aggregated indicator such as the GPI that would be likely to attract public exposure. In the face of these challenges, what are the characteristics of effective sustainable development indicators?

The criteria for the creation of an effective indicator largely depend on the purpose of the indicator, as well as the need to be informative to users. For example, in the case of a gas gauge, the trait of being highly sensitive to change is very important; thus, being highly sensitive to change would be an effective characteristic, but this characteristic may not be relevant for another variable.

Based on a review of the literature on the characteristics of "good" indicators and keeping in mind the attributes of state and national measures of progress, the following characteristics were identified as the best set to work toward. While it is unlikely that any indicator can meet all of the following characteristics, the list can aid in guiding indicator creation and evaluation.

Relevance. Indicators should be constructed so that they have a high degree of relevance to the issues of concern, and the goals and objectives of the stakeholders who will use them.[30]

Sensitive to change over time. Indicators should reflect meaningful variation in the issue of concern such that significant temporal trends can be established that show whether or not conditions are stable, improving or deteriorating.[31]

Comprehensible. Target users should easily understand the indicators. Indicators should be capable of aggregation so that the information presented can be understood by lay people and interpreted to allow an assessment of its significance.[32]

Sensitive to change across space or within groups. A major issue in social and development indicator research is the quest for measures that are sensitive to the distribution of conditions within a population or over a geographic region.[33]

Integrative. Composite indicators, which integrate various measures into an index, can be useful tools for measuring sustainability. Great care needs to be taken, however, in the scaling and weighting of components in such indicators, especially in combining incommensurables. The composites also may be difficult to communicate and explain to the public and policy-makers.[34]

Validity. Indicators should effectively measure progress toward a defined goal. Up and down movements of the indicator should correlate well with movement toward or away from the goal.[35]

Frequency. As far as possible, indicators should be based on data that is collected regularly to enable users follow trends without missing any important ups and downs resulting from data unavailability.[36]

Reliability. An indicator must be reliable. Users must be able to trust what the indicator shows.[37]

Provide timely information. Indicators must provide timely information to allow prompt rectification.[38]

Indicator exposure

In addition to the technical characteristics of effective indicators, also needed is maximum exposure for the indicator. This characteristic was cited earlier in the discussion on whether or not to integrate, where the question was raised of the degree of exposure that a set of indicators would receive compared to a single aggregate indicator. Most indicator observers agree that single aggregate measures are likely to receive more attention than a list of indicators. For example, the genuine progress indicator, an aggregated index, could be expected to receive greater attention from the media and the public than the 25 individual indicators that comprise the index.

Indicator exposure is critical if its purpose is to influence public awareness or public policy. Theoretically, an indicator that receives greater attention from the media and public is more likely to influence decision-making by individuals and policy-makers. While the Dow Jones industrial average is reported on the news every weeknight and the consumer price index and gross domestic product are reported quarterly, the numbers of acres of forest and wetlands that are created and destroyed receive no exposure. The former group of indicators has had far greater influence on policy-making and the actions of individuals than the latter. This criterion is particularly important for sustainable development indicators, which aim at raising awareness about the overall development of a community.

Although an aggregated indicator is likely to get the greatest exposure and a better chance of influencing decision-making, it does so by sacrificing some of the important details in the data. As Hazel Henderson argued: "A single index will gain more media coverage, but at the cost of obfuscation, since no one can unpack all the arcane assumptions behind it."[39]

Conclusion

While economic indicators are useful, they should not be confused with measures of well-being. The well-being of a society is a combination of economic, environmental and social goals and outcomes, articulated by the citizenry. Thus, a measure of well-being must be based on the progress of economic, environmental and community measures in society. Although many indicators could be used to measure well-being, an effective indicator must meet the technical requirements of a good indicator identified above, as well as be able to attract the attention of the public and policy-makers. In the next section, an attempt is made at developing a Minnesota genuine progress indicator, using the methodology for developing the U.S. genuine progress indicator.

Minnesota genuine progress indicator

In 1995, the president of an economic policy think tank in California, Redefining Progress, stated, "There is an urgent need to improve and broaden the accounting framework that steers public policy. If we are to preserve our social structure and natural habitat, we must develop means to estimate their contributions to our economic well-being. We offer the GPI as a step in this direction."[40]

The genuine progress indicator is an aggregate indicator comprised of 25 economic, environmental and social variables converted to monetary units. These variables offer a comprehensive perspective of the well-being of the United States since 1950. This composite sketch of the nation's progress incorporates such variables as the cost of crime, cost of family breakdown, the value of housework and the income distribution.[41] Taken alone, each of the

variables is interesting in its own right; however, when aggregated, they offer a unique perspective of the ups and downs of America since 1950.

While the national gross domestic product is essentially the sum of all economic transactions in the nation, whether they are a cost or a benefit to society, the GPI attempts to attain a more realistic indicator of progress by removing defensive expenditures (i.e., expenditures that do not add well-being but prevent deterioration), social costs and the depreciation of environmental assets and natural resources, and by adding values for nonmarket products and services (e.g., housework) to the nation's personal consumption weighted for income distribution. Like many indicators, the genuine progress indicator is not perfect, however, the inclusion of issues that have typically remained unmeasured and unrecognized, makes the indicator far more informative than any other measure of progress available.

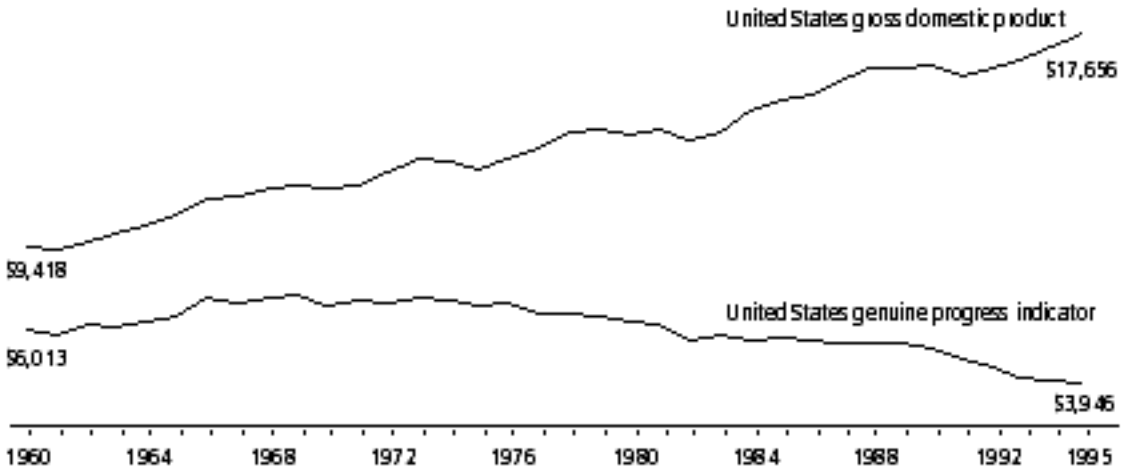
While the GPI was not created in an attempt to replace the GDP, it was in part designed to illustrate the pitfalls of using the GDP as a measure of well-being and to improve and broaden the accounting framework that directs public policy.

The absolute sizes of the U.S. GPI and GDP are irrelevant since the former measures progress as determined by some 25 variables, and the latter, output determined by billions of transactions. However, the relative direction of the lines is very important. The historical trend lines of the U.S. GPI and GDP take significantly different paths. They illustrate a divergence between the two indicators, especially since the mid-1970s, with the GPI falling and the GDP steadily rising.

A genuine progress indicator for Minnesota

Like the nation, Minnesota is in need of improved measures to provide more informed decision-making. To illustrate a historical picture of Minnesotan's well-being since 1960, a Minnesota version of the genuine progress indicator was produced. Data permitting, the methodology that Redefining Progress used in the nation's genuine progress indicator was applied to derive a Minnesota genuine progress indicator. In cases where the data was not available or inadequate, Minnesota estimates were extrapolated from the national figures. An explanation of assumptions and deviations in methodology from those used by Redefining Progress can be found in Appendix II.

From 1960 to 1995, the gap between the U.S. gross domestic product and the genuine progress indicator consistently widened



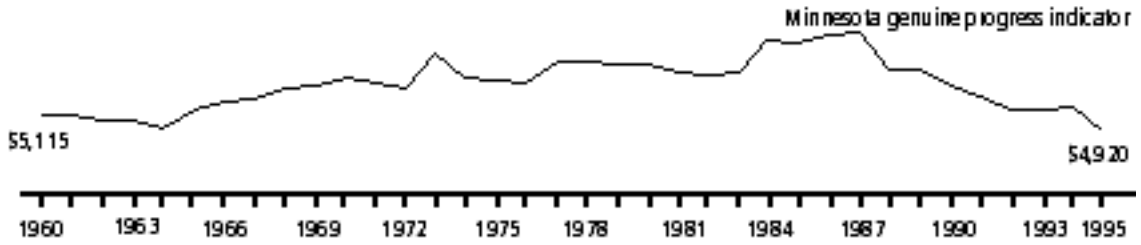
Source: Minnesota Planning

After reaching a peak in the mid-1980s, the Minnesota genuine progress indicator declined to levels in 1995 similar to those of the early 1960s. This fall can be largely attributed to the steady costs associated with environmental degradation. For example, fossil fuel demand has increased, and large tracts of agriculture land have been turned into urban uses.

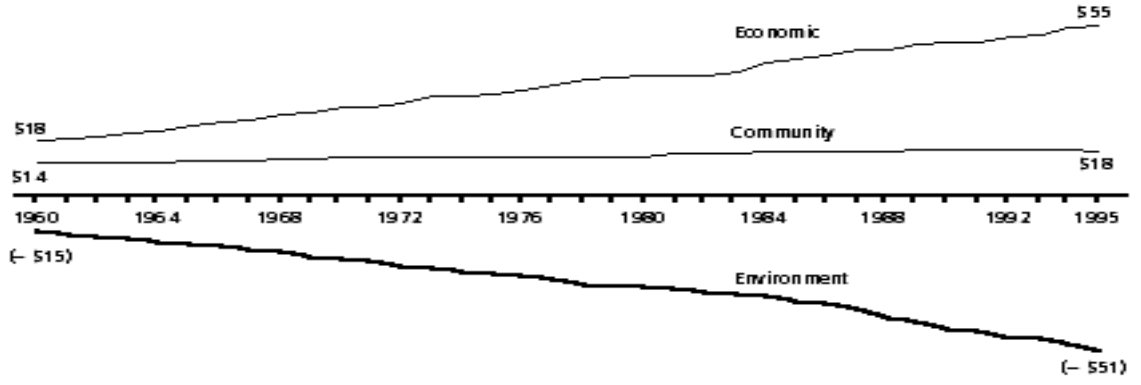
Aggregating the genuine progress indicator variables into either economic, environmental or community categories and then adding their values reveals an inconsistent pattern between the categories. While the environmental variables such as wetland loss and deterioration of air quality are predominately costs, their record since 1960 has revealed an increase in their cost to Minnesotans. Simultaneously, the economic variables such as services of consumer durables have been steadily increasing since 1960, while the community/social variables such as the value of housework have been on a slow rise.

While the economic variables in absolute terms constitute the greatest share of the Minnesota GPI (48 percent), the downturn of the environmental variables with a 30 percent share of the MN GPI was strong enough in the 1980s and 1990s to return the states GPI to the per capita figures of the early 1960s.

The Minnesota genuine progress indicator has declined since the mid-1980s to its lowest level in 1995



Based on the components of the Minnesota progress indicator between 1960 and 1995, the Minnesota economy improved, while the health of communities remained steady and the environment deteriorated



Source: Minnesota Planning

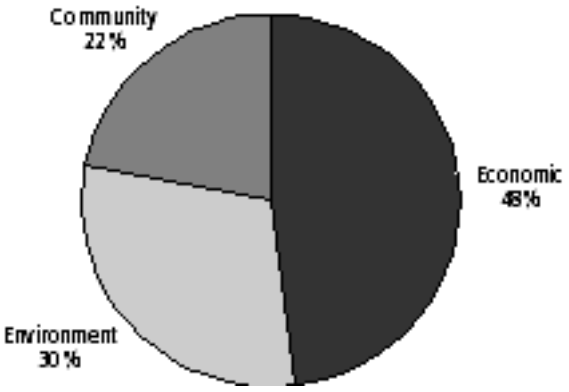
Resembling the U.S. GPI and GDP, the Minnesota GPI and GSP illustrate a divergence as well. To reiterate; the absolute size of the Minnesota GSP and GPI are irrelevant; however, their trends between 1960 and 1995 are important. While the divergence between the Minnesota GSP and GPI is not quite as profound as the national divergence, the Minnesota GPI does depict a slight drop in well-being since 1960. This decrease has taken place while the state's GSP has been on a steady rise.

Examining the cumulative percent changes of the Minnesota GPI and GSP and the U.S. GPI and GDP reveals that GPI figures had cumulatively negative results in 1995 while the GSP and GDP both exceeded a 60 percent gain in constant 1982 dollars.

Comparing the U.S. and Minnesota GPI's reveals a more dramatic swing from highest to lowest point for the national GPI, indicating more volatility. While having its own ups and downs, the Minnesota GPI has remained relatively stable over the last 35 years.

The genuine progress indicator is by no means the definitive indicator of well-being nor is it any easier to evaluate at the individual level. However, the GPI does attempt to incorporate many important facets of Minnesotans' lives that are good indications of their well-being.

In 1995, economic variables accounted for nearly one-half of the total Minnesota genuine progress indicator



Source: Minnesota Planning

Critique of the genuine progress indicator methodology

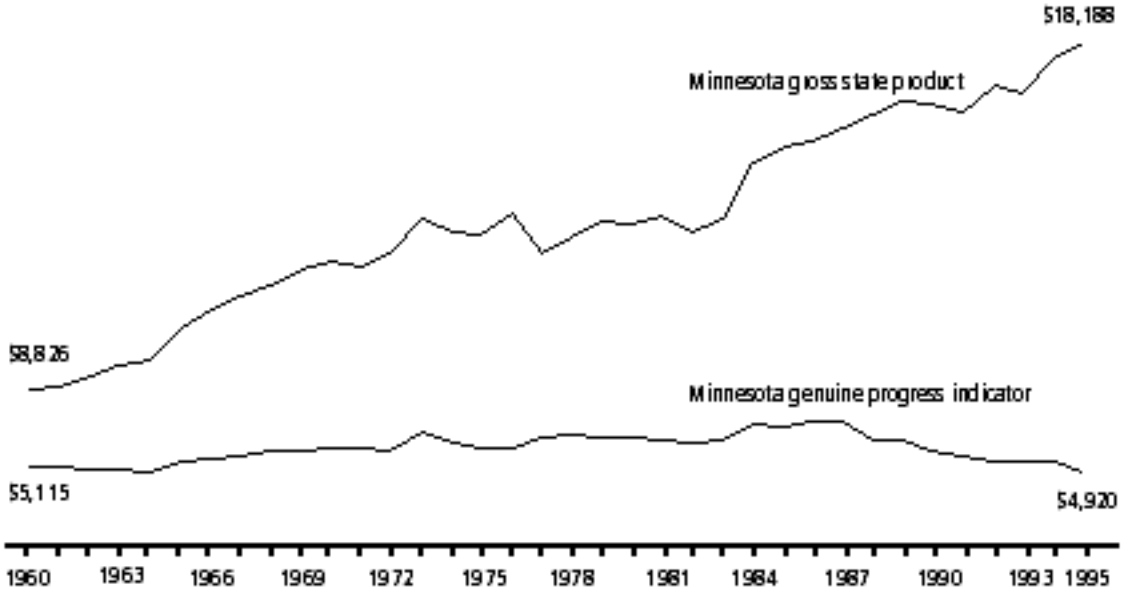
During the application of the national GPI's methodology with Minnesota data to develop the Minnesota genuine progress indicator, the methodology of the GPI was analyzed in depth. This was done to decide whether or not the Minnesota genuine progress indicator would be the best indicator to measure the well-being of Minnesota. While a critique of the 25 individual variables can be found in Appendix III, below are some of the overarching comments about the indicator.

The Redefining Progress' efforts at developing the GPI have had significant impact on the development of indicators several reasons. The first major contribution is the attempt to incorporate "the non-monetary contributions of families, communities and the natural environment."[42] Second, is the adoption a more comprehensive view of the indicator by including environmental, economic and community variables thereby revealing a broader picture than most indicators. Third, the aggregation of the data into one indicator is very significant since it can potentially receive greater attention than 25 individual indicators.

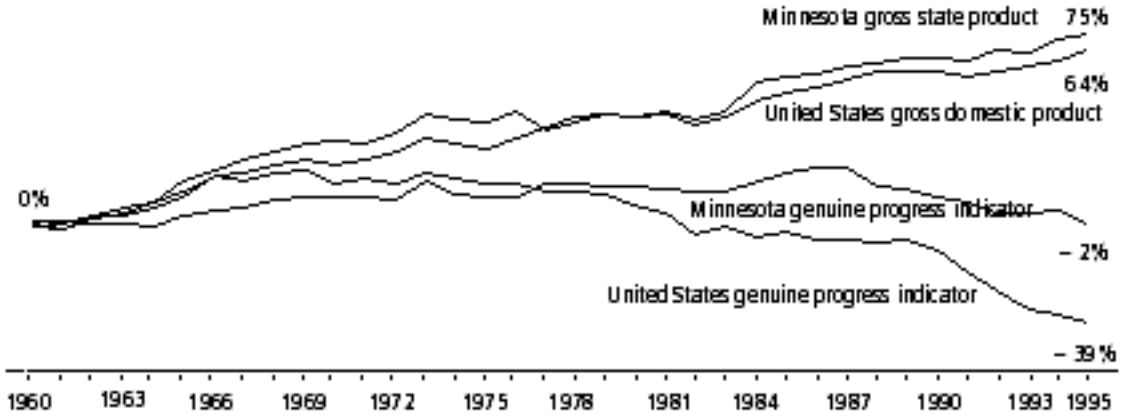
No explanation was given on how the variables that comprise the GPI were selected. This is especially troublesome since the variables significantly influence the conclusions that may be arrived at. Without an adequate explanation of the selection process for these variables, it leaves one to question how they were chosen. A related problem is the lack of citizen input in the process.

The seemingly ambitious effort of Redefining Progress to include data as far back as 1950 required a number of statistical manipulations that

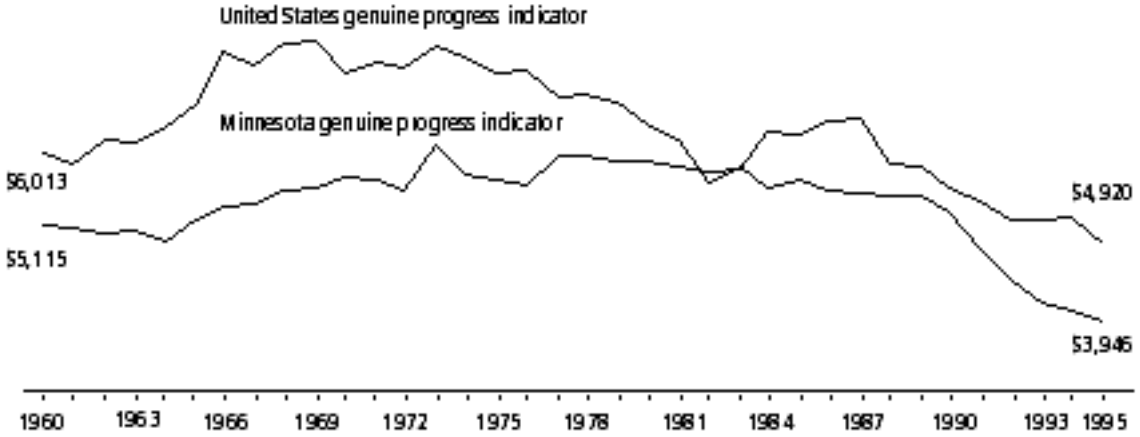
The gap between Minnesota's gross state product and its genuine progress indicator widened



The gap between the U.S. gross domestic product and the U.S. genuine progress indicator grew wider than the gap between Minnesota gross state product and Minnesota genuine progress indicator



Between 1960 and the early 1980s, the per capita U.S. genuine progress indicator was greater than the Minnesota genuine progress indicator per capita, however since then the latter has been greater



Source: Minnesota Planning

have brought the quality of their data into disrepute. For instance, interpolating of the data for many variables in the 1950 -1992 time frame is problematic, especially when working off few data points. In addition, some methods used in the interpolation were unexplained and often appear arbitrary. A more modest time frame based on availability of time series data would have provided a more robust and acceptable indicator.

While beneficial, the use of monetary values for environmental and social variables that traditionally do not have monetary values opened up the GPI to serious criticisms because of the assumptions that usually go with this methodology. Dollar values assigned to the variables, such as wetland costs associated with acres eliminated or wage rates for household work, have problematic assumptions. In some cases, the dollar values do not accurately account for the variability and changes associated with the benefits or costs of the variables.

While the GPI could potentially be an invaluable measure for policy-makers at the national level, it is doubtful this can be achieved without its use at the state, community and local levels. Unfortunately, the type of data used makes it extremely difficult for the replication of GPI below the national level. As the computation of Minnesota GPI illustrates, for nearly all of the variables, no comparable local data is available from the same source. At the same time, it was difficult to find other sources of Minnesota data that are similar to the national data that Redefining Progress used.

Describing a healthy economy

"*Economics*" -- from the Greek *"eco"* meaning "house or habitat" and *"nomos"* meaning "management"

It is easy to forget what economics is all about. As the etymology reminds us, it is not about abstract trade statistics or commercial transactions, but literally means "the management of the household." Ensuring that requirements of the "household" at all levels – home, city, state, country, world, -- are met and sustained is the goal of economics. The basic task of any economy is really the continuation and advancement of life, although few people think of it that way. So commerce is only one dimension of the economy. Education, housing, environmental protection, personal security and many other issues are critical to successful household management.

We often talk about our economy as though it were a self-contained entity -- separate from the people who have created it and make it work, and separate from the physical world in which it exists. In fact, our economy's riches flow directly from the natural world and it's wastes go back to the environment. Our economy is a creature of our society and is fundamentally bound up with the fate of both people and nature.

To create a healthy, *sustainable* economy, we must produce goods and services, create financial wealth *and* operate in ways that improve people's lives and the health of our environment. That means that improvements in one area – economic, environmental or social – cannot come at the expense of the other two. A sustainable economy is not so much about balancing or trading off "the environment" against "the economy," or "the economy" against "the community." Instead, it is seeking to improve all three simultaneously.

The fact that environmental, economic and social conditions are intertwined also means that the states that do the best job of investing in all three have the best chance of securing the highest quality of life for their citizens. Evidence suggests, for example, that states doing the most to protect natural resources also have the strongest economies and best jobs. A stronger economy, in turn, should mean less poverty, less crime and better living conditions for more people. These are the goals of a sustainable economy.

Goals and outcomes of a healthy, sustainable economy

To achieve our vision of sustainable development, some things must grow – jobs, productivity, wages, capitol and savings, profits, information, knowledge, and education – and others – pollution, waste, and poverty – must not. -- Sustainable America: A New Consensus

A sustainable economy replenishes its environment as it supports citizens and their communities. It is meeting our needs today *and* leaving things as good or better than we found them.

In 1992, Minnesotans identified goals for a healthy economy as part of *Minnesota Milestones*, a set of state progress measures which were updated in 1998. In addition, the Minnesota Round Table on Sustainable Development, a group convened by the governor, has described the outcomes of a sustainable economy. Together, these ideas present a picture of what most Minnesotans would like to create and pass on to their children and all future generations. These goals are:

Goal 1: Minnesota will have sustainable, strong economic development

Economic growth creates jobs and may increase opportunities for better jobs and improved living standards. Growth may aid progress toward other Minnesota Milestones goals but does not guarantee it. The use of the word "sustainable" in this goal reflects Minnesotans' belief that economic growth and environmental protection should be complementary objectives. The term also conveys Minnesotans' belief that long-term growth is a higher goal than short-term growth. – Minnesota Milestones 1998: Measures That Matter

To achieve sustainable outcomes, Minnesotans and their economy should:

- Have a diverse mix and geographic distribution of businesses.
- Create a business climate that fosters entrepreneurship and profitability through resource productivity and operational efficiency and that encourages business to invest in communities and the environment.
- Provide sufficient infrastructure and public services to encourage efficient business and community development and protect public health and the environment.
- Efficiently transform natural resources, energy, waste, knowledge, information and skills into goods and services.

Goal 2: All Minnesotans will have the means to maintain a reasonable standard of living

Economic growth provides a foundation for economic prosperity but does not ensure a better standard of living for all Minnesotans. The citizens who helped create Minnesota Milestones stated clearly that living slightly above the poverty level is not adequate for a reasonable standard of living. – Minnesota Milestones 1998: Measures That Matter

- To achieve sustainable outcomes, Minnesotans and their economy should:
- Produce a highly skilled work force that meets business and community needs.
- Produce jobs that provide people with sufficient wages to meet basic needs and contribute to society.
- Provide fair and affordable access to jobs, education, transportation, health care and other basic services.
- Fairly place costs for services on individuals and groups that benefit, and account for impacts on future Minnesotans.

Goal 3: Rural areas, small cities and urban neighborhoods throughout the state will be economically viable places for people to live and work

Many of the people from around the state who helped create Minnesota Milestones expressed the strong desire that they and their children continue to be able to live in their community. Economic opportunity heavily influences where people

choose to live. – Minnesota Milestones 1998: Measures That Matter

To achieve sustainable outcomes, Minnesotans and their economy should:

■ Encourage locally owned and controlled businesses and local production of goods and services that adds value to Minnesota resources.
■ Provide business opportunities in every region of the state tied to local and regional economic, environmental and community amenities.
■ Provide ample opportunities to all Minnesotans for decent, safe and affordable housing.
■ Improve the environment and communities as a natural result of economic activity, not the exception.

Goal 4: Minnesotans will conserve natural resources to give future generations an efficient and strong economy

The Minnesota Milestones vision calls for the wise use of resources – conserving energy, reducing waste and developing innovative ways to recycle. People in Minnesota and throughout the world are gradually learning how to use natural resources in ways that can sustain both economic growth and a healthy environment over the long term. – Minnesota Milestones 1998: Measures That Matter

■ To achieve sustainable outcomes, Minnesotans and their economy should:
■ Attract businesses and business expansions without added incentives because of the quality of life possible here.
■ Replenish renewable resources at least as fast as they are used.
■ Use non-renewable resources efficiently while developing substitutes or substitute technologies when these resources are no longer available.
■ Use land efficiently and prudently while beneficiaries pay the full costs for these uses.
■ Encourage self-regulation and focus regulatory requirements on verifiable, sustainable outcomes rather than procedural measures.

Goal 5: Minnesotans will restore and maintain healthy ecosystems in support of a healthy economy

This goal expresses the importance of lakes, wetlands, forests and wildlife to Minnesota's quality of life. It also reflects the growing understanding that active promotion of healthy ecosystems and habitats, such as prairies and forests, is the key to abundant plant, animal and fish life. Healthy ecosystems serve many environmental, social and economic purposes. –Minnesota Milestones 1998: Measures That Matter

To achieve sustainable outcomes, Minnesotans and their economy should:

■ Create a nontoxic environment for people and ecosystems.
■ Eliminate gradually the concept of "waste" by producing and consuming in ways that reduce or avoid use of materials in the first place, that reuse and recycle materials, or that return waste to "food" for either business or nature.
■ Invest in the state's natural infrastructure – such as wetlands, streams, lakes, natural areas, corridors and forests – so as to nurture critical habitats, sustain clean air, land and water, and safely assimilate wastes.
■ Restore and sustain community and ecosystem health.
■ Improve the quality of life in Minnesota without diminishing it elsewhere.
■ With this description of a healthy Minnesota economy, we ask Minnesotans to question basic assumptions about the relationships between the environment and the economy, the economy and communities.

Measuring what counts for a healthy economy

Introduction

Minnesota needs a flexible, realistic and comprehensive indicator to gauge its progress toward sustainable development. *Economics for*

Lasting Progress has developed a new indicator, the Minnesota progress indicator, to serve this purpose and to complement the various measures already in use.

Minnesotans, and specifically, Minnesota policy-makers, have historically relied on such measures as the unemployment rate, the gross state product and median household income to assess the state's well-being. Modeled after the U.S. gross domestic product, Minnesota's gross state product attempts to measure productivity. But these indicators can be misleading. And, they tell only part of the story.

Consider the 1989 Exxon Valdez oil spill. Here was an incident that destroyed a part of the environment. No one would say this was a good thing, yet viewed through the prism of the U.S. gross domestic product and Alaska's gross state product, the oil spill "improved" the economy because clean-up costs increased both measures.

A new measure of progress

To create a more accurate and holistic measure of the state's economic well-being, the Minnesota progress indicator is proposed. The Minnesota progress indicator is an aggregation of 42 economic, environmental and community measures. The Indicator is not intended to be the definitive indicator for Minnesota's economic well being; it is rather a beginning step in integrating environmental, economic and community information in a way that can help citizens and policymakers view the state's progress from a more realistic and comprehensive perspective.

Minnesota progress indicator

The development of the Minnesota progress indicator was predominately influenced by three works, the *genuine progress indicator, Minnesota Milestones* and *Describing a healthy economy.* While the measures in the *genuine progress indicator* were found to be too broad for any useful state application, the concept of aggregating economic, environmental and community measures was determined to be beneficial.

Using extensive public input, Minnesota Planning's *Minnesota Milestones* project developed goals and a set of progress indicators for the state. Seventy measures based on these goals were developed in the areas of people, community, democracy, economy and environment. The Minnesota progress indicator is not designed to replace *Minnesota Milestones*; rather it should supplement it by providing a more detailed look at Minnesota's economy as it relates to the state's environment and communities. Five *Minnesota Milestones'* goals as well as several measures were used in the Minnesota progress indicator.

Describing a healthy economy provides a vision and characteristics of what a healthy economy should look like, using five *Minnesota Milestones* goals as the foundation. *Describing a healthy economy* further identifies a series of desirable outcomes, which are the basis of the Minnesota progress indicator.

After examining over 70 indicator projects with hundreds of measures, 42 measures were selected to evaluate Minnesota's progress toward the outcome statements (Appendix IV). Data for the measures was gathered for the years 1990 to 1997. Inadequate data before 1990 prevented a longer historical perspective. For each of the eight years examined, the percentage change of each measure was assessed in relation to 1990 levels. Each measure was considered on an equal basis, none were weighted. In some cases, signs were changed so that a graphical upward trend reflected a positive move and a trend down reflected a negative move. This is important, because some variables such as the Toxic Release Inventory are beneficial when they decline, so steps were taken to convert those reductions into representing a positive trend.

The usefulness of the Minnesota progress indicator

These 42 measures were used in four ways. First, all 42 measures were aggregated to form the Minnesota progress indicator. Second, the 42 measures were sorted into three categories, economy, environment and community. When appropriate, measures were used in more than one category (Appendix V). Third, the measures were sorted under 14 of the 22 outcome statements. Due to a variety of constraints, eight outcome statements do not have any measures. Finally, trend data and a more thorough explanation of the methodology is available for each of the measures in Appendix VI.

An underlying assumption of the Minnesota progress indicator is that in the long-run Minnesota's economy can be healthy only if our environment and our communities are healthy. To capture these vital interdependent relationships, the Indicator uses comprehensive measures wherever possible. For example, rather than simply looking at income growth rates, the Indicator links income growth rates to the growth rates of housing and tuition.

Similarly, the Minnesota progress indicator gauges productivity by relating the Gross State Product to the energy used and waste produced in its generation, creating measures of the economy's energy and materials efficiency. These kinds of measures help determine if we are improving our economy at the expense of our communities and our environment.

Another plus: the Minnesota progress indicator is simple yet comprehensive. It can be viewed as a composite index or measures within it can be viewed separately to reveal the progress or decline of various aspects of the economy, environment and communities. This highlights the main purpose of the Minnesota progress indicator, which is, to help policy-makers and citizens realistically assess strengths and weaknesses of the economy in its broadest sense.

A caveat is in order, however. The Minnesota progress indicator does not measure all facets of Minnesota life. Certain areas, such as volunteerism and civic involvement, were excluded to focus on the progress of Minnesota's economy – broadly defining the economy to include community and environmental factors that directly influence the economy.

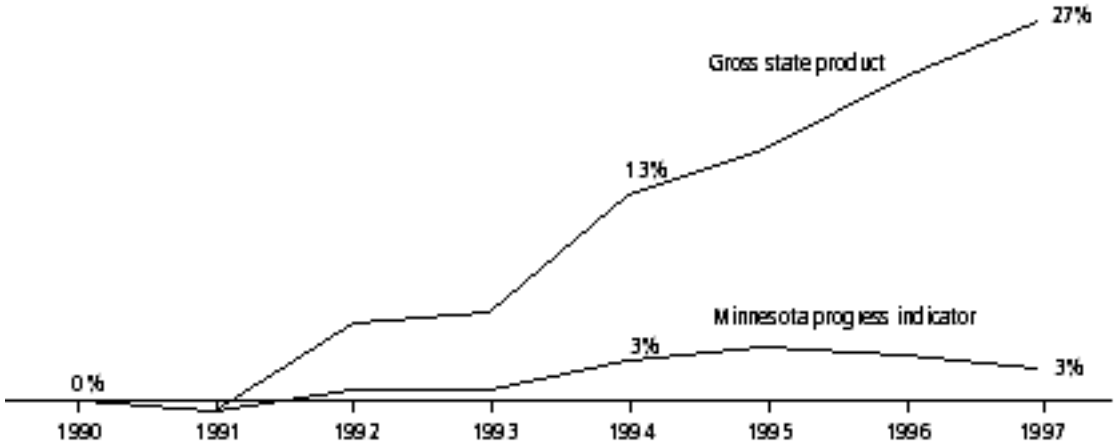
In addition, the Minnesota progress indicator was unable to measure how well the state is doing in certain areas because data is not available. Otherwise, such factors as underemployment, percent of locally owned businesses and household hazardous waste generated and consumed would have been included. To improve the Indicator, the state should systematically begin collecting data on these and other measures.

The Minnesota progress indicator cannot answer all questions about the well-being and the progress of Minnesota's environment, economy and communities. However, by providing a comprehensive look at Minnesota's economic well-being it offers a tremendous amount of value in pointing out areas of concern and success to policymakers and citizens.

Trends in Minnesota's economic health

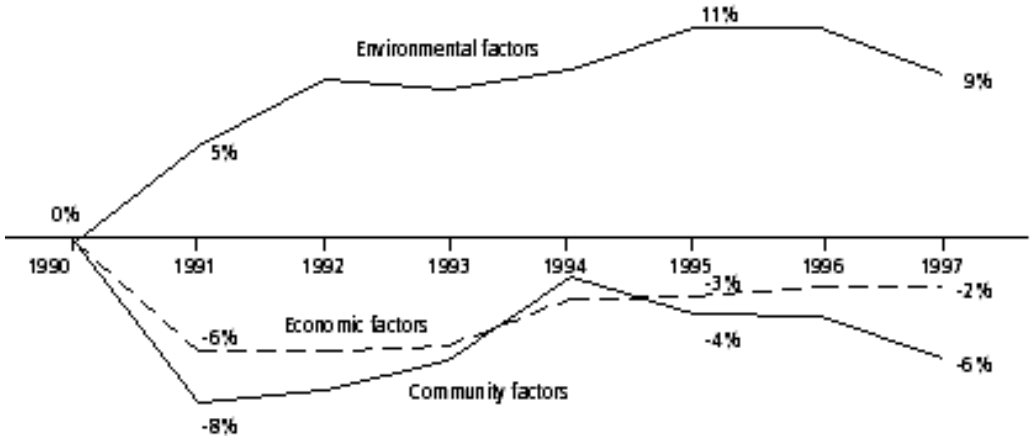
Overall, the Minnesota progress indicator shows that Minnesota's economic health improved only slightly during the 1990s – not nearly as dramatically as the gross state product would indicate. In fact, the gross state product had nine times the growth compared to the Minnesota progress indicator between 1990 and 1997. Specifically, the Minnesota progress indicator grew three percent while the gross state product had a 27 percent gain. This raises the question of whether the gross state product paints too rosy a picture of the state's economy. Strong state and national economies apparently fueled most of the growth for both Minnesota's gross state product and the Minnesota progress indicator between 1993 and 1996.

Minnesota's gross state product clearly outperformed the Minnesota progress indicator
Percentage change from 1990



Minnesota's gross state product is a measure of all goods and services produced in a year. The Minnesota progress indicator is comprised of 42 economic, environmental and community elements that measure the economic progress of the state.

The environmental factors of the progress indicator improved while the economic and community factors fell below 1990 levels
Percentage change from 1990



The 42 measures of the Minnesota progress indicator were grouped into the categories of economic, environmental and community to evaluate the changes in these three areas between 1990 and 1997.

Business diversity improved minimallyercentage change from 1990

The business diversity factor measures the distribution of employment by sector, percent of firms in each sector, proportion of sales by sector and the distribution of employees and population in Minnesota planning areas.
Source: Minnesota Planning

Economy

Despite the fact that Minnesota and the nation experienced prolonged economic growth as measured by such traditional methods as the gross state product, unemployment rates, inflation and income growth, the 26 economic measures that constitute this indicator showed mixed results. Collectively, the Minnesota progress indicator's economic measures stayed below 1990 levels throughout the entire period. They hit their lowest point in 1991 and peaked in 1997.

Besides using such traditional economic measures as the gross state product, income and unemployment, the Minnesota progress indicator's economic measures also include elements such as business failures and the distribution of businesses.

In addition, the Minnesota progress indicator takes conventional economic measures and meshes them with new elements to create more comprehensive measures. For example, the Indicator relates the gross state product to energy use, offering a new measure of the economy's energy efficiency, a factor expected to become more and more significant as global oil supplies diminish and global climate change dictates policy change.

Environment

The measures that compose the environmental factor capture three specific interactions between environment, economy and community. The first set deals with the environmental damage (costs) that result from business activities. The second evaluates whether or not our natural capital is being depleted as a result of our activities. The third measures overall environmental quality as a business asset.

Based on the 21 environmental measures in the Minnesota progress indicator, Minnesota is doing a better job of taking care of the environment than it did in 1990. Gains occurred between 1990 and 1995 before leveling off. Much of the improvement can be attributed to our success in controlling point sources of pollution, as indicated by reduced air pollution, fewer underground storage tanks that leak, and more recycling. A different picture would emerge if we examine indicators that measure the depletion of natural capital or environmental quality.

Community

Overall, the quality of life, as measured by the 15 community elements, worsened between 1990 and 1997, though there was a brief rally in the mid-1990s. The community measures include such things as income distribution, access to jobs, education and health care. Higher health care costs and a large number of business failures -- nearly a three-fold increase from 1990 -- drove the community measure down in the early 1990s. In the mid-1990s, however, a more equitable distribution of income and fewer business failures helped the measure climb.

Goals and outcomes

The 42 indicators that comprise the Minnesota progress indicator were developed to measure the outcome statements. For each outcome, there is first a description of the outcome's importance for a sustainable economy, followed by a list of elements measured in the outcome, then an illustration of the trend for the outcome, an explanation of the trend, and finally a list of other indicators that were considered but not included. Many measures were excluded primarily due to data constraints.

Goal 1: Minnesota will have strong, sustainable economic development

Minnesota's economy has a diverse mix and geographic distribution of businesses. This outcome draws attention to the composition of Minnesota's economy and the spread of economic opportunities in the state. An important characteristic of a robust economy is a diverse mix of economic activities, which reduces its vulnerability to an economic downturn in one or more industries. In addition, measuring the health

of any economy must take into consideration the availability of economic opportunities at all locations, including metropolitan, urban and rural areas. Thus, Minnesota's economy must have a diverse composition of economic activities and also provide people living everywhere in the state access to economic opportunities without requiring them to move to other locations.

Four measures were used to assess the strength of Minnesota's economy. The measures are employment by sector, percent of firms in each sector and sales in each sector. A measure of employees per population in Minnesota Planning

Areas, as defined by the Minnesota Department of Economic Security, is used as a surrogate for the availability of economic opportunities across the state.

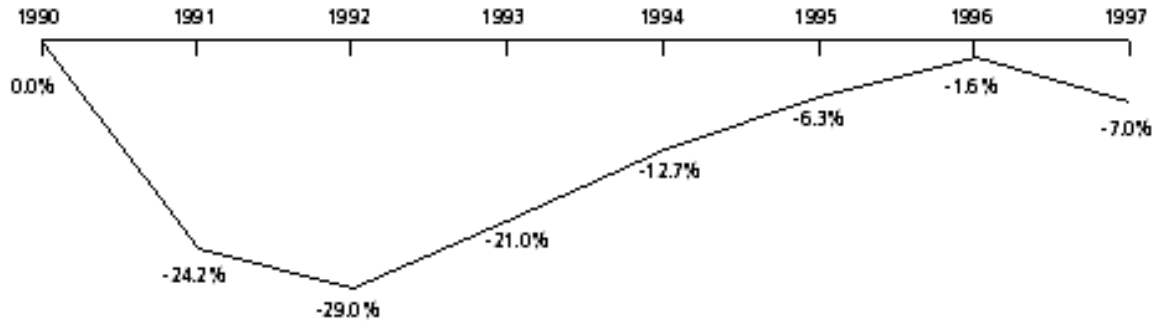
The composite indicator for this outcome shows that since 1990, Minnesota's economy has become more diverse and more economic opportunities have developed for people living in different parts of the state. However, a closer look at the individual measures show that the geographic distribution of businesses has improved but Minnesota's economy is becoming slightly more specialized. All three industrial composition measures show a downturn. Though this pattern may suggest increased vulnerability, it is important to examine the sectors that are increasing in importance to determine their volatility and whether they offer better opportunities for employees.

Other measures considered, but not included for lack of data, were the geographical distribution of new businesses and jobs in the state and the distribution of natural resource consumption or energy use by economic sector.

Minnesota creates a business climate that fosters entrepreneurship and profitability through resource productivity and operational efficiency and that encourages business to invest in communities and the environment. A healthy economy attracts and maintains business investments due to opportunities and the overall business climate. Businesses in such an economy would have a long-term interest in the community and would be more likely to invest in the community. For Minnesota's economy to be competitive, it must retain existing businesses, foster entrepreneurship and generate reasonable returns on investment.

Three factors measure entrepreneuership and profitability in Minnesota's economy. These are business success and failure rates, the state's national rank in new business incorporations and percentage rate of businesses closing, and corporate tax on profits. Each year, the Corporation for Enterprise Development ranks all states for their new companies (normalized by the number of workers) and business closings.

Minnesota's business climate fell and the recovered
Percentage change from 1990



Elements of the business climate factor include the ration of new business incorporations to business failures, Minnesota's national rank in business climate and changes in corporate tax on profits.
Source: Minnesota Planning

Although measures for business investment in the community and the environment should be included, that kind of data is not yet available.

The data suggest a substantial decline in Minnesota's business climate between 1990 and 1992, followed by improvements between 1992 and 1996, before falling again in 1997. The decline in the early 1990s was driven mainly by a substantial number of business failure rates (66.8 percent more in 1991 than in 1990 and 64 percent more in 1992). Although failure rates fell between 1993 and 1996, the rates began to increase again in 1997, pulling down the overall indicator. In comparison with other states, Minnesota does an excellent job of maintaining existing business but has been less successful in attracting new companies.

Other measures considered, but not included for lack of data, were businesses that contribute financially to non profit organizations or to the community, business expansion as measured by employment or gross sales, the number of successful businesses that have started within the last five years, businesses involved in school and civic events and number of businesses involved with pollution prevention programs.

Minnesota efficiently transforms natural resources, energy, waste, knowledge, information and skills into goods and services. Productivity is an important component of a healthy economy. However, productivity should not be gauged only in terms of income and products resulting from economic activities. The amount of resources used in the production process and the waste generated must also be considered.

The gross state product is the most common measure of productivity. However, it does not consider the use of resources and waste generation in the production process. We attempt to compensate for this limitation by linking the gross state product with labor (gross state product per worker), energy consumption (gross state product per million British Thermal Units of energy consumption) and solid waste generation (gross state product per amount of solid waste). In addition, an emissions-to-job-ratio for the manufacturing sector is computed.

After a slight decrease between 1990 and 1991, Minnesota's economy recorded sustained improvements in productivity. Consequently, Minnesota made more efficient use of its resources and generated less waste in the process.

Although worker productivity and energy use improved, the far greater and sustained improvements in waste generation and emissions account for the overall upward trend of the of high school graduates has not composite index.

Other measures considered but not included for lack of data were gross state product per raw material use (natural resource depreciation) and hazardous waste generation.

Goal 2: All Minnesotans will have the means to maintain a reasonable standard of living.

Minnesota produces a highly skilled workforce that meets business and community needs. The quality of workers' education is important for economic productivity and also for effective participation in the community. In other words, an educated citizenry is critical for economic development and community improvement.

Although many measures were considered for this outcome, ultimately, the percentage of high school graduates who pursue additional education or training became the sole measure. This is largely due to data constraints. This factor is a good measure of initial commitment to education or skill training by young people who will make up the state's future work force.

The data show some improvements in post-high school education and training, especially between 1990 and 1994 and a slight decrease thereafter. A cautionary note: It is not appropriate to interpret changes from year to year since the state's survey been based on a consistent and representative sample.

Other measures considered but not included for lack of data were the number of businesses satisfied with the training of employees coming out of universities and colleges, the percentage of labor force involved in continued learning, labor force broken down into highest education attainment level and jobs filled by non-Minnesota residents.

Minnesota produces jobs that provide people with wages sufficient to meet basic needs and contribute to society. Having a labor force that earns good wages is an important characteristic of a vibrant economy. A low unemployment rate typically reduces welfare spending and increases income, consumption and tax revenues.

The measures for this outcome are: the unemployment rate, the cumulative growth rate of the nationally determined poverty income for a family compared to the median income for a Minnesota family and a comparison of income growth rates for the poorest versus the wealthiest citizens.

Looking at distribution of income among Minnesotans during this seven-year period, the poorest 20 percent gained more financial ground than did the wealthiest 20 percent. However, the growth in median income for a family outpaced the growth of income for residents classified as poor by federal guidelines. In addition, Minnesota's unemployment rate fell to historically low levels by 1997.

Other measures considered, but not used due to lack of data included underemployment, hours required to work at minimum wage to meet basic needs and the percent of jobs that pay less than a livable wage.

Productivity has steadily improved
Percentage change from 1990

The productivity factor includes gross state product per worker, gross state product per unit of energy consumption, gross state product per ton of solid waste and a toxic release inventory emission-to-manufacturing job ratio.

Skills of Minnesota's work force have risen
Percentage change from 1990

This indicator is based on the percentage of high school students who pursue additional education.
Source: Minnesota Department of Children, Families and Learning

Minnesota provides fair and affordable access to jobs, education, transportation, health care and other basic services. Access to health care, education, transportation and other basic services are essentials for a strong economy and thriving communities. Employment has been addressed under a separate outcome.

The measures selected for this outcome are tuition costs as a percent of median disposable income, percentage of Minnesotans with health insurance coverage, the average monthly cost of health insurance and public transportation trip miles for the Twin Cities compared to population.

Minnesotans have less access to basic services, which is primarily because tuition and health care costs rose faster than income between 1990 to 1997. The public transportation and health care coverage measures fluctuated above and below the 1990 levels throughout the time period.

Other measures considered but not used due to lack of data were: number of vocational and job training programs and the percent of Minnesotans living within one-quarter mile of a public transit stop.

Goal 3: Rural areas, small cities and urban neighborhoods throughout the state will be economically viable places for people to live and work

Minnesota encourages locally owned and controlled businesses and promotes local production that adds value to Minnesota resources. Community and state economies benefit if they can add value to homegrown natural resources. In Minnesota, adding value to agricultural and timber products results in jobs, income and taxes within the state rather than elsewhere. Similarly, if businesses are owned locally rather than by an outsider, profits are more likely to stay in Minnesota.

The measures used for this outcome are sales of value-added agricultural products as a percent of total Gross State Product and sales of value-added timber products as a percent of total gross state product. Information on local ownership and how many of our resources are processed locally was not available, so these could not be measured.

While both factors were below 1990 levels at the beginning and the end of the time period considered, the upward trend in the middle is a result of an increase in value-added agriculture products in 1993 and 1994 and value-added timber products in 1995.

Other measures that were considered but not used due to lack of data were: the percent of locally owned businesses, percent of products/ services that local businesses buy from each other and a comparison of wood processing volume to saw-timber harvest volume.

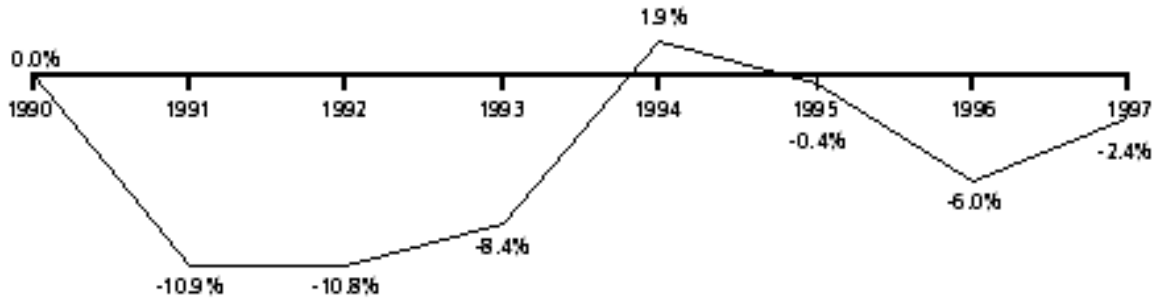
The state and communities provide ample opportunities to all Minnesotans for decent, safe and affordable housing. Shelter is a fundamental necessity of life, and thus it is imperative that all Minnesotans have access to safe and affordable housing.

The measures used for this outcome assessed median annual rent as a percentage of median family income, the growth in house prices compared to the growth in the median household income level and the percent of the state's residents who are home owners. The apartment rent data that was included was for the Twin Cities since it is the only data available.

Overall, access to housing has improved. Home ownership has become more expensive during this period, but more Minnesotans own their homes and rents have become more affordable.

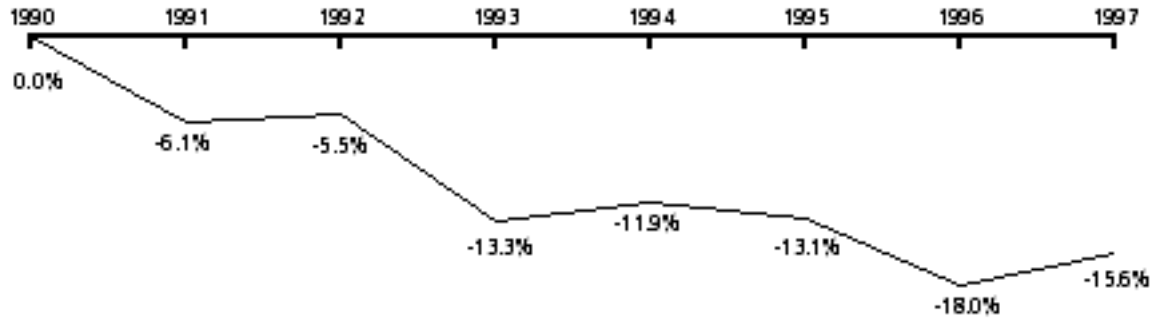
Other measures considered but not included due to lack of data were distribution of affordable housing throughout the state, percent of households spending more than 30 percent of their income on housing and annual growth in assessors market value of the state's homesteads.

Percentage change from 1990



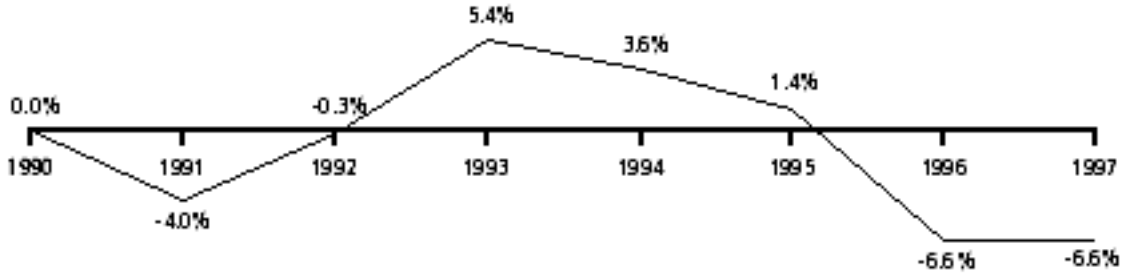
Unemployment rate, comparison of poverty income to median income and comparison of growth rates for the poorest and wealthiest Minnesotans make up this indicator.

Access to education, health care and transportation continuously fell
Percentage change from 1990



The measures graphed here are tuition costs as a percent of median disposable income, health insurance coverage, health insurance costs and per capita public transportation miles for the Twin Cities

Value-added timber and agricultural products show a mixed trend
Percentage change from 1990



The factors included in this chart are sales of value-added timber and agricultural products as a percentage of Minnesota's gross state product.
Source: Minnesota Planning

Goal 4: Minnesotans will conserve natural resources to give future generations an efficient and a strong economy

Minnesotans replenish renewable resources at least as fast as they are used. Maintaining and not degrading Minnesota's renewable resources are vital to ensuring a healthy environment, strong communities and vibrant economy in the future. Moreover, Minnesota wants to continue developing its ability to use renewable resources for generating energy. Doing so will improve the state's economy and environment.

Measures for this outcome are: volume of timber harvest, percent of renewable energy (wind, hydroelectric and solar power) consumed, annual water use per day per capita and change in the depth of water table (aquifers). Due to our limited knowledge of what constitutes a sustainable rate of use, these measures cannot be used directly to assess whether resources are being used up faster than they can be replaced, they are, however, useful measures of our consumption of renewable resources.

In general, Minnesotans are using renewable resources at a faster rate in 1997 than they did in 1990. For example, more of our energy is from renewable sources. At the same time, our timber harvest has increased and we are using water at a higher rate. In fact, our aquifers are at levels lower than historical averages.

Other measures considered for this outcome, but not used for lack of data included water use as compared with a 1:50-year drought rainfall recharge amount and yearly tons per acre loss of topsoil.

Minnesotans use nonrenewable resources efficiently while developing substitutes or substitute technologies when these resources are no longer available. Minnesotans are increasingly dependent on fossil fuels for heating, electricity and, especially, transportation. This is a concern because of the harmful effects that extracting, transporting and burning fossil fuels has on communities and the environment. Though renewable fuels play a small role in providing energy needs today, it is likely that their role will increase in the future.

The measures considered for this outcome are annual energy consumption per person, annual gasoline consumption per capita and annual vehicle miles traveled per person.

Minnesotans use more nonrenewable energy – namely gasoline – than they did seven years ago. This increased use in gasoline is strongly related to an increase in the number of vehicle miles traveled since 1990. In addition, overall per-person energy consumption has risen as well.

Other measures considered but not included for lack of data were the amount of minerals extracted each year in relation to known reserves, and reduced energy production due to conservation measures.

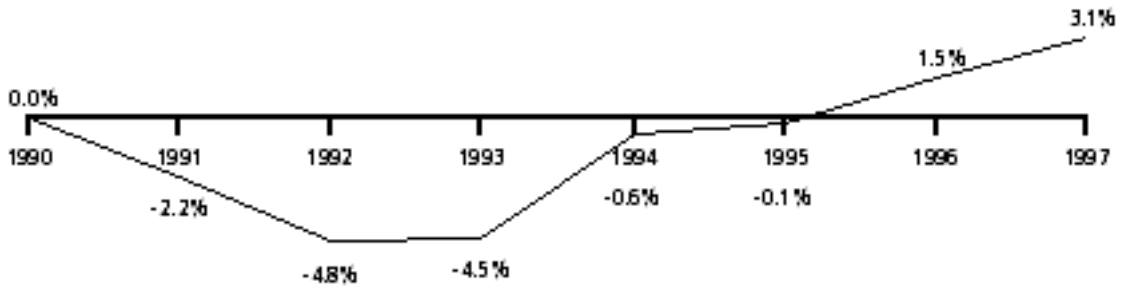
Goal 5: Minnesotans will restore and maintain healthy ecosystems in support of a healthy economy

Minnesota needs to create a nontoxic environment for people and ecosystems. Industrial production processes have long used and created toxic chemicals. Stricter regulations in the 1990s have reduced the use of some toxic chemicals. However, ensuring that Minnesota has a nontoxic environment also requires concerted efforts to reduce toxins used in the state's households. No indicators could be found to measure this.

Measures for this outcome are: percent of monitored wells with atrazine below or equal to 1 part per billion, criteria air pollutant emissions and the tons of toxins released into the environment as measured by the Toxic Release Inventory.

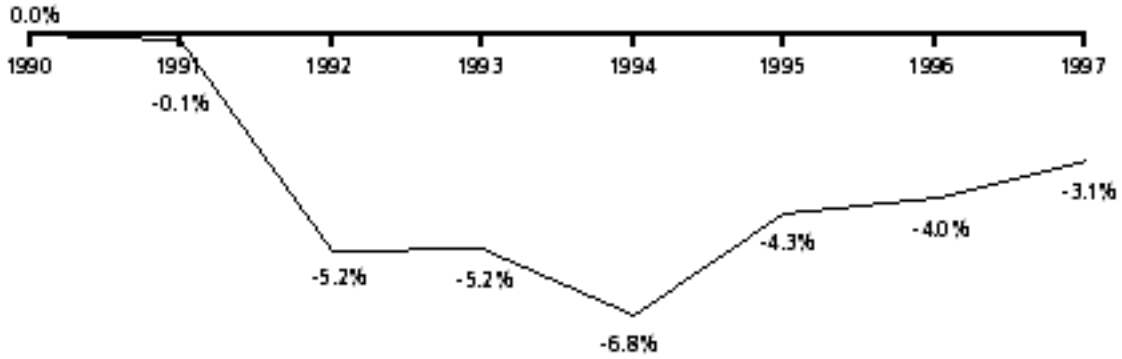
The three measures used here suggest that, by 1997, Minnesota was releasing fewer toxins into its air, water and soil. A dramatic decrease in the

Housing access fell before escalating in the mid-90s
Percentage change from 1990



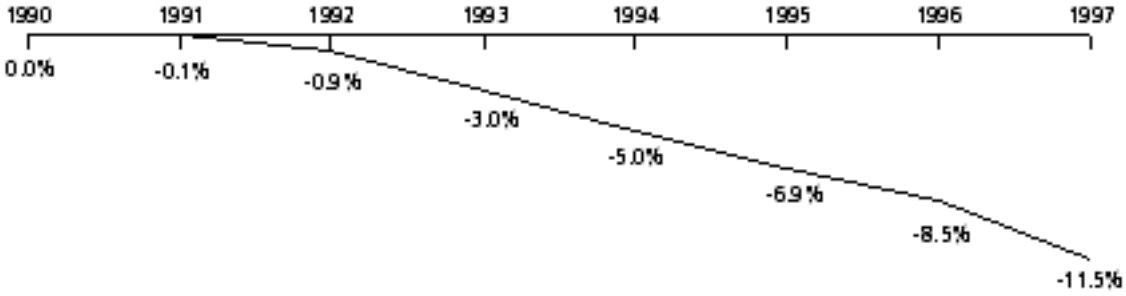
This chart measures median monthly rent as a percentage of median household income, ratio of median-household-income-to-house-prices and home ownership rates.

Minnesota's renewable resources are under greater pressure
Percentage change from 1990



This chart measures the combined trends of volume of timber harvest, percent of renewable energy used, annual water use and change in depth of two Minnesota acquifers compared to historical levels.

Minnesotan's are using more nonrenewable (irreplaceable) sources of energy
Percentage change from 1990



This trend line represents the combined annual energy consumption, annual gasoline consumption and vehicle miles traveled.
Source: Minnesota Planning

Toxic Release Inventory, a measure used by the Environmental Protection Agency, and a drop in air emissions from the criteria pollutants during this period drove this outcome's trend line in a positive direction. One caveat: The Toxic Release Inventory measures only a portion of hazardous chemicals used and it may be misleading to assume that the overall amount of hazardous waste has decreased due to a drop in the release inventory.

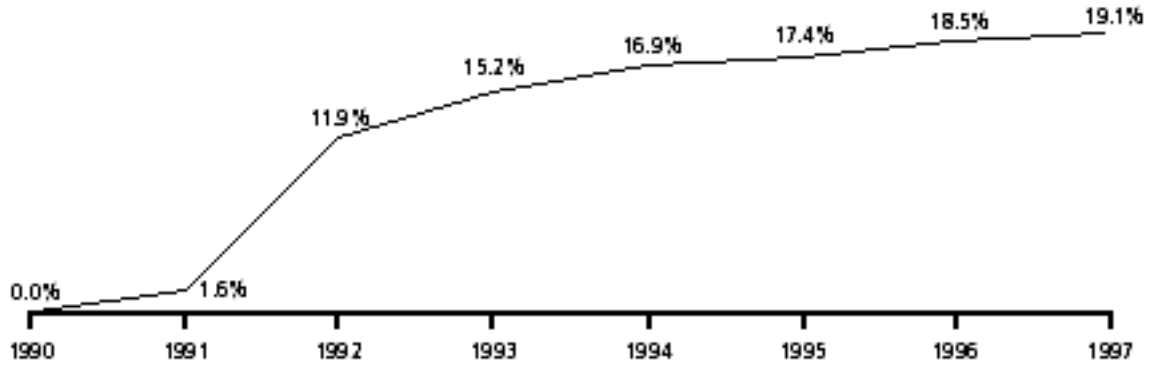
Other measures considered but not included for lack of data were the volume of hazardous waste generated each year, and the pounds of household hazardous waste generated by type.

Eliminate the concept of "waste" by producing and consuming in ways that reduce or avoid use of materials in the first place, that reuse and recycle materials, or that return waste to "food" for either business or nature. It is likely that many consumers and many businesses waste resources. Waste can be generated during production, consumption and disposal. Today, however, many businesses recognize that reducing waste helps their bottom line. At the same time, consumers are doing a better job of recycling.

With the toxic and hazardous waste being considered in the previous outcome, the factors measured under this outcome are the tons of solid waste per person per day and the percentage of solid waste recycled.

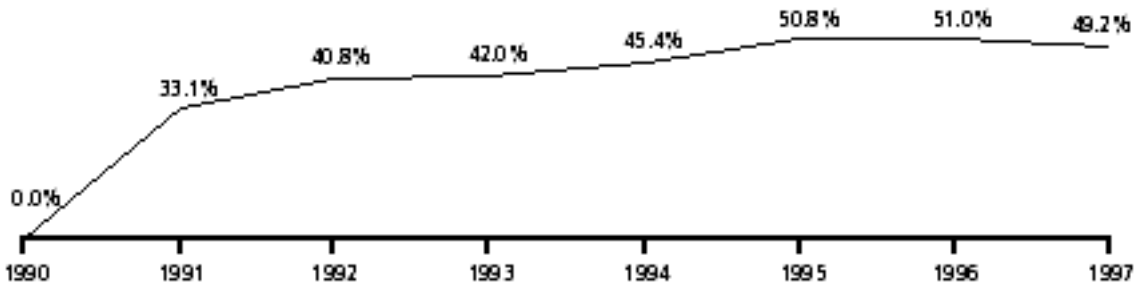
Though Minnesotans are putting more waste into

Minnesota's environment has become less toxic
Percentage change from 1990



The three factors in this trend line include criteria air pollutant emissions, percentage of monitored wells with atrazine below or equal to one part per billion and toxic release inventory emissions.

Progress has occurred in eliminating waste
Percentage change from 1990



Trends measured on this chart are tons of solid waste generated and percentage of solid waste recycled.
Source: Minnesota Planning

their landfills, many more residents have embraced recycling as a means of disposal. The amount of solid waste generated per capita increased by 11 percent between 1990 and 1997. At the same time, the percent of solid waste that was recycled doubled to reach 46 percent in 1997.

Another measure that was considered but not used due to lack of data was the number of businesses using recycled material to produce a product. This would be a valuable future indicator.

Invest in the state's natural infrastructure – such as wetlands, streams, lakes, natural areas, corridors and forests – so as to nurture critical habitat, sustain clean air, land and water, and safely and productively assimilate wastes. Improving the quality of Minnesota's air, water and land is one of the most significant challenges facing the state. Given the previous high levels of pollution and waste released into Minnesota's air, water and land, it is crucial that we reduce pollution to levels that allow our air, water and land to absorb our waste without damage.

To assess the condition of Minnesota's air, water and land, the following measures were identified: the number of leaking underground storage tanks; emissions of criteria air pollutants (sulfur dioxide, nitrogen oxide, lead, volatile organic compounds, particulate matter less than 10 microns in diameter); carbon dioxide emissions, lake transparency for surface water, annual use of fertilizer and nitrate levels for ground water.

Minnesota's natural infrastructure has been showing signs of distress, especially after 1994. Increasing levels of carbon dioxide emissions have reduced air quality while higher levels of nitrate in wells signify deterioration in groundwater quality. The good news is that the state has fewer leaking underground storage tanks and that surface water quality seems to be improving. Emission of criteria pollutants has slightly fallen during the period as well.

Other measures considered but not used due to lack of data were acidity of rainfall and surface water, number of hazardous waste sites with the percent cleaned or being remedied, and acres of contaminated land.

Minnesota needs to sustain and restore community and ecosystem health. Minnesota is blessed with a diverse natural environment including prairie and farmland in the south and west, forests in the north, brush land in the northwest and east-central counties and lakes scattered throughout the state. The health of these ecosystems is vital not only for the animals and plants that comprise them, but also for Minnesota's economy and communities.

This outcome has only one measure -- population trends of key indicator species for each kind of habitat. Five species are combined to make up one. They are: loons for lakes, sharp-tailed grouse for brush land, black-throated green warblers for forest, prairie chicken for prairie and pheasant for farmland.

The Minnesota Progress Indicator shows the health of Minnesota's ecosystem has worsened since 1992, after an improvement in 1991 and 1992. Decreasing populations of sharp-tailed grouse in the brush land and pheasants in the farmland primarily caused the decline. Data on loons go back only to 1994. However, the loon population has increased since then. The prairie chicken and warbler populations fluctuated throughout the time period.

Other measures considered but not included due to lack of data were the number of acres threatened with ecologically significant weed and feral animal populations and the number of acres in managed areas that offer some degree of legal protection to plants and animals and incidents of habitat fragmentation.

Next steps

To better measure what counts, *Economics for Lasting Progress* recommends that:

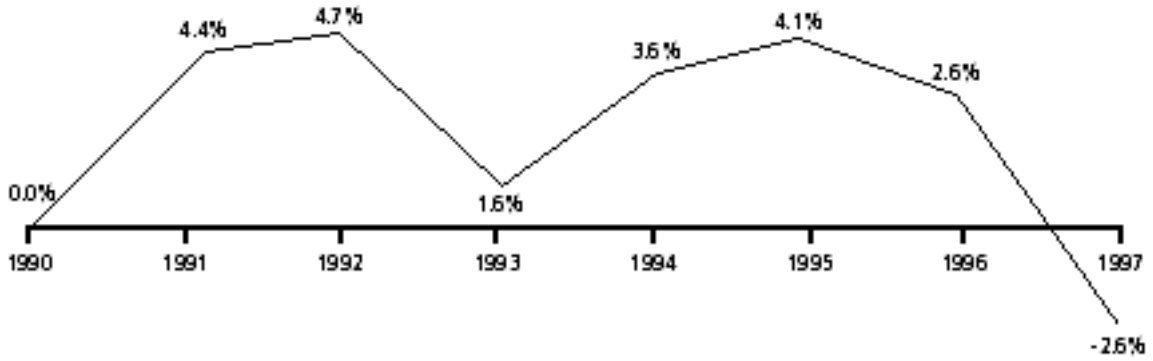
Minnesota adopts a new way to measure the

health of its economy. This new indicator of progress, the Minnesota progress indicator, would be updated on a biennial basis by Minnesota Planning and its partners.

Minnesota Planning spearhead a collaborative statewide initiative to identify and define additional measures that should be included in the Minnesota progress indicator, and any other improvements that may be warranted.

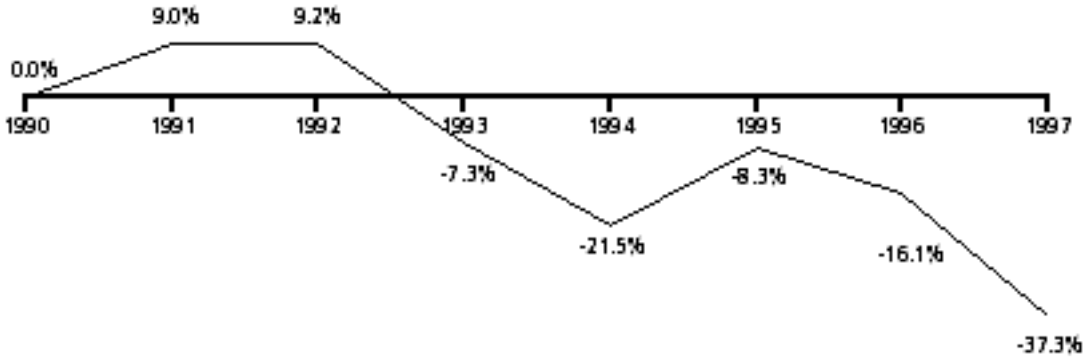
State agencies, communities and economic development authorities use the Minnesota progress indicator to consider areas needing improvement and the potential environmental, economic and community effects of projects.

Improvements in Minnesota's air, water and land are falling off
Percentage change from 1990



This trend line measures emissions of criteria air pollutants, emissions of carbon dioxide, number of leaking underground storage tanks, comparison of recent and historical lake transparency, annual quantity of fertilizers used and percentage of monitored wells with below or equal to three parts per million of nitrate.

The health of Minnesota's habitat has been declining
Percentage change from 1990



This graph combines the population trends of keystone indicator species (loons for lakes, sharp-tailed grouse for brush land, black-throated green warbler for forest, prairie chicken for prairie and pheasant for farmland) for Minnesota's five primary habitat types.
Source: Minnesota Planning

Appendix I
Variables for computing the genuine progress indicator

Economic variables
Personal consumption
Income distribution
Personal consumption weighted for income distribution
Services of consumer durables
Cost of underemployment
Cost of consumer durables
Net capital investment
Net foreign lending and borrowing*
Environmental variables
Cost of water pollution
Cost of air pollution
Cost of noise pollution
Loss of wetlands
Loss of farmland
Depletion of nonrenewable energy resources
Other long-term environmental damage
Cost of ozone depletion
Loss of forests
Community/Social variables
Value of household work and parenting
Value of volunteer work
Services of highways and streets
Cost of crime
Cost of family breakdown
Loss of leisure time
Cost of commuting
Cost of household pollution abatement
Cost of automobile accidents

*This variable was excluded from the Minnesota genuine progress indicator calculation because a similar state measure does not exist.

Appendix II
Methodology for computing the Minnesota genuine progress indicator

Personal consumption expenditures
Because personal consumption expenditure data is only collected on the national level, the ratio of Minnesota total personal income to U.S. total personal income was used to derive an estimate for Minnesota personal consumption expenditures. The decision to use total personal income was based on a statistical analysis that revealed the close correlation between total personal income and personal consumption expenditures.

Income distribution
While the Census Housing and Household Economic Statistic Division calculates annual income distributions for the United States, no similar measure is calculated for individual states. With this information, and no good historical data from any other national or state source between 1960 to 1995, the Integrated Public Use Microdata Series data was used to estimate income distributions for 1960,1970, 1980 and 1990. Data between these years was interpolated based on the decennial estimates. In addition to these estimates, the only other reliable income distributions that were found are in the Minnesota Department of Revenue's 1991, 1993, 1995 and 1997 tax incidence studies. Because of slight methodological differences between the census and Department of Revenue data, these two data sets are not compatible in their simplest form. Because of the importance of the weighted personal consumption expenditure variable and the interesting trend revealed in the tax incidence reports staff decided to show the Minnesota genuine progress indicator with and without the information from Department of Revenue. In an effort to use consistent data, the base progress indicator only uses the census data.
Income distribution is calculated by dividing the lowest quintile share in the base year (1960 for the Minnesota genuine progress indicator) by the lowest quintile share for the year being determined and then multiplying this by 100. While there are a variety of methodologies to determine an income distribution index, this is the equation used by Redefining Progress.

Personal consumption weighted by the income distribution
This variable is simply personal consumption expenditures divided by the income distribution.

Redefining Progress uses the same calculation.

Value of housework

Redefining Progress determined the value of housework using estimates from Robert Eisner based on a series of national work surveys conducted by the University of Michigan. No similar surveys were found for Minnesota, thus the Redefining Progress housework figures were extrapolated to estimate Minnesota's value of housework based on a Minnesota to United States population ratio. This estimate was slightly manipulated using labor force participation rate data in an effort to more accurately reflect the value of housework in Minnesota. In accounting for the difference between labor force participation rates, it is assumed that with a higher participation rate, that value of household work increases due to the greater scarcity of time for household work and leisure when more time is devoted to labor hours.

Value of volunteer time

Similar to the approach used by Redefining Progress, the Minnesota value of volunteer time was derived through the use of a variety of surveys. No methodologically consistent state or national historical survey of volunteer time is made. Therefore, Minnesota figures were interpolated from national survey information to supplement what state data was available.

The equation used for calculating the value of volunteer time is the number of Minnesotans times the percent of population volunteering times the hours spent volunteering per week for a year multiplied by $8 an hour. This equation is slightly different from Redefining Progress', because the data used for the Minnesota genuine progress indicator did not require determining the average number of weeks per year spent volunteering.

Services of consumer durables

Because no state figure for the stock of durable goods is calculated, the ratio of Minnesota to national total personal income was used to arrive at a Minnesota estimate. A statistical analysis showed a strong correlation between total personal income and the stock of consumer durables. Because the genuine progress indicator is an annual measurement, the services of the consumer durables are calculated and the expenditures on consumer durables are removed to gain a more accurate value of the services that a durable good provides in one year, rather than over its entire life time.

Services of streets and highways

While the Bureau of Economic Analysis calculates the value of services provided by streets and highways for the nation, it does not do so for individual states. The national figure, which is broken into federal streets and highways, and state and local streets and highways could be easily extrapolated into a Minnesota estimate using U.S. Department of Transportation statistics on miles of road based on federal or state and local jurisdiction. Using data points from the Department of Transportation every five years and interpolating between those years for both Minnesota and the nation, a Minnesota to U.S. ratio was calculated from which an accurate estimate of services provided by Minnesota's streets and highways was derived.

Cost of crime

The cost of crime variable is broken up into three components: cost of locks, cost of crime to households and cost of alarms. Due to the lack of Minnesota data on the cost of locks and alarms, the national numbers were extrapolated for Minnesota based on the Minnesota to U.S. household ratio. The number of households was selected because the alarm and lock costs are primarily associated with residential alarms and locks. For the cost of crime to household variable, actual Minnesota crime numbers were applied to the nation's average costs per various crimes. This methodology is similar to that used by Redefining Progress.

Cost of family breakdown

The cost of family breakdown has two components: the cost of divorce and the social cost of TV viewing. The cost of divorce is based

on the number of divorces and the number of children affected. While historical records were available on the number of divorces in Minnesota, no figures have been maintained on the number of children affected. National annual averages of the children affected per divorce were applied to the Minnesota divorce numbers to obtain an estimate of the number of Minnesota children affected. The costs assigned to each divorce and child affected are the same as those used by Redefining Progress - $5,000 and $7,500, respectively. The social cost of TV viewing is principally based on the hours of viewing per day, the number of households, percent of households with TVs and the percent of households with children. Minnesota-specific data was available for the number of households and the percent of households with children. National data was used for the hours of viewing per day and the percent of households with TVs. Thirty cents per hour, as determined by Redefining Progress, is used as the "social cost" of children watching TV.

Leisure

Because no Minnesota figures were available, national figures were used for the percent of labor force that is unconstrained and the hours of lost leisure per worker per year. *Unconstrained* is defined as being able to work as many hours as the worker desires. In the calculation of hours of lost leisure per worker per year, Redefining Progress' assumptions of the number of potential leisure hours in a year (3,650, or 10 a day) was retained as well as the estimates for the number of total hours of annual work. Minnesota civilian labor force data was used. The calculation for the value of lost leisure is the civilian labor force multiplied by the percent of labor force that is unconstrained times the hours of lost leisure per worker per year times $8 per hour, where the hours of lost leisure per worker per year are equal to 975 hours (amount of leisure hours in 1969) minus 3,650 (hours of potential leisure per worker per year) minus total hours of annual work per worker.

Cost of underemployment

This variable measures the cost of people being unable to work as many hours as desired. Redefining Progress used the inverse of unconstrained hours - an estimate of the number of constrained hours multiplied by $8 per hour - to derive this cost. Since no Minnesota-specific data on constrained hours was available, the ratio of the Minnesota to the U.S. work force was used to extrapolate a Minnesota estimate.

Cost of consumer durables

Because no Minnesota data for the stock of durable goods is calculated, the ratio of Minnesota to U.S. total personal income was used to arrive at a Minnesota estimate. A statistical analysis showed a strong correlation between total personal income and the stock of consumer durables.

Cost of commuting

The cost of commuting has two components: the indirect costs associated with the loss of time and the direct costs related to the money spent to operate a vehicle or for fare on a bus or other public transportation. The commute time estimates used Minnesota data for 1990 and 1980; no Minnesota data is available prior to that, so national trends were applied to Minnesota for the 1960s and 1970s, working back from the 1980 estimate. In addition, Minnesota data on the number of working Minnesotans was used when calculating the indirect costs. For the direct costs, Redefining Progress used national data for the cost of user-operated transport and the price of purchased local transportation. Since no similar state data was available, Minnesota figures were extrapolated from this data based on motor vehicle registrations for the user-operated transport and public bus registrations for the purchased local transportation.

Cost of personal pollution control

The Bureau of Economic Analysis publishes national data on the cost of personal abatement and control expenditures but does not do so for individual states. Given this and the fact that this data is based purely on spending for motor vehicle emission abatement devices and the operation of these devices, a Minnesota figure was

extrapolated using a Minnesota to U.S. vehicle registration ratio.

Cost of auto accidents

Minnesota data on the number of auto accidents was available back to 1962 and costs associated with those accidents were estimated since 1972. Before 1972, the costs associated with the auto accidents were extrapolated based on a Minnesota to U.S. accident ratio and using the same accident cost data from the National Safety Council as used by Redefining Progress.

Water pollution

No estimate of Minnesota water pollution could be found, therefore Redefining Progress' estimate was extrapolated into a Minnesota estimate based on the ratio of inland water in Minnesota as compared to the United States. The water pollution estimate was based on general damage to water quality and damage from siltation.

Air pollution

No Minnesota historical estimate of air pollution back to 1960 could be found, therefore the Redefining Progress' estimate was extrapolated based on the ratio of total water and land area in Minnesota as compared to the United States. Total land and water area was used because the majority of the six air pollution cost categories dealt directly with land-related costs, such as damage to agricultural vegetation, and aquatic and forest acid rain damage.

Cost of noise pollution

Since no Minnesota estimate of noise pollution is known to exist, Redefining Progress' figures were extrapolated based on the Minnesota to the U.S. population ratio. The population ratio was selected because the costs of noise pollution appear to be borne solely by people.

Loss of wetlands

The calculation of costs associated with the loss of wetlands was estimated using a combination of Minnesota and national data. The Natural Resources Conservation Service provided the1992, 1982 and presettlement estimates of Minnesota wetland acreage. These estimates were used in conjunction with Redefining Progress' data on average wetland acreage loss in the 1960s and 1970s, along with values assigned to losing wetlands, to calculate estimates of Minnesota's costs associated with the loss of wetlands were calculated.

Loss of farmland

Farmland is lost through three activities: urbanization, erosion and compaction. The Natural Resources Inventory provides estimates of the loss of farmland due to urbanization for 1992 and 1982 for Minnesota. Before 1982, the annual conversion of cropland to urban land was estimated using the National Agricultural Lands Study figure of 300,000 acres extended nationally and the fact that in 1982 Minnesota had 5.47 percent of the cropland in America. For losses due to erosion, the Redefining Progress figures were extrapolated in a couple of ways during different time frames to get Minnesota estimates. For the 1980s and 1990s, Natural Resources Inventory national and state estimates of wind and water erosion rates were used to develop a ratio. In the 1960s and 1970s, the U.S. Department of Agriculture used a different methodology. At the time, land was considered to either need treatment or not need treatment. With both Minnesota and U.S. data, a ratio was determined based on acres of cropland that were in need of treatment. Since no Minnesota-specific data was available on losses as a result of compaction, a Minnesota estimate was derived by using the ratio of Minnesota to U.S. acreage in cropland.

Loss of nonrenewable resources

Department of Public Service provided data on the consumption of fuel energy in the state. Using this data and the estimated resource replacement costs provided by Redefining Progress, ($75 per barrel), based on the assumed cost of producing the equivalent energy from biomass loss of nonrenewable resource figures were estimated for Minnesota.

Long-term environmental damage

The Department of Public Service provided

Minnesota data for this variable. U.S. growth rates were used to estimate Minnesota energy consumption from 1900 to 1960. These figures were used with Redefining Progress' $1 per barrel estimate to calculate Minnesota's long-term environmental damage.

Cost of ozone depletion

Since no state-level data was available on ozone depletion, the Redefining Progress ozone cost figure was extrapolated to get a Minnesota estimate based on the population ratio of Minnesota to the U.S.

Loss of forests

Loss of forests is composed of two parts: damage from roads built in national forests and loss of old-growth forests. No accurate historical data on Minnesota forest roads could be obtained; therefore Minnesota numbers were estimated based on National Forest Road data and the ratio of national forest land in Minnesota to that in the U.S. The other cost associated with loss of forests is the loss of old growth forests, but since Redefining Progress looked only at old-growth forests in the Pacific Northwest, this component was ignored for Minnesota calculations.

Net capital growth

Since many of the factors that go into calculating net capital (buildings, machinery and other infrastructure) growth are not calculated for Minnesota, the labor force ratio of the Minnesota to United States was used to obtain a Minnesota estimate.

Net foreign lending and borrowing

No Minnesota figures could be estimated.

Appendix III

Critique of the genuine progress indicator methodology

Personal consumption expenditures

This variable was used as a starting point because of the "presumed correlation between consumption and well-being."[43] Redefining Progress went on to say "To truly reflect economic reality, an index of well-being would adjust the gross consumption figure for ambiguous and regrettable consumption. It would subtract out an estimate of the portion of consumption that people say they wish that they didn't consume. We have not done so."[44] Since a more robust way of estimating personal consumption was identified, it is not clear why that approach was not adopted.

Given that the computation of genuine progress indicator is based on the personal consumption expenditures and that a comparable statistic does not exist at the state level, fruitful comparisons between national and state genuine progress indicators are limited. This limitation is frustrating because a widely used genuine progress indicator would be possible only if the measure had meaning for states, metropolitan areas and localities as well as the nation. In creating the Minnesota genuine progress indicator, a ratio of Minnesota to U.S. personal income was used to derive a Minnesota personal consumption expenditures value. Having to do this calculation complicates a meaningful comparison between the U.S. genuine progress indicator and the Minnesota genuine progress indicator.

Income distribution

Income distribution has many inherent problems, particularly defining and estimating income. In addition to many definitions of income, the different accounting techniques for determining the various incomes may lead to different estimates. For instance, a person who claims little or no income for a year may be classified as poor but in reality may be extremely wealthy. Also, the income measure is complicated by the arbitrarily choice of 1951 as a base year.

Despite these problems, incorporating the disparity of income distribution into the genuine progress indicator makes good sense when calculating a well-being progress indicator.

Personal consumption weighted for income distribution

This calculation is Redefining Progress' way of incorporating the income distribution disparity into the Genuine Progress Indicator.

Value of household work and parenting

Redefining Progress took a positive step in including the value of household work in the genuine progress indicator; however, the methodology and sources used are somewhat problematic. It appears that the estimates are based on only married couples. The question arises of why the household work done by all households was not included.

A review of the sources used revealed that one article written by Robert Eisner does not identify the methodology used to derive at the estimates but only states the data is from a University of Michigan survey. This presents problems for calculating Minnesota figures and clouds an understanding of all of the assumptions used in deriving his estimates. Redefining Progress stated that Eisner included estimates for 1946, 1956, 1966, 1976 and 1981. It is interesting that he made estimates for 1946 and 1956 when he used studies done in 1965, 1975 and 1981. Additionally, Leete and Schor in their book Assessing the Time Squeeze Hypothesis, claim that the 1965 Michigan study used by Eisner is markedly bias in its calculation of working time.

Value of volunteer work

The inclusion of the value of volunteer work in the genuine progress indicator is beneficial because it accounts for work that would otherwise be overlooked by traditional indicators. Redefining Progress used $8 as the hourly value for volunteer services although they admitted that the value of volunteering has changed over time. Even though it used surveys that provided a consistent time series, Redefining Progress admitted there are some comparability problems due to inconsistent questions used in the surveys.[45]

Services of consumer durables

Measuring the annual flow of services rather than one-time expenditures strives to get at a more accurate measure of the benefits derived from consumer durables.

Services of highways and streets

Redefining Progress used two values: estimate of net stock and an estimate of the annual services by multiplying the net stock estimates by .075 to impute annual services from the stock of highways and streets. Its methodology for coming up with the .075 figure seems a bit arbitrary: the methodology assumed that 25 percent of vehicle miles are for commuting, but to figure the cost of commuting, it assumed that 30 percent of vehicle miles are for commuting. In addition, the figures on the printed copy varied slightly from the data on the Excel file Redefining Progress provided.

Cost of crime

Basing the cost of crime estimate on the cost of locks is highly questionable. The lock figures (private expenditures on locks) appear to be based on locks for vehicles and houses, as well as such things as suitcase locks and safe deposit boxes. The inclusion of suitcase locks and safety deposit boxes would appear to have little merit. Another criticism is that Redefining Progress had only a single data point on the cost of locks.

With regard to the cost of crime to households, Redefining Progress used data for 1975, 1980, 1981 and 1992 and then interpolates figures between these years, assuming a constant growth rate. It is puzzling why, instead of assuming a constant growth rate it does not use personal and household crime statistics to create a more accurate rate of growth or decline.

In its explanation for cost of crimes Redefining Progress says it uses the 1992 Klaus estimate, while in the genuine progress indicator table it appears that it used the 1975, 1980, and 1981 data. Redefining Progress did not explain this discrepancy in the discussion of methodology.

One noticeable omission in the cost of crime is

murder. While it may be controversial to assign a dollar value to a human life, doing so would enhance this measure.

Cost of family breakdown

The cost of family breakdown is divided into two variables: the cost of children watching TV and the cost of divorce. The data used for the cost of children watching TV, a questionable variable for the breakdown of the family, is hours of TV watched per day for a household. Since this data applies to all people watching TV, not exclusively children, the cost is inaccurate.

With regard to the cost of divorce, Redefining Progress stated, "The costs assigned to divorce are arbitrary: $5,000 per divorce and $7,500 per child affected."[46] Again, the use of arbitrary numbers is problematic. In addition, it appears that the assignment of 30 cents per hour for the social cost of children watching TV is arbitrary as well.

While some of the methodology for this variable is questionable, Redefining Progress deserves praise for including this measure into the genuine progress indicators. The structure of the family has undergone many changes since 1950, and it is beneficial to try to account for some of these changes.

Loss of leisure time

Redefining Progress' counting of 15 hours a weekday and 24 hours a weekend day as potential leisure time is controversial because they include sleep time. Sleep time should be excluded in the potential number of leisure hours. In calculating the loss of leisure, Redefining Progress only counts the change in relation to 1969 (the year of greatest leisure); the selection of only this year allows the variable to go one way. It appears that Redefining Progress used different household work hours for this calculation than it did for estimating household work value. This type of inconsistency is problematic.

In addition, the "unconstrained" hours approach used to look at household work and work statistics appears to be based on many assumptions.

Cost of underemployment

A problem with this variable is the use of 1969 and 1989 data (two business cycle peaks). Although other business cycles occurred between those years, Redefining Progress assumed a smooth curve between 1969 and 1989, arguing that the GPI is oriented toward long-term trends. In addition, it applied the same growth rate before 1969 and after 1989.

The inclusion of underemployment, while difficult to accurately measure, reveals a part of the employment story that the unemployment rates alone do not.

Cost of consumer durables

No comment.

Cost of commuting

Redefining Progress calculated the direct costs of commuting by local transportation (buses and trains) using the same procedure it used for cars. It assumed that 30 percent of train and bus travel is for work commutes. In Minnesota, given the greater number of riders and buses during commuting hours.

As mentioned earlier, the assumption of that 30 percent of car miles is for commuting differs from a 25 percent estimate that Redefining Progress used in computing the services of highways and streets.

Since Redefining Progress valued both the direct and indirect costs of commuting to work, it is not evident why it did not value the "direct cost" to vehicles for going to the grocery store or hardware store (household work) since it valued the time spent in such activities as work and not leisure.

Cost of household pollution abatement

One of Redefining Progress' rationales for using this figure is that people make defensive expenditures on such items as air and water filters. According to the Survey of Current Business, it appears what is being counted as pollution abatement control spending is only motor vehicle

emission abatement devices and the operation of these devices, which is a narrow assessment of the costs that could be attributed to household pollution abatement control spending. So this measure does not get at the air and water filter expenditures that Redefining Progress outlined.

Cost of automobile accidents

Although the methodology for estimating the cost of automobile accidents is reasonable, it may not be reasonable to assume that all auto accidents are avoidable and that the full costs of accidents should be classified as defensive expenditures.

Cost of water pollution

The cost of water pollution is broken down into two variables: damage to water quality (from point sources) and damage from siltation. The origin of Redefining Progress' 1972 estimate of $12 billion for damage to water quality is unclear. The source it cited only refers to water pollution costs ranging from $15 to $20 billion in 1985.

Redefining Progress only uses this one point on damage to water quality to extrapolate up and down from 1972. Similarly, Redefining Progress uses one data point in 1980 to extrapolate before and after the costs attributed to siltation. Despite these problems, the inclusion of damages done to the environment and in this case water takes into account a factor that would typically be overlooked in traditional well-being indicators.

Cost of air pollution

The air pollution cost data is based on only one estimate for 1970 and is limited to six categories. As Redefining Progress pointed out, the estimate is conservative because it excludes most damage to health and the cost of mortality. Excluding the health costs attributed to air pollution seems to leave a big gap in its methodology.

Cost of noise pollution

This variable is based on one estimate in 1972 and extrapolated before and after that year. This type of estimate seems to be less than scientific, given the difficulty in assessing a cost attributed to noise. Redefining Progress also assumed that the cost of noise pollution grew three percent before 1972 and one percent after 1972, both of which are somewhat arbitrary figures.

Loss of wetlands

One of the main questions here is the decision to start the loss of habitat at $23.1 billion in 1950 (the amount of damage from presettlement to 1950) instead of at zero dollars. Significant damage certainly occurred to these habitats before 1950, but the decision to start from a positive number seems to defeat the purpose of having a base year. Perhaps it should be cumulative starting in 1950, not at presettlement.

An additional criticism of this variable is that all wetlands are assumed to have the same value - $230 per acre before 1950 and $1,390 (with a five percent increase per year) after. No attempt is made to take into account the positive value, if any, of the purpose for which the filled wetland is being used. It also makes the assumption that filling a wetland is a negative. While in most cases this is true, the benefits of filling a wetland could in some instances outweigh the negatives. This same argument could be applied to changes in farmland and forest acreage as well.

Finally, given the difficulty in measuring wetland acreage, Caution should be taken in viewing Redefining Progress' changes in acreage between 1950 and 1992 as well as the presettlement estimate.

Loss of farmland

As with the wetlands variable, this variable starts with a positive value for 1950, $69.3 million, rather than at zero dollars. The loss of farmland variable has three parts: losses due to urbanization, losses due to erosion and losses due to compaction. The source for the value of converted cropland is not specified. The bases are not clear for Redefining Progress' assumption of $10 billion in annual damage from erosion before1950 or its assumption that the rate of erosion grew by one percent annually between 1950 and 1972. Erosion damage is cumulative (each year includes that years' damage plus all

previous damage), so the final figure will be quite high. Loss due to soil compaction is extrapolated forward and backward from a single 1982 data point and it is unclear why a three percent increase is assumed.

Additionally, it is obvious that some amount of losses due to erosion and compaction are inevitable, given the equipment used and the terrain that many farms are built on. While Redefining Progress calculates a loss for each farmland that goes into urbanized land, they do not make an attempt at valuing the service that that land is providing as urban land.

Depletion of nonrenewable energy resources

As Redefining Progress states, "Many economists argue that physical depletion of resources is irrelevant because technology will always come to the rescue."[47] With this statement in mind, using the full amount of non-renewable energy production as a loss is going to the extreme. We believe that it is more reasonable to assume that X percent of energy produced from non-renewables is acceptable, and especially back in the 1950s and 1960s when technology of alternative renewable sources was not as cost competitive as it is today.

For their replacement cost of nonrenewable energy, it is uncertain why they chose biomass as the alternative fuel to cost out. A combination of alternative renewable energy sources could provide a more likely scenario.

Other long-term environmental damage

The application of a one dollar per barrel “tax” based on most energy consumption is arbitrary. In addition, Redefining Progress uses a cumulative methodology for this variable as well by calculating damage back to the early 1900s. It is more plausible to make it cumulative beginning in 1950 when the indicator begins.

Cost of ozone depletion

Redefining Progress stated that "the cost per kilogram of CFC-11 and CFC-12 is based on an arbitrary set at $15 per kilogram (in 1972 dollars)." It then said that one-third of worldwide use of cholrofluorocarbons, which destroys ozone, is in the United States. Neither of these assumptions is supported by any sources. Additionally, the use of CFCs has been banned in the United States. It is recognized, however, that the half-life of CFCs is long and thus damage due to U.S. CFC usage still exists.

Loss of forest

Loss of value from forests has two parts: damage from roads built in national forests, with damage of $10,000 per mile, decreasing to $7,500 per mile from 1979 onward, and loss of old-growth forests. Redefining Progress acknowledged that the damage from roads varies greatly depending on the circumstances of each road, but estimated that each mile of road affects 500 acres of forest. The second measure is not applicable to Minnesota, since Redefining Progress assumed that “the remaining old growth of consequence is limited to the Pacific Northwest.” The limit is questionable, as is the lack of a general cost associated with the loss of forests to other uses.

Net capital investment

Why this variable is included in the GPI is unclear. Redefining Progress argues that "for an economy to prosper over time, the supply of capital (buildings, machinery and other infrastructure) must be maintained and increased to meet the demands of the increased population. If this does not occur, the society is consuming its capital as income." So in a sense, this measure is no better than the GDP because it equates more buildings and tractors per worker with improvement. This would seem contradict the aim of a genuine progress indicator.

Net foreign lending or borrowing

No comment.

Appendix IV
List of Minnesota progress indicator measures

Goal 1
Outcome I: Have a diverse mix and geographic distribution of businesses

- Distribution of employment by sector
- Percent of firms in each sector
- Gross sales in each sector contributing to GSP
- Distribution of employees and population in the Minnesota planning areas

Outcome II: Foster entrepreneurship and profitability and invest in communities and the environment.

- New business incorporations to business failures
- Minnesota's national rank in new companies and business closings
- Percentages of total general funds resources from corporate and bank excise tax

Outcome IV: Efficiently transform natural resources, energy, information and skills into goods and services.

- Gross state product per worker
- GSP per unit of energy consumption
- GSP per amount of solid waste
- Toxic release inventory emission-to-manufacturing job ratio

Goal 2
Outcome I: Produce highly skilled workforce that meets business and community needs.

- Percentage of high school graduates who pursue additional education or training

Outcome II: Produce jobs that provide people with wages sufficient for them to meet basic needs and contribute to society.

- Unemployment rate for Minnesota
- Comparison of median income to poverty income
- Comparison of growth between poorest and wealthiest income quintiles

Outcome III: Provide fair and affordable access to jobs, education, transportation, housing, health care and other basic services.

- Tuition costs as a percent of median disposable income
- Health insurance coverage
- Cost of health insurance
- Per capita public transportation trip miles for the Twin Cities

Goal 3
Outcome I: Encourage locally owned and controlled businesses, and local production that adds value to local resources.

- Contribution of agriculture value-added to GSP
- Contribution of timber value-added to GSP

Outcome III: Provide all Minnesotans ample opportunities for decent, safe and affordable housing.

- Median monthly rent as a percent of median household income
- Income-to-house price ratio
- Homeownership rates

Goal 4
Outcome II: Replenish renewable resources at least as fast as they are used.

- Timber harvests compared to sustainable allowable cut
- Alternative energy consumption as a percentage of total consumption
- Annual water use per day per capita
- Comparison of 1990-1997 aquifer levels to historical averages in the Prairie du Chien-Jordan aquifers

Outcome III: Use nonrenewable resources efficiently while developing substitutes or

substitute technologies for when these resources are no longer available.

- Annual energy consumption per person
- Annual gasoline consumption per capita
- Annual vehicle miles traveled per person

Goal 5

Outcome I: Create an economic environment that is nontoxic to people and ecosystems.

- Annual quantity of fertilizer used
- Tons of toxins released per year into the environment

Outcome II: Gradually eliminate the concept of "waste" by production and consumption design that avoids, reuses and recycles materials, or returns waste back into "food" for either business or nature.

- Tons of solid waste per person per day
- Percent of solid waste recycled

Outcome III: Invest in the state's natural infrastructure – such as wetlands, streams, lakes, natural areas and forests – to provide critical habitat, sustain clean air, land and water, and safely and productively assimilate wastes.

- Emissions of criteria pollutants
- Emissions of carbon dioxide
- Number of leaking underground storage tanks
- Comparison of the 1990-1997 Lakes Secchi transparency index data to historical averages
- Percentage of monitored wells with one or fewer parts per billion of atrazin.
- Percentage of monitored wells with three or fewer parts per million of nitrate

Outcome IV: Sustain and restore community and ecosystem health.

- Population trends of keystone indicator species by each habitat type

Appendix V

Classification of MPI measures into economy, environment and community

Measure	Economy	Environment	Community
Employment by sector	X		
Number of firms by sector	X		
Gross sales in each sector contributing to GSP	X		
Distribution of employees by population for Minnesota Planning areas	X		X
Business start-up and failure rates	X		X
National rank in new companies and business closings	X		
Growth of corporate tax on profits	X		
GSP per worker	X		
GSP per unit of energy consumption	X	X	
GSP per amount of waste (hazardous waste)	X	X	
Emission-to-job ratio for the manufacturing sector	X	X	
Percent of high school graduates pursuing additional education or training	X		X
Unemployment rate	X		X
Percent of median income needed for basic needs	X		X
Income growth of the poor versus the wealthy			X
Tuition costs as a percent of median disposable income	X		X
Health care insurance coverage			X
Health care expenses (out-of-pocket)as a percent of annual income	X		X
Public transportation trip miles for the Twin Cities	X		X
Agriculture value-added in gross sales as a percent of total GSP	X		X
Timber value-added in gross sales as a percent of total GSP	X		X
Median annual rent compared to median annual income of renters	X		X
Income-to-house price ratio	X		X
Homeownership rates	X		X
Volume of timber harvested compared to sustainable allowable cut	X	X	
Percent of energy produced by renewable sources (wind, hydropower,		X	
Annual water use per day per capita		X	
Change in depth of water table (aquifers) over time		X	
Annual energy consumed per person	X	X	
Annual gasoline consumption per capita	X	X	
Annual vehicle miles traveled per person	X	X	
Number of leaking underground storage tanks (LUSTS)		X	
Annual quantity of fertilizer used		X	
Tons of toxins released per year into the environment (TRI)		X	
Tons of solid waste per person per day		X	
Percent of solid waste recycled		X	
Emissions of criteria pollutants		X	
Emissions of carbon dioxide		X	
Lake transparency		X	
Percent of monitored wells with < = 1 ppb of atrazine		X	
Percent of monitored wells with < = 3 ppm of nitrate		X	
Population trends of keystone indicator species by each habitat type		X	
Total indicators = 42	26	21	15

Appendix VI

Data sources and methodology for Minnesota progress indicator measures

The 42 measures that comprise the Minnesota progress indicator are sorted according to the goal and outcome statement. For each measure, there is a table that contains the raw data that was used to form that measure, the data source, any notes and an explanation of the calculation for the measure.

Because several of the measures in the Minnesota progress indicator use data on population, gross state product and income, they are noted here, but not included in the data tables for the measures.

Minnesota: Basic data				
Year	Population	Real GSP (in million 1992 unchained $)	Median family income *	Median household income**
1990	4,375,099	$ 105,054	$ 43,031	$ 31,806
1991	4,416,292	105,089	44,785	31,808
1992	4,469,450	110,662	46,518	31,115
1993	4,515,118	111,467	48,817	32,256
1994	4,570,355	118,699	51,996	33,638
1995	4,626,514	121,527	54,396	36,018
1996	4,682,748	128,097	56,200	38,554
1997	4,734,830	133,810	60,577	41,482

Sources:Population data is in the *1998 Economic Report to the Governor*, table 1, p 78, and compiled by the Demographic Center at Minnesota Planning. The table is also available on the Internet at www.minnstats.state.mn.us/gov_econ/index.html.

Median income data is provided by the U.S. Census Bureau and is available on the Internet at www.census.gov/hhes/income/4person.html.

Gross state product data is provided by the Bureau of Economic Analysis and is available on the Internet at www.bea.doc.gov/bea/regional/data.htm.

Notes:
* Refers to family of four
** Represents a three-year average, with the last year being the year it was recorded.

Goal 1

Outcome I:

Indicator 1: Distribution of employment by sector, 1990-1997									
Year	Mining	Const.	Mfg.	TCPU	Trade	FIRE	Service	Gov.	Herfindahl index
1990	0.4%	3.7%	18.8%	5.1%	24.4%	5.9%	25.8%	15.9%	0.1941
1991	0.4	3.6	18.5	5.1	24.2	5.9	26.2	16.0	0.1949
1992	0.4	3.5	18.2	5.0	24.0	6.0	27.1	15.8	0.1966
1993	0.3	3.5	18.1	4.9	24.0	6.1	27.4	15.7	0.1974
1994	0.3	3.5	17.9	4.9	24.2	6.1	27.5	15.6	0.1978
1995	0.3	3.5	17.9	4.9	24.4	5.8	27.2	15.9	0.1978
1996	0.3	3.7	17.7	4.9	24.3	5.9	27.6	15.6	0.1982
1997	0.3	3.8	17.5	5.0	24.1	5.9	28.2	15.2	0.1989

Source: *1998 Economic Report to the Governor*, table 12, p 89. Data comes from the Research and Statistics Office, Minnesota Department of Economic Security. Available on the Internet at www.minnstats.state.mn.us/data.html.

Calculation: The distribution of employment by sector is measured by the Herfindahl index. The index examines the degree to which employment is spread across a range of industries by adding the sum of the square of each sector's share of employment. A score of "zero" indicates perfect diversification, and a score of "one" indicates that all employment is concentrated in just one industry.

Indicator 2: Percentage of firms in each sector

Year	Ag.	Mining	Const.	Mfg.	TCPU	Wholesale	Retail	FIRE	Services	Herfindahl
1990	1.2%	0.1%	9.6%	7.1%	4.4%	9.1%	25.6%	8.7%	34.2%	0.215
1991	1.3	0.2	9.5	6.9	4.5	8.9	25.1	9.0	34.8	0.216
1992	1.3	0.1	9.4	6.9	4.5	8.7	24.6	9.2	35.2	0.216
1993	1.3	0.1	9.4	6.8	4.5	8.9	23.7	9.4	35.8	0.217
1994	1.4	0.1	9.6	6.8	4.5	8.8	23.3	9.4	36.0	0.217
1995	1.4	0.1	9.7	6.8	4.6	8.7	22.9	9.5	36.2	0.217
1996	1.5	0.1	10.0	6.8	4.7	8.6	22.3	9.7	36.4	0.216
1997*	1.5	0.1	10.0	6.8	4.7	8.6	22.3	9.7	36.4	0.216

Source: U.S. Census Bureau. Available on the Internet at www.census.gov/epcd/cbp/view/cbpview.html.
Notes:*No data for 1997, so 1996 figures were used.

Calculation: The Herfindahl index is used to examine the degree to which firms are spread across a range of industries. The index is measured by adding the sum of the square of each sector's share of firms. A score of "zero" indicates a perfect spread of firms and a score of "one" indicates that all firms are concentrated in just one industry.

Indicator 3: Gross sales in each sector contributing to GSP
(in millions of current dollars)

Year	1990	1991	1992	1993	1994	1995	1996	1997
Total GSP	99,460	102,696	110,662	114,637	124,617	131,072	140,930	149,394
Agriculture, forest, fish	3,823	3,136	3,180	1,801	3,232	2,797	4,315	3,631
Mining	519	558	632	540	592	677	663	679
Construction	4,440	4,275	4,666	4,854	5,286	5,729	6,342	6,693
Manufacturing (durable	12,440	11,537	12,252	12,602	13,845	14,571	15,107	16,369
Manufacturing (non-	9,088	9,233	10,112	9,854	10,764	11,079	11,686	11,901
Transportation and utilities	8,167	8,855	8,857	9,305	9,820	10,161	10,814	11,485
Wholesale trade	7,321	7,907	8,444	8,957	10,176	10,648	11,791	12,568
Retail trade	8,806	9,013	9,648	10,374	11,210	11,750	12,225	13,004
FIRE	15,635	17,137	18,915	21,041	21,914	23,459	25,110	27,515
Services	17,783	18,809	21,064	22,018	23,647	25,594	27,601	29,839
Government	11,437	12,236	12,892	13,290	14,131	14,608	15,275	15,710
Herfindahl index	0.11739	0.12005	0.12209	0.12643	0.12305	0.12512	0.12361	0.12640

Source: Bureau of Economic Analysis. Available on the Internet at www.bea.doc.gov/bea/regional/gsp/gsplist.html.

Calculation: The Herfindahl index is measured by adding the sum of the square of each sector's contribution to GSP. A score of "zero" indicates a perfect distribution of gross sales, and a score of "one" indicates that all gross sales are concentrated in just one industry.

Indicator 4: Distribution of employees and population in the Minnesota planning areas								
Year		Central	Northea	Northwe	Minneap	Southea	Southw	Gini coeff-
1990	Employ.	235,557	133,803	212,785	1,283,11	215,386	188,130	0.0730
	Pop.	478,119	311,342	486,298	2,288,72	420,094	390,525	
1991	Employ.	240,157	136,205	215,502	1,289,89	219,272	189,116	0.0657
	Pop.	485,863	310,324	487,902	2,318,53	423,606	390,065	
1992	Employ.	242,173	136,213	214,956	1,290,11	218,947	187,014	0.0644
	Pop.	493,690	312,805	491,815	2,352,12	428,237	390,782	
1993	Employ.	252,413	138,262	222,832	1,320,44	224,182	191,056	0.0604
	Pop.	501,363	312,599	494,260	2,383,72	432,256	390,915	
1994	Employ.	265,911	144,265	236,922	1,395,42	230,417	200,572	0.0607
	Pop.	512,426	314,366	499,893	2,415,20	435,507	392,956	
1995	Employ.	270,876	145,855	238,051	1,414,67	229,520	199,850	0.0617
	Pop.	523,556	315,800	506,166	2,448,96	437,005	395,020	
1996	Employ.	273,592	145,540	239,582	1,414,17	229,293	199,496	0.0587
	Pop.	534,489	317,199	511,079	2,482,85	440,013	397,110	
1997	Employ.	275,885	147,478	242,700	1,439,80	233,196	200,027	0.0584
	Pop.	545,983	318,714	514,906	2,514,11	442,989	398,119	

Source: Minnesota Department of Economic Security, Research and Statistics Office. This data is also available on the Web at www.des.state.mn.us/lmi/laus/sda.html.

Calculation: The Gini coefficient, a measure of deviation from equality, was computed to examine the distribution of employment and population in six Minnesota planning areas as defined by the Minnesota Department of Economic Security. Using employment and population figures for each of the planning areas, each area's share of the state's employment and total population was computed. Each area's share of employment was then subtracted from the share of populations and the result recorded in absolute values. The sum of the absolute values for all the planning areas is the Gini coefficient. If employment were equally distributed among the regions (according to their populations), the coefficient would be equal to "zero" if employment is concentrated in only one area; the coefficient would be "one". Thus, the Gini coefficient takes a value between zero and one, with one being the maximum inequality and zero referring to an equal distribution of employment and population.

Outcome II

Indicator 1: New business incorporations to business failures								
Year	1990	1991	1992	1993	1994	1995	1996	1997*
New business	9,678	9,608	10,041	10,845	11,429	12,203	12,639	12,655
Business failures	529	1,583	1,523	918	722	904	596	1,183
New business-to-failure ratio	18.3	6.1	6.6	11.8	15.8	13.5	21.2	10.7

Source:Dun & Bradstreet Marketing Services.
Note: *Preliminary data

Calculation: To obtain the new business-to-failure ratio, the number of new businesses was divided by the number of business failures.

Indicator 2: Minnesota's national rank in new business and business closing								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Business closings rank	9	5	9	6	5	6	14	3
New companies rank	33	36	35	46	48	41	46	37
Average rank	21	20.5	22	26	26.5	23.5	30	20

Source: Corporation for Enterprise Development, *Development Report Card for the States,* 1990 to 1998 editions.

Calculation: This indicator is based on the Corporation for Enterprise Development's annual ranking of the 50 states in terms of new businesses and business closures. To obtain a single measure, the state's rank in both measures was added and divided by two.

Indicator 3: Percentages of total general funds resources from corporate and bank excise tax			
Fiscal year	Total general fund resources ('000)	Corporation income and bank excise tax ('000)	Percent of resources from corp. income and bank excise tax
1990	$7,246,560	$478,901	6.61%
1991	7,492,305	457,934	6.11
1992	7,613,917	420,278	5.52
1993	8,202,407	509,534	6.21
1994	9,040,016	551,822	6.10
1995	9,623,779	665,757	6.92
1996	10,421,467	701,735	6.73
1997	11,545,628	680,898	5.90

Source: *1998 Economic Report to the Governor*, table 49, p 127. Data provided by the Department of Finance. Available on the Internet at www.minnstats.state.mn.us/gov_econ/Heading49.html.

Calculation: The share of state resources that comes from corporate income and bank excise tax is determined by dividing the income generated from the corporate income and bank excise tax with the total general fund resources.

Outcome III

Indicators 1, 2 and 3

Comparison of GSP with energy use, worker productivity and solid waste						
Year	Energy consumption	GSP/	Workers	GSP/worker	MSW generation	GSP/MSW
1990	1384.7	$75.87	2,129,520	$49,332	4,178,543	$25,141
1991	1411.3	74.46	2,136,739	49,181	4,112,366	25,554
1992	1401.9	78.94	2,184,964	50,647	4,082,533	27,106
1993	1445.6	77.11	2,242,655	49,703	4,220,512	26,410
1994	1482.7	80.06	2,310,379	51,376	4,370,355	27,160
1995	1541.5	78.84	2,378,604	51,091	4,550,534	26,706
1996	1541.5*	83.10*	2,433,376	52,641	4,785,172	26,769
1997	1541.5*	86.81*	2,484,984	53,847	5,007,403	26,722

Sources: Bureau of Economic Analysis (GSP)
Minnesota Department of Public Service. *Minnesota Energy Data Book 1997*, (energy).
Minnesota Office of Environmental Assistance. *Report on 1997 SCORE Programs,* and phone contact with Mark Rust (MSW)
1998 Economic Report to the Governor, table 12, p 89. Data provided by the Research and Statistics Office, Minnesota Department of Economic Security. Available on the Internet at www.minnstats.state.mn.us/data.html (workers).
Note: *Due to the lack of data, 1995 data was used for 1996 and 1997 Minnesota energy consumption.

Calculations: GSP is divided into energy consumption, number of workers and municipal solid waste generation to get the GSP/energy, GSP/worker and GSP/MSW ratios.

Indicator 4: Toxic release inventory emissions-to-manufacturing job ratio			
Year	TRI* (tons)	Mfg. Jobs	Ratio
1990	41,183,440	400,833	102.74
1991	41,183,440	395,205	104.21
1992	27,919,012	397,100	70.31
1993	24,801,331	406,413	61.02
1994	21,599,033	414,689	52.08
1995	18,484,674	425,864	43.41
1996	16,889,782	429,613	39.31
1997	15,680,836	434,935	36.05

Sources: *1998 Economic Report to the Governor*, table 13, p. 91. Data provided by the Research and Statistics Office, Minnesota Department of Economic Security. Available on the Internet at www.minnstats.state.mn.us/data.html (mfg. jobs).
Steve Tomlyanovich at the Minnesota Department of Public Safety (TRI data).
Note:*The TRI data is based on a common set of TRI chemicals identified by the Environmental Protection Agency.

Calculations: Total of toxic release inventory emissions is divided into the number of manufacturing jobs to get the ratio.

Goal 2

Outcome I

Indicator 1: Percent of high school graduates who pursue additional education or training								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Percent of graduates	70%	72%	74%	74%	75%	74%	73%	73%

Source: Minnesota Department of Children, Families & Learning. *Minnesota High School follow-up Survey* 1990-1997.

Calculation: No calculation necessary.

Outcome II:

Indicator 1: Unemployment rate, Minnesota								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Unemployment rate	4.9%	5.1%	5.2%	5.1%	4.0%	3.7%	4.0%	3.3%

Source*: 1998 Economic Report to the Governor*, table 7, p. 84. Data provided by the Research and Statistics Office, Minnesota Department of Economic Security. Available on the Internet at www.minnstats.state.mn.us/gov_econ/Heading7.html.

Calculation: No calculation necessary.

Indicator 2: Comparison of median income to poverty income								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Median income ($)	43,031	44,785	46,518	48,817	51,996	54,396	56,200	60,577
Median income (cum. %)	1.6%	5.6%	9.5%	14.5%	21.0%	25.6%	28.9%	36.7%
Poverty income ($)	12,700	13,400	13,950	14,350	14,800	15,150	15,600	16,050
Poverty income (cum. %)	5.0%	10.5%	14.6%	17.4%	20.6%	22.9%	25.9%	28.8%
Poverty to median income ratio	3.15	1.85	1.53	1.21	0.98	0.90	0.90	0.78

Sources: Median income for a family of four provided by the U.S. Census Bureau and available on Internet at www.census.gov/hhes/income/4person.html.

Calculation: The cumulative percent changes of median income and poverty income over the period were calculated and then divided to get a ratio.

Indicator 3: Comparison of growth between poorest and wealthiest income quintiles											
Quintile	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Ratio
1990	0.7%	1.9%	3.1%	4.5%	6.1%	7.8%	10.0%	12.7%	16.5%	36.8%	1.9
1992	0.9	2.1	3.2	4.5	5.8	7.6	9.7	12.3	16.2	37.8	2.38
1994	1.1	2.2	3.3	4.6	6.0	7.7	9.8	12.4	16.1	37.0	2.97
1996	1.0	2.1	3.2	4.4	5.8	7.4	9.4	12.0	15.8	38.9	2.57

Source: Department of Revenue. *Minnesota Tax Incidence Study,* 1991, 1993, 1995 and 1997.
Note: Interpolation and extrapolation methods were used to provide estimates for years without data (1991, 1993, 1995 and 1997).

Calculation: To compare the incomes of the wealthiest and the poorest Minnesotans, the percent of income owned by the first and tenth quintiles of the population were used. For each year, the share of the first quintile was divided by the share of the tenth quintile. The bigger the result, the more unequal the income distribution.

Outcome III

Indicator 1: Tuition costs as a percent of median disposable income									
Year	Private		U of M		MNSCU		Average tuition		Tuition to income ratio
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	
1990	$ 9,204	11.39%	$2,379	7.74%	$1,384	6.05%	$4,322	8.40%	10.0%
1991	10,044	9.13	2,630	10.55	1,485	7.30	4,720	8.99	10.5
1992	10,785	7.38	2,898	10.19	1,612	8.52	5,098	8.70	11.0
1993	11,467	6.32	3,242	11.87	1,676	4.00	5,462	7.40	11.2
1994	12,196	6.36	3,381	4.29	1,761	5.07	5,779	5.24	11.1
1995	12,919	5.93	3,526	4.29	1,821	3.41	6,089	4.54	11.2
1996	13,574	5.07	4,113	16.65	2,072	13.78	6,586	11.83	11.7
1997	14,315	5.46	4,404	7.08	2,083	0.53	6,934	4.35	11.4

Sources: Higher Education Services Office, Minnesota Private College Research Foundation (tuition)
U.S. Census Bureau (income).

Calculation: Estimated average tuition by adding the tuition for private four-year institutions (uncapped) and tuition for the University of Minnesota (Twin Cities campus) and the two-year average tuition for state colleges and universities and dividing the result by three. The average tuition is divided by the state's median income for a family of four to get the ratio between tuition and median income increases.

Indicators 2 and 3: Health insurance coverage and cost of insurance health								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Uninsured	8.90%	9.30%	8.10%	10.10%	9.50%	8.00%	10.20%	9.20%
Cost per month	88.91	99.88	108.54	116.28	119.61	130.13	119.88	123.96

Sources: Percent uninsured is provided by US Bureau of the Census and also available on the Internet at www.census.gov/hhes/hlthins/hlthin/hlthin97/3yr97.html.

The average cost per enrollee per month from the *1998 Economic Report to the Governor*, table 21 p.99, provided by Minnesota Department of Health, Occupational Systems and Compliance Division. Available on the Internet at www.minnstats.state.mn.us/gov_econ/index.html.

Calculation: No calculations were required.

Indicator 4: Per capita public transportation trip miles for the Twin Cities								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Annual vehicle miles per capita	12.4	12.1	12.4	12.7	12.9	11.8	11.7	11.7
Twin Cities area population	2,288,663	2,318,532	2,352,121	2,383,725	2,415,207	2,448,967	2,482,858	2,515,119

Source: Twin Cities Metro Transit at the Metropolitan Council.

Calculation: Annual public transportation vehicle miles per capita were obtained by dividing the total annual vehicle miles (provided by Metro Transit) by the total population of the Twin Cities metropolitan area for each year.

Goal 3

Outcome I

Indicators 1 and 2: Contribution to GSP by food and timber value-added							
Year	1990	1991	1992	1993	1994	1995	1996
GSP *	$99,751	$103,301	$110,662	$114,637	$124,617	$131,358	$141,573
Food and kindred*	3,683.2	3,607.7	4,221.7	4,662.5	4,842.3	4,710.2	5,023.4
Lumber and wood*	102,5.4	1,048	1,209.4	1,398.5	1,646.7	1,522.7	1,436.1
Paper and allied products*	1,611	1,609.4	1,602.8	1,648.3	1,711.5	2,147.2	1,956.3
Percent of food value-added	3.7%	3.5%	3.8%	4.1%	3.9%	3.6%	3.5%
Percent of lumber and paper	2.6	2.6	2.5	2.7	2.7	2.8	2.4

Source: *1998 Economic Report to the Governor*, table 26, p.104. Minnesota Department of Trade and Economic Development, Information and Analysis Division provided the data. Available on the Web at www.minnstats.state.mn.us/gov.econ/index.html
Notes: No data was available for 1997, so 1996 values were used.
*All figures are in millions of nominal dollars.

Calculation: The contribution of food value-added was calculated by dividing the amount of food and kindred products into the GSP. The contribution of lumber and paper value-added was calculated by adding up the lumber and wood value-added and paper and allied product value-added then dividing that sum into the GSP.

Outcome II

Indicator 1: Average monthly rent as a percent of median household annual income								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Studio	$362.48	$366.37	$369.37	$371.32	$383.47	$400.20	$414.04	$426.91
1 bedroom	457.83	465.85	471.41	479.32	491.48	510.48	530.33	551.28
2 bedroom	570.27	580.71	590.87	602.58	617.68	644.43	665.90	693.01
3 bedroom	716.36	730.35	748.01	761.43	794.50	825.88	868.34	910.41
Total	510.45	519.75	527.73	537.23	550.92	573.84	596.08	620.21
Rent to income ratio	1.60%	1.63%	1.70%	1.67%	1.64%	1.59%	1.55%	1.50%

Sources: Apartment Search, Edina (rent)
U.S. Census Bureau (income)
Notes: Monthly average rent is computed in December of the year. Rent data was only available for the Twin Cities metropolitan area.

Calculation: The proportion of average annual rent to median annual household income of renters is determined by dividing the total monthly rent (the average of studio, one-, two-, and three-bedroom) by the annual median household income.

Indicator 2: Income to House price ratio								
Year	1990	1991	1992	1993	1994	1995	1996	1997
All MSA counties	$79,900	$82,500	$85,000	$88,000	$89,000	$93,000	$99,000	$105,500
All non-MSA counties	43,000	45,500	48,000	50,580	51,000	60,000	61,900	65,500
Income-to-house price ratio	77.0%	76.4%	75.8%	76.0%	80.2%	74.6%	73.8%	75.0%

Source: *1998 Economic Report to the Governor*, table 43, p.121 (housing prices). Data provided by the Federal Housing Finance Board, Research Division. Available on the Web at www.minnstats.state.mn.us/gov_econ/index.html.
U.S. Census (income)

Calculation: Median housing prices were obtained using housing prices for metropolitan statistical area and non- metropolitan statistical area counties. In each case, the median income for a family of four was divided by the median housing prices. The result for MSA and non-MSA counties were added and divided by two to get an average ratio of income to house price.

Indicator 3: Home ownership rates								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Minnesota	71.8%	68.9%	66.7%	65.8%	68.9%	73.3%	75.4%	75.4%
United States	64.2	64.1	64.1	64	64	64.7	65.4	65.7

Source: U.S. Bureau of the Census, *Housing Vacancy Survey, Annual 1998*, table 13. Available on the Web at www.census.gov/hhes/www/housing/hvs/annual98/ann98t13.html

Calculation: No calculation required.

Goal 4

Outcome 1

Indicator 1: Timber harvests (millions of cords)								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Harvest	3.45	3.53	3.85	4.1	4.11	3.72	3.81	3.74

Source: John Krantz, Division of Forestry, Minnesota Department of Natural Resources.

Calculation: No calculation required.

Indicator 2: Alternative energy consumption as a percentage of total consumption*								
Year	1990	1991	1992	1993	1994	1995	1996**	1997**
Percent of alternate energy	4.7	4.9	4.7	5.1	5	4.8	4.8	4.8

Source: Minnesota Department of Public Service. *Minnesota Energy Data Book.* June 1997.
Notes: *Alternative energy as calculated here includes hydropower, wood, other biomass, wind, municipal waste, sludge and solar consumption from sources originating in Minnesota.
**No data was available for 1996 and 1997, so 1995 data was used.

Calculation: No calculation required.

Indicator 3: Water use per capita per day								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Total water used (billions of gallons)	1088	1091	1133	1106	1183	1196	1182	1163
Water use (gallons per day)	681.3	676.8	694.5	671.1	709.2	708.2	691.6	672.9

Sources: Minnesota Department of Natural Resources, Division of Waters. *1995 and 1996 Water Year Data Summary*, May 1997.
Minnesota Planning, State Demographic Center (population).

Calculation: Total water consumed was divided by population and 365 days to get water used per person per day.

Indicator 4: Comparison of the 1990-1997 aquifer levels to historical averages in the Mt. Simon and Prairie du Chien–Jordan aquifers								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Proportion compared to average	109%	106%	102%	97%	98%	101%	103%	101%

Source: Tom Gullet, Minnesota Department of Natural Resources.

Calculation: A series of steps was involved in calculating the proportional average aquifer levels for the Mt. Simon and Prairie Du Chien–Jordan aquifers. First, for each observation well, a winter and summer reading were selected for each year that data was available, using similar months in the year. These data points were compared to the historical winter and summer average for the well. The observations were then averaged for each aquifer, and then the two aquifers were averaged to get an overall comparison of the 1990 to 1997 data to historical averages. A value of 109 percent in 1990 suggests that for both aquifers, the observations for 1990 were 109 percent of average or nine percent above the historical average.

Outcome II

Indicator 1: Annual energy consumption per person						
Year	1990	1991	1992	1993	1994	1995
Total energy consumed (trillion Btus)	1314.8	1340.5	1323.6	1371.8	1409.1	1467.1
Energy use per person (million Btus)	300.5	303.5	296.1	303.8	308.3	317.1

Source: Department of Public Service. *Minnesota Energy Data Book.* June 1997.
Minnesota Planning, State Demographic Center (population).
Note: No energy consumption data was available for 1996 and 1997, so 1995 energy use per person was used for those years.

Calculation: Annual energy consumption per person was calculated by dividing population by total energy consumption

Indicator 2: Annual gasoline consumption per capita								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Fuel consumption (million gallons)	2323.6	2331.4	2390.5	2463.6	2571.3	2655.2	2815.4	2873.5
Fuel consumption per capita (gall.)	531.1	527.9	534.9	545.6	562.6	573.9	601.2	606.8

Source: Department of Public Service for 1990-1995 gasoline data and the U.S. Department of Transportation for the 1996 and 1997 gasoline data.
Minnesota Planning, State Demographic Center (population).

Calculation: We divided gasoline consumption by population to get gasoline consumption per capita.

Indicator 3: Annual vehicle miles traveled per person								
Year	1990	1991	1992	1993	1994	1995	1996	1997
VMT (millions)	38946	39254	41162	42214	43317	44072	44465	48350
VMT per capita	8901.7	8888.5	9209.6	9349.5	9477.8	9526.0	9495.4	10211.5

Source: Department of Public Service for 1990-1995 VMT data and the U.S. Department of Transportation for 1996 and 1997 VMT data.
Minnesota Planning, State Demographic Center (population).

Calculation: Annual vehicle miles traveled per capita were obtained by dividing total annual vehicle miles traveled by total population.

Goal 5

Outcome I

Indicator 1: Percent of monitored wells with one or fewer parts per billion of atrazine							
Year	1990	1991	1992	1993	1994	1995	1996
Wells sampled	120	252	124	143	101	101	66
Total number of wells	115	246	119	142	99	93	60
Percent of wells	96%	98%	96%	99%	98%	92%	91%

Source: John Hines, Minnesota Department of Agriculture.
Note: No data was available for 1997, so 1996 data was used.

Calculation: The number of wells with one or fewer parts per billion of atrazine was divided by the total number of wells to obtain a percentage.

Indicator 2: Tons of toxins released per year into the environment							
Year	1991	1992	1993	1994	1995	1996	1997
Total	46,416,041	32,488,379	28,969,027	24,311,821	24,656,949	22,075,368	20,195,093
Common*	41,183,440	27,919,012	24,801,331	21,599,033	18,484,674	16,889,782	15,680,836
Dissimilar**	5,232,601	4,569,367	4,167,696	2,712,788	6,172,275	5,185,586	4,514,257

Source: Toxic release inventory data provided by Steve Tomlyanovich, Minnesota Department of Public Safety.
* This represents the amount of toxins released using a common set of chemicals across all years.
** This represents the amount of toxins released for all years.

Calculation: No calculation required.

Outcome II

Indicator 1: Tons of solid waste per day per capita								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Municipal solid waste ('000 tons)	4,178.5	4,112.4	4,082.5	4,220.5	4,370.4	4,550.5	4,785.2	5,007.4
Tons MSW per person per day	0.96	0.93	0.91	0.93	0.96	0.98	1.02	1.06

Sources: Minnesota Office of Environmental Assistance. *Report on 1997 SCORE Programs* and phone contact with Mark Rust at the OEA (MSW). Minnesota Planning, State Demographic Center (population).
Note: Data for 1990 was given for nine months, so an equitable amount was assumed for the remaining three months.

Calculation: Data on MSW generation was divided by the total population and then by 365 days.

Indicator 2: Percent of solid waste recycled								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Percent recycled	22%	36%	39%	40%	42%	45%	46%	46%

Source: Minnesota Office of Environmental Assistance. *Report on 1997 SCORE Programs* and phone contact with Mark Rust at the OEA.
Calculation: No calculations were necessary.

Outcome III

Indicator 1: Annual quantity of fertilizer use								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Fertilizer use (millions of tons)	2.3	2.1	2.1	2.1	2.2	2.1	2.2	2.4

Source: Minnesota Crop and Livestock Reporting Service. *Minnesota Agricultural Statistics,* 1990-1998.

Calculation: No calculation required.

Indicator 2: Emission of criteria pollutants (tons per year)								
	1990	1991	1992	1993	1994	1995	1996	1997
Volatile	432,070	411,700	402,200	399,107	408,739	403,827	400,855	397,832
Sulfur	137,645	145,987	147,607	159,287	157,718	161,728	159,555	167,765
Particula	968,479	910,635	918,616	862,357	922,378	919,415	932,762	961,749
Nitrogen	430,085	411,822	415,553	440,762	445,710	460,474	454,936	462,902
Carbon	1,944,422	1,853,576	1,762,459	1,689,45	1,677,194	1,565,768	1,558,170	1,476,343

Source: Thomas McMullen, U.S. Environmental Protection Agency.

Calculation: Changes from 1990 were determined for each pollutant and then for each year; data on the five pollutants was averaged.

Indicator 3: Emissions of carbon dioxide (millions of tons)								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Carbon dioxide emissions	82.93	83.74	85.14	90.71	93.19	96.50	99.22	99.22

Source: Energy consumption estimates were provided by Minnesota Pollution Control Agency from the Energy Information Administration's *State Energy Data Report 1996*, table 155.
Note: Since there was no data for 1997, 1996 data was used.

Calculation: The Minnesota Pollution Control Agency provided the data in Btu format so a long series of calculations was required to derive carbon dioxide emissions.

Indicator 4: Number of leaking underground tanks								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Releases	1449	1144	1094	1006	918	830	763	1041
Source: John Kaehler, Minnesota Pollution Control Agency, May 1999.								

Calculation: No calculation required.

Indicator 5: Comparison of the 1990-1997 Lakes Secchi transparency data to historical averages								
Year	1990	1991	1992	1993	1994	1995	1996	1997
Secchi (ave. measurement in meters)	3.22	3.25	3.39	3.26	3.38	3.62	3.76	3.70
Proportion compared to average	100.9%	101.6%	106.2%	102%	105.7%	113.3%	117.9%	115.8%
Source: Jennifer Klang, Minnesota Pollution Control Agency.								

Calculation: As a measurement of the quality of lake water, the Minnesota Pollution Control Agency has calculated the Lakes Secchi transparency index on hundreds of lakes dating back decades. For this indicator, an overall historical average measurement was found and then compared to average readings for each of the years between 1990 and 1997. This indicator compares the individual year averages to the overall historical average to determine if Minnesota lakes are clearer and in better quality than in the past. A value of 102 percent in 1993 suggests that on average, the observations for 1993 were 102 percent of average, or two percent above the historical average.

Indicator 6: Percent of monitored wells with three or fewer parts per million of nitrate							
Year	1990	1991	1992	1993	1994	1995	1996
Wells sampled	120	252	124	143	101	101	66
Total number of wells with < = 3 ppm	65	129	59	59	47	41	23
Percent of wells	54%	51%	48%	41%	47%	41%	35%
Source: John Hines, Minnesota Department of Agriculture. Note: No data for 1997, so 1996 data was used.							

Calculation: A percentage was calculated by dividing wells sampled by those with three or less parts per million of nitrate.

Outcome IV

Indicator 1: Population trends of keystone indicator species					
Year	Index of abundance	No. of sharp-tailed	Male prairie	Percent of	Estimated fall
1990	1.1	2,7435	1,228	–	1.93
1991	1.2	2,5586	1,432	–	2.26
1992	1.4	1,8873	1,913	–	1.64
1993	1.7	1,4085	1,179	–	1.33
1994	1.2	1,3811	1,084	56%	1.28
1995	1.4	1,2486	1,274	63	1.74
1996	1.2	1,0527	1,447	64	1.36
1997		1,2516	934	67	1.28
Source: Minnesota Department of Natural Resources.					

Calculation: Annual trends for each species are calculated. Trend data is averaged for each year to get a comprehensive annual figure.

Notes

[1] Well-being, development and progress *are used interchangeably in this paper.*
[2] *Cobb, C., Halstead, T., and Rowe J.,* The Genuine Progress Indicator: Summary of Data and Methodology. *San Francisco, CA: Redefining Progress. 1995.*
[3] *Friedenberg, H. L., and Beemiller, R. M.,"Comprehensive of the Gross State Product by Industry, 1977-1994,"* Survey of Current Business. *June 1997.*
[4] *Stinson, Thomas, "Gross State Product: A New Measure of Minnesota's Economy."* 1989 Economic Report to the Governor. *Economic Resource Group, St. Paul (1989)*
[5] *Alfsen, K H., "A Green GDP- Do we need it?"* Economic Survey *1996 p. 35.*
[6] *Daly H. E., Beyond Growth: The Economics of Sustainable Development. Boston: Beacon Press. 1996. p. 40.*
[7] *Cited in Duthie D., "How to Grow a Green Economy"* New Scientist *137 (1993) p.39*
[8] *ul Haq, Mahbub, et al. Redefining Wealth and Progress. New ways to Measure Economic, Social and Environmental Change. The Caracas Report on Alternative Development Indicators. New York: International Technology Development Group of North America, Bootsrap Press (1990) p. 88.*
[9] *Repetto, Robert and et al.* Wasting Assets: Natural Resources in the National Income Accounts. *Washington D.C: World Resource Institute (1989) p. 15.*
[10] *Atkinson, G, and Hamilton, K. "Accounting for Progress: Indicators for Sustainable Development."* Environment *38 (1996) p. 40.*
[11] *Cobb C. W. and Cobb, Jr., John B.* The Green National Product: A Proposed Index of Sustainable Economic Welfare. *Lanham, Md.: University Press of America (1994) p. 250.*
[12] *Cobb and Cobb, Jr.*
[13] *Net national product is calculated by taking the gross national product and subtracting an allowance for depreciation of tangible reproducible capital (thus it only applies to structures and equipment, not natural resource capital). It is believed that net national product is a more useful measure of economic performance than GNP, but it generally receives less attention.*
[14] *Daly H. E. and Cobb, J. B., For the Common Good: Redirecting the Economy toward Community, the Environment and Sustainable Future. Boston: Deacon Press 1994 p. 78.*
[15] *Cobb and Cobb, Jr. p. 26.*
[16] *Cobb and Cobb, Jr. p. 27.*
[17] *Cobb and Cobb, Jr. p. 30.*
[18] *Cobb and Cobb, Jr. p. 31.*
[19] *The economic, environmental and social variables included in the ISEW are personal consumption, distributional inequality, weighted personal consumption, services of household labor, services of consumer durables, services of streets and highways, public expenditures on health and education, expenditures on consumer durables, defensive expenditures on health and education, costs of commuting, personal expenditures on pollution control, costs of auto accidents, costs of water pollution, costs of air pollution, costs of noise pollution, loss of wetlands, loss of farmland, depletion of nonrenewable resources, long-term environmental damage, cost of ozone depletion, net capital growth, and change in international position.*
[20] *Cobb and Cobb, Jr. p. 11.*
[21] *The variables included in the GPI are personal consumption, income distribution, personal consumption weighted for income distribution, value of household work and parenting, value of volunteer work, services of consumer durables, services of highways and streets, cost of crime, cost of family breakdown, loss of leisure time, cost of underemployment, cost of consumer durables, cost of commuting, cost of household pollution abatement, cost of automobile accidents, cost of water pollution, cost of air pollution, cost of noise pollution, loss of wetlands, loss of farmland, depletion of nonrenewable energy resources, other long-term environmental damage, cost of ozone depletion, loss of forests, net capital investments, and net foreign lending and borrowing.*
[22] *Atkinson and Hamilton*
[23] *Duthie, p. 40.*
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[38] *ibid.*
[39] *Henderson. p. 6*
[40] *Cobb, C., Halstead, T., and Rowe, J., p. 2.*
[41] *See Appendix I for the full listing of the variables used in computing the GPI.*
[42] *Cobb, C., Halstead, T., and Rowe J., p. 1.*
[43] *Ibid. p.11.*
[44] *Ibid. p.12.*
[45] *Ibid.*
[46] *Ibid. p. 11.*
[47] *Ibid. p. 28.*