SMART GROWTH INDEX®

A Sketch Tool for Community Planning

Community Process Guide

When and How to Apply Smart Growth INDEX

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by

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1. Introduction

This process guide describes ways in which the Smart Growth INDEX (SGI) software can support community planning processes. The guide devotes particular attention to SGI's indicators, including detailed definitions and guidance on their application. This is a companion document to the Getting Started and Reference Guides that detail technical use of the software.

SGI is a GIS-based sketch tool intended to help stakeholders and decision-makers:

- ***Create plans*** through issues identification, alternatives analysis, and goal-setting.
- ***Implement plans*** by evaluating development consistency with goals.
- ***Achieve plans*** by measuring cumulative progress toward goals.

At its heart is a set of indicators that are used to benchmark existing conditions, evaluate alternative courses of action, and monitor change over time. Indicators are measurements of key community characteristics that provide insights into overall conditions. For example, the residential density indicator of "dwellings per acre" is a useful measurement of an area's suitability for transit service because of its spatial representation of potential ridership.

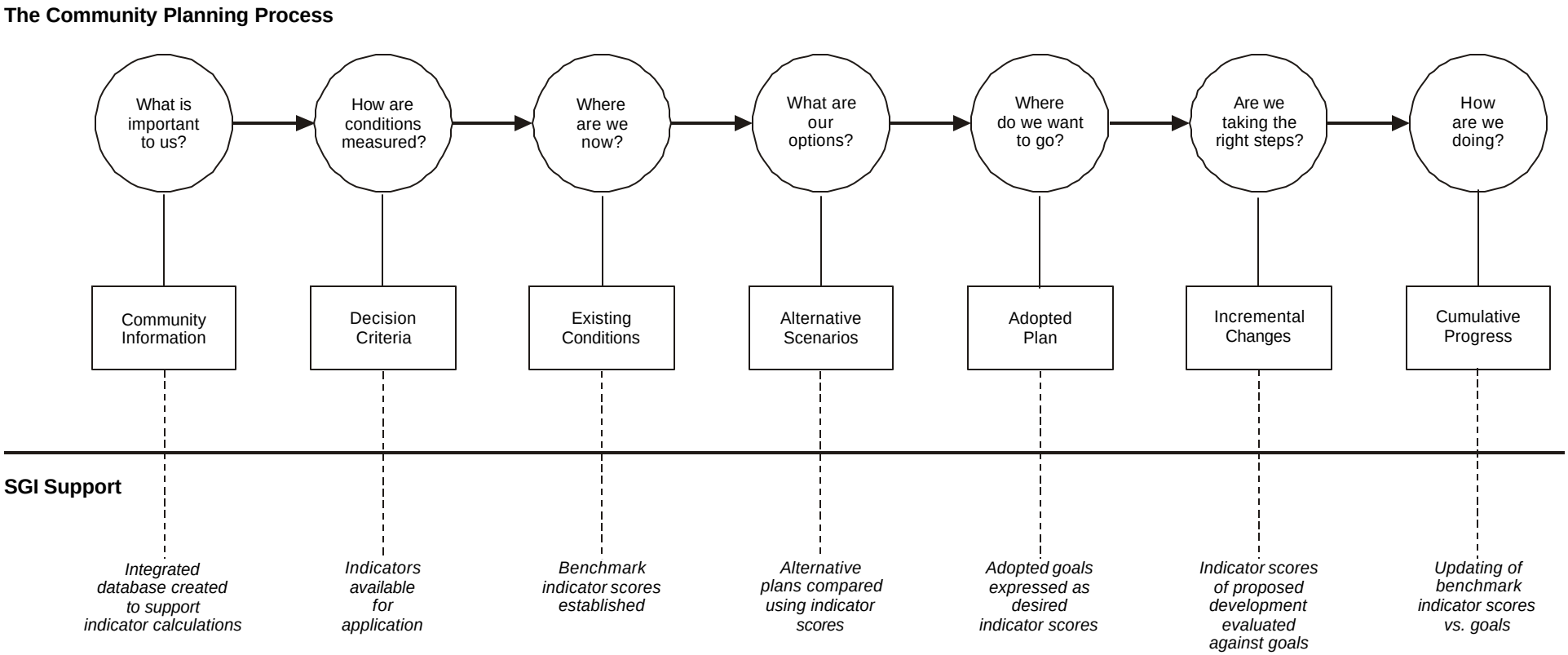
The premise of SGI is that community plan formulation and implementation can be valuably informed by a standardized set of indicator measurements that are used regularly to gauge planning actions. Figure 1 illustrates a typical community planning process and the stages where the tool can provide decision-making support. Some communities may choose to apply the tool systematically in all stages, while some may find it most helpful at one or two points.

Important process-related features of the software include:

- *Sketches.* Any number of planning scenarios or "sketches" can be modeled in an area. Sketches can represent actual or proposed conditions. Usually a "base" sketch is used as a starting point in an application and "alternative" sketches are created to represent different ideas and approaches to the issues at hand.

- *Sketch areas.* The software can be applied to any portion of a region or community where data is available to support indicator calculations. Sketch areas may be created using official boundaries, such as local government jurisdictions, traffic analysis zones, zip codes, or other administrative boundaries. Natural features such as watersheds may be used, or users may also create unique one-of-a-kind boundaries to fit special needs.

Figure 1. SUPPORT OF COMMUNITY PLANNING WITH SGI



- *Type of sketch.* SGI can create two types of sketches, either a forward-looking "forecast" or a single point-in-time "snapshot." Forecast sketches are usually created when stakeholders are preparing long-range growth plans for entire communities or regions, or large parts of them. Snapshot sketches are usually prepared for purposes of impact assessment, either under today's conditions or at an assumed future date. Forecast sketches are known as dynamic analyses because they simulate change over time, and snapshot sketches are known as static analyses because of their single point-in-time calculations. Forecast sketches use a "rasterized" grid of cells to represent geography, while snapshot sketches use actual property parcels.

- *Indicators.* Indicators are "yardsticks" for identifying an area's strengths and weaknesses, testing alternative courses of action, and monitoring change over time. SGI has a menu of 28 indicators available for evaluating sketches. From this menu, users may select those indicators that are most relevant to a given situation from categories of land-use, housing, employment, travel, and environment. To make the most effective use of SGI, users need to be familiar with the measurements made by the indicators in order to determine which indicators are relevant to a particular study or project; and to correctly interpret indicator scores, including the desired direction of change in scores (increase or decrease) when evaluating alternative scenarios. Figure 2 illustrates the two kinds of indicator measurements made by SGI: first, a numerical score for the sketch area; and second, mapping of the spatial pattern that produced the score. In this way users obtain both quantitative and geographic assessments of an area. The numeric scores are interpreted in relation to typical standards in the professional literature, common conditions in the local area, other alternative sketch scores, or adopted goals in cases where they already exist. The geographic results are used to delineate areas where strengths can be protected and areas where weaknesses need to be corrected.

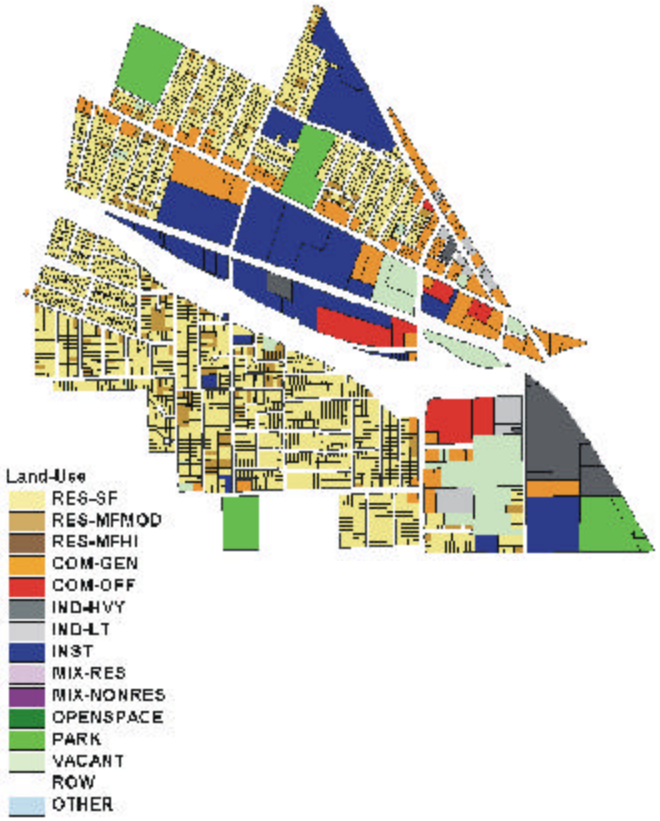
2. Organizing Applications

Once SGI is installed, there are three basic process-related tasks in organizing sketches:

- *Select a sketch boundary.* The boundary should be derived from the scope and objective of the sketch, e.g. city limits if an entire municipality is being evaluated, or the neighborhood vicinity if a major development proposal is being examined. In all cases, care should be exercised along the boundary edge to insure that important adjacent features that affect the sketch area are included, e.g. an elementary school near the boundary of a residential area study.

Figure 2. INDICATOR EXAMPLE: HOUSING PROXIMITY TO PARKS

Sketch Area



Numeric Result

2,049 ft.
Average walk distance from
all dwellings to closest park.

Mapping Result

- *Select a sketch type.* The question of whether to prepare a forecast or snapshot sketch usually goes hand-in-hand with boundary selection because the two items are closely linked. Forecast sketches simulate spatial growth for up to 20 years into the future, and their boundaries usually encompass entire communities or regions, or large portions of them. Snapshot sketches can also be prepared for large areas, but because of their parcel-based detail they are also suitable for small, neighborhood-scale sketches.

- *Select indicators.* To evaluate sketches, users select those indicators that are most relevant to the issues at hand, e.g. employment-related indicators for an office park versus housing indicators for a residential subdivision. Occasionally, a user may select all indicators when a comprehensive set of measurements is desired, such as benchmarking existing conditions at the outset of a community planning process. At the time indicators are selected, users will also want to agree on the desired direction of change in each indicator's score from sketch to sketch, e.g. a neighborhood infill project might want to see housing and employment density scores increase, and distance to transit and other amenities decrease. Making these determinations at the outset of a process will help stakeholders interpret indicator scores as the process unfolds.

To illustrate a simplified SGI application, a series of hypothetical neighborhood snapshot sketches are shown in Figure 3. This example assumes a policy initiative to densify employment along an arterial corridor to encourage travel mode shifting to transit. The objective is to create a corridor of ridership that will support frequent transit service. "Employees per acre" is selected as a key indicator of transit service feasibility (higher employment density supports greater frequency in transit service). Each panel in Figure 3 is discussed sequentially in the following sections as the neighborhood planning process unfolds.

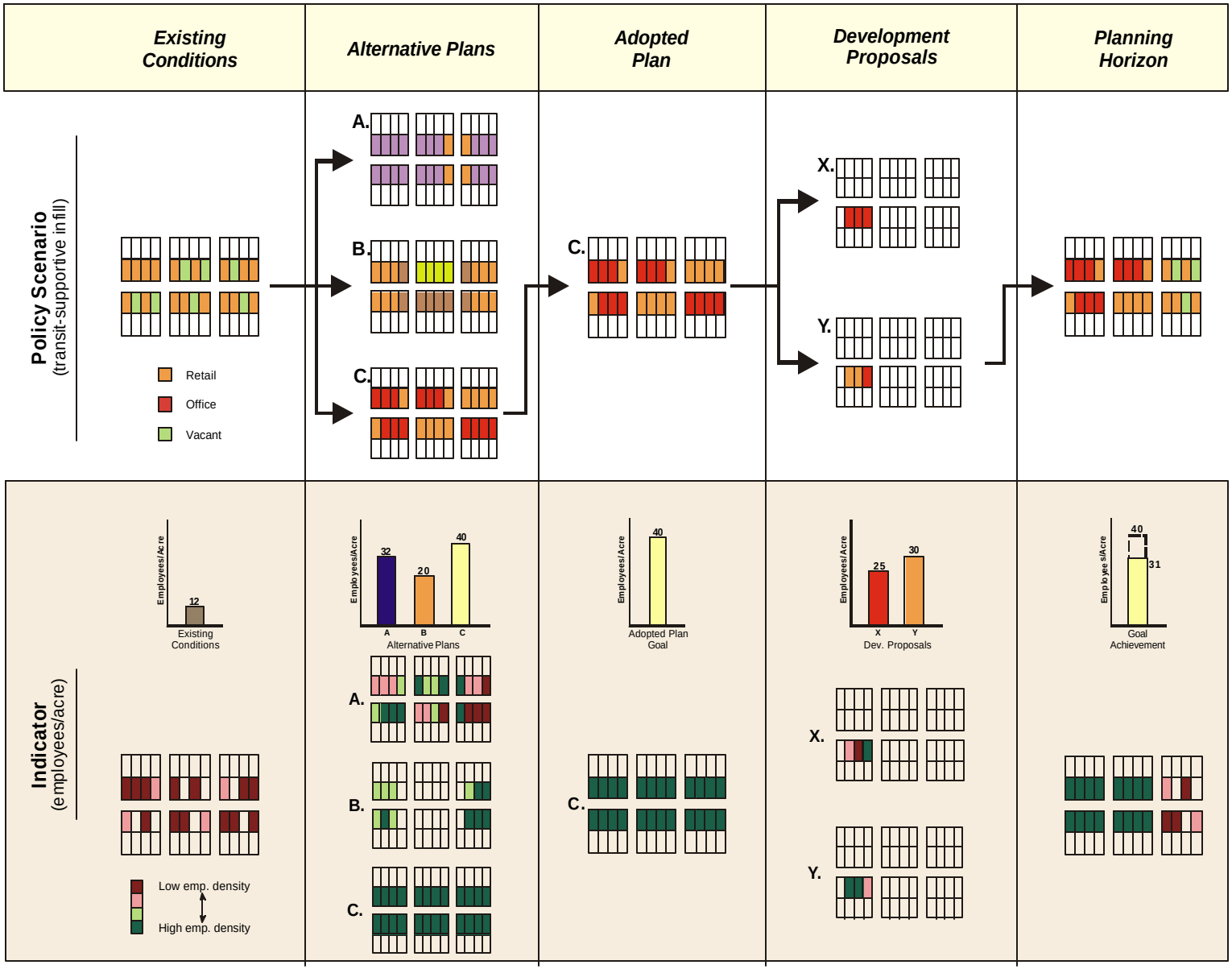
3. Benchmarking Current Conditions

Most SGI applications will begin with benchmark measurements of existing conditions in a sketch area. Existing condition indicator scores can be calculated in either forecast or snapshot sketches, and are used to:

- *Identify an area's strengths and weaknesses.* Benchmark scores and mapping will reveal problems and opportunities that merit attention in plans.

- *Provide input into the formulation of community standards.* Benchmark scores are an important reference point when formulating policy standards that will be applied to community development.

Figure 3. HYPOTHETICAL APPLICATION OF SMART GROWTH INDEX



- *Provide a baseline for gauging change.* During plan implementation when development proposals are evaluated, the proposals' scores can be compared to benchmark measurements to gauge the amount of change that development would cause.

- *Provide a baseline for gauging progress.* During periodic monitoring of plan accomplishments, updated benchmark measurements can be compared against previous benchmarks to gauge cumulative progress toward goals.

Benchmarking is shown in the left-hand panel of Figure 3, where the indicator finds a relatively low 12 employees/acre, which is insufficient to support frequent transit service. This segment of the neighborhood corridor therefore meets the threshold issue test of needing land-use changes to increase employment density.

4. Creating Plans

Once existing conditions have been assessed and action issues identified, stakeholders can use forecast or snapshot sketches to create and evaluate alternative plans that respond to the issues. These can range from comprehensive community plans to any number of special-purpose regional or neighborhood plans. Alternatives can be evaluated as forecast or snapshot sketches according to the following general sequence.

- *Preparation of alternative plans.* In response to identified issues stakeholders can create any number of alternative plans. Each of these is represented by a sketch in the software, with each sketch containing its own unique mix of features. For example, if housing was identified as an issue, one alternative might contain a mix of single and multi-family dwellings while another alternative might have only single-family units.

- *Review of alternative scores.* Stakeholders review alternative sketch indicator scores and mapping in comparison to other alternatives and benchmarks to determine which alternatives respond most effectively to identified issues. For example, if excessive walking distance to parks was identified as a problem at the outset, stakeholders would review the alternatives' park proximity scores to determine which alternative offered the shortest walking distance.

- *Iteration to preferred alternative and adopted plan.* Using the software to provide rapid adjustment of sketches and feedback of results, stakeholders can iterate among alternatives to a preferred, and ultimately adopted, plan.

- *Modeling of adopted goals.* Once a plan is formally adopted, its build-out or full implementation can be modeled and the resulting indicator scores used as quantitative expressions of its goals.

In the Figure 3 example, three alternative plans are suggested for the neighborhood corridor by stakeholders: a) vertical mixed-use with employment on lower floors and housing on upper floors; b) new commercial retail with separate multi-family housing and a small park; and c) a mix of offices and retail. The three alternative plans are scored with the employment density indicator producing results of 32, 20, and 40 employees/acre, respectively. Given the hypothetical policy objective of increased density for transit support, Plan C is adopted and its build-out measurement of 40 employees/acre becomes the corridor's goal.

5. Implementing Plans

Once plans are adopted, SGI can help implement them by evaluating the consistency of development proposals against plan goals. It can also gauge the magnitude of change that a development would cause. These implementation checks can be accomplished with snapshot sketches according to the following general sequence:

- *Acquire development proposal in GIS form.* In order to apply SGI as a development evaluation tool, it will be necessary to obtain development proposals in GIS form. Given the widespread use of CAD in preparing development plans and the relatively easy conversion of CAD files to GIS format, many communities are finding it reasonable to request major development proposals in GIS format.

- *Score base case development proposal.* The development proposal is scored with relevant indicators and the results are: 1) compared to existing conditions to gauge the amount of change the development would cause; and 2) compared to adopted goals to determine how much goal achievement the development would accomplish.

- *Iterate to acceptable proposal.* Again using the software's capability for rapid sketch modification and feedback, stakeholders and decision-markers can iterate to an acceptable development scheme during the permitting process.

In the Figure 3 example, this step shows two versions of a development proposal, X and Y. Proposal X contains offices and Proposal Y includes offices plus retail. The employment density indicator reveals that Proposal Y's employment density is 20% greater than Proposal X, and is therefore preferred because it is more supportive of the adopted corridor goal.

6. Achieving Plans

Periodically, snapshot sketches can be used to measure cumulative change and overall progress toward goals. This type of application would include the following steps:

- *Retrieve benchmark indicator scores.* Indicator scores from the previous benchmark year are used as the starting point, e.g. year 2000.

- *Incorporate built and natural environment changes.* The model's database is updated with constructed changes in the built environment, and resulting changes in the natural environment, that have occurred during the reporting period, e.g. 2000-2005.

- *Update indicator scores.* An updated "existing conditions" case is scored to establish new measurements for the new benchmark year, e.g. 2005. The changes in indicator scores between 2000 and 2005 become the amount of goal achievement for the period.

In the Figure 3 example, cumulative changes over several years are measured, revealing a density increase from 12 to 31 employees/acre, which is substantial partial achievement of the goal of 40 employees/acre. However, despite this areawide progress, indicator mapping shows a continuing weakness in employment density in the eastern portion of the corridor where additional attention needs to be focused in order to fully achieve the plan.

7. Special Purpose Applications

In addition to the generic planning process described above, SGI can be applied to any special purpose study where SGI's indicators are relevant to the study's scope or objectives. Examples include municipal annexations, environmental impact reports, capital improvement planning, and facility siting. Any kind of comparative evaluation or trade-off analysis that is land-based could conceivably be simulated in SGI providing that its indicators are relevant to the issues at hand.

8. Examples of Community Indicator Results

To further illustrate the use of indicators, this section of the guide presents a hypothetical community that has applied SGI in two planning situations. The first application is a forecast sketch of the community's land-use plan and the second is a snapshot sketch of a redevelopment site in the center of the community.

Figure 4 presents two alternative land-use plans that have been evaluated with forecast sketches. In this example, the community's urban growth boundary was used as the sketch boundary and the year 2020 was used as the planning horizon. The "business as usual" alternative shown on the left of Figure 4 represents continued agricultural land conversion to low-density residential use, and continued strip development along arterial corridors. In contrast on the right, the "smart growth" alternative retains much of the agricultural land and instead allocates residential growth to a more diverse mix of housing types centrally located in the community. Employment and shopping are similarly concentrated where infill opportunities and existing infrastructure can accommodate them, and where multi-modal travel is more feasible.

Indicator results for the two alternative plans are shown in Table 1 in comparison to existing conditions. The "business as usual" plan would result in lower residential and employment densities, and these conditions, in turn, would produce greater auto dependency, higher travel costs, increased energy and water use, and more pollutant emissions than current conditions. In contrast, the "smart growth" plan results in higher densities, creating a built environment that is more transit-oriented and less auto-dependent, with lower energy and water consumption rates, and reduced pollutant emissions. The "smart growth" alternative is therefore considered preferable because of its superior sustainability.

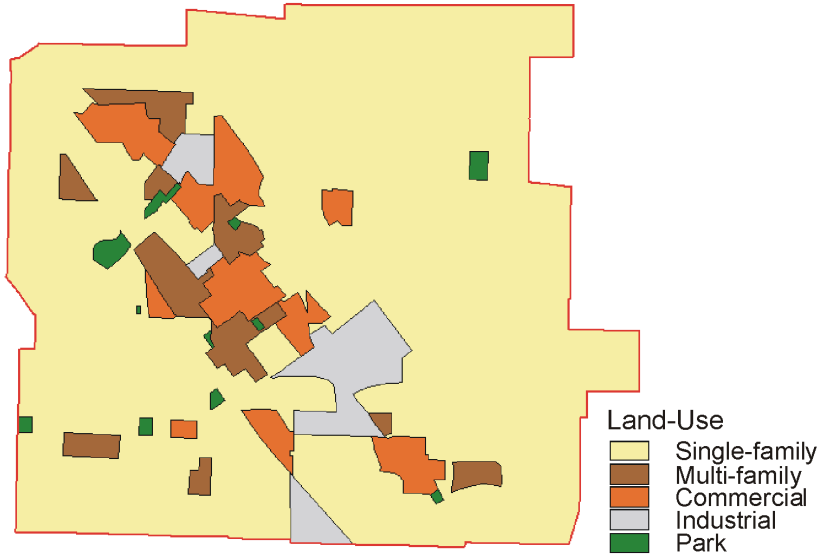
Turning to the snapshot example, Figure 5 shows a 30-acre redevelopment site in the center of the community. Having adopted the "smart growth" plan described above, community stakeholders formulated two alternative redevelopment plans for the site as also shown in Figure 5. The first alternative responds to infill housing goals with a proposed multi-family residential project in the lower left; and the second alternative responds to open space goals with a multi-use park proposal in the lower right. These snapshot sketches used a one-half mile radius boundary surrounding the subject property to evaluate the impacted neighborhood with and without each proposal.

Indicator results for the redevelopment alternatives are shown in Table 2 in comparison to existing conditions. Adding the multi-family residential project to the neighborhood would improve the area's conformance with the community plan in several respects: higher residential density, increased use mix, better jobs/housing balance, greater multi-modal travel, less energy and water use, and less pollutant emissions. Alternatively, the park plan's benefits are limited to greater park space and closer park proximity for area residents. Although these latter benefits are worthy, on balance the residential alternative appears to be more consistent with community goals for the area.

It should be kept in mind that these are highly simplified examples, and SGI indicator scores do not necessarily constitute the "best answer" to every situation. Stakeholders in real world conditions will want to use a variety of tools; SGI should only be one of several sources of information used to build consensus in community planning processes.

Figure 4. ALTERNATIVE COMMUNITY LAND-USE PLANS

Business as Usual Plan



Smart Growth Plan

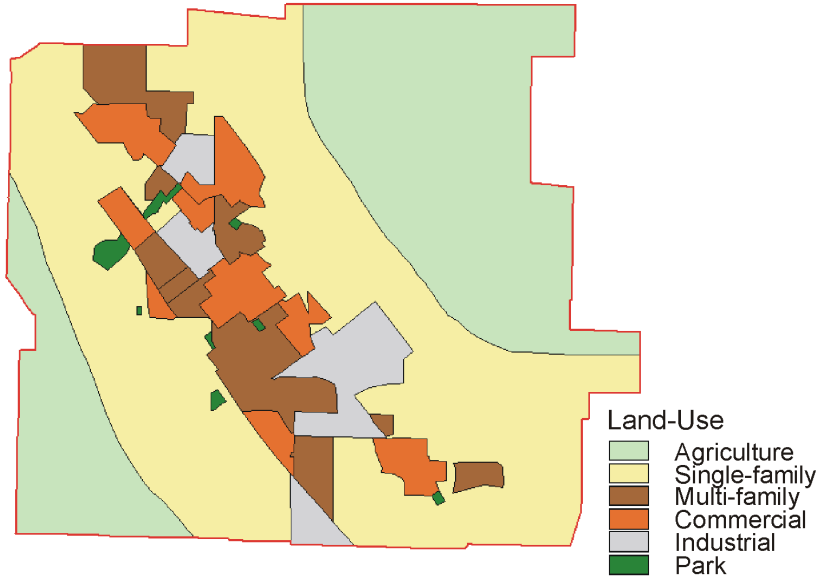


Table 1

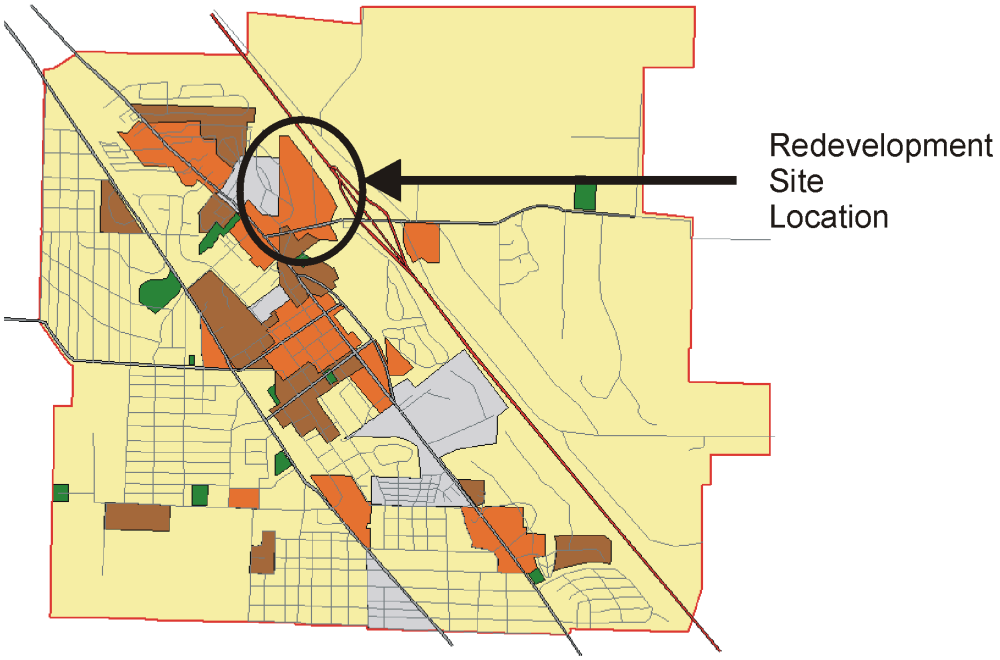
COMPARISON OF FORECAST INDICATOR SCORES

	Selected Indicators	Forecast Sketches			Indicator Units
		Existing Conditions	Business as Usual Plan	Smart Growth Plan	
Land-Use					
Growth compactness	✔	8,500	8,400	11,000	Persons/sq.mi. in developable area
Population density	✔	8,200	8,100	10,600	Persons/sq.mi. in total area
Incentive area use for housing					
Incentive area use for employment					
Jobs/workers balance					
Housing					
Housing density	✔	5	4	9	Dwelling units/acre
Housing transit proximity	✔	8	6	23	% dwellings w/i 1/4 mi. of route
Residential energy use	✔	125	135	110	MMBtu/yr./capita
Residential water use	✔	150	150	125	Gal./day/capita
Employment					
Employment density	✔	10	8	17	Employees/acre
Employment transit proximity	✔	14	12	31	% employees w/i 1/4 mi. of route
Travel					
Vehicle miles traveled	✔	20	22	17	Total VMT/day/capita
Vehicle trips	✔	5	6	4	Total VT/day/capita
Arterial vehicle hours traveled	✔	0.20	0.25	0.15	VHT/day/capita
Freeway vehicle hours traveled	✔	0.10	0.14	0.10	VHT/day/capita
Arterial vehicle hours of delay	✔	0.09	0.11	0.06	VHD/day/capita
Freeway vehicle hours of delay	✔	0.06	0.08	0.04	VHD/day/capita

Table 1 *Continued*

	Selected Indicators	Forecast Sketches			Indicator Units
		Existing Conditions	Business as Usual Plan	Smart Growth Plan	
Travel Continued					
Auto driver mode share	✔	87	88	79	% daily person trips
Auto passenger mode share	✔	5	5	6	% daily person trips
Transit mode share	✔	5	6	9	% daily person trips
Walk/bike mode share	✔	3	3	6	% daily person trips
Auto travel costs	✔	7,600	8,000	6,100	$/household/yr.
Environment					
Oxides of nitrogen (NOX) emissions	✔	21	23	18	Lbs./yr./capita
Oxides of sulfur (SOX) emissions	✔	275	280	255	Lbs./yr./capita
Hydrocarbon (HC) emissions	✔	270	275	250	Lbs./yr./capita
Carbon monoxide (CO) emissions	✔	246	259	231	Lbs./yr./capita
Particulate matter (PM) emissions	✔	256	264	249	Lbs./yr./capita
Greenhouse gas emissions	✔	8,600	8,900	8,000	Lbs./yr./capita

Figure 5. REDEVELOPMENT SITE & ALTERNATIVE PLANS



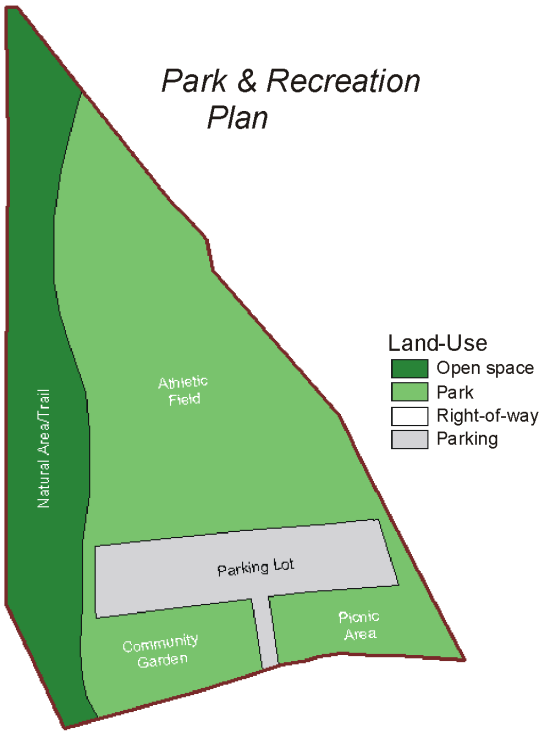


Table 2

COMPARISON OF SNAPSHOT INDICATOR SCORES

	Selected Indicators	Snapshot Sketches			Indicator Units
		Existing Conditions	Residential Alternative	Park & Rec. Alternative	
Land-Use					
Population density	✔	7,000	7,200	7,000	Person/sq.mi.
Use mix	✔	0.40	0.55	0.50	0 to 1 scale (1 = high)
Jobs/workers balance	✔	0.8	0.9	0.8	Jobs/total employed residents ratio
Housing					
Residential density	✔	9	13	9	Dwelling unit/acre
Single-family housing share					
Multi-family housing share	✔	22	31	22	% of total dwellings
Housing transit proximity	✔	45	53	45	% dwellings w/i 1/4 mi. of stops
Housing recreation proximity	✔	30	24	56	% of dwellings w/i 1/4 mi. of parks
Residential energy use	✔	125	121	125	MMBtu/yr./capita
Residential water use	✔	150	136	150	Gal./day/capita
Employment					
Employment density					
Employment transit proximity					
Travel					
Sidewalk completeness					
Pedestrian route directness					
Pedestrian design index					
Street network density					
Street connectivity					
Vehicle miles traveled	✔	20	19	20	Total VMT/day/capita

Table 2 *Continued*

	Selected Indicators	Snapshot Sketches			Indicator Units
		Existing Conditions	Residential Alternative	Park & Rec. Alternative	
Travel Continued					
Vehicle trips	✔	5	4.5	5	Total VT/day/capita
Auto travel costs	✔				$/household/yr.
Environment					
Open space	✔	4	4	11	% total area
Park space availability	✔	1.5	1.6	3.0	Acres/1,000 residents
Carbon monoxide (CO) emissions	✔	246	241	246	Lbs./yr./capita
Hydrocarbon (HC) emissions	✔	270	266	270	Lbs./yr./capita
Oxides of sulfur (SOX) emissions	✔	275	270	275	Lbs./yr./capita
Oxides of nitrogen (NOX) emissions	✔	21	19	21	Lbs./yr./capita
Particulate matter (PM) emissions	✔	256	252	256	Lbs./yr./capita
Carbon dioxide (CO_2)	✔	8,600	8,550	8,600	Lbs./yr./capita