

Representing Uncertainty in Collaborative Urban Planning: Social Equity Indicators in Scenario Planning Tools

Robert Goodspeed
Sabiha Zainulbhai
Bonnie Wang

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Overview

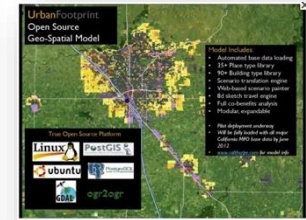
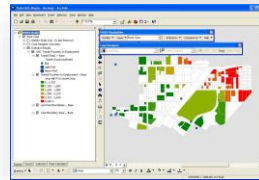
- Part 1: New Social Equity Indicator Tools
- Part 2: Representing Uncertainty

PART 1: EQUITY INDICATOR TOOLS

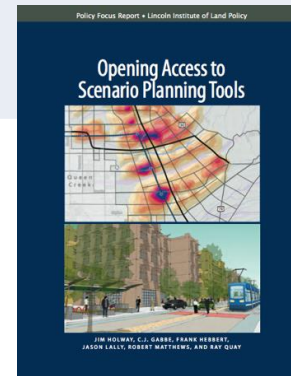
Practice Introduction

- **Land use planning** is the organization of land, resources, facilities and services in a community through the creation of a **plan** which guides implementation decisions
- Communities have **significant ability** to shape land development, but it often requires **collaboration** to coordinate:
 - Zoning, subdivision, and other land development regulations (municipalities)
 - Provision of public facilities (schools, libraries, others)
 - Management of roads and transit systems (muni., transit providers, state DOT)
 - Parks and preservation of farmland and natural areas (muni., conservation organizations)
 - Etc
- Land use planning can utilize a **variety of analysis** on the diverse topics it involves: economics, housing, transportation, environment, social equ, etc...
- One such analysis tool is ...

Sketch Planning Support Systems



	Envision Tomorrow	INDEX	Urban Footprint	I-PLACE ^{3S}
Where?	Across the U.S.	30 states and 6 countries	California Metros	Metro Sacramento
Illustrative Indicators	<ul style="list-style-type: none"> • Estimated Vehicle Miles Traveled / Greenhouse Gas Emissions • Impervious Surface • Housing Diversity / Affordability • Energy Use • Air Quality 			



For tool description see Goodspeed 2013, Chapter 3; Holway et al 2012 (right)

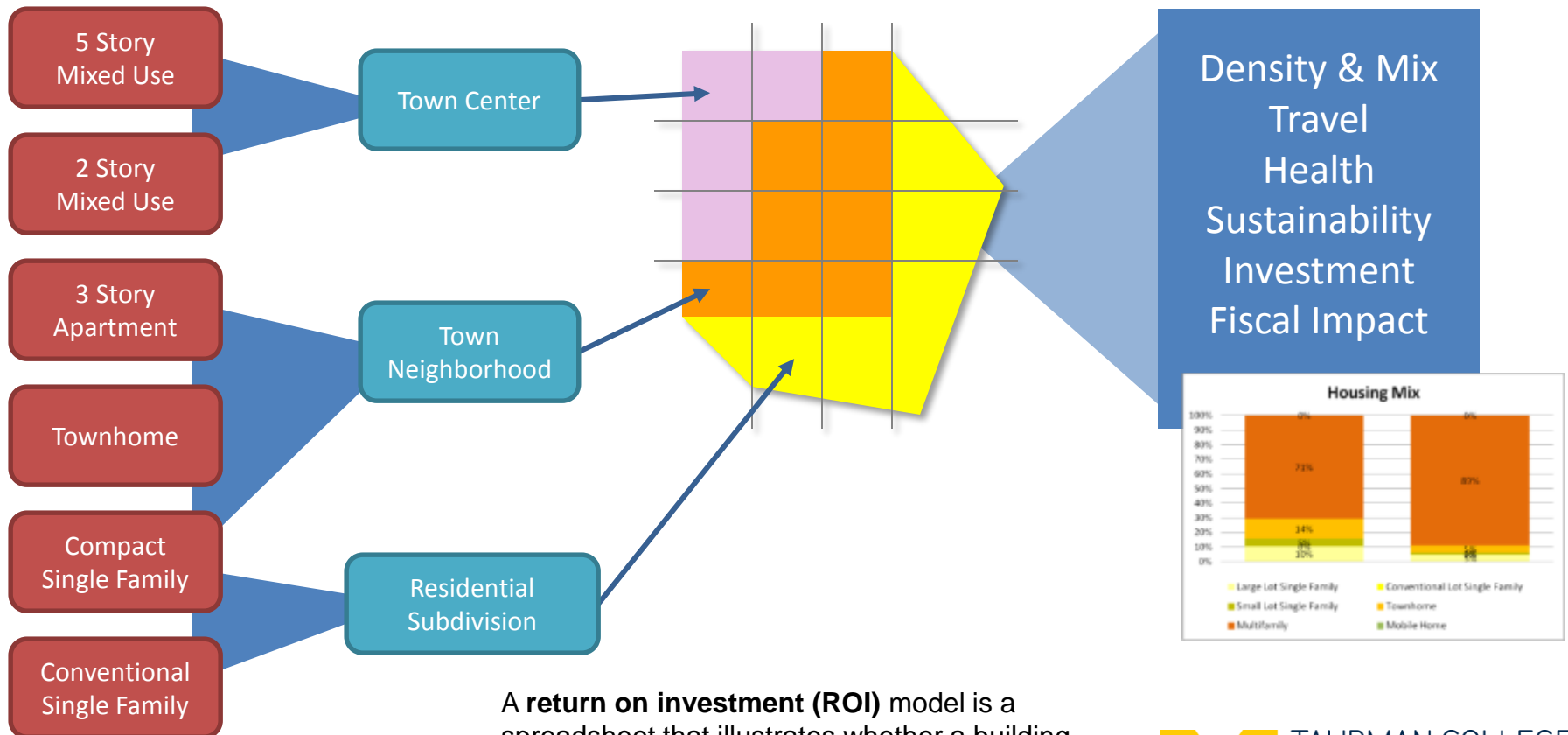
Overview of Envision Tomorrow + Tool

Buildings
ROI Model

Development Types
Scenario Spreadsheet

GIS
Painting
ArcGIS

Evaluation Criteria
Scenario Spreadsheet



A **return on investment (ROI)** model is a spreadsheet that illustrates whether a building makes financial sense given existing rents, cost of construction, public subsidies, and other financial factors.

Slide Source: Fregonese Associates

Place Types Composed of Regionally Calibrated Prototype Buildings

Mix of Buildings

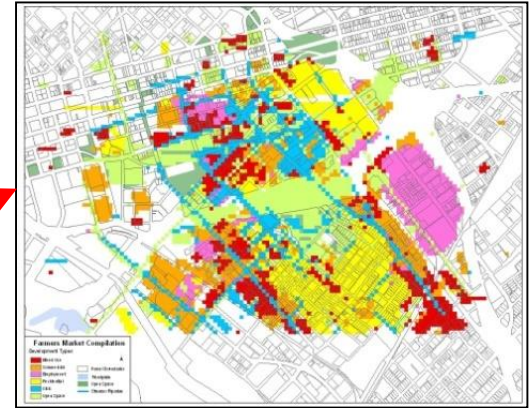
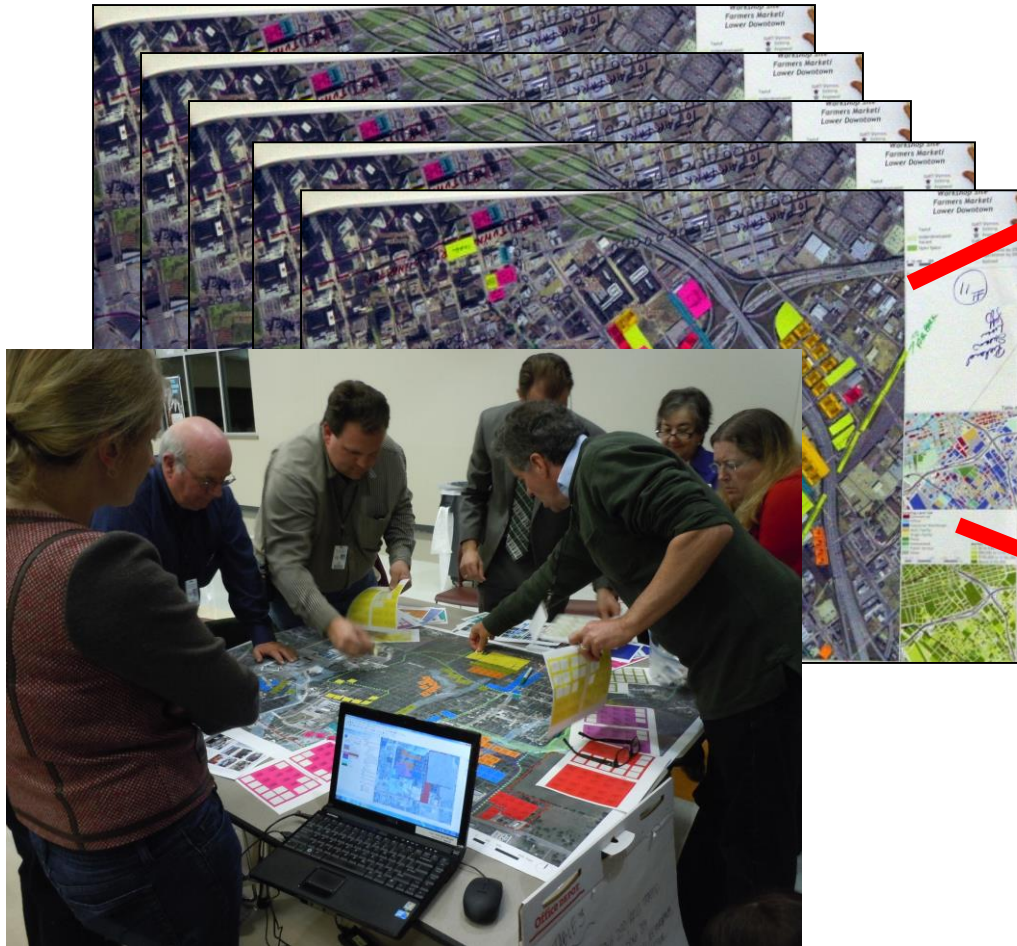
Place Types	Development Type Name	Single Family Large Lot	Single Family Standard Lot	Single Family Compact Lot	Townhomes Market Rate	Multi-Family Affordable	Multi-Family Mixed Income	Multi-Family Market Rate
		Clear Building Mix						
	Downtown Commercial Core							
	Business / Commerce District							
	Transit Oriented District				10%		20%	10%
	Medical / Institutional Center							
	Western Reserve Town Center			20%			20%	
	University / College Town District							15%
	New Town Center				25%			25%
	Neighborhood Main Street						20%	
	Arterial Commercial District							
	Lifestyle Center / Mall District							15%
	Corporate Campus							
	Light Industrial Business Park							
	Heavy Industrial Development							

Place Types Include Street Characteristics

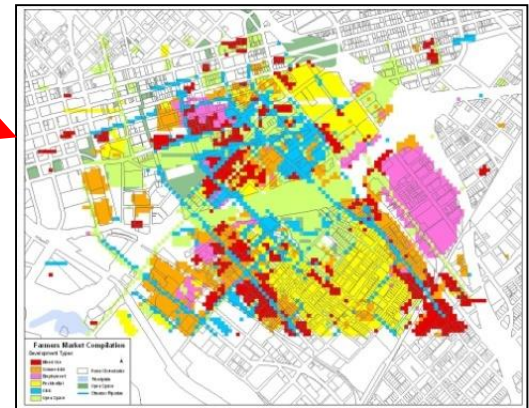
2. Enter Development Type Names	Block Size					Street Characteristics									Percentage
	Block Width 1 (ft)	Block Width 2 (ft)	Buildable Block Area (Sq Ft)	Total block Area (to center line) (Sq Ft)	Total Block Area (Acres)	Number of Drive Lanes	Drive Lane Width	On-street Parking Width	Bike Lane Width	Sidewalk Width	Total Landscaping Width	Total Street Width	Cul-de-sac as percent of all intersections		
Clear Streets															
New Town Center	800	400	320,000	436,100	10.0	4	11	8	-	10	10	90	30%		
Neighborhood Main Street	400	400	160,000	219,024	5.0	2	10	8	4	12	-	68	0%		
Arterial Commercial District	800	350	280,000	391,600	9.0	4	11	8	-	10	10	90	10%		
Lifestyle Center / Mall District	900	600	540,000	648,261	14.9	4	11	-	-	10	5	69	35%		
Corporate Campus	900	900	810,000	906,304	20.8	2	11	-	-	10	10	52	35%		
Light Industrial Business Park	900	900	810,000	887,364	20.4	2	11	-	-	5	10	42	35%		
Heavy Industrial Development	1,200	1,200	1,440,000	1,560,001	35.8	3	11	8	-	-	-	49	0%		
Downtown Residential Neighborhood	350	350	122,500	176,400	4.0	2	10	8	5	12	-	70	0%		
Suburban Multi-Family Neighborhood	600	300	180,000	245,824	5.6	3	9	8	4	6	5	68	15%		
Senior Living Community	400	400	160,000	221,841	5.1	2	9	8	4	12	5	71	15%		
Mixed-Income Neighborhood	600	300	180,000	248,941	5.7	3	9	8	4	10	-	71	10%		
Compact Residential Neighborhood	400	300	120,000	167,244	3.8	2	9	8	4	10	-	62	10%		
Suburban Subdivision	600	600	360,000	408,321	9.4	2	9	8	-	-	5	39	50%		
Rural Residential Development	1,400	350	490,000	528,984	12.1	2	11	-	-	-	-	22	60%		
Abandonment 55%			-	-	-	-	-	-	-	-	-	-	0%		
Abandonment 35% (+10%)			-	-	-	-	-	-	-	-	-	-	0%		
Vacancy 20%			-	-	-	-	-	-	-	-	-	-	0%		
Open Space			-	-	-	-	-	-	-	-	-	-	0%		
HHLG Growth 20%			-	-	-	-	-	-	-	-	-	-	0%		

Slide Source: Fregonese Associates

ET+ Is Used to Create Multiple Scenarios in Collaborative Workshops



Compilation Scenario A



Compilation Scenario B

Photo Source: Goodspeed (2013), also (2015); Other slide images: Austin Sustainable Places Project. Lockhart Community Design Workshop: Scenario Planning Charrette. Presented at Lockhart Demonstration Site, January 31, 2013.

Planning Workshop Evaluation Survey Technical Memorandum

Robert Goodspeed
Taubman College of Architecture and Urban Planning
University of Michigan
rgoodspe@umich.edu

December 4, 2013

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1. Introduction

As part of dissertation field research, I developed a planning workshop evaluation survey (Goodspeed 2013). Although the survey was designed for my research focusing on the role of planning support systems, it contains questions about a range of issues useful to collect at planning workshops. This memorandum presents the questions that were used, along with a brief note for how they were scored.

Since my research in this area is ongoing, I am very interested to hear from anyone who would like to use these questions to evaluate a planning meeting or workshop, or would like to suggest improvements to these questions.

2. Survey Implementation Notes

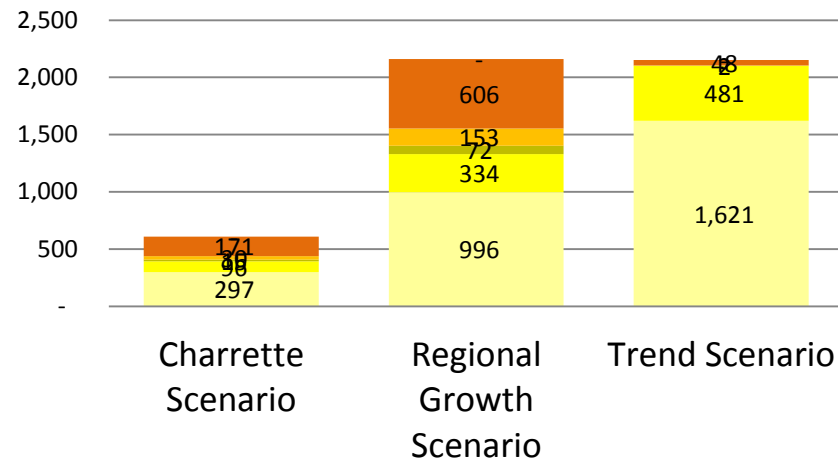
The survey was conducted at the conclusion of the planning workshop. After a brief verbal introduction by the researcher, the survey was distributed in hard copy to all participants. This technique resulted an estimated coverage of 85-95% of all workshop participants, versus the 27% coverage achieved by emailing and online survey to participants several days later. Despite coming at the end of a lengthy workshop, participants were willing to complete the three-page survey.

After collection, responses were manually entered into spreadsheet software and analyzed using statistics software.

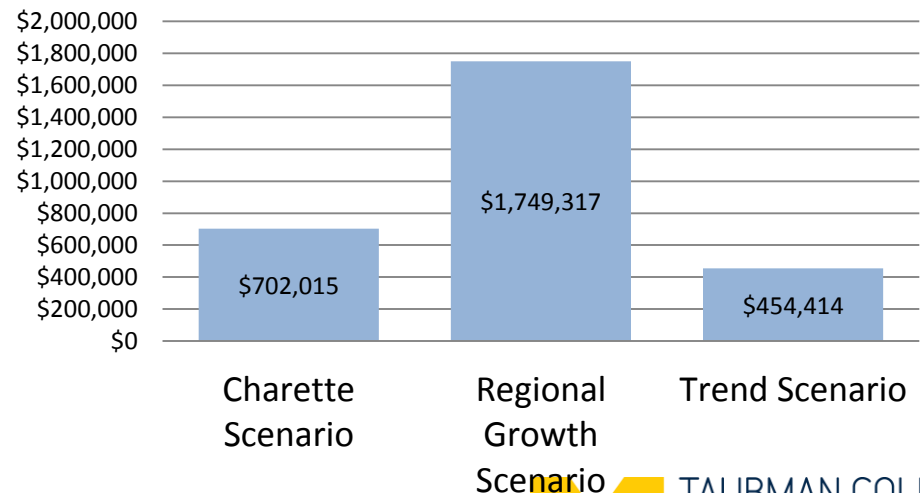
Real-Time Scenario Planning Indicators

1. Developed Acres
2. Rate of Redevelopment/Infill
3. Housing by Type
4. Housing Mix
5. Population
6. Employment by Type
7. Employment Mix
8. Jobs-Housing Balance
9. Housing Units per Net Acre
10. Jobs per Net Acre
11. Property Tax Revenue
12. Sales Tax Revenue
13. Fiscal Impact

Housing by Type



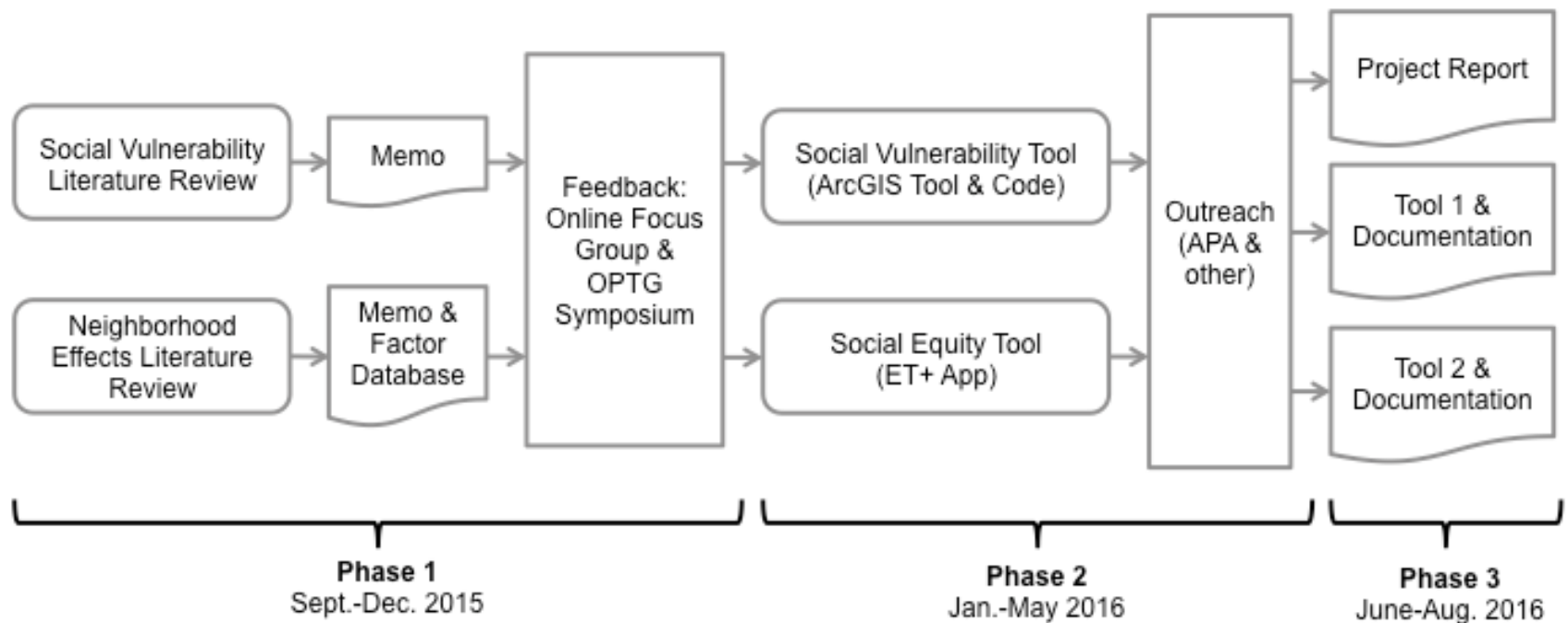
Sales Tax Revenue



What tools did we create?

- A **social vulnerability tool** to map out the community before planning has begun
 - The “base map” is typically focused on existing buildings & infrastructure – not social issues
- A **neighborhood effects tool** to allow ET+ users to conduct additional analysis of their land use scenarios
 - Existing analysis focuses on issues such as fiscal impact and travel behavior

Tool Development Process

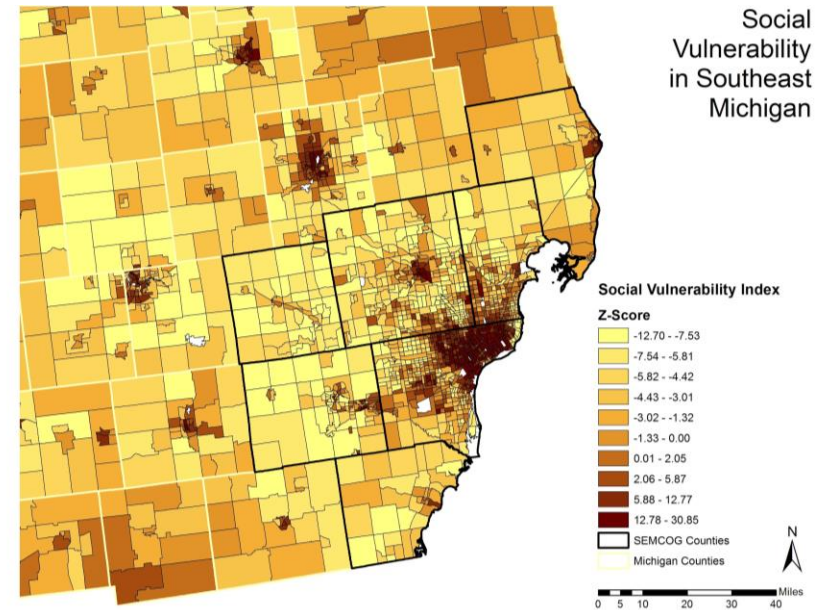


Social Equity Tool

Large body of descriptive and theoretical work on social vulnerability, a few validated indices (Lee 2014, Mendes 2009, Cutter et al 2000)

Created a new index, only 1 correlation greater than .3 at the individual level!

- **Demographics**
 - Percentage of non-white residents
 - Percentage of population under age 18 and over age 65
- **Social and economic**
 - Unemployment rate for civilian population in labor force 16 years and over
 - Percentage of households with no vehicles available
- **Wealth and Inequality**
 - Percentage with income in the past 12 months below poverty level
- **Healthcare and Food Access**
 - Percentage of people without health insurance coverage
 - Percentage of population with disability
 - Food desert status (Yes = 1, No = 0) (more than 1 mile away from the nearest supermarket)
- **Education and Language**
 - Percentage of population with less than regular high school diploma
 - Percentage of limited English speaking household
- **Housing**
 - Percentage of Vacant housing units
 - Percentage of households who pay more than 30 % of their income rent
 - Percentage of renter-occupied housing units



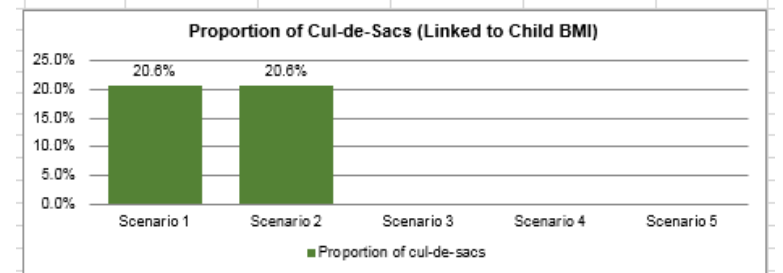
Neighborhood Effects Tool

- A growing body of “neighborhood effects” research has documented the role of neighborhoods in various well-being outcomes. Our tool identifies built environment factors in the tool linked to different outcomes.

Indicators

- Child BMI (Grafova 2008)
 - Proportion of cul-de-sacs
- Adult BMI (Rundel et al 2007)
 - Land use mix
 - Population density
- Collective Efficacy (Cohen, Inahami, Finch 2008)
 - Proportion of open space
- Upward mobility, adult BMI, heart disease, diabetes (Ewing, Meakins and Hamidi 2014)
 - Population density
 - Employment density
 - Land use mix
 - Building size mix
 - Intersection density

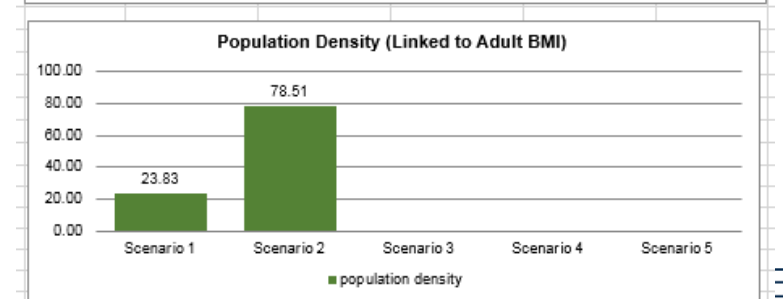
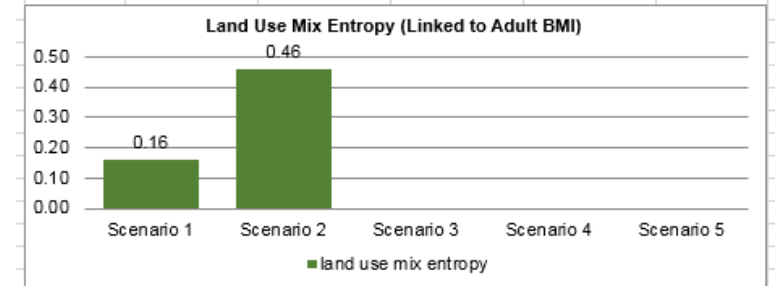
Existing	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
	20.6%	20.6%			



Grafova (2008) found a **positive** relationship between living in a neighborhood built after 1969 (used as a proxy for high cul-de-sacs) and Child BMI.

Narrative report: Scenario 2 has characteristics associated with **lower** child BMI than scenario 1.

Existing	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
	0.16	0.46			
	23.83	78.51			



Rundel et al (2007) found a **negative** relationship between land use mix and population density and Adult BMI

Scenario 2 has characteristics associated with **lower** adult BMI than scenario 1.

PART 2: REPRESENTING UNCERTAINTY

Why care about uncertainty?

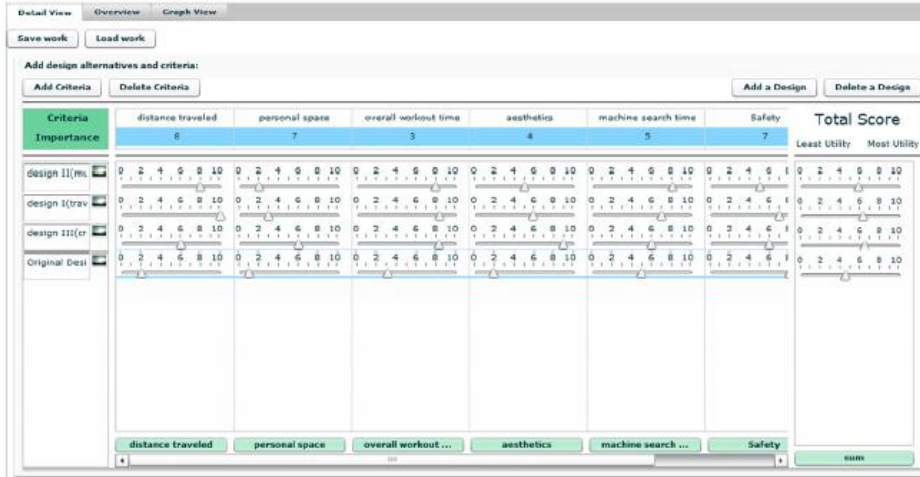


Figure 1. The interface for the Certainty Decision Support System.

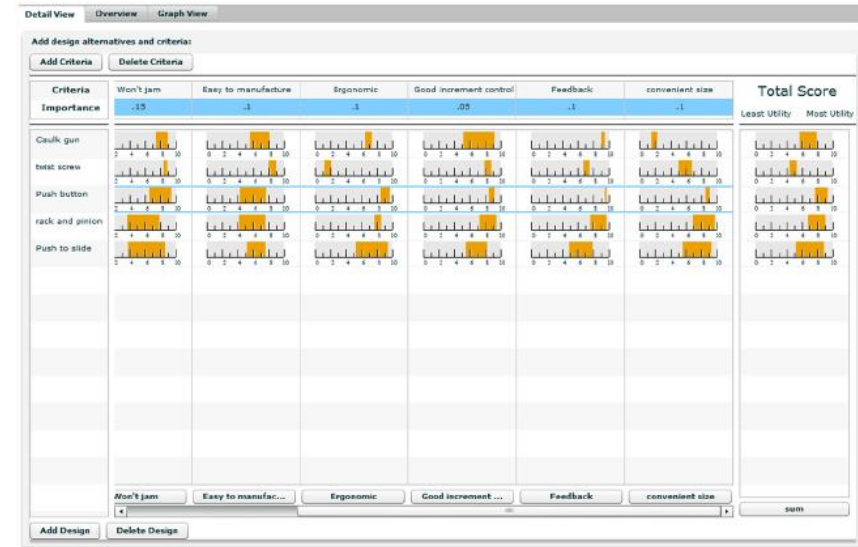


Figure 2. The top-level interface for the Uncertainty Decision Support System.

In a laboratory experiment a tool which showed uncertainty as a **range of values** (Dong and Hayes 2012):

- Helped users understand when uncertainty made a choice unclear;
- Helped users make good decisions even with ambiguity;
- Encouraged users to seek clarifying information;
- Was **preferred** by users!

Only concerns the simplest form of **statistical** uncertainty.

1. What are we uncertain about in planning?

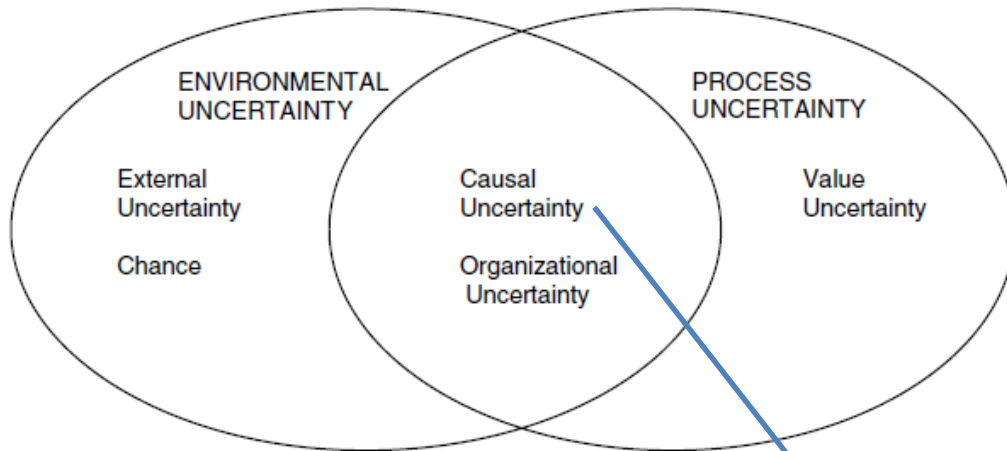


Figure 5. Dimensions of environmental and process uncertainty.

Table 3.
Dimensions of process and environmental uncertainty

<i>Dimensions of Process Uncertainty^a</i>	<i>Dimensions of Environmental Uncertainty^b</i>
Uncertainty in knowledge of the environment;	Uncertainty about the causal relations in the local environment
Uncertainty about the intentions of other people and organizations;	Uncertainty about human and aspects
Uncertainty about appropriate value judgments	Uncertainty about the external environment
	Uncertainty about chance events

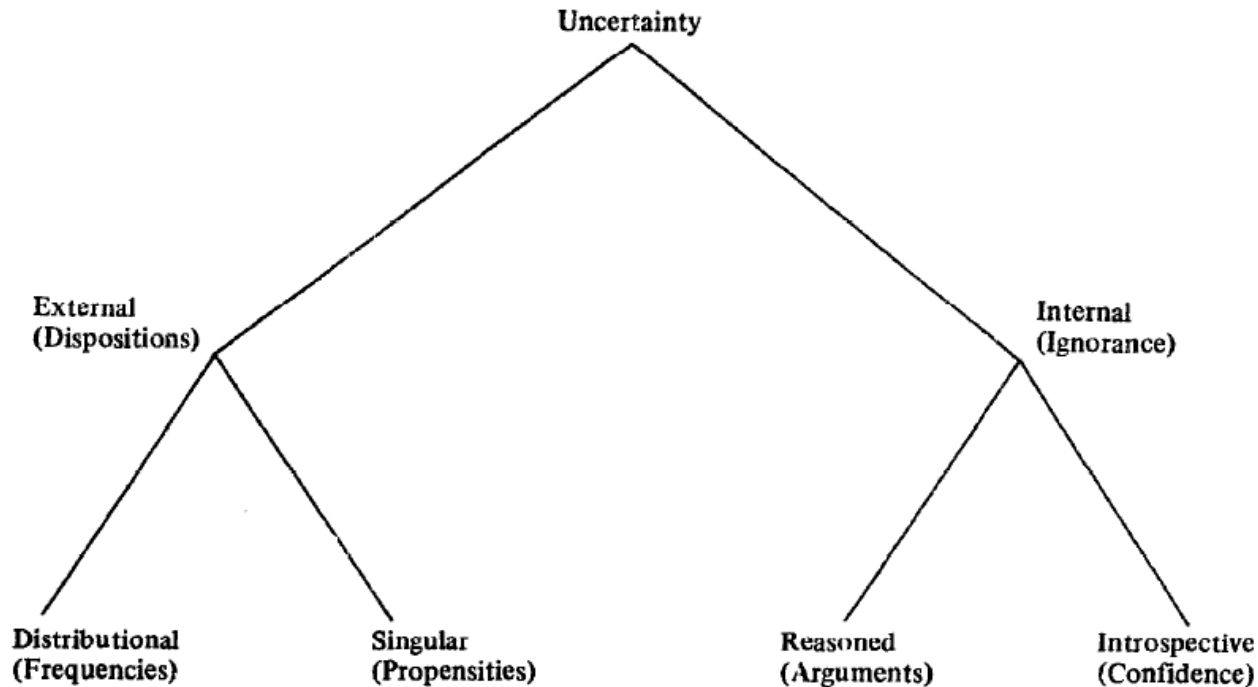
a. Based on Friend and Jessop (1969).

b. Based on the change factors of Mack (1971).

Options
Consequences
Utility/Value

Source: Abbot (2005)

2. How do we think about the uncertainty of knowledge in these categories?



Source: Kahneman and Tversky (1982)

Sources of Uncertainty and Representation Options

	Source of Uncertainty	Type	How to address?
Social Vulnerability Tool	Index Uncertainty (ACS errors)	Distributional	Compute margin of error – impossible!
	Temporal Uncertainty (relevance of past information)	Singular	Draw attention to years, rates of change
	Construct Uncertainty (validity of construct)	Singular	Report empirical validation
Neighborhood Effects Tool	Factor Uncertainty (Causal-consequences)	Distributional	Report traditional measures (P values)
	Strength Uncertainty (Causal-utility)	Singular	Describe study design; details
	Temporal Uncertainty (relevance of old studies)	Singular	Display study years
	Geographic Uncertainty (relevance of external studies)	Singular	Provide context comparison

Conclusions

- The adoption of planning tools which utilize external knowledge, introduces new source of **causal uncertainty** in planning decisions;
- Most sources of uncertainty are **singular** and not **distributional** in nature, meaning statistical principles do not apply;
- We need improved knowledge about **which representations** can foster consideration of these sources of uncertainty in collaborative planning contexts

Discussion

- For works cited and further background, see accompanying memo, Goodspeed, Zainulbhai, and Wang, “Development of tools for considering social equity in scenario planning,” 18 November 2015.
- Funding provided by Lincoln Institute of Land Policy, Grant #URG082015

Contact

Robert Goodspeed - rgoodspe@umich.edu, @rgoodspeed
Project RAs: Sabiha Zainulbhai, Bonnie Wang

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