

MOVING TOWARD A SUSTAINABLE CALIFORNIA

exploring livability, accessibility & prosperity

A WORKSHOP ON AUGUST 9, 2016



Bruce Appleyard, Ph.D.

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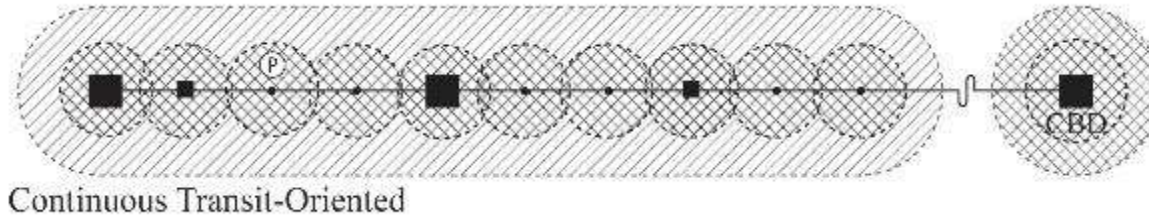
Matthew Taecker



CFA Consultants



TCRP H-45 *Livable Transit Corridors* *Methods, Metrics and Strategies*



a nationwide quality of life analysis of
over 350 transit corridors and thousands of stations in the U.S.
Handbook for Building Livable Transit Corridors
Livability Calculator
Innovative Transportation Calculator

Bruce Appleyard, Ph.D.

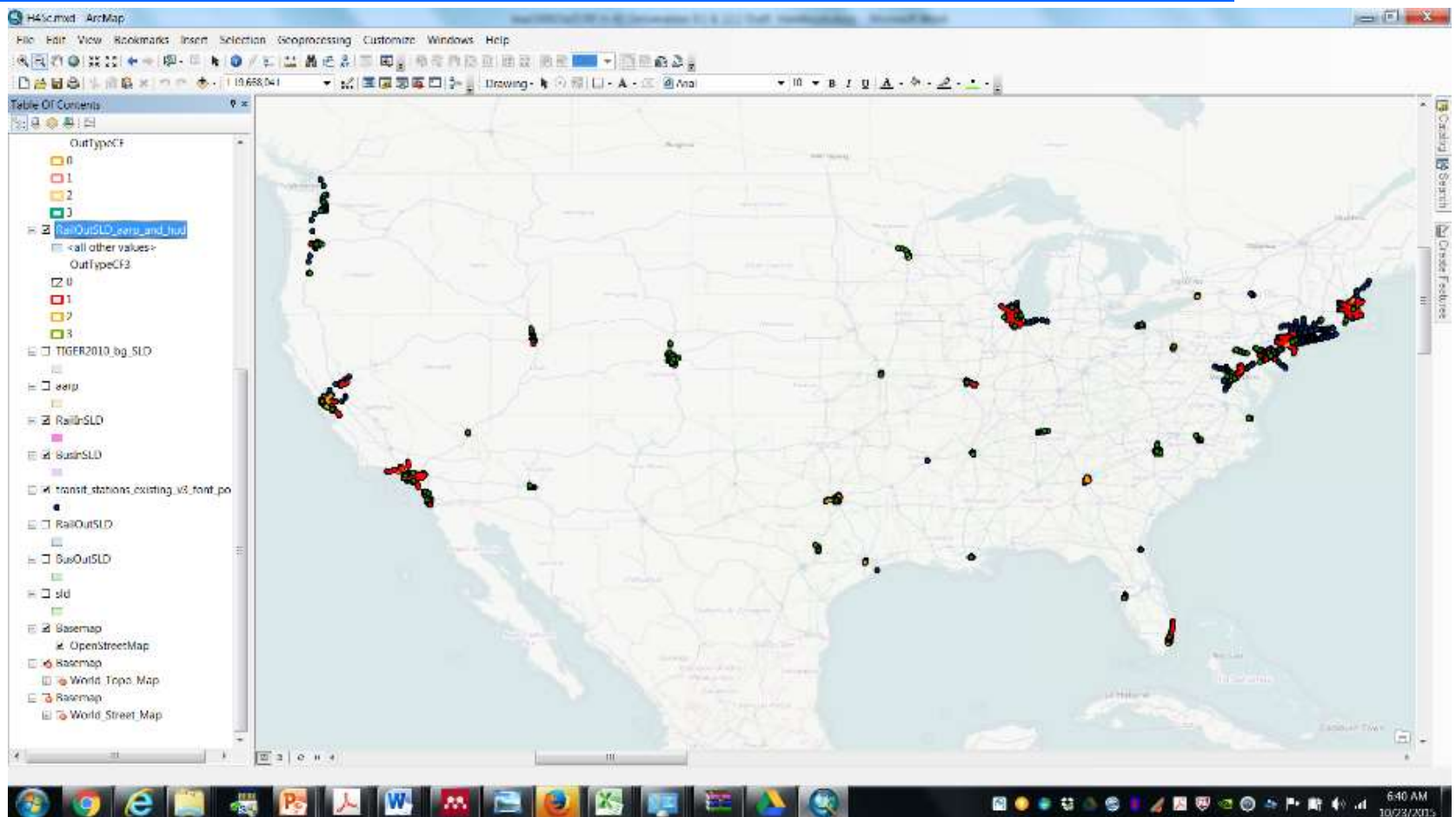
Assistant Professor, San Diego State University

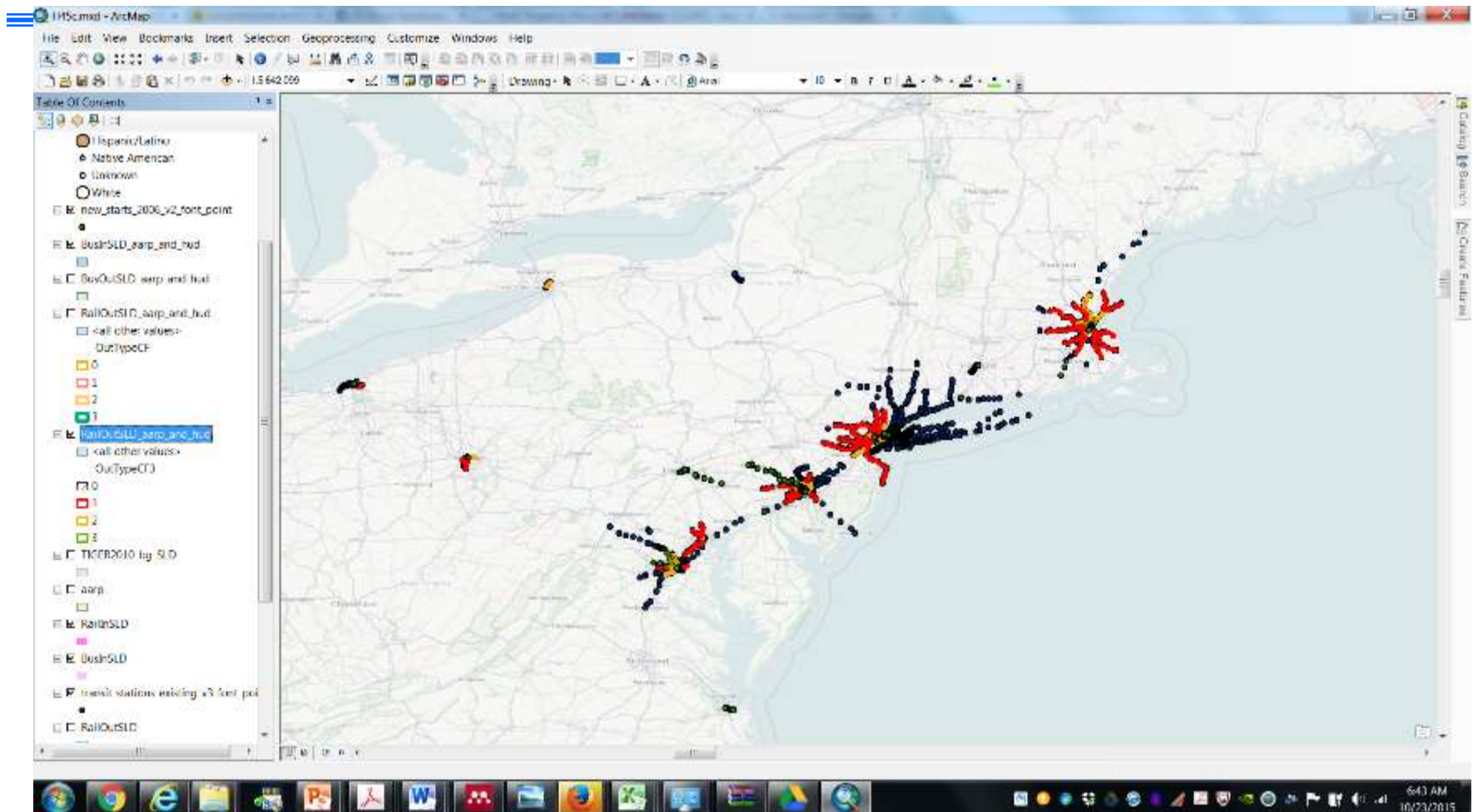
Christopher E. Ferrell, Ph.D.

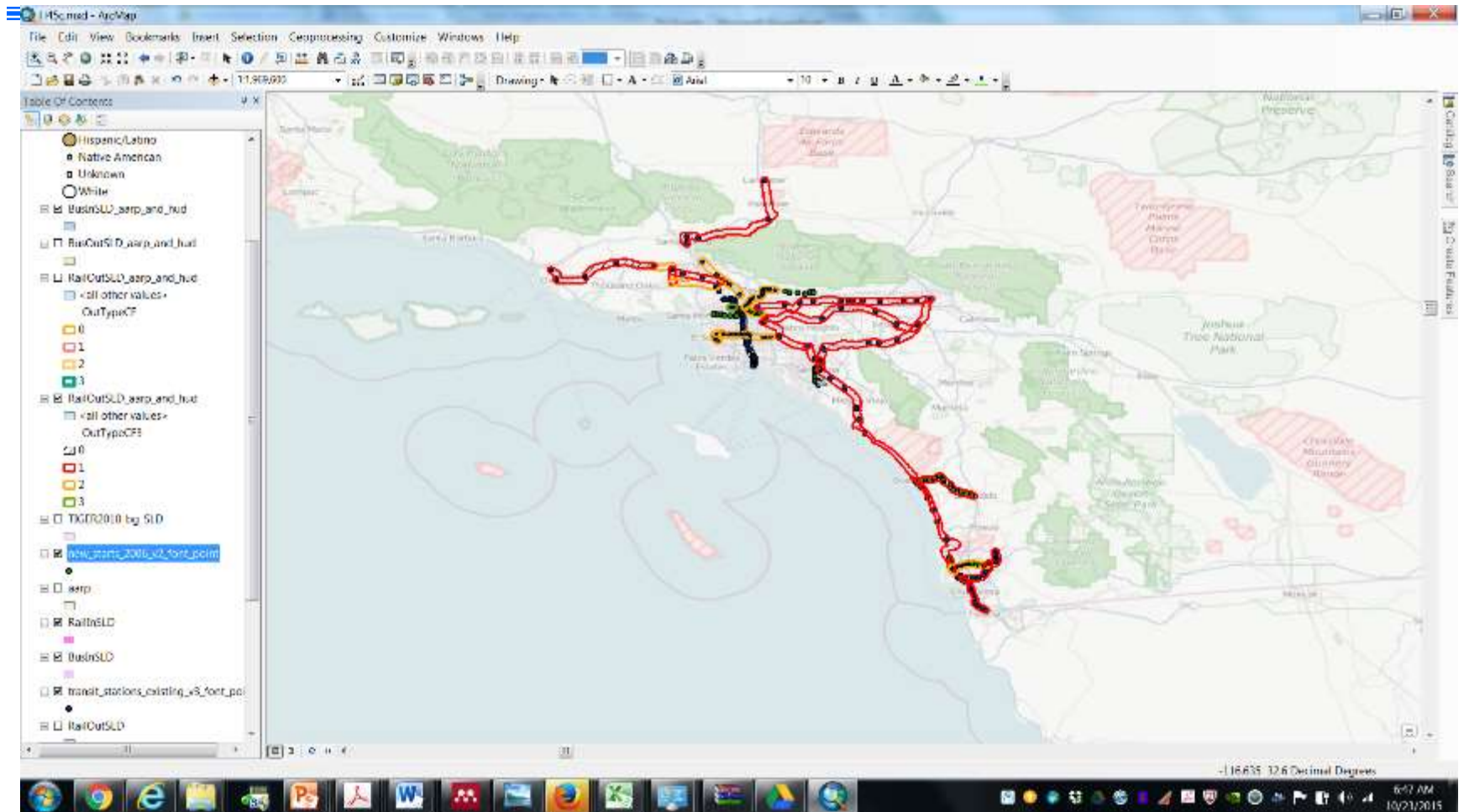
Principal, CFA Consultants

Matthew Taecker









HUD/USDOT/EPA Livability Principles

Partnership for Sustainable Communities' Livability Principles

Livability Performance Principles

Provide more transportation choices

Promote equitable and affordable housing

Enhance economic competitiveness

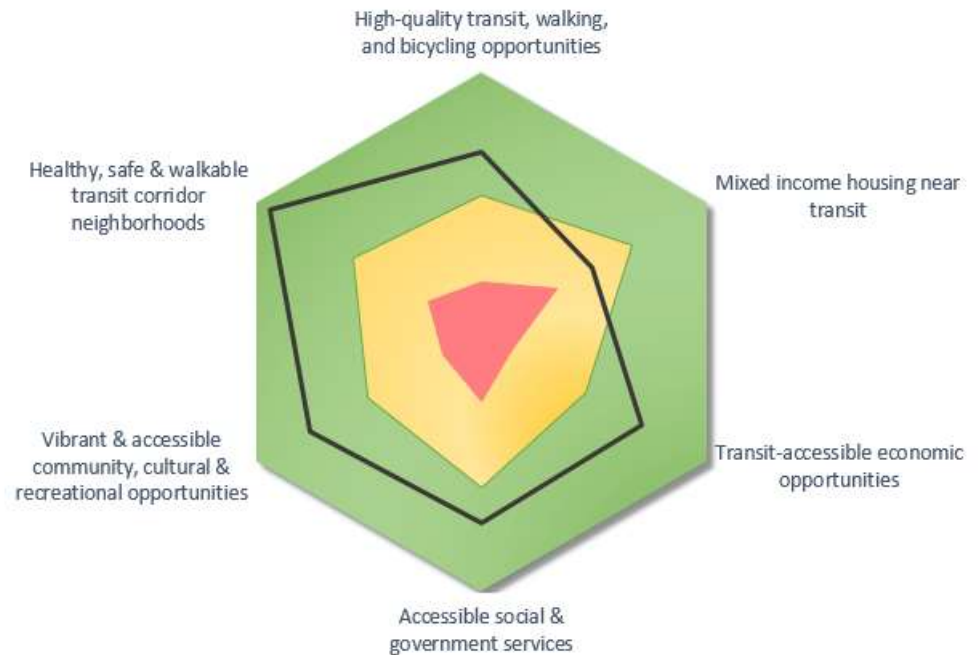
Support existing communities

Coordinate and leverage federal policies and investments

Value communities and neighborhoods



Livability Performance



5 Steps for Livable Transit Corridor Planning

Livability Calculator



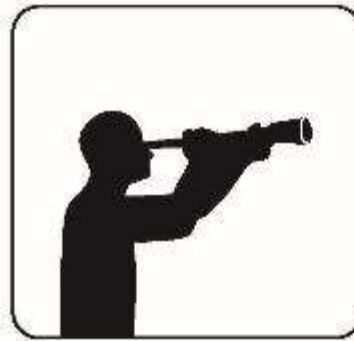
1. INITIATE PROJECT



2. ASSESS THE CORRIDOR



3. IDENTIFY GOALS



4. DEVELOP A VISION



5. IMPLEMENT STRATEGIES

↑
Scoping

↑
Visioning

↑
**Policies &
Programs**



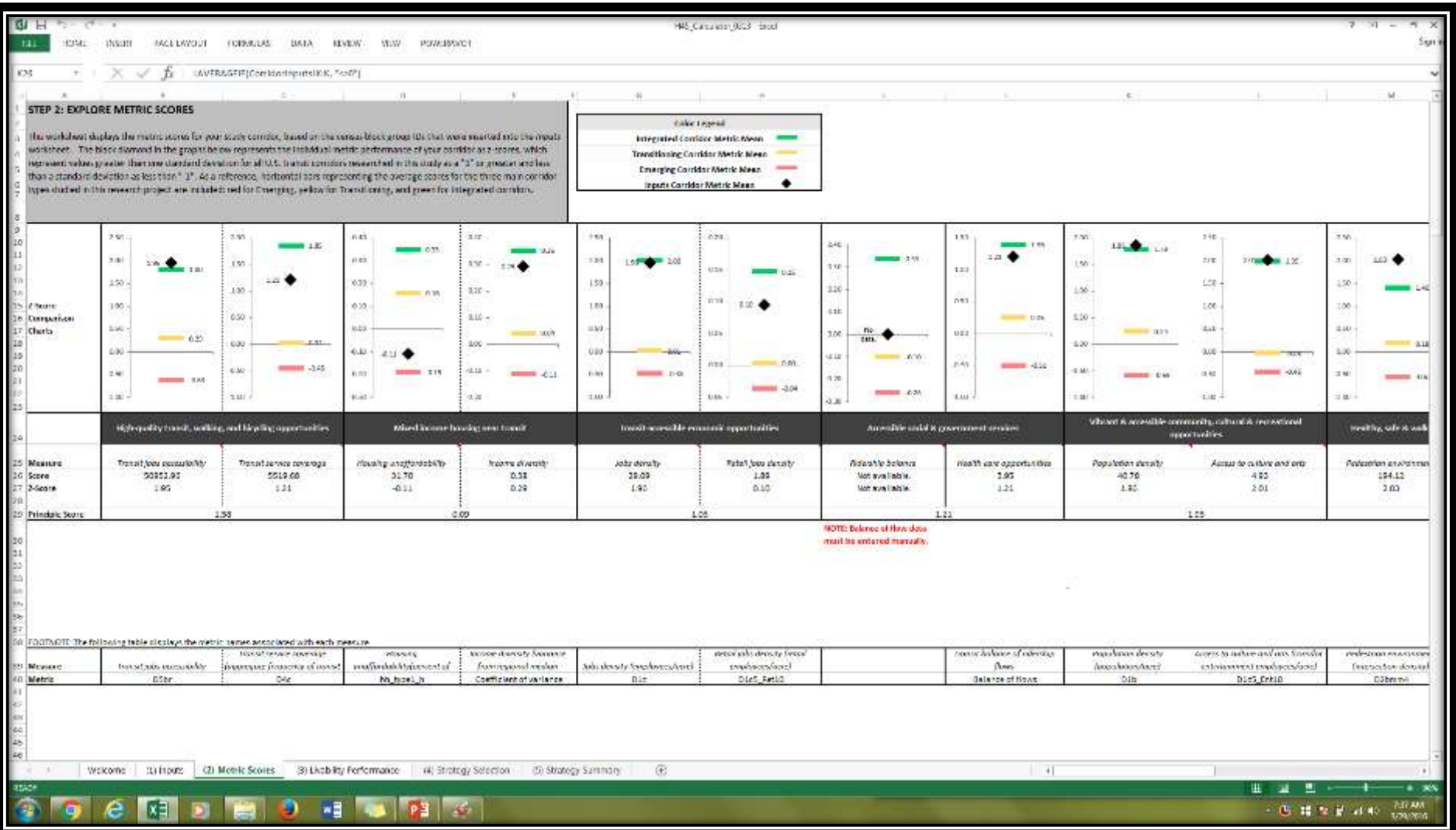


Livability Calculator



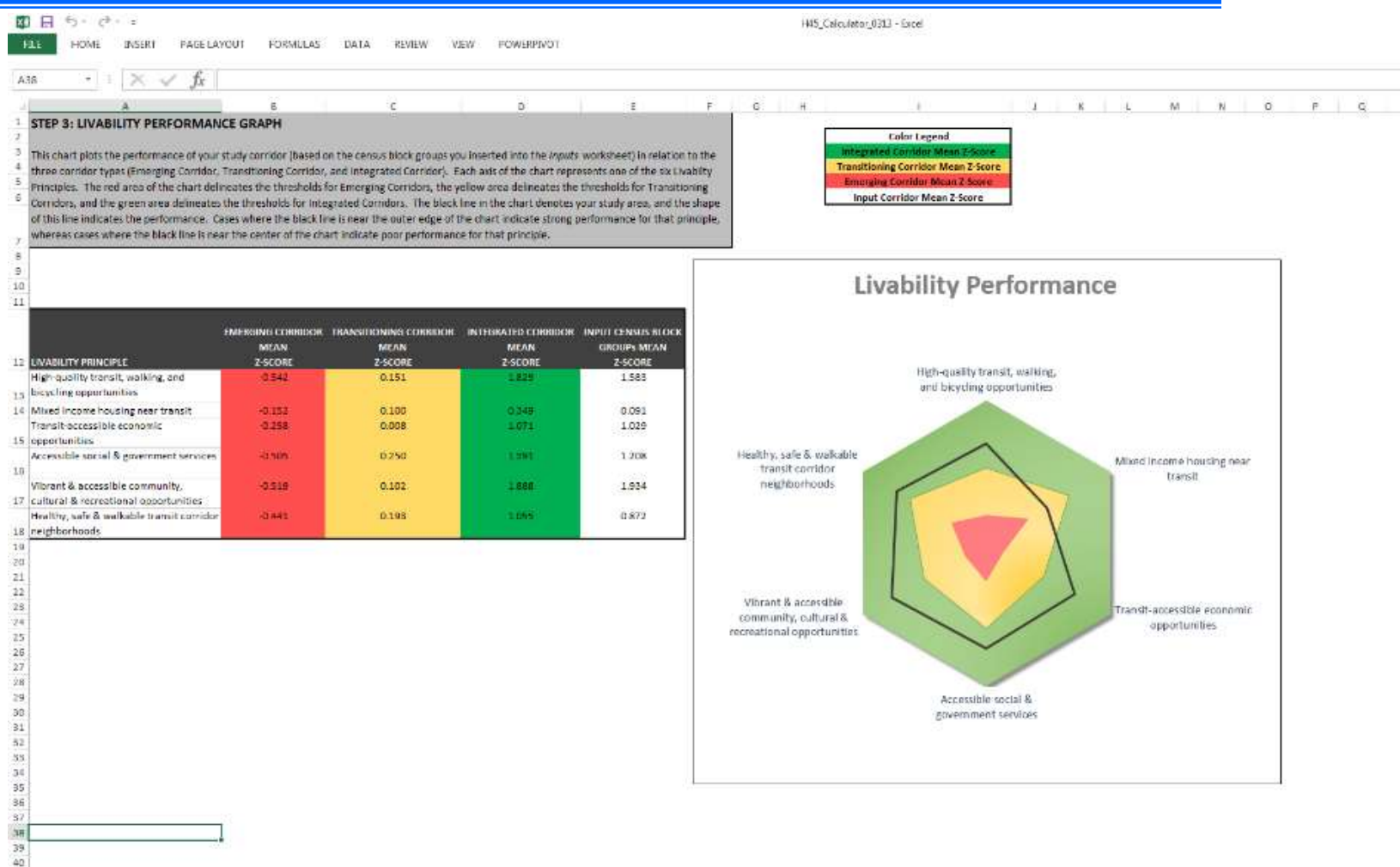


Livability Calculator:



STEP 3: LIVABILITY PERFORMANCE GRAPH

- This chart plots the performance of your study corridor (based on the census block groups you inserted into the *Inputs* worksheet, in relation to the three corridor types (Emerging Corridor, Transitioning Corridor, and Integrated Corridor).



FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW POWERPINT

C20 =

STEP 4: SELECT STRATEGIES TO ADDRESS METRIC PERFORMANCE

This worksheet allows you to assess the performance of the input census block groups across the all the metrics. Strategies and goals can also be selected (using the checkboxes) here in order to address performance concerns. Proceed to the next worksheet to view a summary of the selected strategies. Metrics colored in red indicate performance consistent with the Emerging Corridor typology, metrics colored in yellow indicate performance consistent with the Transitioning Corridor typology, and metrics colored in green indicate performance consistent with the Integrated Corridor typology. It follows that strategies associated with areas of poor performance should be considered most carefully.

Color Legend

- Integrated Corridor
- Transitioning Corridor
- Emerging Corridor
- Data Not Available

Clear All Checkboxes

PRINCIPLE	METRIC PERFORMANCE	SELECTED STRATEGIES		
High-quality transit, walking, and bicycling opportunities	Transit job accessibility	REGIONAL ACCESS <ul style="list-style-type: none"> <input type="checkbox"/> Connected Network Planning <input type="checkbox"/> Circutous Route Retrofits <input type="checkbox"/> Transit Frequency and Reliability <input type="checkbox"/> Last-Mile Shuttles <input type="checkbox"/> Jobs-Housing Alignment <input type="checkbox"/> Activity Center Master Plans <input type="checkbox"/> Regional Competitiveness <input type="checkbox"/> Station Area Profiles (to identify jobs or housing growth opportunities) <input type="checkbox"/> Compact Development 	CONNECTIVITY <ul style="list-style-type: none"> <input type="checkbox"/> Connected Network Planning <input type="checkbox"/> Circutous Route Retrofits <input type="checkbox"/> Complete Streets <input type="checkbox"/> Last Mile Shuttles <input type="checkbox"/> Pedestrian and Bicycle Network Maintenance 	DEMAND MANAGEMENT <ul style="list-style-type: none"> <input type="checkbox"/> Alternative Modes <input type="checkbox"/> Circutous Route Retrofits <input type="checkbox"/> Parking Management and Requirements <input type="checkbox"/> Transit Pass Subsidies <input type="checkbox"/> Zoning Overlay Districts
	Transit service coverage			
Mixed income housing near transit	Housing unaffordability	AFFORDABILITY <ul style="list-style-type: none"> <input type="checkbox"/> Location Efficiency <input type="checkbox"/> Transit Pass Subsidies <input checked="" type="checkbox"/> Regulatory Streamlining <input checked="" type="checkbox"/> Inclusionary Housing <input checked="" type="checkbox"/> Local Housing Trust Funds <input checked="" type="checkbox"/> Anti-Displacement Strategies <input checked="" type="checkbox"/> Land Assemblage & Joint Development <input type="checkbox"/> Station Area Profiles (development site identification) 	VARIETY <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Housing Production & Targets <input checked="" type="checkbox"/> Regulatory Streamlining <input checked="" type="checkbox"/> Inclusionary Housing <input checked="" type="checkbox"/> Land Assemblage & Joint Development <input checked="" type="checkbox"/> Local Housing Trust Funds <input checked="" type="checkbox"/> Anti-Displacement Strategies <input checked="" type="checkbox"/> Form-Based Codes (housing type flexibility) <input type="checkbox"/> Station Area Profiles (development site identification) 	
	Income diversity			
Transit-accessible economic opportunities	Job density	JOBS AND HOUSING <ul style="list-style-type: none"> <input type="checkbox"/> Mix of Uses <input type="checkbox"/> Jobs-Housing Alignment <input type="checkbox"/> Activity Center Master Plans <input type="checkbox"/> Station Area Profiles (to identify jobs or housing growth opportunities) 	VITALITY AND GROWTH <ul style="list-style-type: none"> <input type="checkbox"/> Compact Development <input type="checkbox"/> Regional Competitiveness <input type="checkbox"/> Financial Feasibility & Joint Development <input checked="" type="checkbox"/> Land Assemblage & Joint Development <input type="checkbox"/> District Financing and Value Capture <input type="checkbox"/> Social Investments 	REUSE <ul style="list-style-type: none"> <input type="checkbox"/> Financial Feasibility and Incentives <input checked="" type="checkbox"/> Land Assemblage & Joint Development <input type="checkbox"/> District Financing and Value Capture <input type="checkbox"/> Pro-Development Assistance <input type="checkbox"/> Social Investments

Welcome | (1) Inputs | (2) Metric Scores | (3) Livability Performance | (4) Strategy Selection | (5) Strategy Summary

READY



Dynamic Strategy Selection

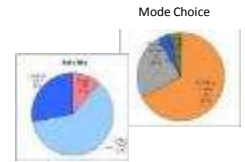
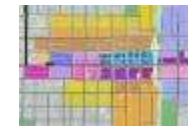
STEP 5: VIEW SELECTED STRATEGIES

This worksheet displays all the strategies selected in the previous worksheet. Clicking the hyperlink in the "HANDBOOK PAGE REFERENCE" column will open the user manual to the relevant page, allowing you to learn more about the strategy.

ATTENTION: Please make sure the handbook is in the same folder as the Calculator. Each hyperlink will open a new window in Adobe Reader. Please close unwanted windows to avoid complications.

STRATEGY	HANDBOOK PAGE REFERENCE	NUM. OF GOALS COVERED	GOALS COVERED	NUM. OF PRINCIPLES COVERED	PRINCIPLES COVERED
Transit First Subsidies	PAGE 326	2	Demand Management affordability	2	High-quality transit, walking, and bicycling opportunities Mixed income housing near transit
Anti-Displacement Strategies	PAGE 110	2	Transit affordability	1	Mixed income housing near transit
Form-Based Codes (housing type flexibility)	PAGE 89	2	Transit affordability	2	Mixed income housing near transit Mixed income housing near transit
Housing Production & Targets	PAGE 108	2	Transit affordability	1	Mixed income housing near transit
Inclusionary Housing	PAGE 110	2	Transit affordability	1	Mixed income housing near transit
Land Access/age & Land Development	PAGE 118	2	Transit affordability	2	Mixed income housing near transit Transit-accessible economic opportunities
Local Housing Trust Funds	PAGE 110	2	Transit affordability	1	Mixed income housing near transit
Regulatory Streamlining (Station Area Policies (development site identification))	PAGE 112	2	Transit affordability	1	Mixed income housing near transit Mixed income housing near transit





Innovative Transportation Calculator

***Smart Mobility Framework Implementation Project
Sustainable South Bay (LA) Strategies Project***

Funded by Caltrans and the Strategic Growth Council



Presentation to SBCC
By Bruce Appleyard, PhD
September 8, 2014



Innovative Transportation Calculator



NEV Ownership due to innovative transportation (percent of population)

1%



NEV Use due to infrastructure (as percent of VMT)

19%



Transit Use due to Innovative Transportation (percent increase)

1%



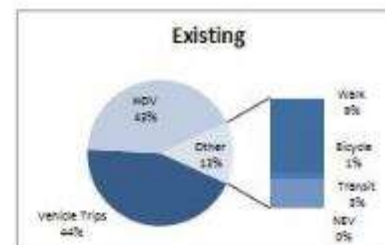
Pedestrian mode share increase due to Innovative Transportation and Land Use (percent increase)

1%



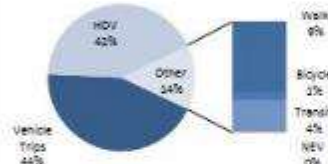
HOV/Carpooling Use due to Innovative Transportation (percent increase)

1%

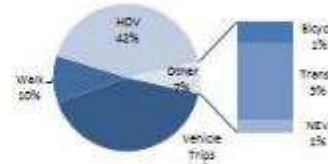


Traditional Transportation

Traditional LU

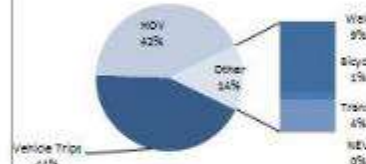


Innovative LU

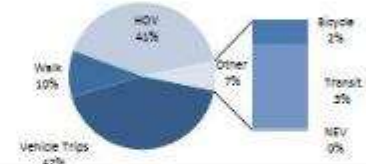


Innovative Transportation

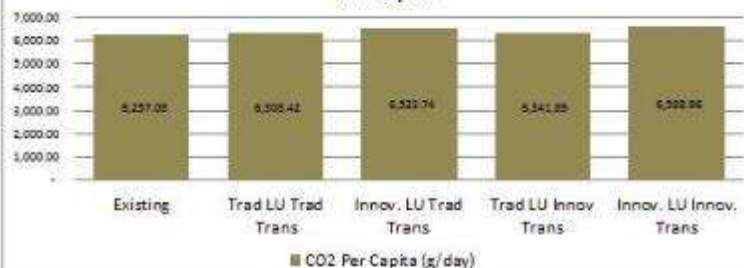
Traditional LU



Innovative LU



Transportation Carbon Emissions (CO2) Per Capita



Daily VMT per Capita



Developed by: San Diego State University, Institute of Metropolitan Planning + Design (IMP+D)
Contact: Bruce Appleyard and Caleb Schroeder
Questions: bappleyard@mail.sdsu.edu

An Approach Toward Measuring Livability (Access & Prosperity)?

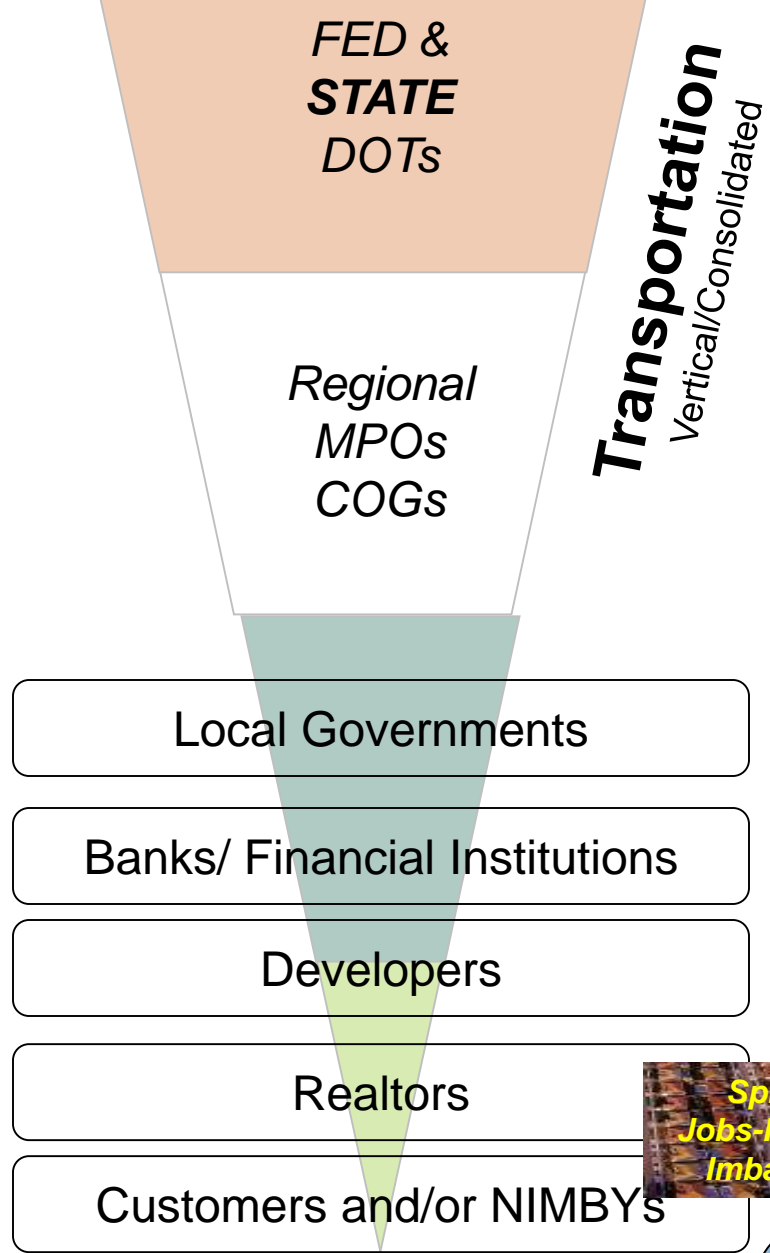
Problem Understanding:

- Decision Domains &
- Actors/Agents

Problem Solving:

- Frameworks
- Ethics

Big Problem: The T LU Imbalance “Tribal”



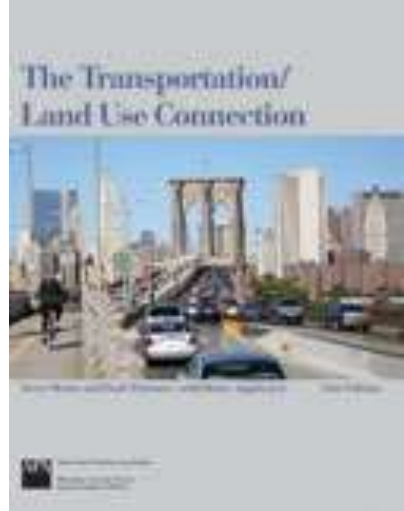
Local: City/County

Neighborhood

Site

Land Use
Horizontal/Fragmented

Vicious Cycle





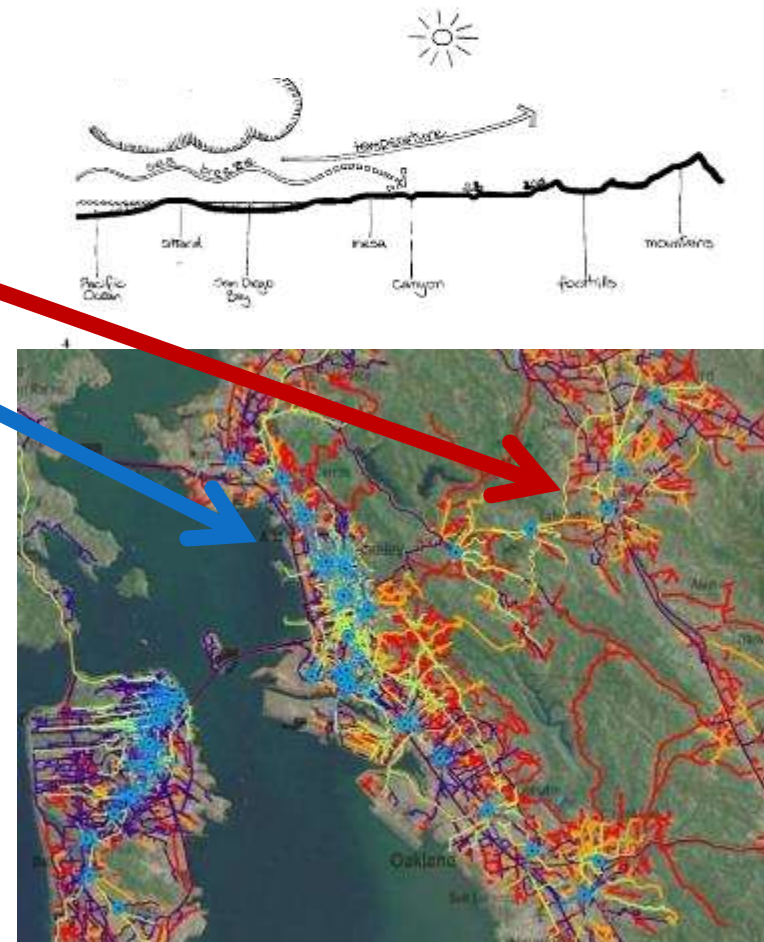
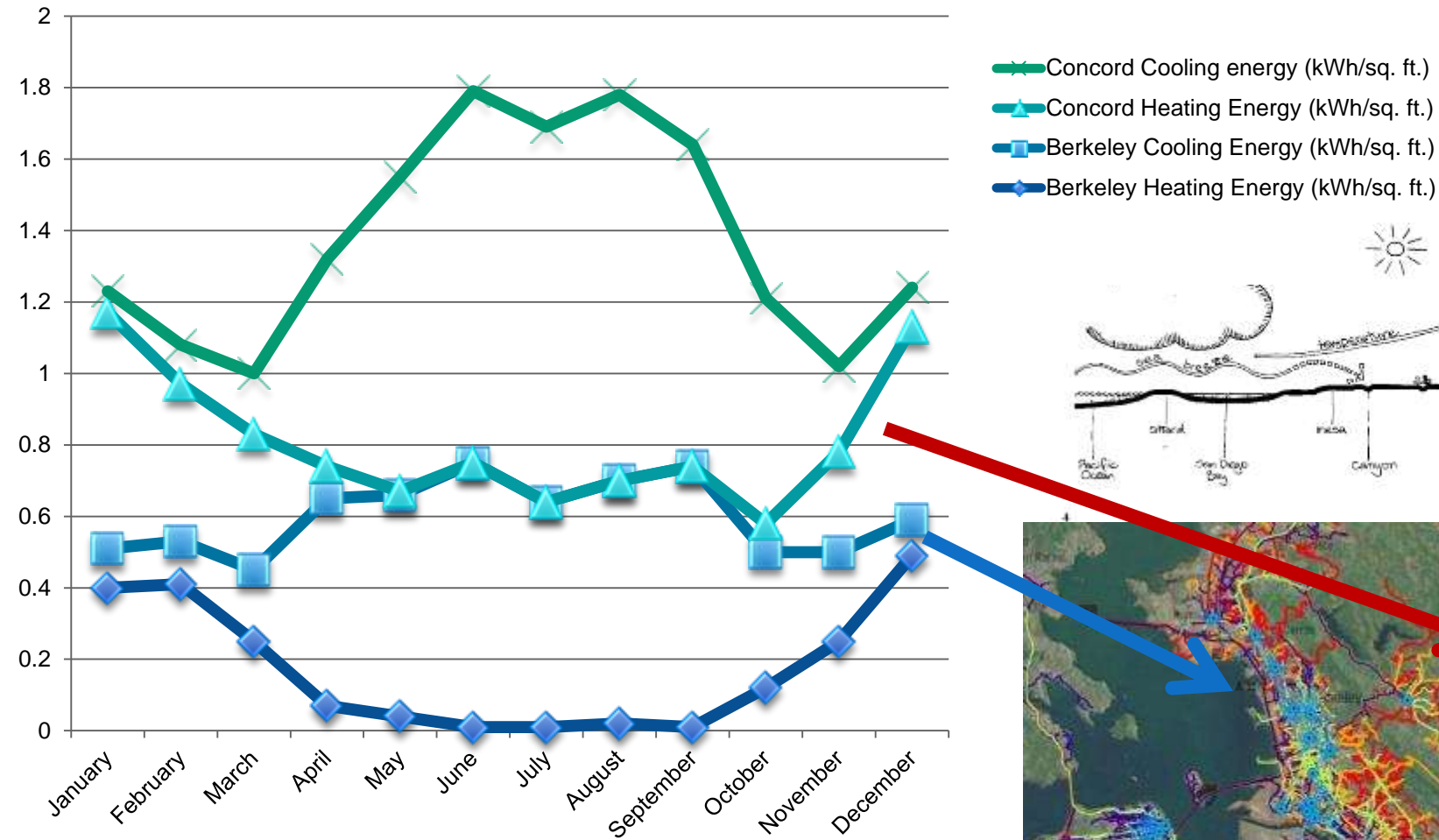
A transportation &
land use imbalance
leads to
auto-dependent
sprawl and
congestion



...and to a sub-optimal realization of benefits from transit investments



Future Work: Housing Energy Consumption by Location



Actors & Agents

Stewards:
Planners,
Engineers,
Urban Designers



Livability
Opportunities
in Public Realm
(Inputs)

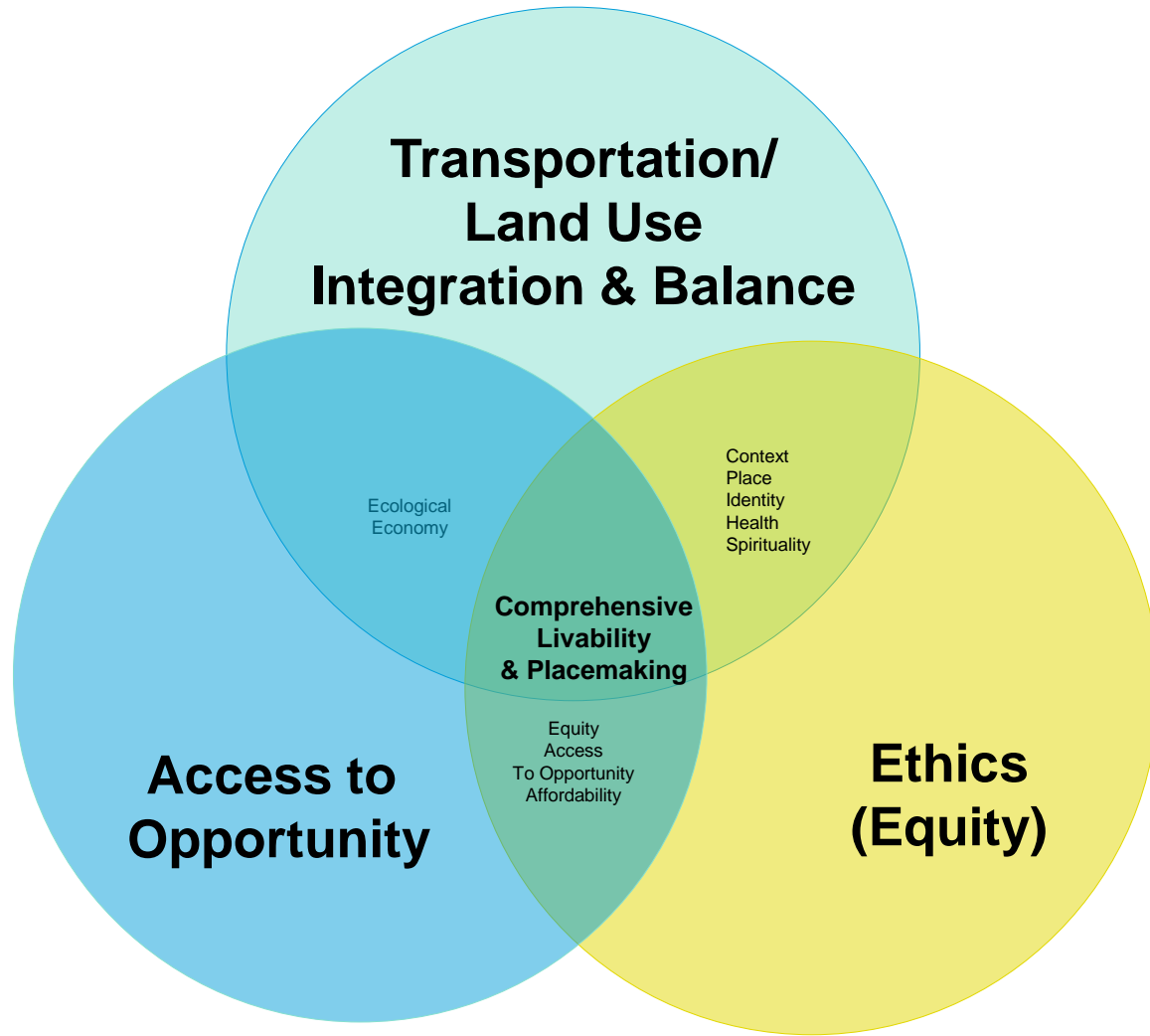


Constituents
Residents,
Workers & Visitors



Quality of Life
Satisfaction
(Outcomes)

Approach Overview: Definitions



Triple Bottom Line of Livability

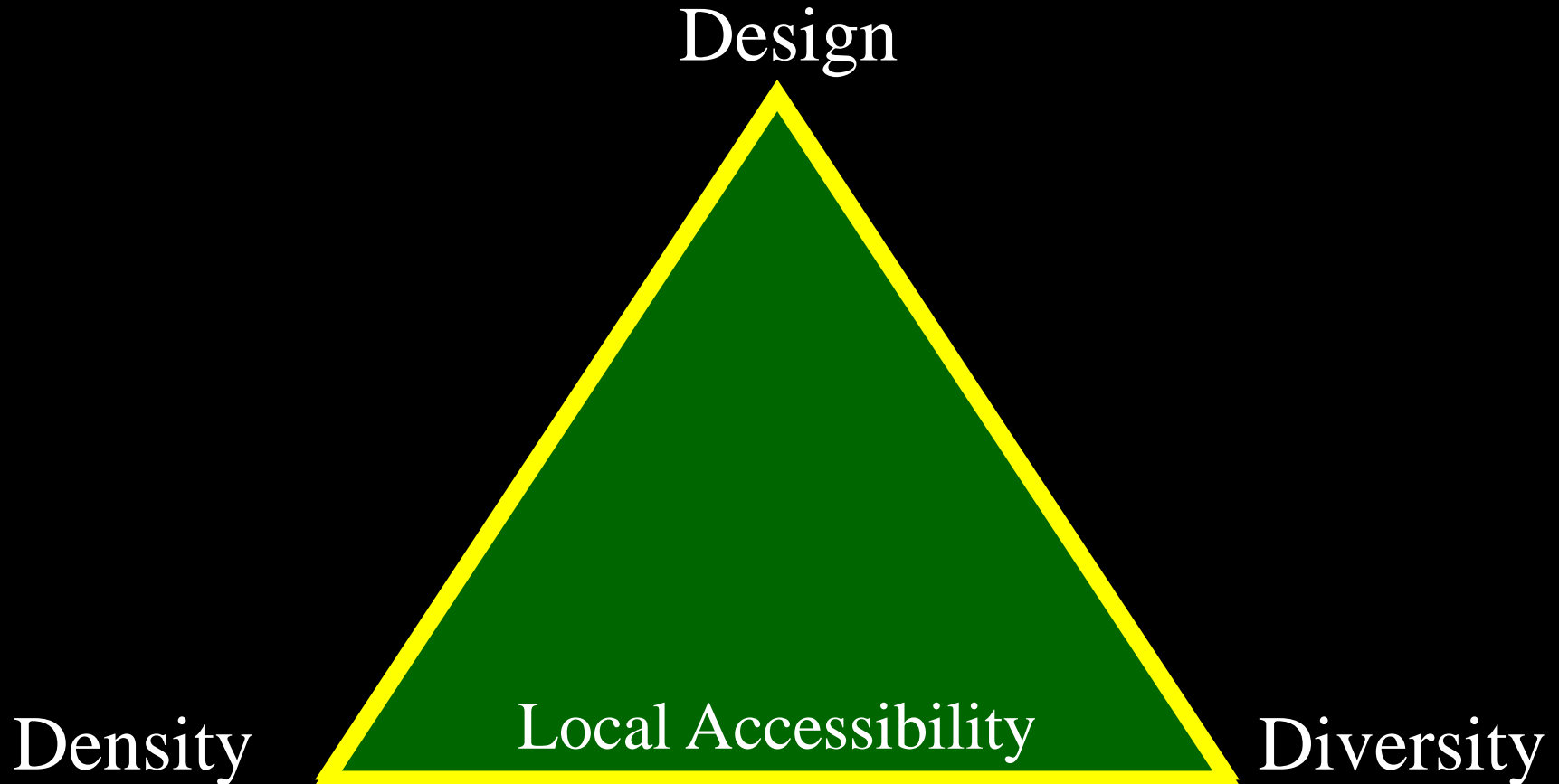
Transportation Land Use Integration for Livability (TLI4L) Definition/Mission Statement

Integrating transportation and land use to create and steward the equitable access to opportunities for people to pursue and/or maintain fundamental quality of life needs,

without obstructing similar livability pursuits of others, especially society's less powerful and most vulnerable.

Appleyard, B., Ferrell, C., Carroll, M., & Taecker, M. (2014). Toward Livability Ethics. *Transportation Research Record: Journal of the Transportation Research Board*, 2403, 62–71. <http://doi.org/10.3141/2403-08>

The Metrics (Dimensions) of Livability



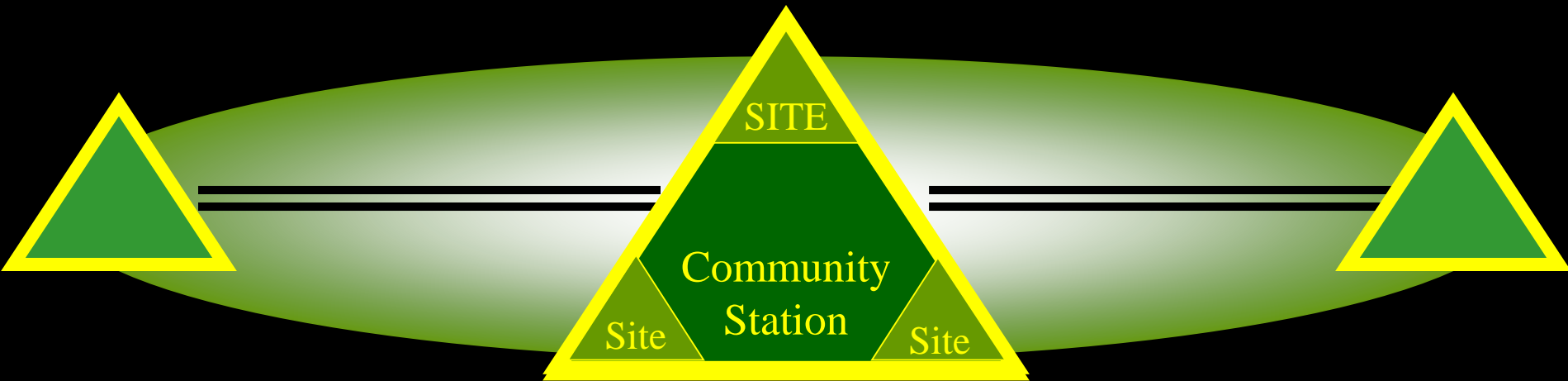
- Jobs
- Affordable housing
- Shopping (retail employee density)
- Health care services
- Arts & culture

The Metrics (Dimensions) of Livability

Housing
Affordability

Socio-Economic
Diversity

Regional Accessibility



Transit service
coverage (frequency of
transit service per sq. mile)

Balanced
Transit Ridership

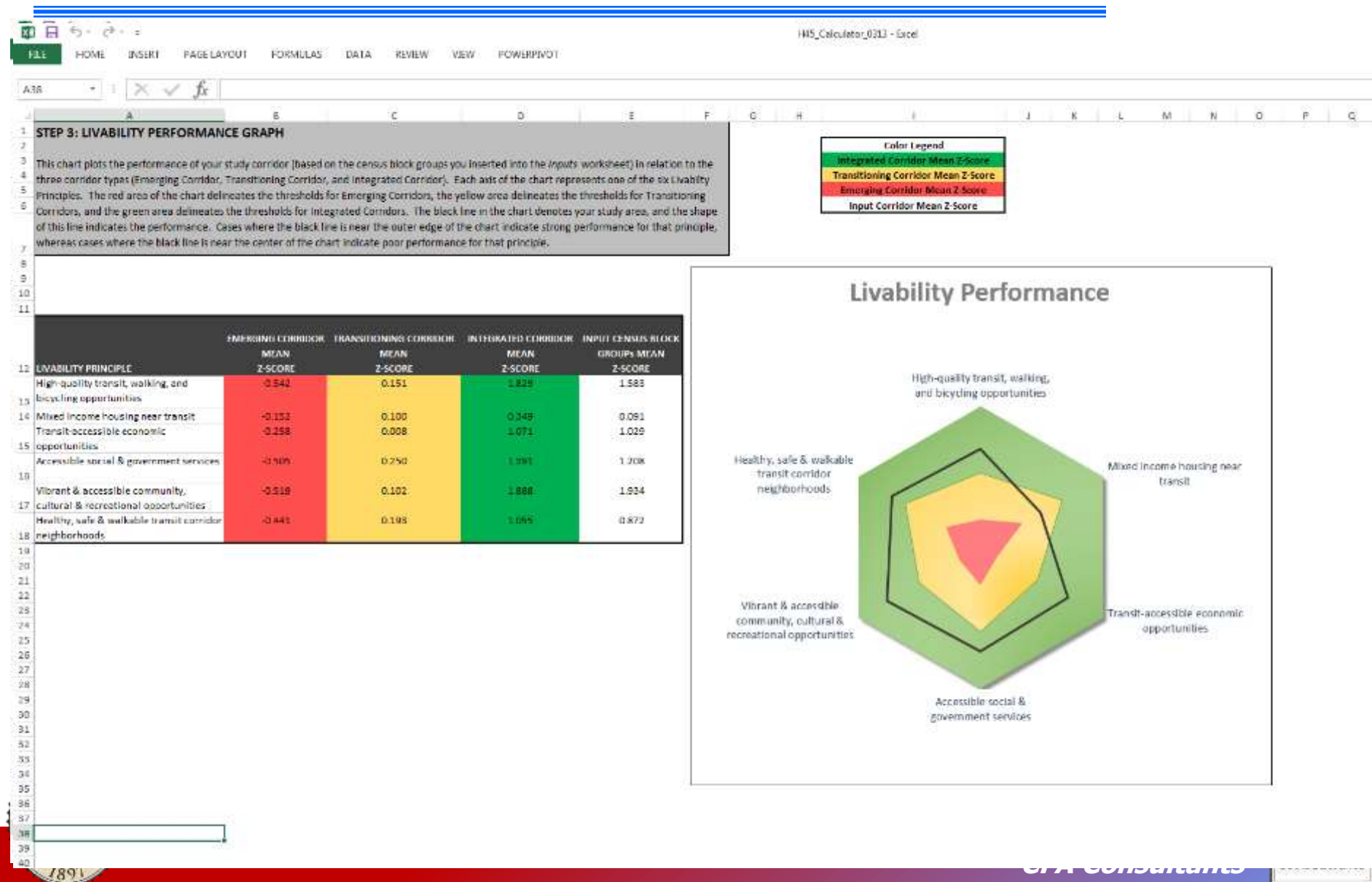
Safety

Table 1. Summary of Metrics

USDOT/EPA/HUD Partnership Principles	Transit Corridor Livability (TCL) Principles	Factor Category	Factor Name	Metric Description	Data Source(s)
Provide more transportation choices	High-quality transit, walking, and bicycling opportunities	Place	Regional Access	Transit jobs accessibility	Environmental Protection Agency's Smart Locations Database (SLD)
		People	Transit and non-auto service quality	Corridor Transit Service Coverage (aggregate frequency of transit service per square mile)	SLD
Promote equitable, affordable housing	Mixed income housing near transit	Place	Mixed income housing	Corridor housing affordability burden (percent of income spent for housing)	SLD
		People	Economically and age- diverse population	Corridor income diversity (Variance from regional median household income)	American Community Survey/U.S. Census
Enhance economic competitiveness	Transit-accessible economic opportunities	Place	Employment opportunities	Corridor jobs density (employees/acre)	SLD
		People	Consumer opportunities	Corridor retail jobs density (corridor retail employees/acre)	SLD
Support existing communities	Accessible social & government services	Place	Effective services	Corridor transit balance of ridership flows	Transit agency ridership survey data
		People	Accessible services	Corridor health care opportunities (health care employees/ acre)	SLD
Coordinate and leverage federal policies and investment	Vibrant & accessible community, cultural & recreational opportunities	Place	Urban form	Corridor density (population/acre)	SLD
		People	Cultural & recreational opportunities	Access to culture & arts (# corridor arts employees/ acre)	SLD
Value communities and neighborhoods	Healthy, safe & walkable transit corridor neighborhoods	Place	Pedestrian-oriented environment	Corridor pedestrian environment (intersection density)	SLD
		People	Neighborhood safety	Corridor pedestrian collisions per capita	California's Transportation Injury Mapping System (TIMS)

STEP 3: LIVABILITY PERFORMANCE GRAPH

- This chart plots the performance of your study corridor (based on the census block groups you inserted into the *Inputs* worksheet, in relation to the three corridor types (Emerging Corridor, Transitioning Corridor, and Integrated Corridor).





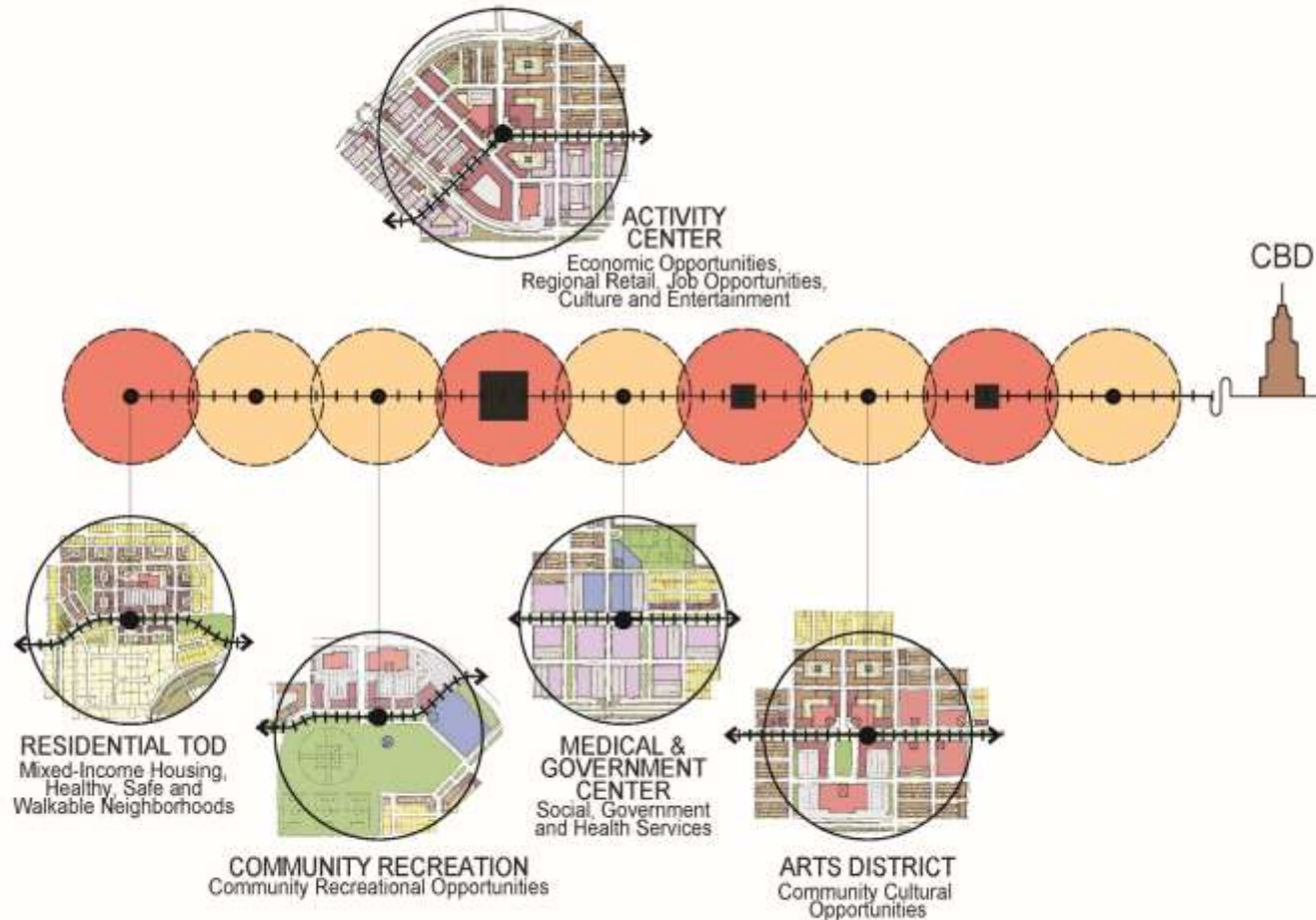
LEGEND

- Urban Areas w/ Underutilized Land
- Transit Stop w/out Destinations

- Single Use & Low Intensity
- Single Use & Moderate Intensity
- Mixed Use & Moderate/High Intensity

- Park & Ride
- Local Destinations w/ Transit
- Major Destination w/ Transit

Transportation Land Use Integration for Livability (TLI4L) Station Typology

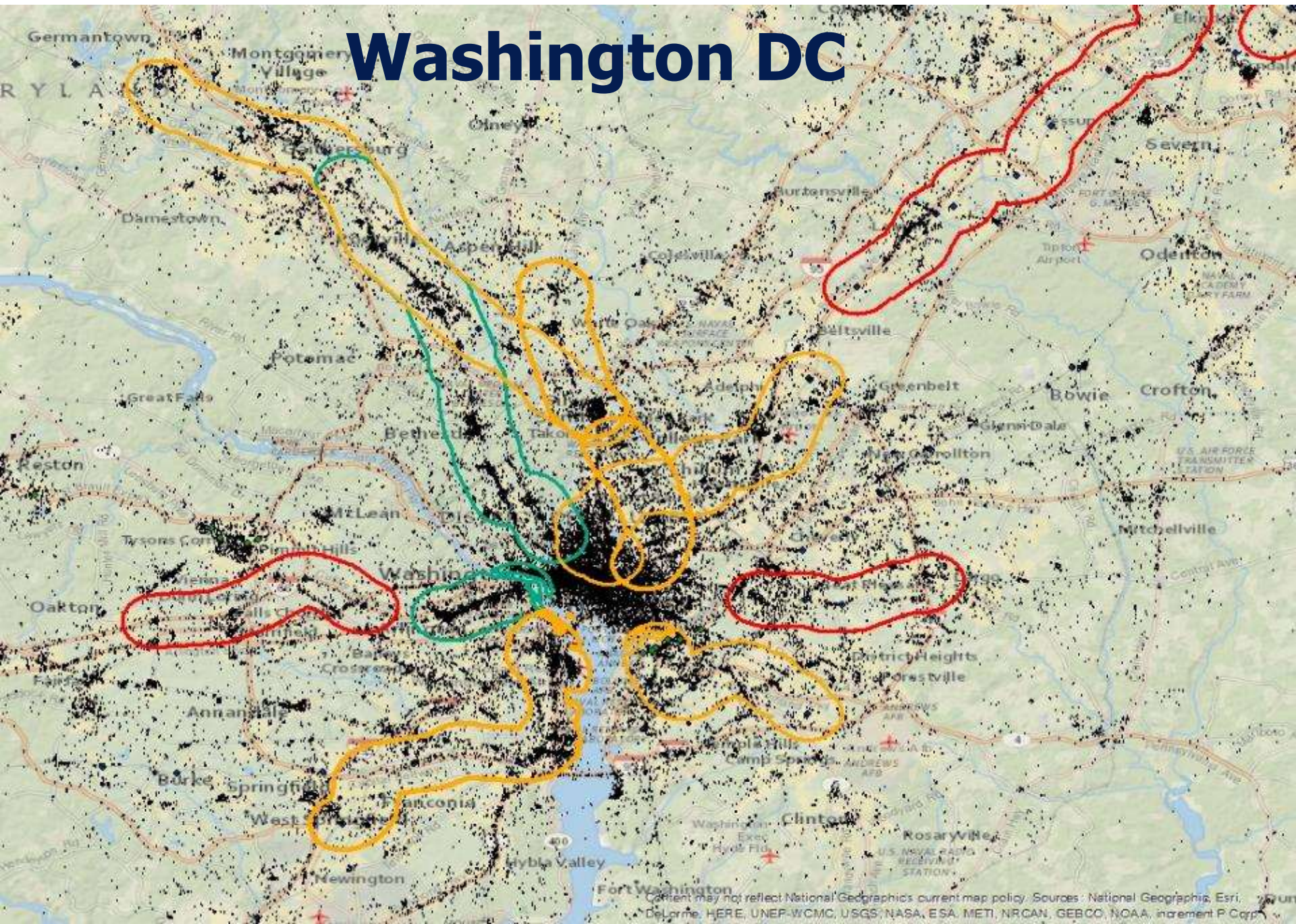


[illegible]

Washington DC

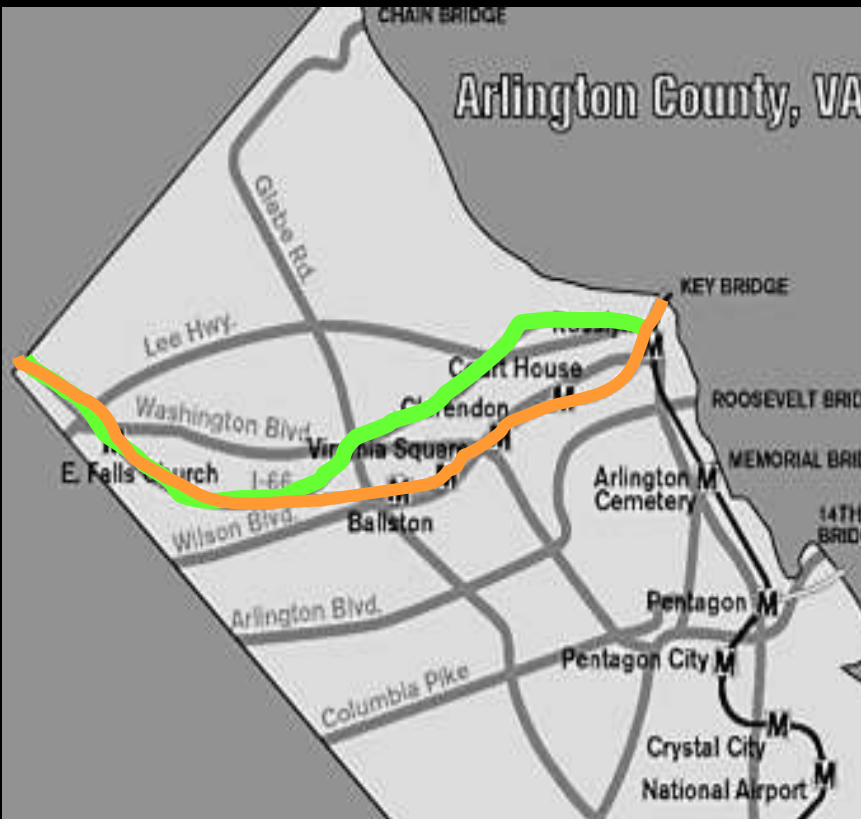
A map of Washington, DC, and its surrounding metropolitan area. The map is overlaid with several colored lines and shapes. A large red outline encompasses the entire area shown, from Germantown in the northwest to Fort Belvoir in the southeast, and from the Potomac River in the west to the Annapolis area in the east. A green outline highlights the central urban core, including the District of Columbia, Arlington, and parts of Alexandria and Fairfax. An orange outline follows major highways and corridors, including I-495, I-270, and I-95. A yellow outline highlights specific areas in the north and east, including Gaithersburg, Rockville, Silver Spring, and Beltsville. The map shows various landmarks, including the Potomac River, the District of Columbia, and numerous cities and towns. The title 'Washington DC' is prominently displayed at the top center in a large, bold, blue font.

Washington DC



How to Create Livable Transit Corridors: Infrastructure Investment As Leverage

- Re-orientated Metro from the middle of Interstate 66 to a struggling retail corridor



How They Did It With Land Use: Focusing Development Around Stations



- County adopted a General Land Use Plan (GLUP) indicating willingness to rezone to higher densities within a 1/4 mile around Metro stations
- But land remained zoned for fairly low density, motivating developers to seek rezoning
- In exchange for incorporation of TOD supporting elements, County approved rezoning for higher densities
- Consistency established trust with developers

Factor Analysis and Linear Regression Model Results

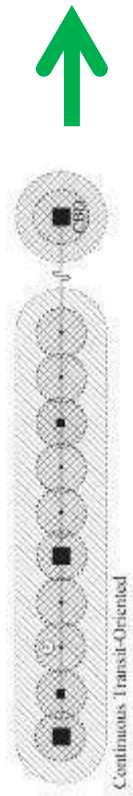
Dependent Variable: Non-Automobile Mode Split Percentage

Variable	Coefficient	Significance
Factor 1: Transportation/Land Use Integration/Livability Opportunities	0.3970	***
Transit jobs accessibility		
Transit service coverage (aggregate frequency of transit service per square mile)		
Housing unaffordability (percent of income spent for housing)		
Jobs density (employees / acre)		
Retail jobs density (retail employees / acre)		
Transit balance of ridership flows		
Health care opportunities (health care employees/ acre)		
Population density (population / acre)		
Access to culture & arts (# corridor entertainment employees / acre)		
Destination TAZ Population Density		
Destination TAZ Mixed Use (Jobs-Housing Balance)		
Factor 2: Housing and Transportation Affordability (negative in factor analysis)	0.0254	***
Housing unaffordability (percent of income spent for housing)		
Median Commute Distance		
Factor 3: Income Diversity	0.1230	***
Income diversity (Variance from regional median household income)		
Healthy, safe, walkable transit corridor neighborhoods		
Pedestrian environment (intersection density)	0.3480	***
Pedestrian collisions per 100,000 pedestrians	-0.2090	***
Constant	0.0410	***
Model Fit		
N	278	
R Square	0.920	

Notes:

- * = $p < 0.10$
- ** = $p < 0.05$
- *** = $p < 0.01$

QOL Validation



Transportation Land Use Integration

Density
Diversity
Design
Destination Accessibility

=

Walk



Bike



Transit



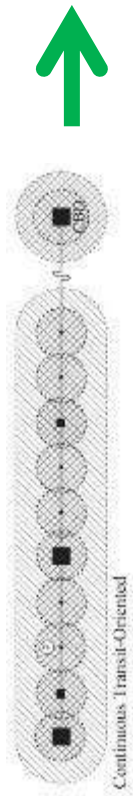
161%

Traffic
Fatalities
Per 100k



-1.3 person
(-21%)

QOL Validation



**Transportation
Land Use Integration**
Density
Diversity
Design
Destination Accessibility

	Household Costs	HH Transport Costs	Median Commute Distance	Unemployment Rates
=		\$\$\$\$\$	\$\$\$\$\$	\$\$\$\$\$
		↓	↓	↓
	\$115 sq. ft.	\$-2,737 (-27%)	-4.9 Miles (-49%)	-1.0%



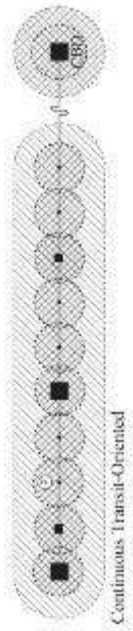
Transportation Land Use Integration

Density

Diversity

Design

Destination Accessibility



=

Obesity Rates



-7%
(- 2. %)

Voting Rates



19.38%
(3.38%)

Volunteer Rates



14.58 %
(3.38%)

Miles Driven (VMT) Annually

\$\$\$\$\$

↓ -6,162 Miles
About 3 Tons
of Carbon

QOL Validation

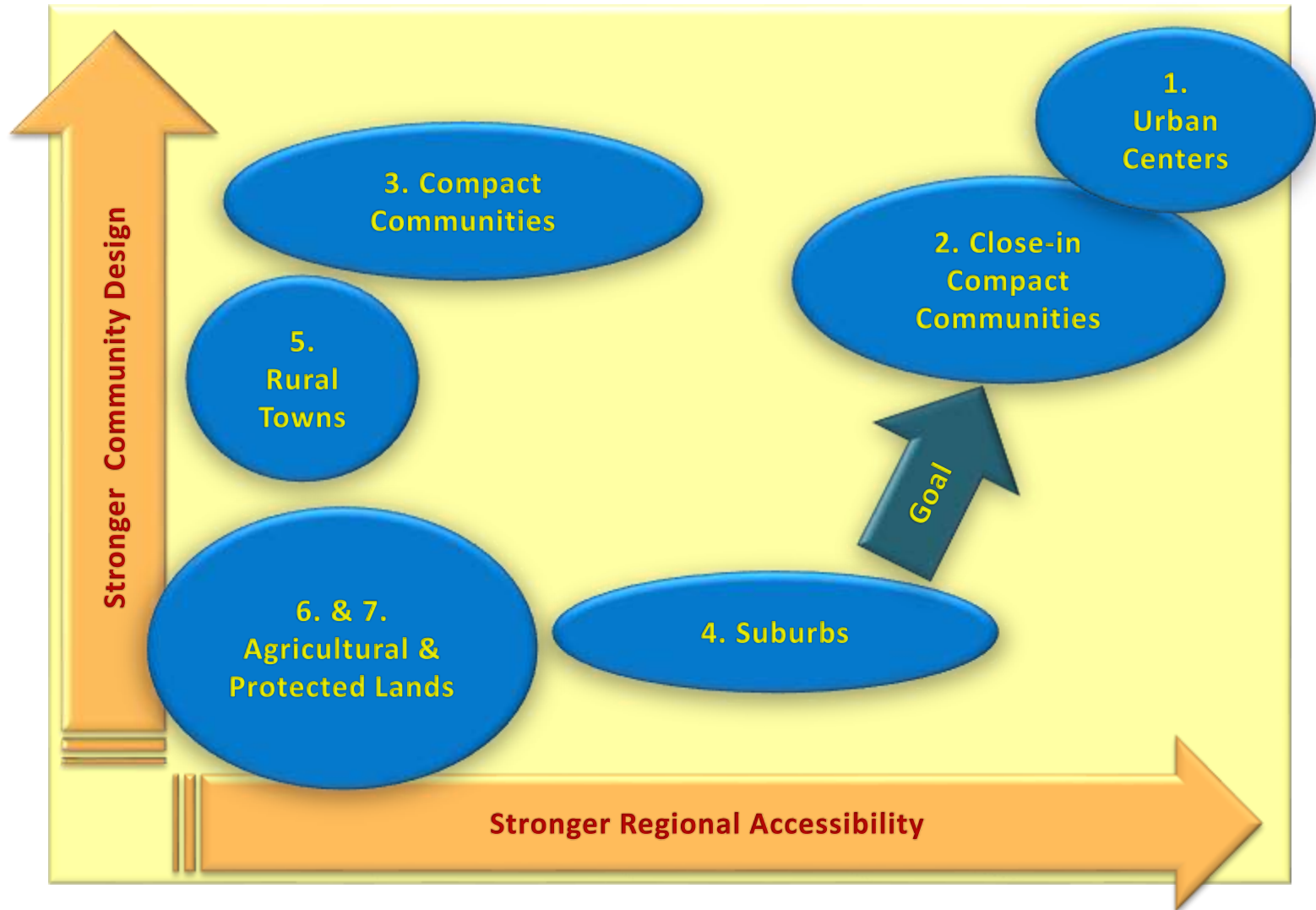
What? Why? How?

- **“What are we trying to measure?”**
- **“Why this particular metric?”**
 - Basically, what does the metric tell us?
 - Determine through empirical research, theory, and the association measures have to policy,
- For example, research tells us that regional accessibility/centrality is one of the strongest predictors of lowering VMT and auto use (2).
- The 3 Ds (Density, Diversity Design) work well because they are relatively straight forward measures of walkability, and have a relatively clear tie to policy



Caltrans Smart Mobility Framework

Place Types

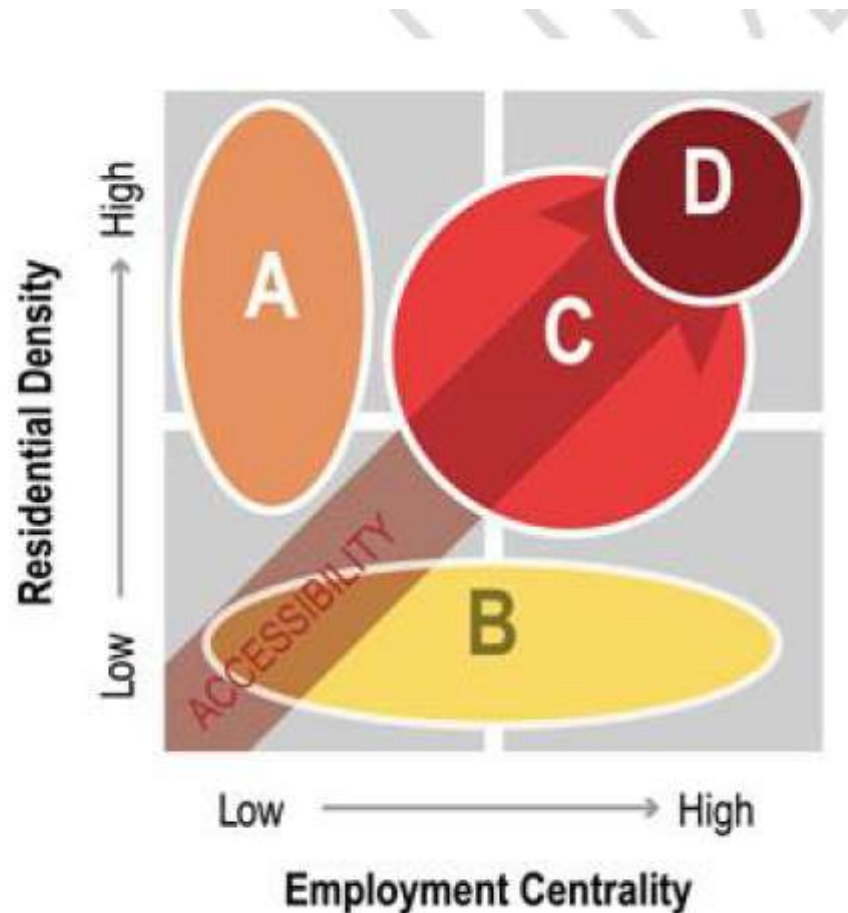


How is the metric going to be used?

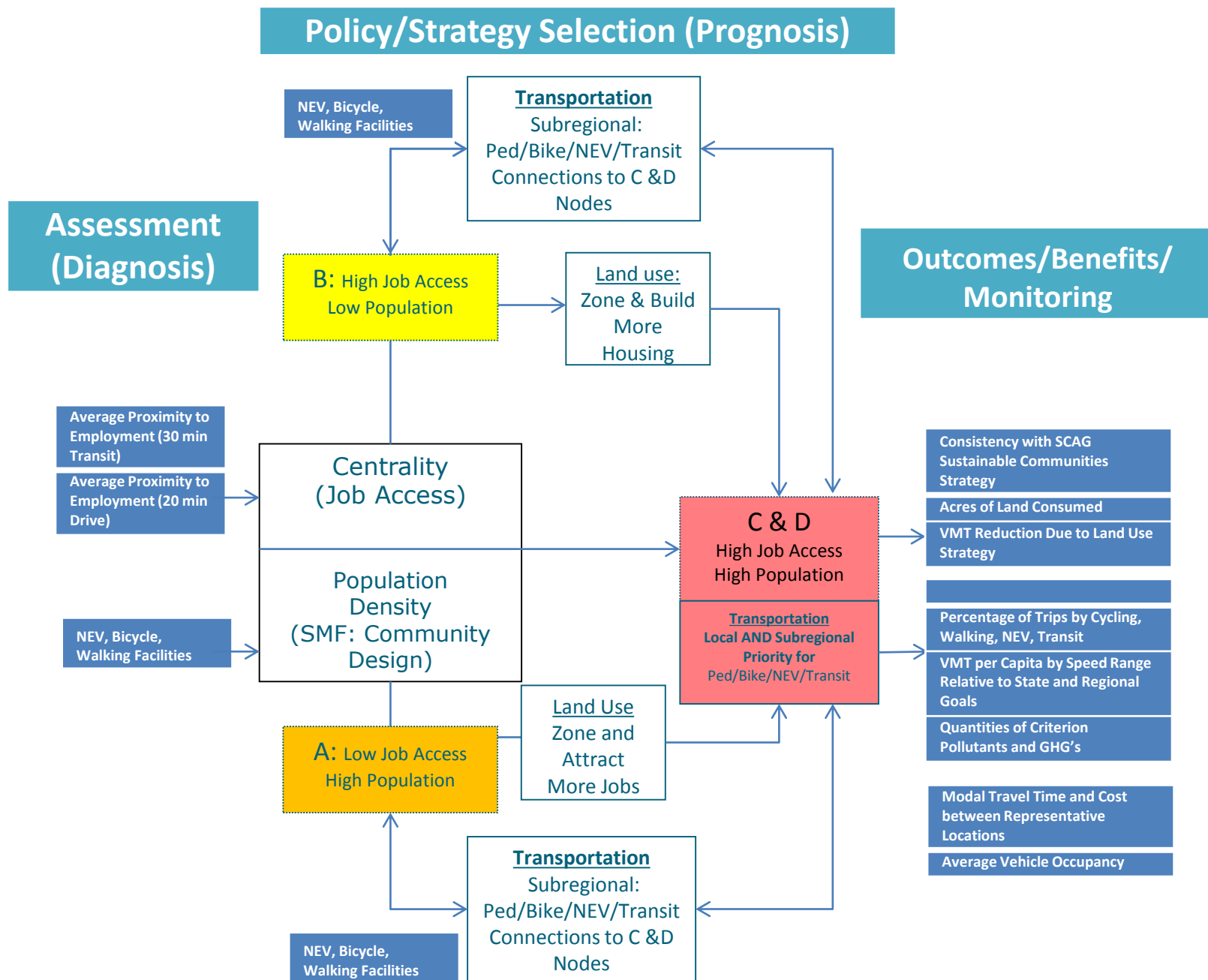
PURPOSE: At least four purposes:

- Initial Assessment (Diagnosis):
- Policy Decision-making (Prognosis);
- Forecasting;
- Monitoring (Livability Ethics);

Metro Countywide Sustainability Planning Policy



SMF/CSPP Measures to Guide Land Use & Transportation Decisions



Who? How? And Where?

“Who?”

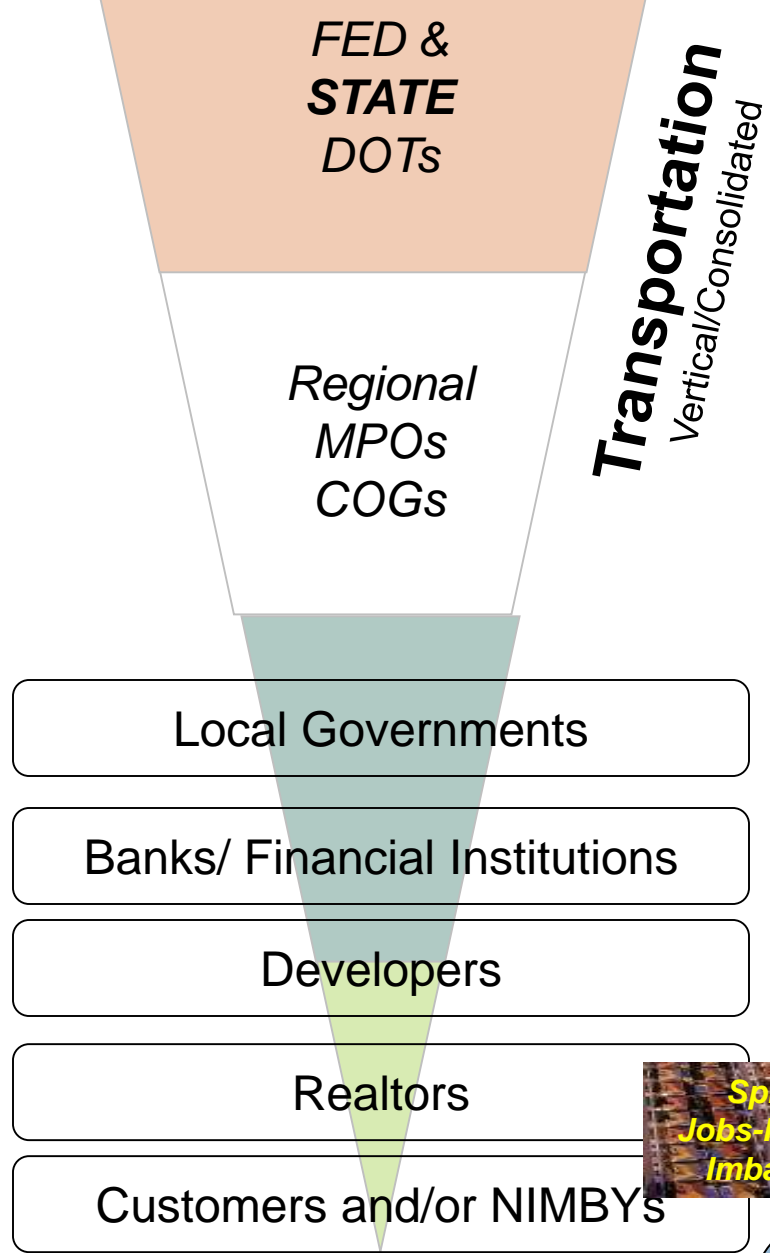
- Who are the best agencies to either generate, disseminate, and/or act upon these measures?

“How?” & “Where?”

- Are these measure going to be acted upon?



Big Problem: The T LU Imbalance “Tribal”



Local: City/County

Neighborhood

Site

Land Use
Horizontal/Fragmented

Vicious Cycle

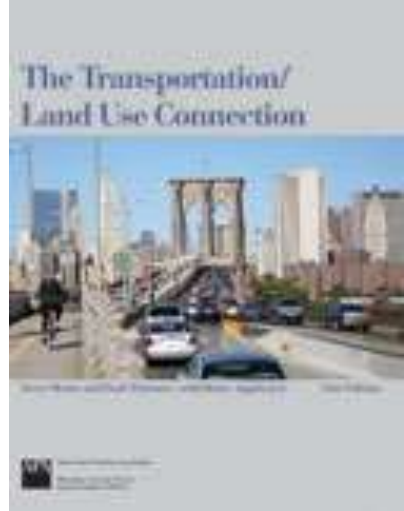
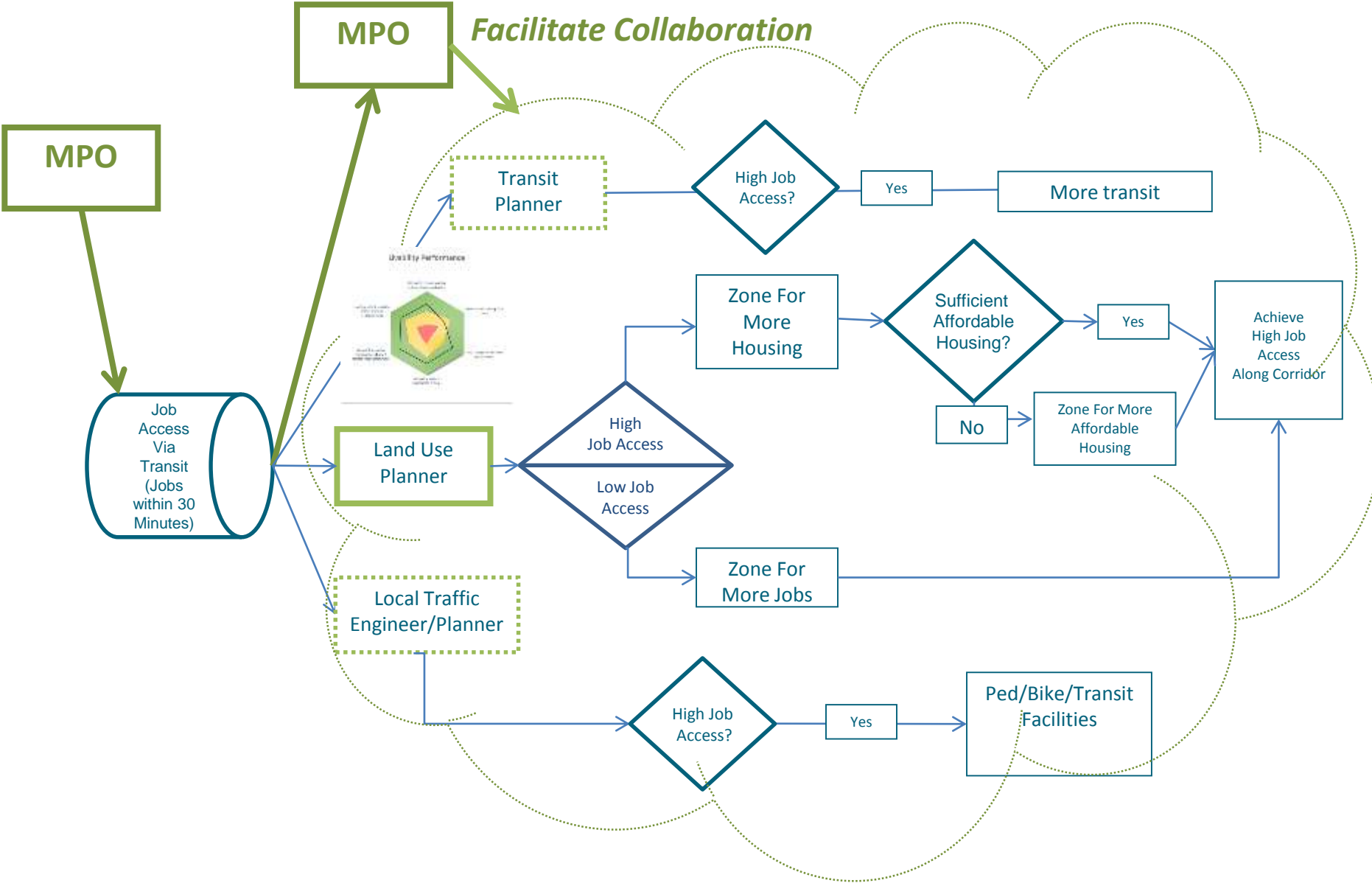


Illustration of how Livability Metrics can be used to Guide Corridor Livability Strategies

Production of Metric	Use of Metric	Action upon Metric	Outcome
----------------------	---------------	--------------------	---------



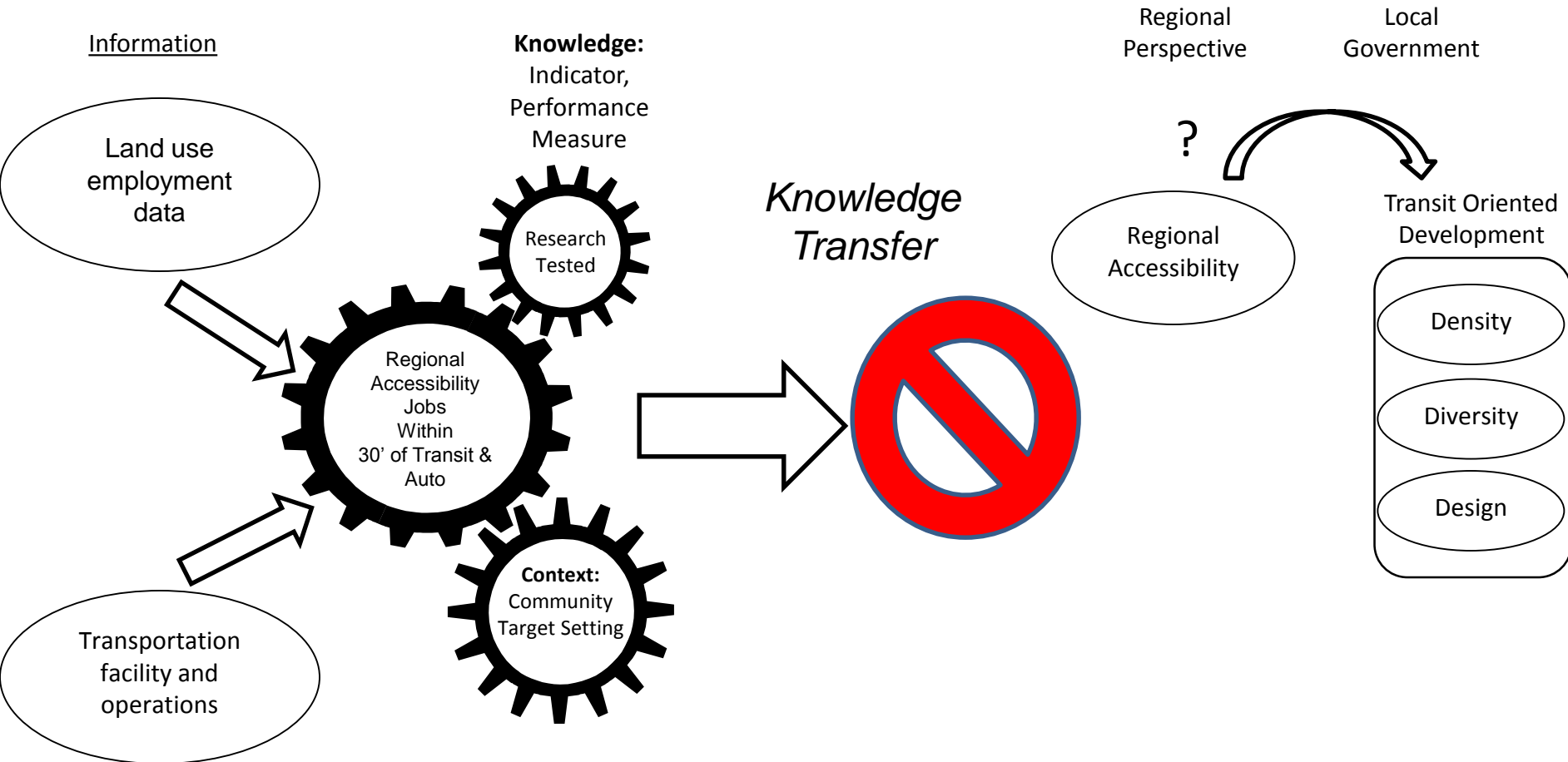
Transportation

Regional Accessibility Performance Measure

Land Use

Responsibility
to Act upon the PM

*Who Acquires/Calculates
Regional Accessibility Measure*



Essential Measures for Land Use/Transportation Strategy Decisions

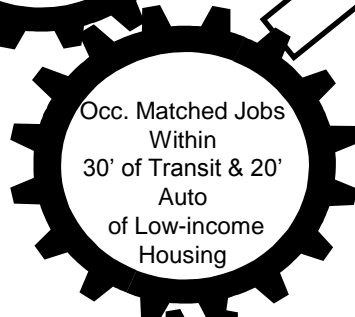
*Policy
Solutions In Red*

Regional
Perspective

Responsibility
to Act upon Measures

Local
Perspective

*Fed/State/Regional
Incentives
For Development*



Regional
Access
between
Jobs/housing

Local
Government

Transit Oriented
Development

Density

Diversity

Design

Accessible
Affordable
Housing
(near transit)

Housing
Affordability

*Flexible,
Inclusive Zoning*

Walkability

*Transportation
Infrastructure &
Incentives*

Transit
Access

*Developer
Incentives*

*Affordable
Housing Incentives*

Demand
Local Accessibility
Network walkscore
transit score
Supply
Intersection Density
Transit LOS

- Transit trips per capita
- Workers commuting by transit, bicycle, or foot
- Vehicle miles traveled per capita

Number of
Affordable
homes and
rental units
Near
employment
centers and/or
well-served by
transit

5 Steps for Livable Transit Corridor Planning

Livability Calculator



1. INITIATE PROJECT



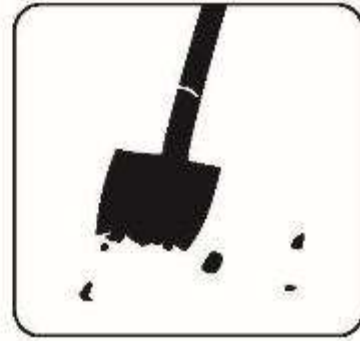
2. ASSESS THE CORRIDOR



3. IDENTIFY GOALS



4. DEVELOP A VISION

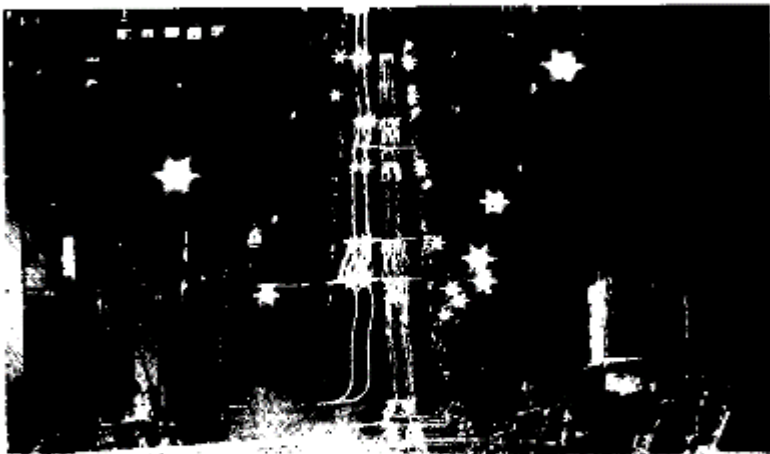


5. IMPLEMENT STRATEGIES

Scoping

Visioning

**Policies &
Programs**



Nighttime views of three streets. Ted Berger

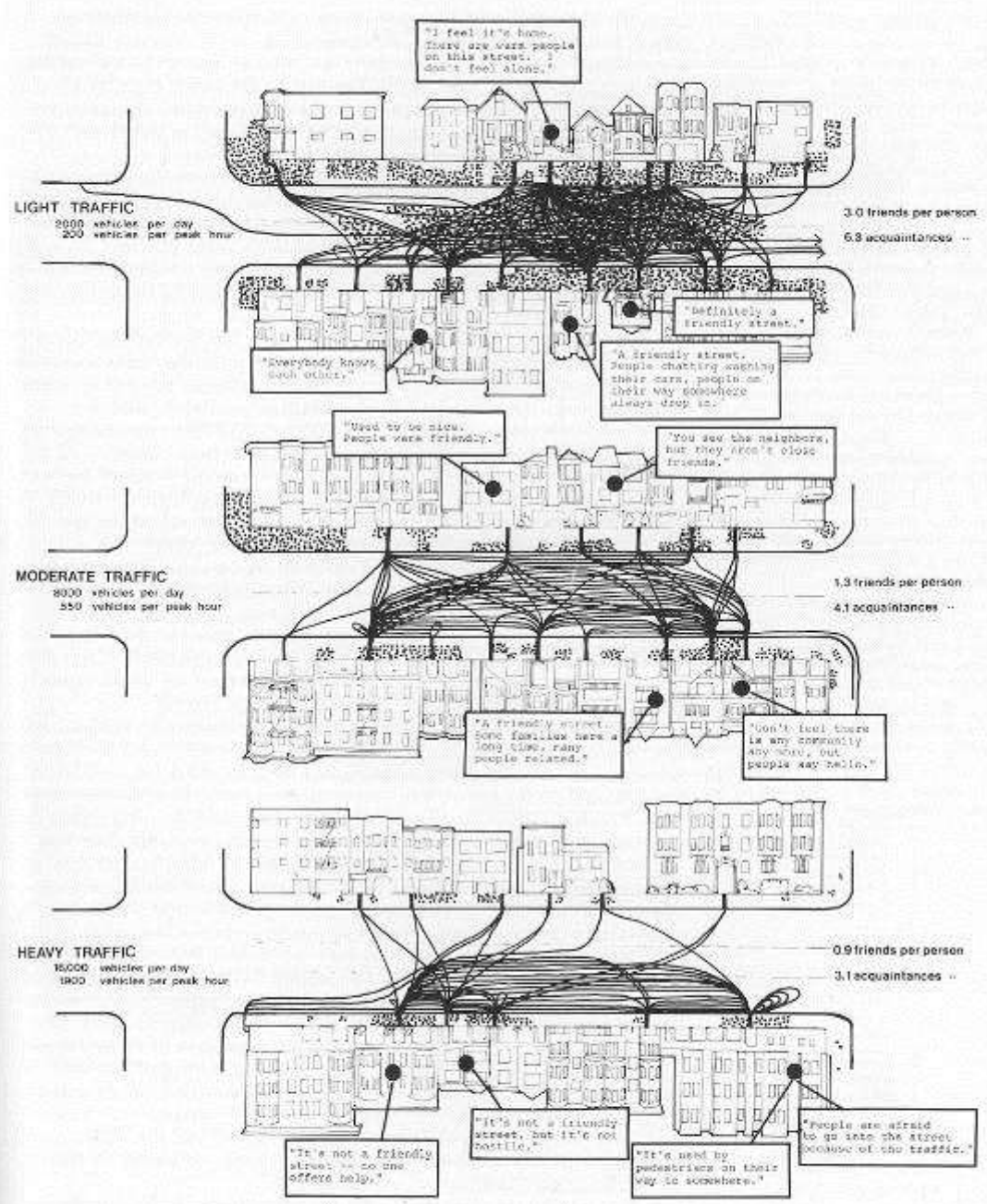


FIGURE 3. San Francisco. Neighboring and visiting on three streets: lines show where people said they had friends or acquaintances. Dots show where people are said to gather

What is the extent of your home territory?

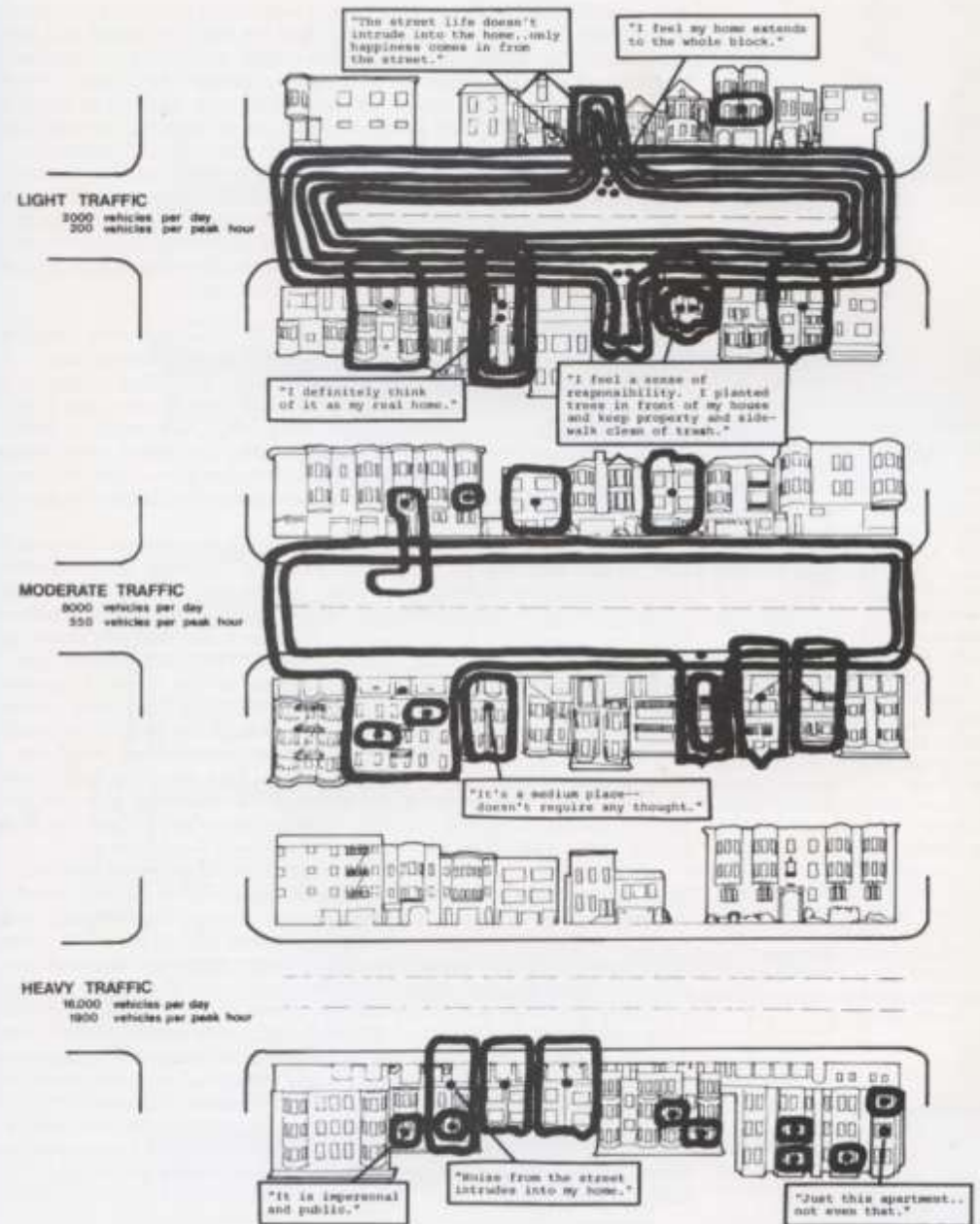


FIGURE 4.
San Francisco. Home Territory on three streets: lines show areas people indicated as their "home territory"

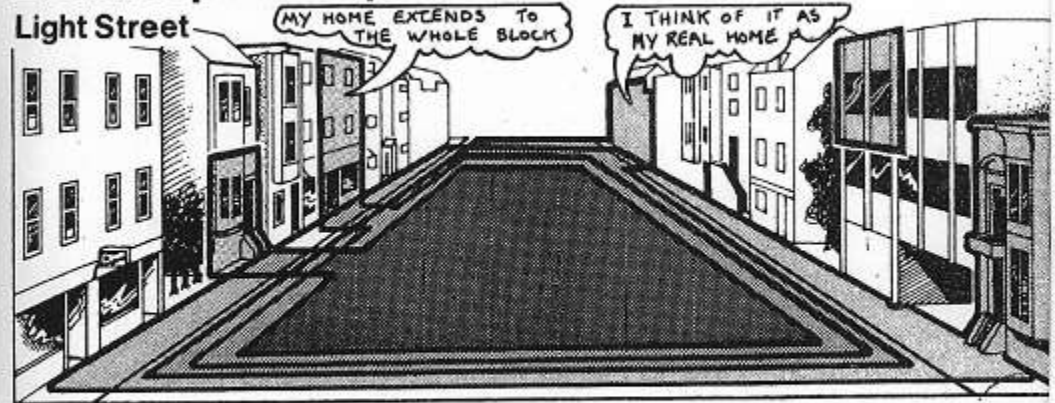
What is the extent of your home territory?

Additional Findings:

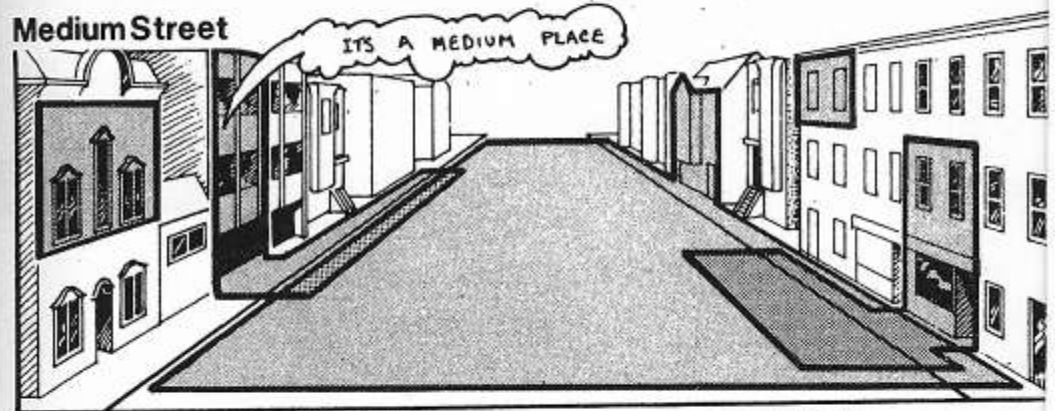
- ↑ Traffic
- ↓ Neighborhood pride
- ↓ Property values

2: Conception of personal territory

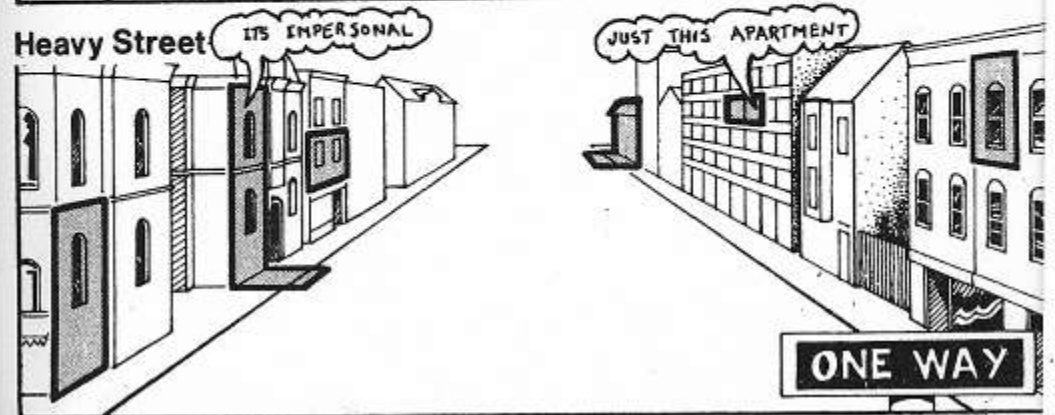
Light Street



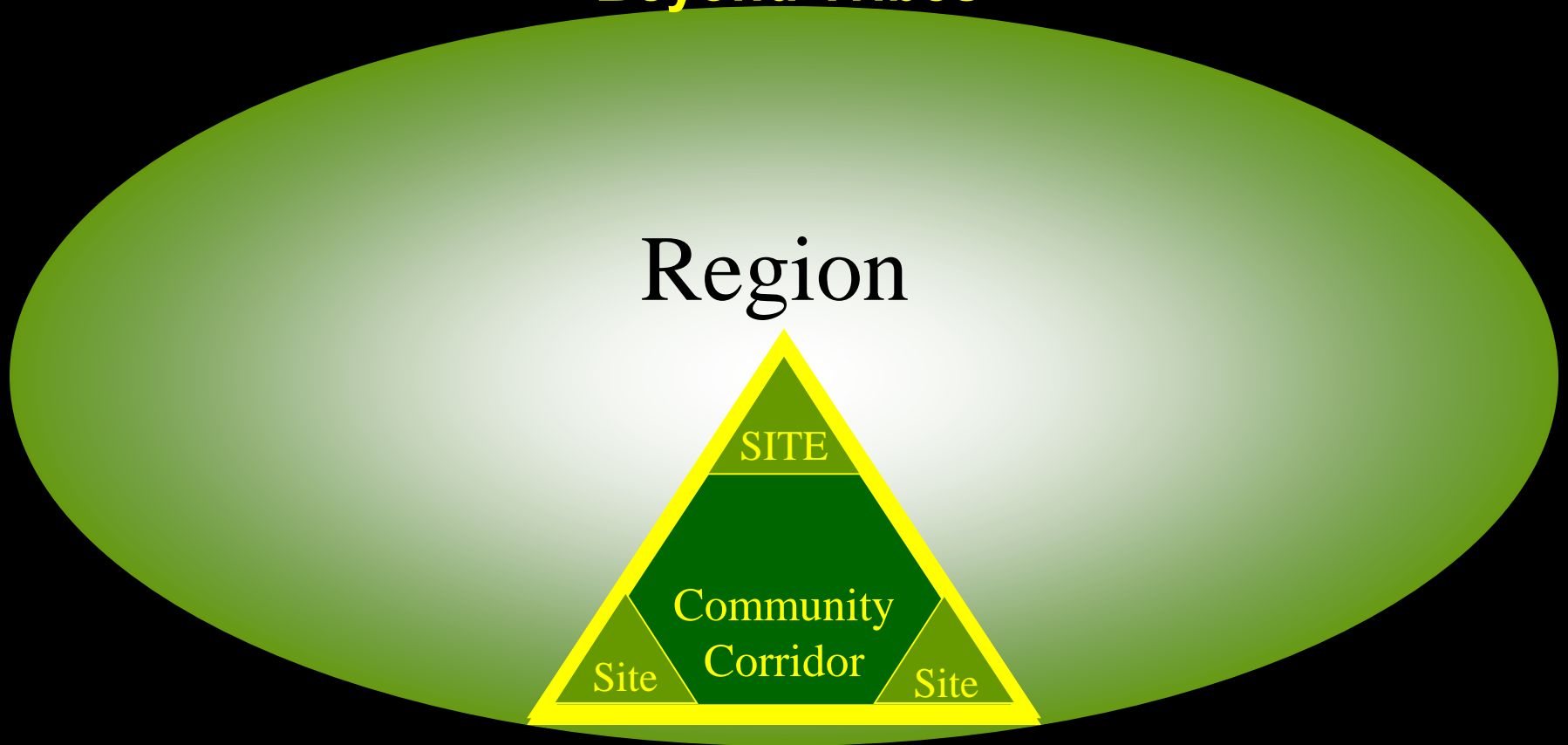
Medium Street

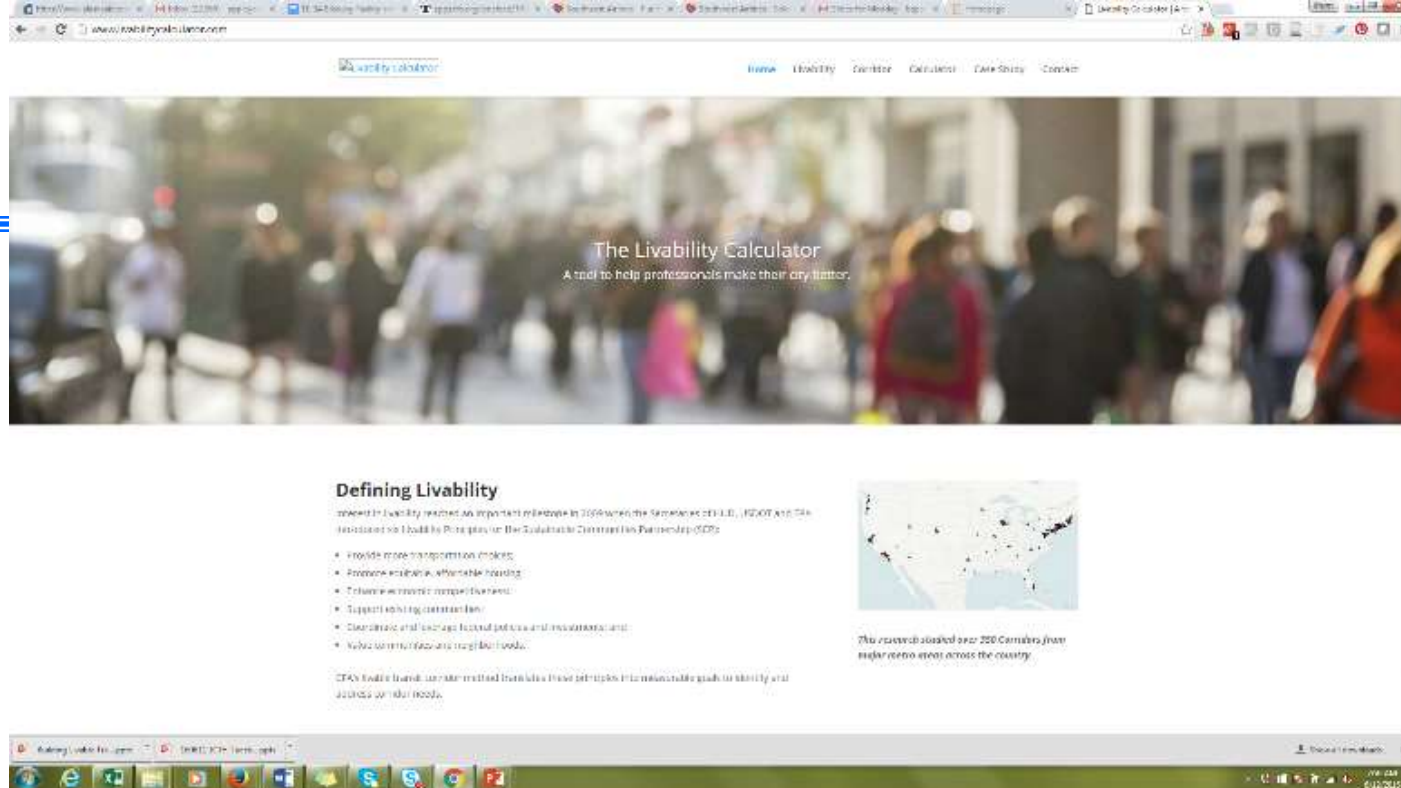


Heavy Street



Big Solution: Multiple Perspectives For Realizing Sustainability, Livability and Equity “Beyond Tribes”





thank you very much!

Questions and Discussion

www.livabilitycalculator.com



