

TRANSPORTATION LEADERSHIP ACADEMY



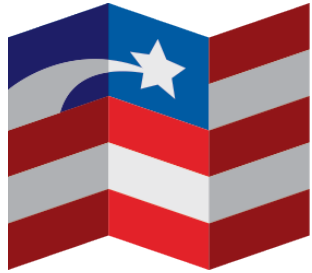
Transportation
for America



U.S. Department of Transportation
**Federal Highway
Administration**

MEASURING THE ECONOMIC IMPACT OF TRANSPORTATION INVESTMENTS

NICHOLAS DONOHUE, BETH OSBORNE,
& SAM SESKIN



Transportation for America

Transportation Leadership Academy

May 19, 2016

Beth Osborne, Vice President for Technical Assistance

www.T4america.org

@t4america

What is Success?



What is Success?



What is Success?



What is Success?



What is Success?

Atlanta Travel Time

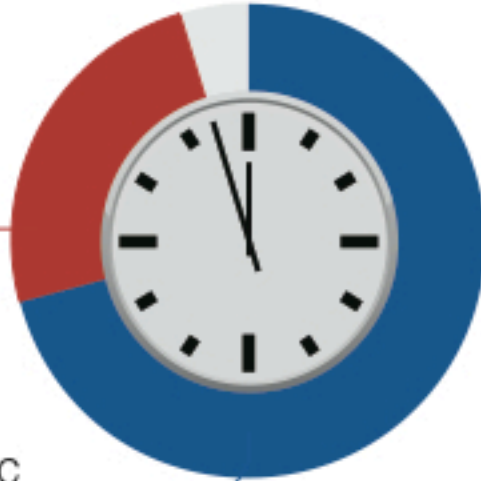
57.4 minutes

Extra rush hour delay

14.8 mins

Travel time without traffic

42.5 mins



Chicago Travel Time

35.6 minutes

Travel time without traffic

24.9 minutes

Extra rush hour delay

10.7 minutes



What is Success?

Denver 1982

1.09

50.6 minutes

46.4 mins

4.2 mins

Travel Time Index

Average travel time

Travel time without traffic

Extra rush hour delay

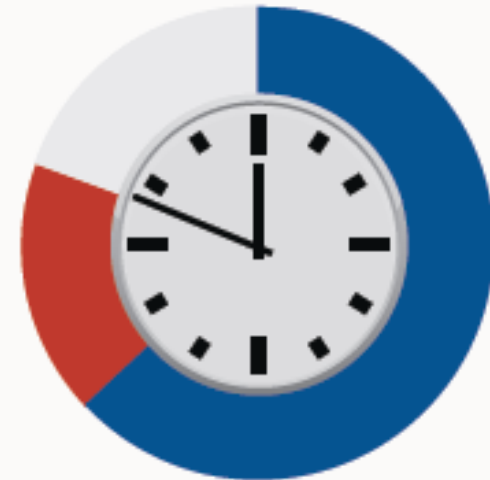
Denver 2007

1.31

49.6 minutes

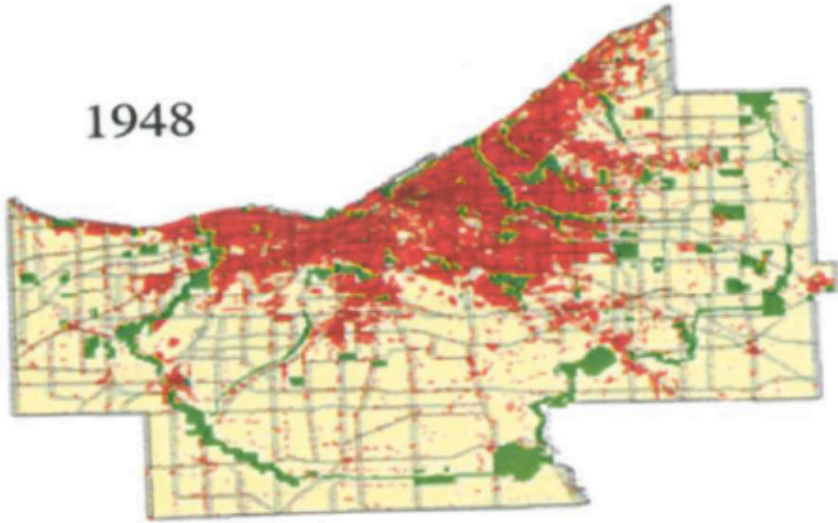
37.9 minutes

11.7 minutes

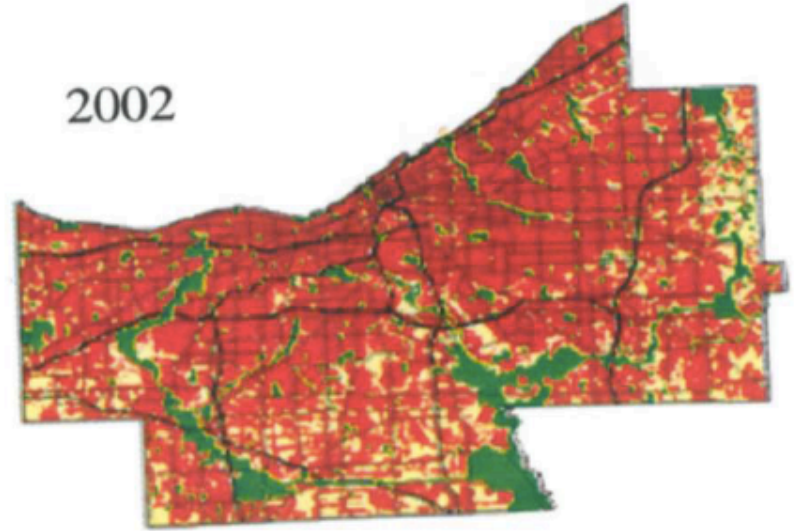


What is Success?

1948



2002



1950: 1,389,582

2002: 1,393,978

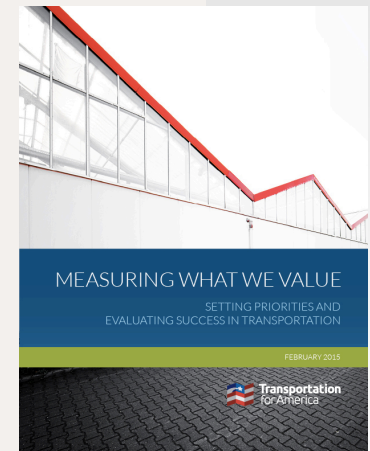
Source: TTI	1982	2007
% peak VMT congested	10	28
% of lane miles w/ congestion	10	23
Number of rush hours	3	5
Freeway and arterial miles	2420	4490

Economic Measures

TABLE 3


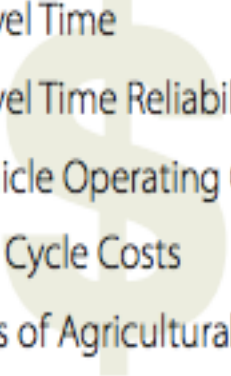

Recommended economic health and resilience measures

- Return on Investment/Benefit-Cost Analysis
- Availability of Matching Funds
- Ability to Financially Maintain Project over Lifetime
- Jobs Created
- Redevelopment Opportunity
- Tax Yield per Acre
- Regional Gross Domestic Product
- Transit Frequency
- Associated Infrastructure Cost
- Industrial Access to Freight Services



Minnesota's Corridors of Commerce

Table 2. Benefit-Cost Factors (PRISM)

Social	Economic	Environmental
<ul style="list-style-type: none">• Safety• Bicycle/Pedestrian Health Effects• Noise 	<ul style="list-style-type: none">• Travel Time• Travel Time Reliability• Vehicle Operating Costs• Life Cycle Costs• Loss of Agricultural Land 	<ul style="list-style-type: none">• Emission (CO₂ + Criteria Pollutants)• Wetland Effects• Runoff 

Metropolitan Transportation Commission

ECONOMY



Increase gross regional product



Increase non-auto mode share and reduce VMT per capita

Maintain the transportation system

ENVIRONMENT



Reduce per-capita greenhouse gas emissions from cars and light-duty trucks



Direct all non-agricultural development within the urban footprint



Reduce premature deaths from exposure to particulate emissions

Reduce injuries and fatalities from collisions

Increase average daily time spent walking or biking

EQUITY



House all of the region's projected housing growth



Decrease housing and transportation costs as a share of low-income household budgets

Sacramento Council of Governments

Indicator	Specific Measures	Page(s)
Driving access	Total jobs within 30-minute drive by Community Type	73-75
Vehicles Miles Traveled (VMT)	Total weekday VMT & average annual growth rates - regionally, by county, and per capita	79
	Weekday VMT by source and total	81
	Commute share of household-generated VMT	81
	Weekday VMT by source per capita or per job	81
	Total VMT per capita	81
	Percent change in VMT per capita or per job compared to 2012	81
	Weekday household-generated VMT per capita by Community Type	82
Weekday household-generated VMT per capita by TPA	83	
Household-generated commute VMT by Community Type and regional total	Household-generated commute VMT by Community Type and regional total	84
	Commute VMT per worker by Community Type and regional total	84
Congested Vehicle Miles Traveled (VMT)	Congested VMT total and per capita	91
	Congested VMT by source – total, per capita, per job	91
	Congested VMT for household-generated travel by Community Type	92
Transit Service	Increases in transit vehicle service hours per day by transit type	112
Transit productivity	Weekday transit vehicle service hours	123
	Weekday passenger boardings	123
	Weekday boardings per service hour	123
Bicycle Infrastructure	Farebox revenues as percent of operating costs (farebox recovery rate)	124
	Increases in miles of bicycle route mileage by county	114
Bike route miles per 100,000 population	Bike route miles per 100,000 population	114
	Transit, walk and bike travel	Weekday person trips by transit, walk and bike modes
Transit, walk and bike trips per capita		119
Transit, bike and walk trips per capita by Community Type		117
Transit trips per capita by Transit Priority Area (TPA)		118
Roadway Utilization/ Optimal use	Underutilized, optimally utilized, over-utilized roadways by roadway type	97
Commute Travel	Weekday commute tours by mode Commute mode share	108
Non-Commute Travel	Weekday non-commute person trips by mode Non-commute mode share	108

Metropolitan Council

Criteria and Measures	Points	% of Total Points
1. Role in the Regional Transportation System and Economy	175	17.5%
Measure 1 - Role in Regional Economy		
Measure 2 - Current daily heavy commercial traffic		
Measure 3 - Connection to Job Concentrations, Manufacturing/Distribution Locations, Educational Institutions, and local activity centers		
2. Usage	175	17.5%
Measure 1 - Current daily person throughput		
Measure 2 - Forecast 2030 average daily traffic volume		
3. Equity and Housing Performance	100	10.0%
Measure 1 - Connection to disadvantaged populations and project's benefits, impacts, and mitigation		
Measure 2 - Housing Performance Score		
4. Infrastructure Age	75	7.5%
Measure 1 - Date of construction and remaining useful life		
5. Congestion Reduction/Air Quality	150	15.0%
Measure 1 - Cost effectiveness (project cost/vehicle delay reduced)		
Measure 2 - Cost effectiveness (project cost/kg per day reduced)		
6. Safety	150	15.0%
Measure 1 - Cost effectiveness (project cost/crashes reduced)		
7. Multimodal Facilities and Connections	100	10.0%
Measure 1 - Ridership of transit routes directly and indirectly connected to the project		
Measure 2 - Bicycle and pedestrian connections		
Measure 3 - Transit, bicycle, or pedestrian elements of the project		
8. Risk Assessment	75	7.5%
Measure 1 - Risk Assessment Form		
Total	1,000	100.0%

Virginia Commonwealth Transportation Board

3

Performance

VTrans Need: Cave Spring Urban Development Area

[Click for details](#)

Project Benefit Score

1.4

Final Score

Statewide Rank

District Rank

HB2 COST

1.1

177/287

23/37

TOTAL COST

0.7

186/287

25/37

Congestion Mitigation		Safety		Accessibility			Environment		Economic Development			Land Use
15% of score		20% of score		25% of score			10% of score		20% of score			10% of score
50%	50%	50%	50%	60%	20%	20%	50%	50%	60%	20%	20%	100%
Increase in Daily Person Throughput	Decrease in Person Hours Delay	Reduction in Fatal and Severe Injury	Reduction in Fatal and Severe Injury Rate	Increase in Access to Jobs	Increase in Access to Jobs for Disadvantaged Populations	Improved Access to Multimodal Choices (Users Benefit Value)	Air Quality (Total Benefit Value)	Acres of Natural/Cultural Resources Potentially Impacted	Economic Development Support (Sq. ft.)	Intermodal Access Improvements (Tons Benefit Value)	Travel Time Reliability Improvement	Transportation Efficient Land Use
0	0.3	4.5	2.2	0	0	0	0	8.0		0	7.5	0

4

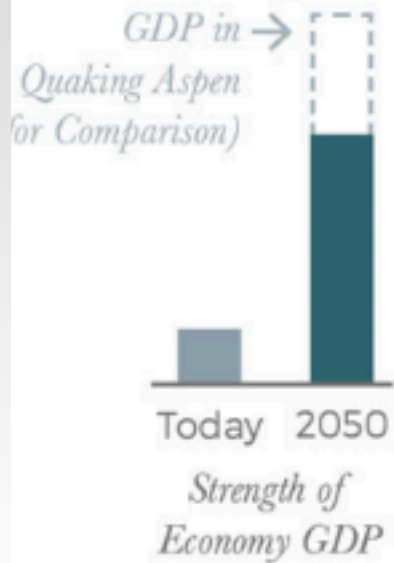
Envision Utah

ALLOSAURUS SCENARIO

Struggling economy

Weak

-2%

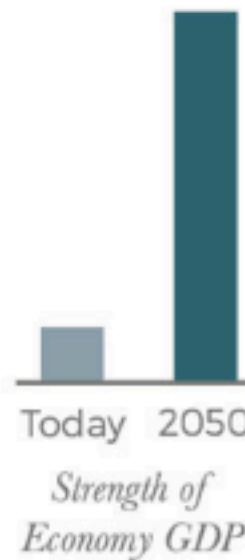


QUAKING ASPEN SCENARIO

Very strong economy

Very Strong

+11%



Envision Utah

- Air quality declines as we grow and does not meet health standards.
- Transportation distances are longer for people, goods, and services.
- Housing is less affordable, and household transportation costs are higher.
- Recreational facilities are crowded, adversely affecting both residents and tourists.
- Agriculture declines as farmland and water are sold off.

However, the following increase our ability to attract and retain businesses and employees:

- Energy costs remain low.
- Public lands produce more economic benefits.

Results:

- Economy is weak.
- Average incomes are low.
- Tax revenues are low and may not meet increased demand for services or other state needs.
- Young Utahns cannot find good jobs and must leave.
- Poverty, including intergenerational poverty, increases, as does demand for public assistance.

Envision Utah

- Air quality significantly improves and is significantly cleaner than health standards.
- Transportation distances remain reasonable for people, goods, and services; Utah is a transportation hub, with high-speed trains that connect us to other western cities and more international flights.
- Housing and household transportation costs remain affordable.
- Recreational facilities meet the growing demand of residents, and tourism booms.
- Agriculture becomes a stronger industry and provides more local foods.
- Energy costs are moderate.
- Public lands produce more economic benefits.

Results:

- Economy is very strong.
- Average incomes are high.
- Tax revenues are high.
- Young Utahns can generally find a broad range of high-quality jobs.
- Poverty, including intergenerational poverty, significantly decreases, as does demand for public assistance.

Questions and Comments

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COMMONWEALTH of VIRGINIA
Office of the
SECRETARY of TRANSPORTATION

Measuring Economic Development

Nick Donohue
Deputy Secretary of Transportation
May 19, 2016



Support for New Economic Activity

- ***What*** – Degree to which project supports local economic development strategies and projects
- ***When*** – Changes compared to existing conditions
- ***Where*** – Corridor level analysis
- ***How*** – Project sponsor would provide information regarding steps taken toward specific economic development actions
 - Documentation would be required to verify information provided by sponsor

Support for New Economic Activity

- **Examine amount of allowable commercial and industrial growth within a buffer of the project**
 - **Buffer can be up to 5 miles**
- **Calculate total of potential new square footage within the buffer area of the project**
- **Focus on progress and efforts of locality to advance development on the site**

Support for New Economic Activity

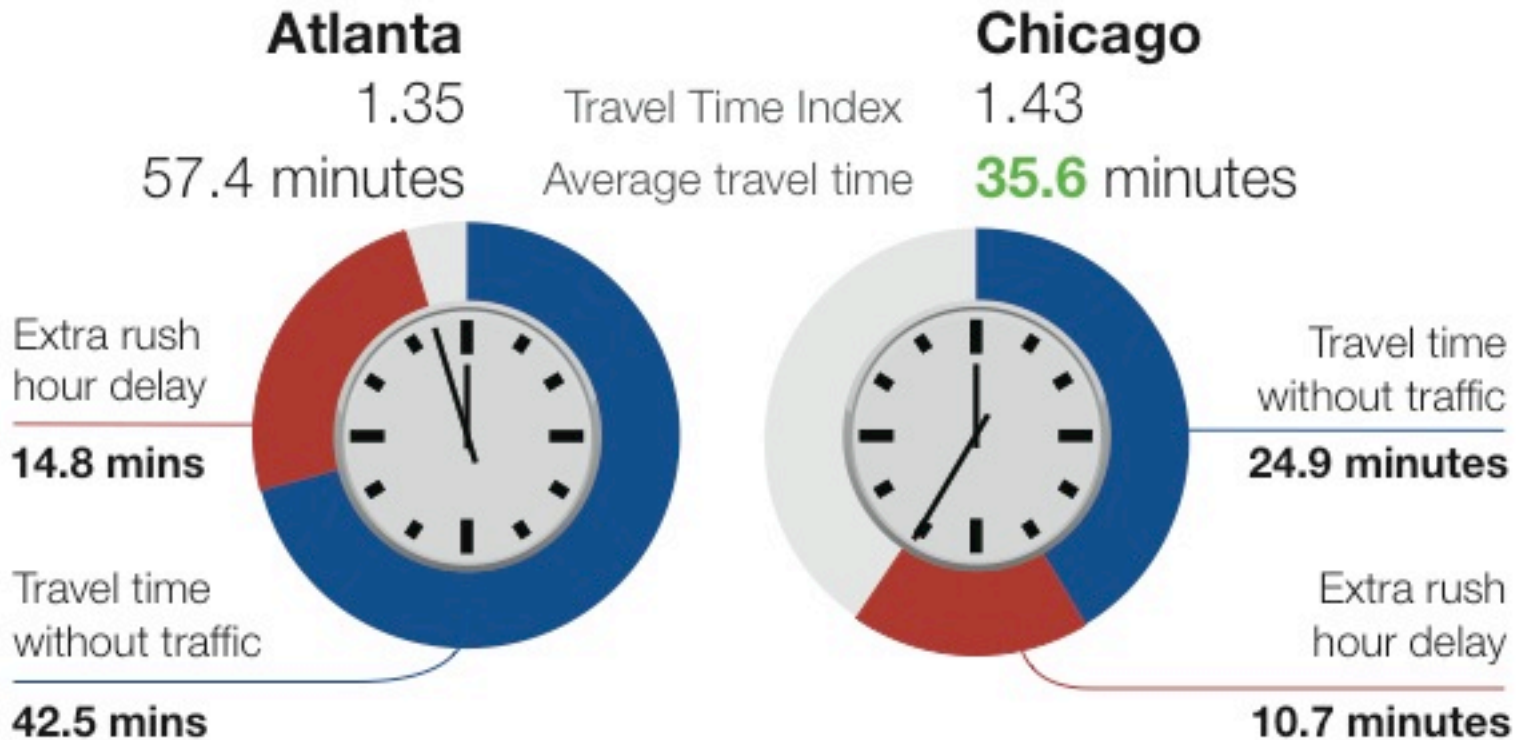
Does/Is the site...

- **Consistent with local economic development strategy?**
- **Incorporated into the regionally adopted Comprehensive Economic Development Strategy?**
- **Zoned for the development?**
- **Have a pending or approved plan of development?**
- **Have utilities in place or programmed in the capital budget of the locality?**

Support for New Economic Activity

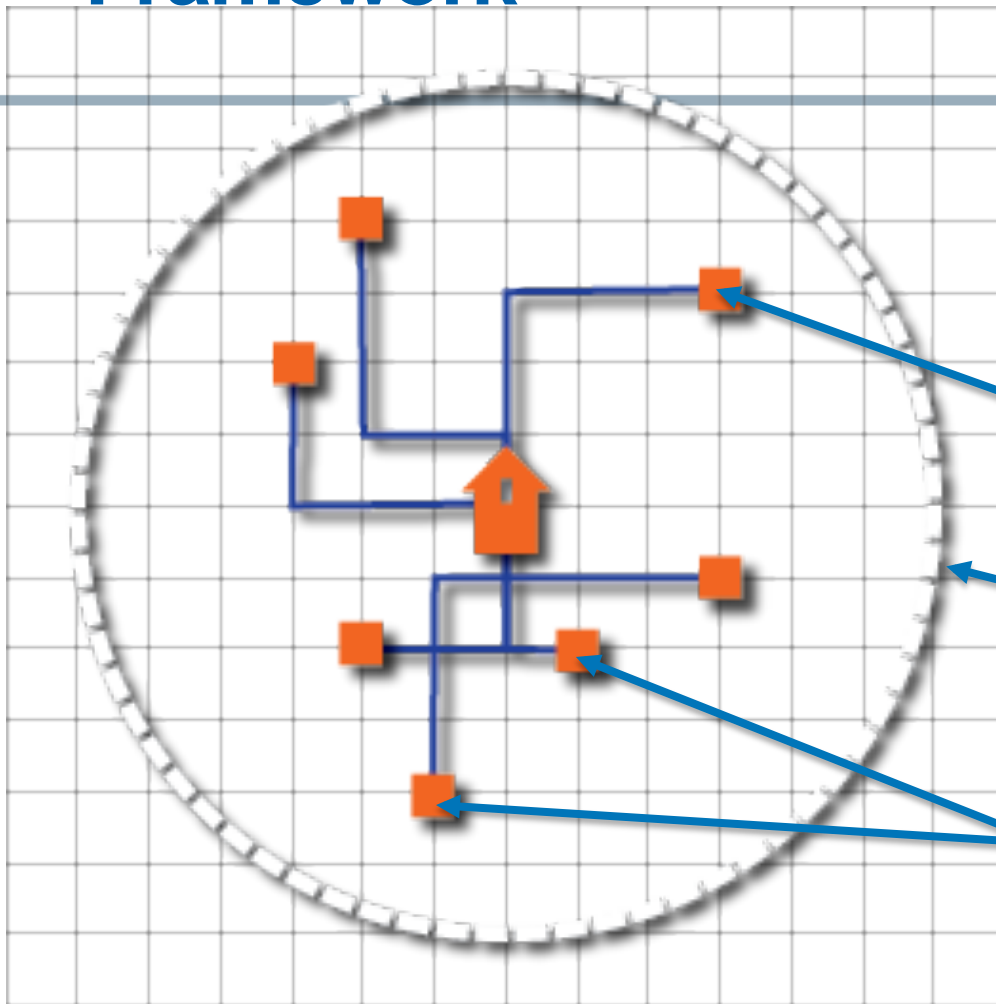
Project	Sq Footage	Progress	Score
A	4,000,000	1	4,000,000
B	2,000,000	3	6,000,000
C	1,000,000	5	5,000,000

Why does Accessibility Matter?



Though Atlanta has a much lower (better) Travel Time Index (TTI), Chicago commuters spend 20 minutes less per peak period trip.

Virginia's Accessibility Framework



The number of jobs reachable within a given travel time on a given network, where:

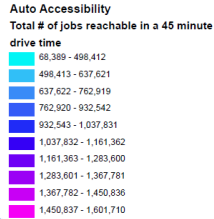
JOBS = Number of Jobs reachable from each Census Block Group

TRAVEL TIME = within 45 minutes over an *actual network* (using peak period speeds for each mode)

DECAY = Factor reflecting decrease in value of opportunities that are farther away (based in traveler surveys)

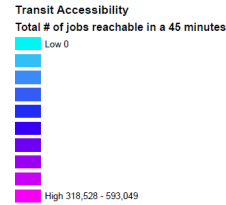
Assessing Transportation Conditions in the Northern Virginia Region:

Automobile



← **Auto Accessibility Map**
(Access to jobs in 45 minutes from each Census Block Group)

Transit



Walk Accessibility Map
(Access to jobs in 45 minutes from each Census Block Group)

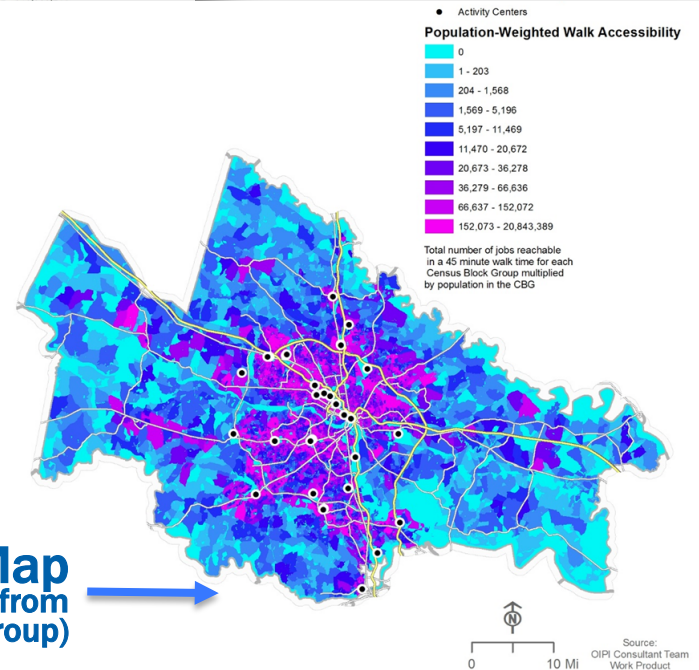
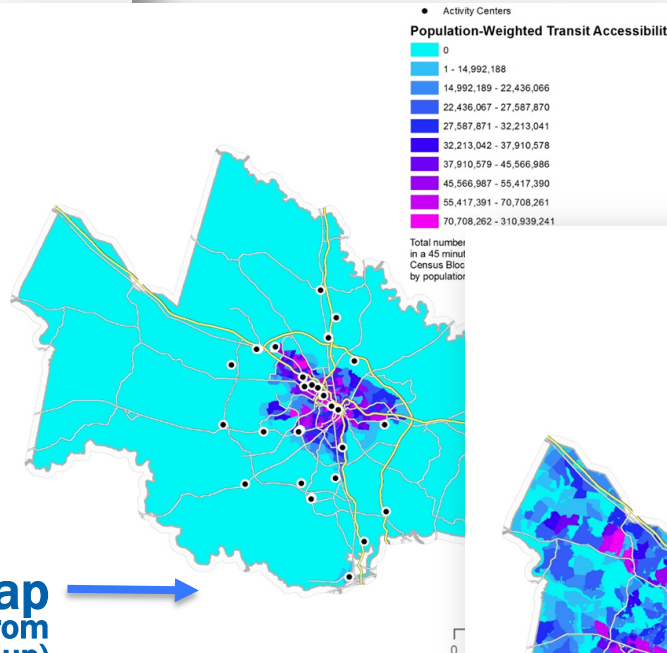
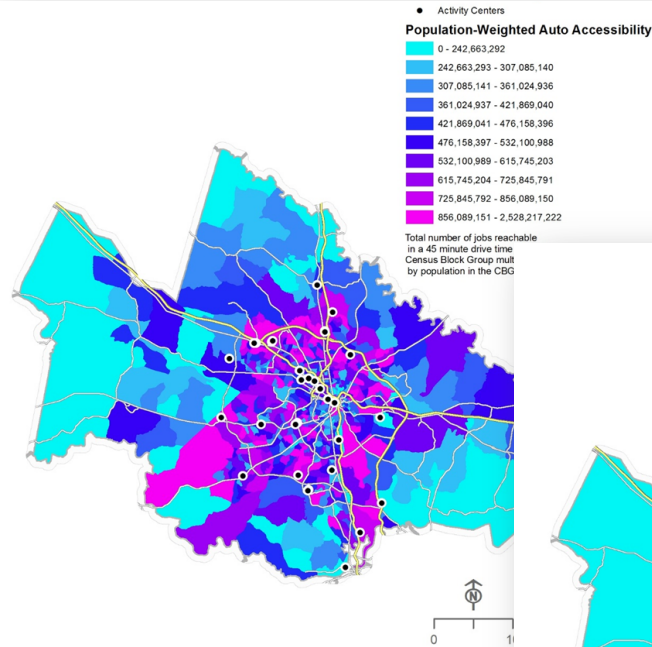
Walk



Transit Accessibility Map
(Access to jobs in 45 minutes from each Census Block Group)

Assessing Transportation Conditions in the Richmond Region

Auto Accessibility Map
(Access to jobs in 45 minutes from each Census Block Group)



Transit Accessibility Map
(Access to jobs in 45 minutes from each Census Block Group)

Note that the range of values for each map goes from highest to lowest accessibility by mode (i.e. the same color in each mode doesn't necessarily equal the same number of jobs accessible)

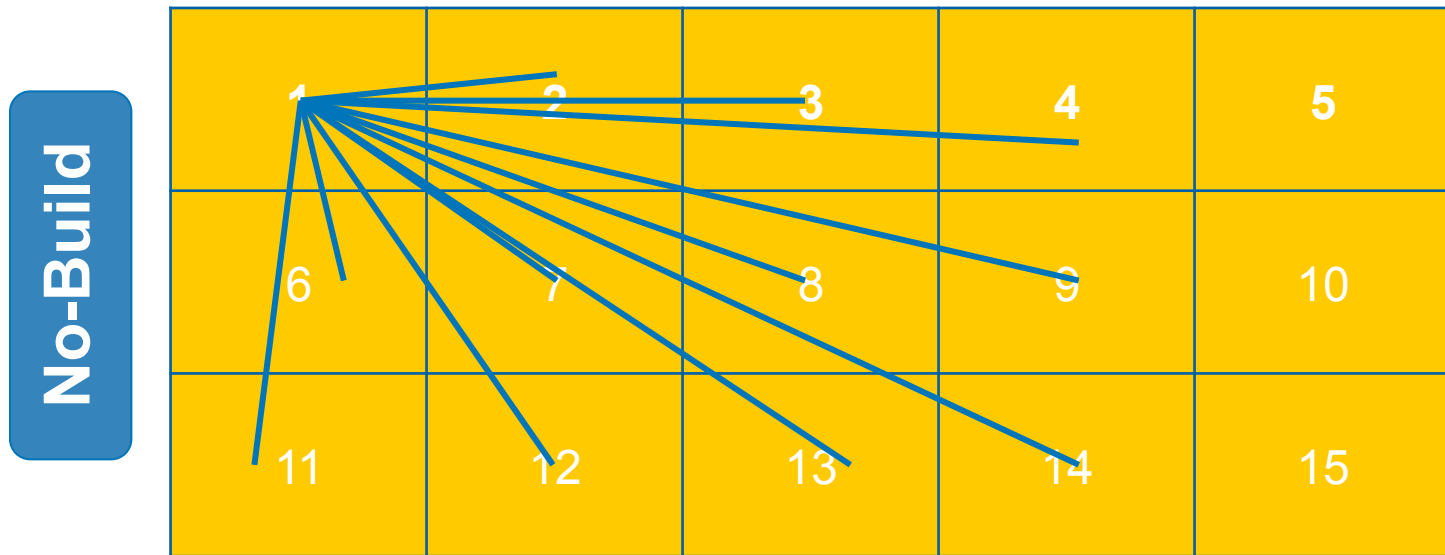
Walk Accessibility Map
(Access to jobs in 45 minutes from each Census Block Group)

Accessibility in the HB2 Scoring Process

- **VTrans2040 Needs Assessment used access to employment by mode as a measure in each region to determine Needs**
- **For HB2 project scoring, the same model will measure:**
 - **The increase in access to employment**
 - **The increase in access to employment for disadvantaged population**

Access to Jobs

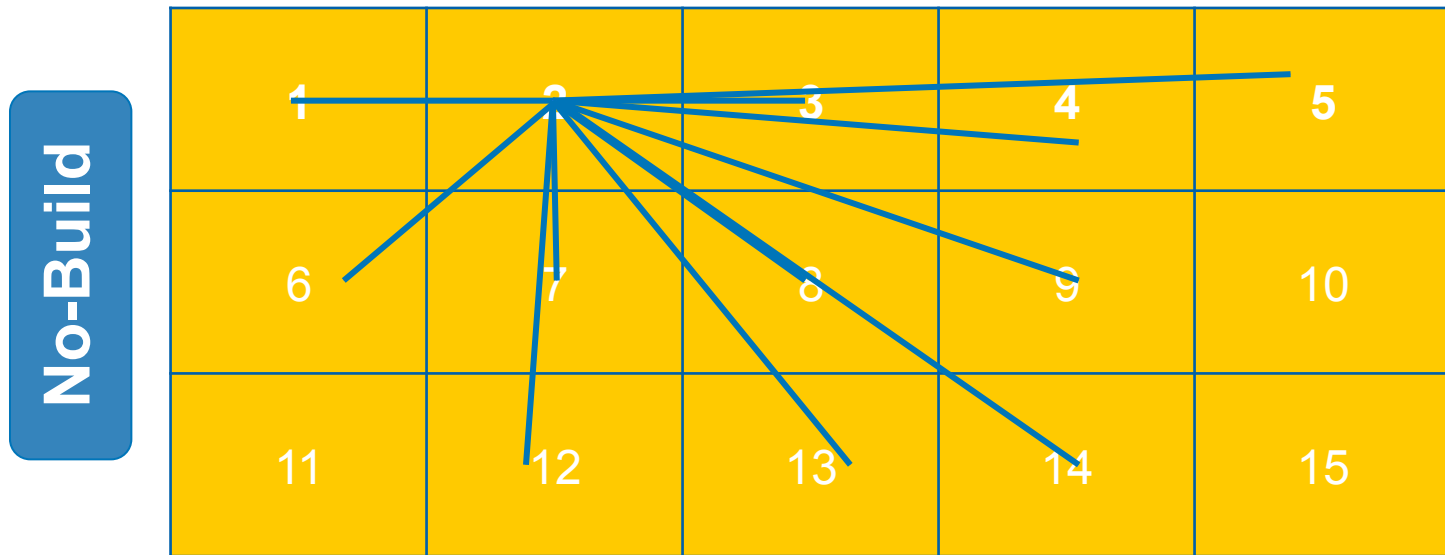
- Accessibility Tool



Tool analyzes existing accessibility to jobs

Access to Jobs

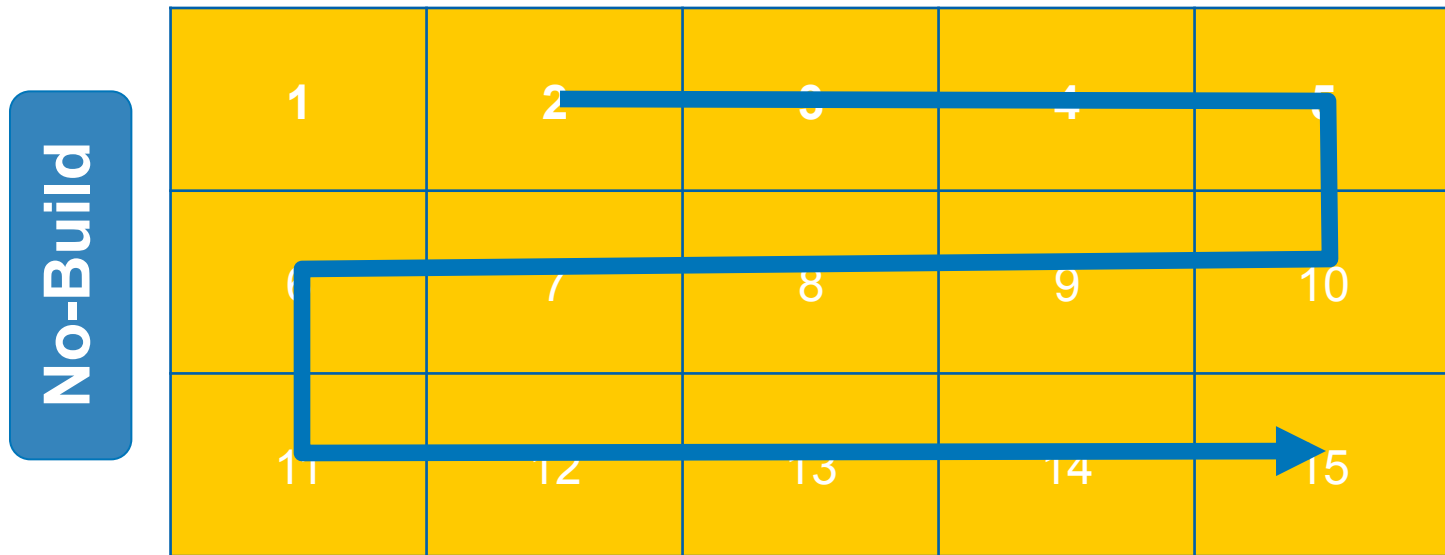
- Accessibility Tool



Tool moves to next block, assessing existing accessibility

Access to Jobs

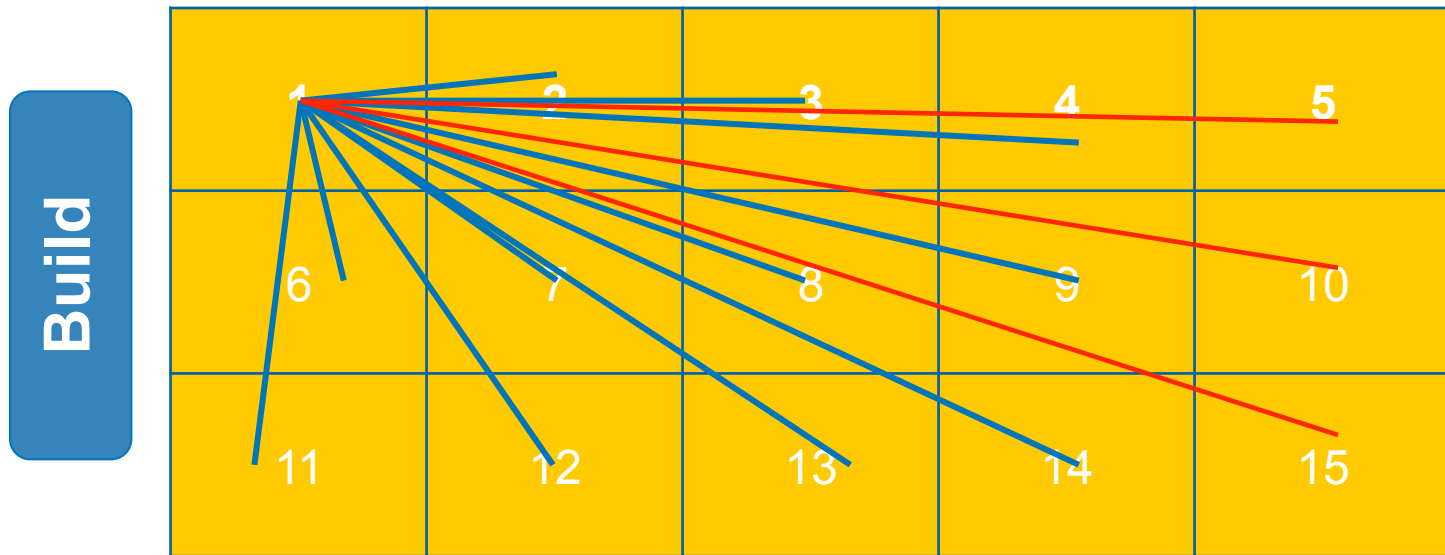
- Accessibility Tool



Process is repeated for all blocks to establish existing accessibility to jobs

Access to Jobs

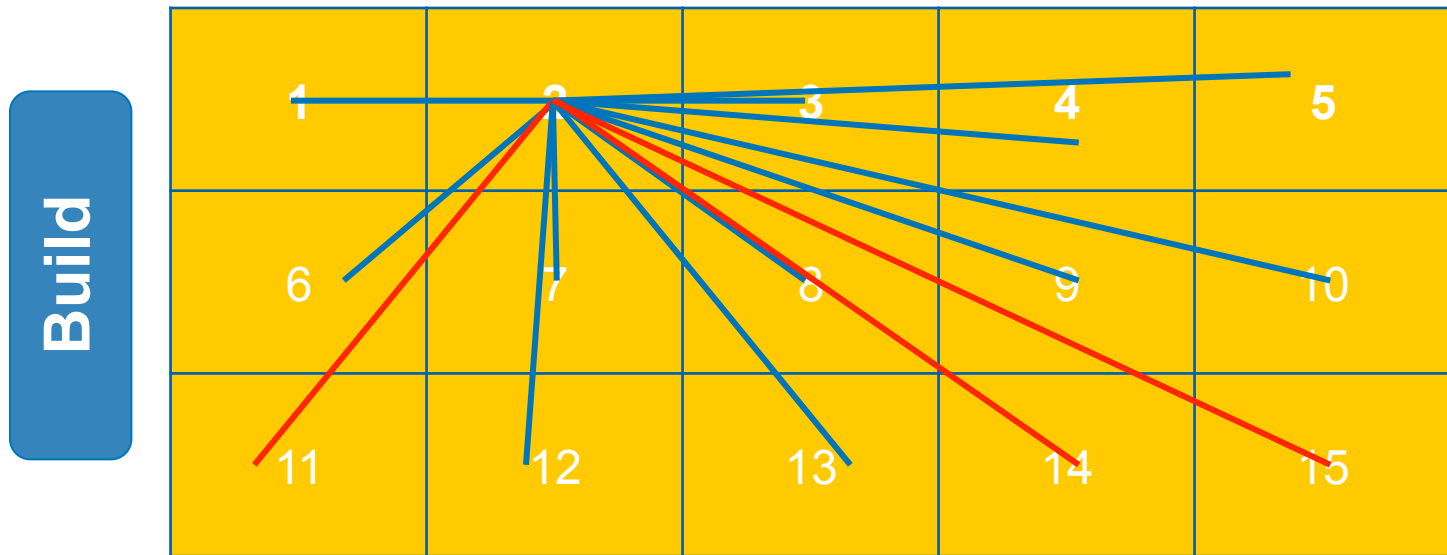
- Accessibility Tool



Tool then analyzes change in access to jobs based on proposed improvement

Access to Jobs

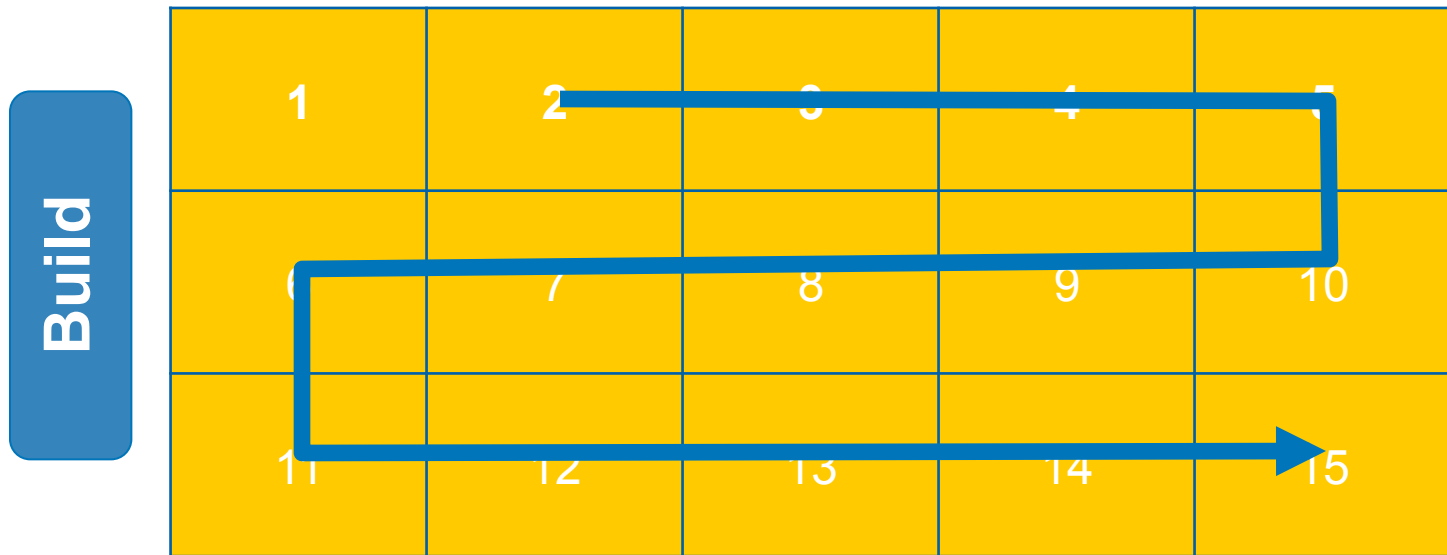
- Accessibility Tool



Tool moves to next block, calculating change in job access

Access to Jobs

- Accessibility Tool



Process is repeated for all blocks – increase in access for each block is summed and used to score projects

IT'S NOT ABOUT THE MEASURES.
IT'S ABOUT HOW YOU USE THEM.

Part 2: Measuring Economic Impacts

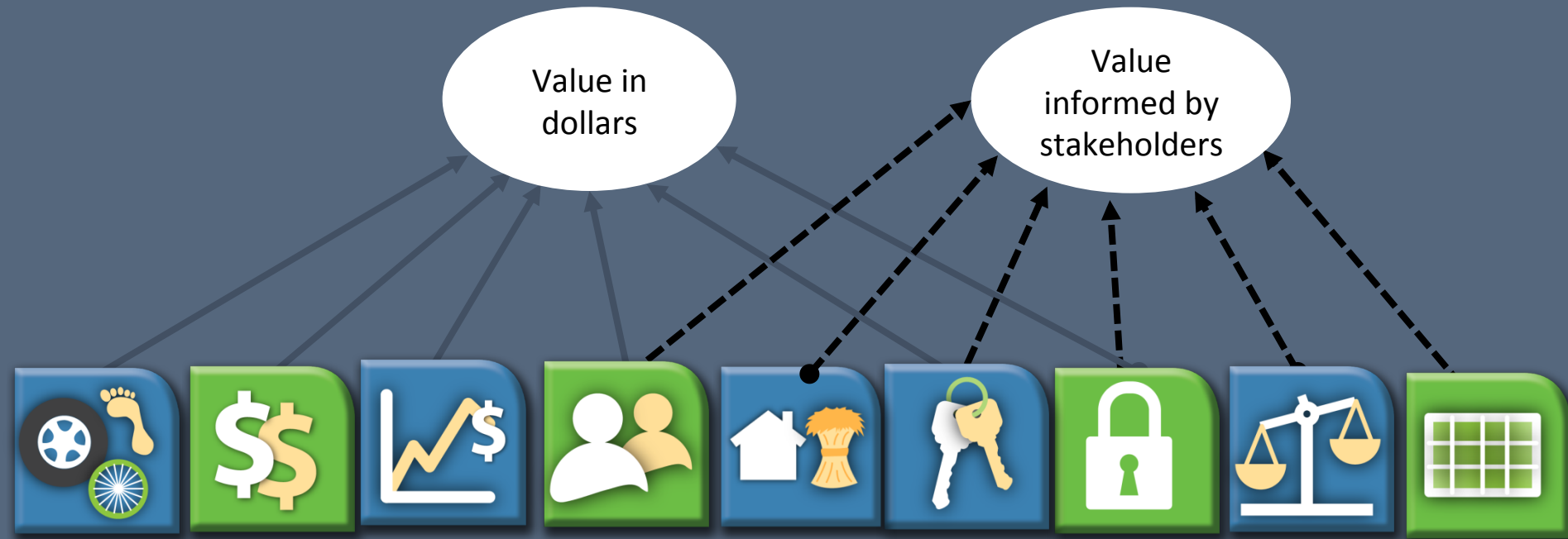
Transportation Leadership Academy

Indianapolis Indiana

May 2016

Samuel Seskin

Two ways of measuring value:



Illustrative indicators measured in dollars

- MO.1 - Travel Time
- MO.3 - Reliability (Recurring congestion)
- MO.4 - Reliability (Non-recurring congestion)
- MO.5 - User Costs
- EV.2 - Changes in transportation costs by industry (business travel and freight)
- EV.4 - Changes in productivity from increased connectivity
- ES.1 - Criteria Air Contaminants
- ES.4 - Life-cycle CO₂e
- FT.1 - Capital Costs
- FT.2 - Other Lifecycle Costs
- FT.3 - Total Revenue
- SA.1 - Fatal, Injury A, and Injury B Crashes
- QL.1 - Lives saved due to active transportation
- QL.2 - Reduced incidence of diseases due to active transportation
- QL.3 - Quality of the travel environment
- QL.4 - Noise Impacts

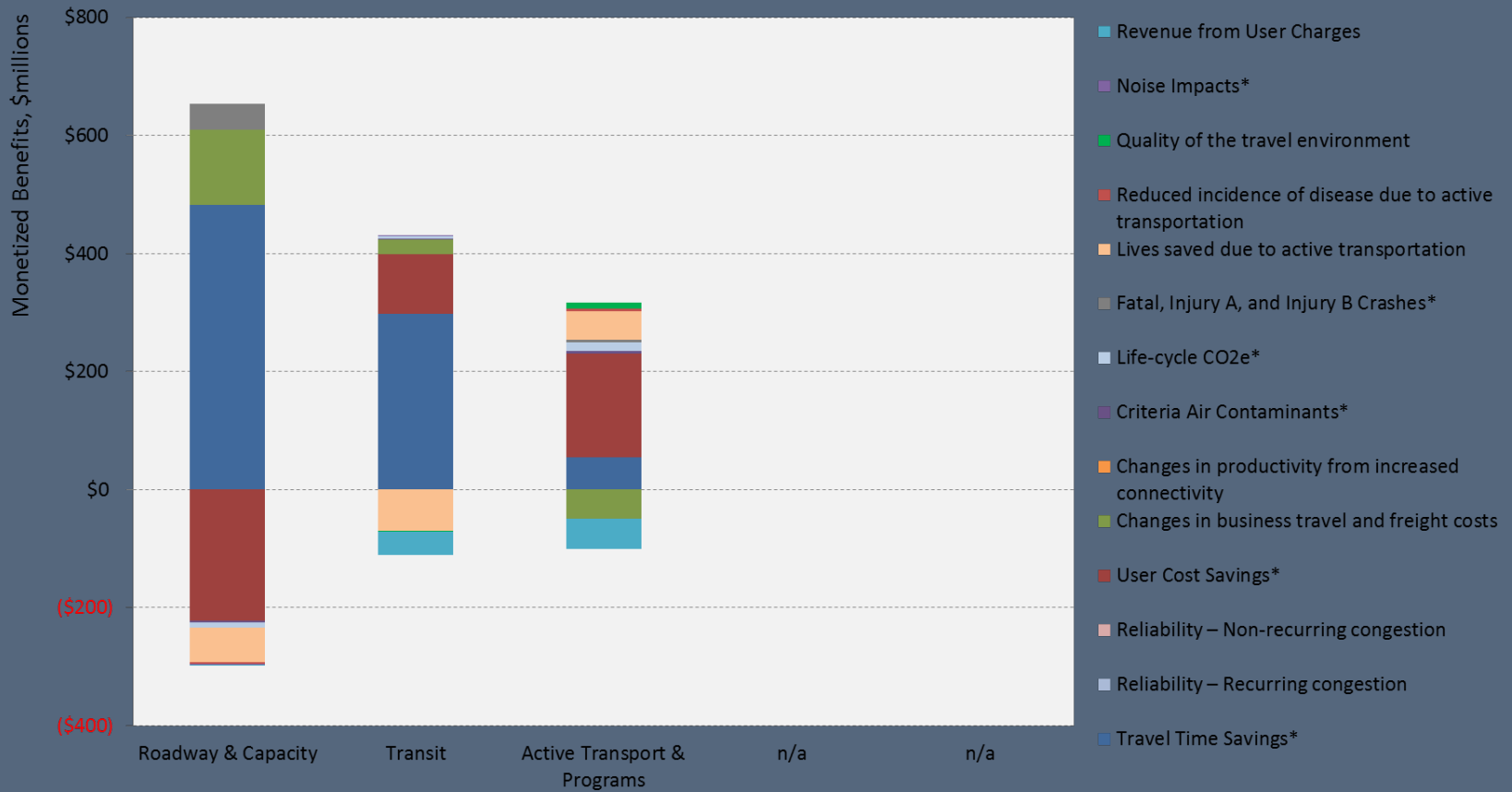
Indicators of economic vitality

CATEGORY	GENERAL INDICATORS	INDEX	SPECIFIC INDICATORS	MONETIZED	QUANTITATIVE SCORING	QUALITATIVE SCORING	REPORT ONLY
ECONOMIC VITALITY	Economic Impacts of Spending for Construction	EV.1	Number of jobs associated with plan or bundle of actions, and associated income metrics				✓
	Economic Impacts of more Efficient Transportation Services	EV.2	Changes in transportation costs by industry (business travel and freight)	✓	✓	✓	✓
		EV.3	Changes in employment by industry, and associated income metrics				✓
	Structural Economic Effects of Transportation System Improvements	EV.4	Changes in productivity from increased connectivity (agglomeration effects)	✓	✓	✓	✓
		EV.5	Changes in the total value of exports and imports				✓

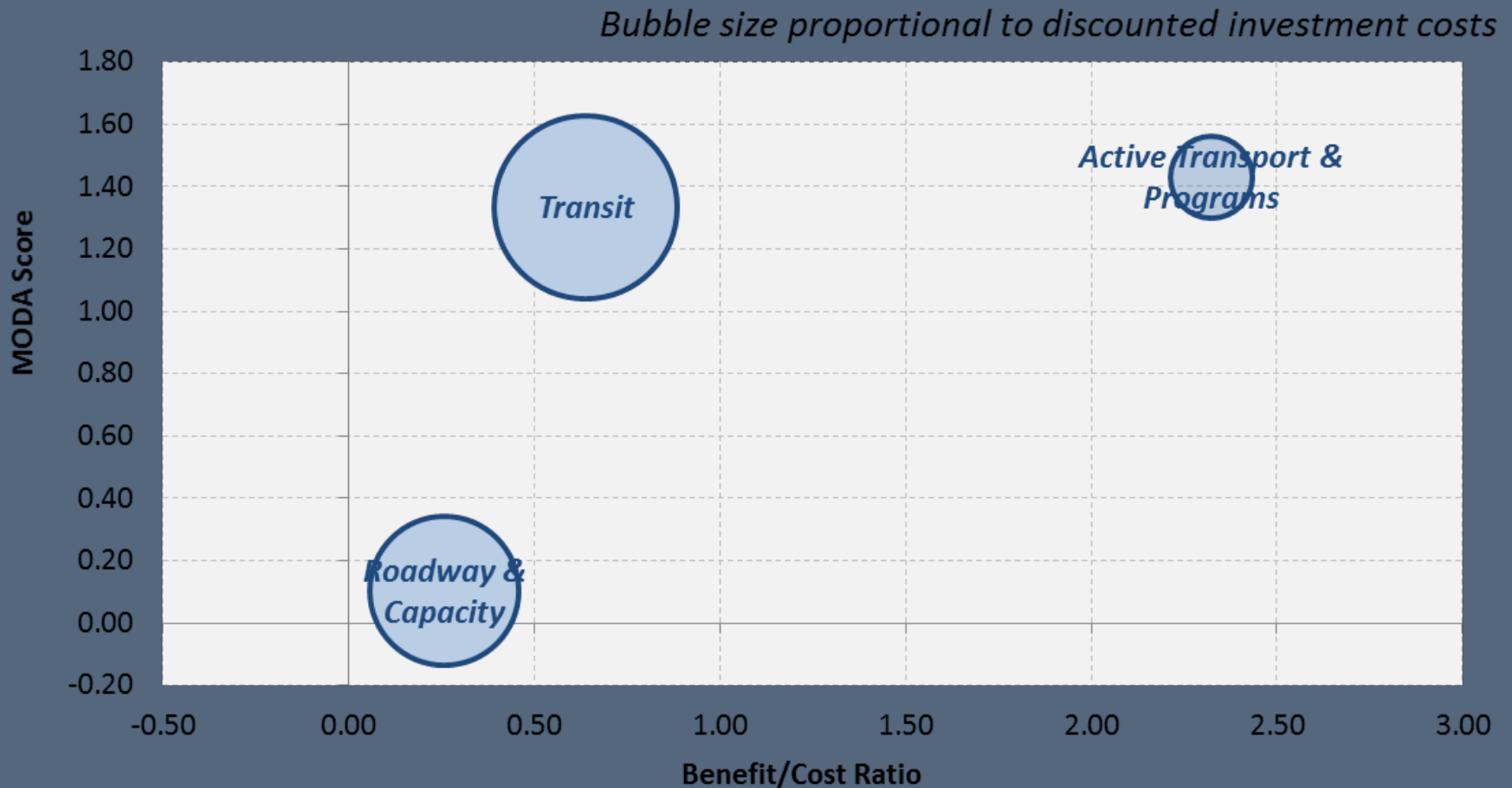
Indicators of livability and quality of life

<i>CATEGORY</i>	<i>GENERAL INDICATORS</i>	<i>INDEX</i>	<i>SPECIFIC INDICATORS</i>	<i>MONETIZED</i>	<i>QUANTITATIVE SCORING</i>	<i>QUALITATIVE SCORING</i>	<i>REPORT ONLY</i>
QUALITY OF LIFE & LIVABILITY	Physical Activity	QL.1	Lives saved due to active transportation	✓	✓	✓	✓
		QL.2	Reduced incidence of diseases due to active transportation	✓	✓	✓	✓
	Journey Ambience	QL.3	Quality of the travel environment	✓	✓	✓	✓
	Noise	QL.4	Noise Impacts	✓	✓	✓	✓

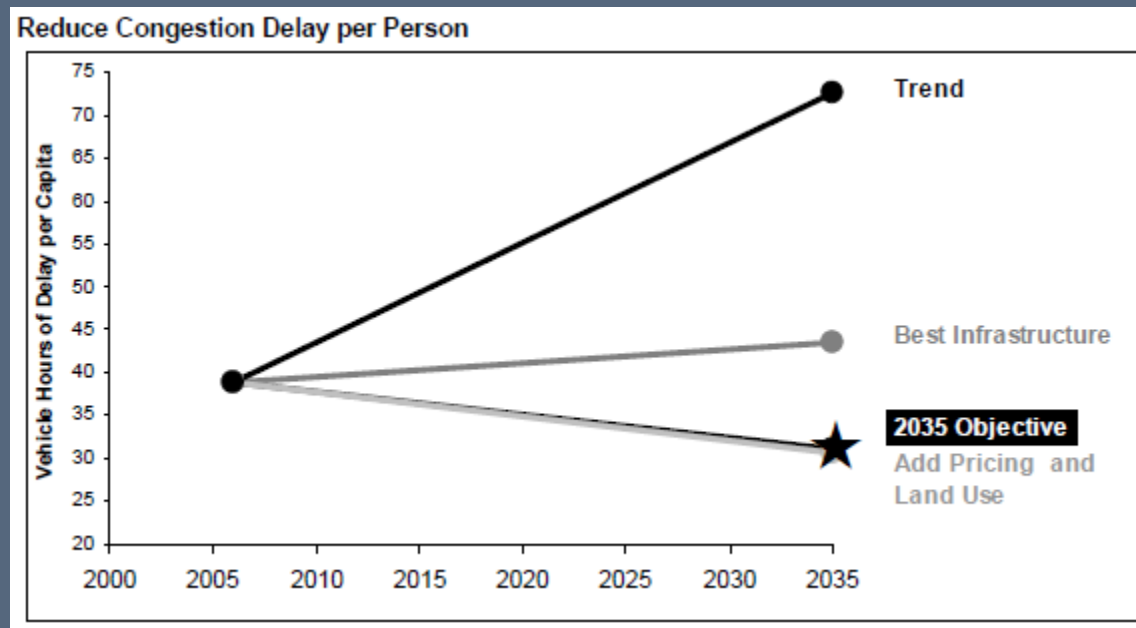
Measuring benefits in dollars (Oregon Test Case)



Comparison of stated value to \$benefit-cost ratio (Oregon Test Case)



Best Practice Example: Metropolitan Transportation Commission



Best Practice Example: Metropolitan Transportation Commission

Figure 4: Benefit Cost Ratio

High: B/C of 10 or higher	
<u>Transit efficiency</u> <ul style="list-style-type: none"> • Muni & AC Transit transit priority measures • Van Ness bus rapid transit <u>Roadway expansion:</u> Route 84 widening	<u>Freeway efficiency</u> <ul style="list-style-type: none"> • Freeway Performance Initiative • HOT lanes with express bus (Santa Clara, Regional)
Medium-high: B/C between 5 and 9	
<u>Roadway maintenance</u> <u>HOV Lanes</u> <ul style="list-style-type: none"> • Marin-Sonoma Narrows • I-680 Contra Costa and Solano • I-80 Airbase to I-505 (Solano) <u>Freeway efficiency:</u> HOT lanes with express bus (Alameda)	<u>Roadway operations/expansion</u> <ul style="list-style-type: none"> • I-580 Truck climbing lanes (Alameda) • I-80 reliever route (Solano) • Jepson parkway connection (Solano) <u>Major interchange:</u> Route 237/US 101 <u>Transit efficiency:</u> Geary bus rapid transit
Mid-range: B/C between 1 and 4	
<u>Transit maintenance</u> <u>Transit expansion/efficiency</u> <ul style="list-style-type: none"> • BART to Livermore • Marin County Transit • I-80, I-580, I-680 express bus • Geneva/Harney bus rapid transit • Capital corridor expansion • MTA historic streetcar <u>Major interchanges</u> <ul style="list-style-type: none"> • I-80/I-680/Route 12 • I-580/US 101 • I-680/Route 4 • Route 237/Route 85 • Route 25/US 101/Santa Teresa Blvd. • I-680 northbound /I-580 westbound 	<u>HOV Lanes:</u> I-80 from Carquinez Bridge to Route 37 <u>Roadway expansion</u> <ul style="list-style-type: none"> • I-80 Airbase to Route 12 • Route 12 widening • Route 92 uphill passing lane • Route 239 Brentwood/Tracy expressway • Route 152 new alignment • US 101 widening south Santa Clara County • Jepson parkway phases 1 and 2 • Widen Route 4 to San Joaquin County Line • Dumbarton Bridge access (San Mateo) <u>Regional programs</u> <ul style="list-style-type: none"> • Transportation for Livable Communities • Port Emissions/Truck Retrofit
Low: B/C less than 1	
<u>Regional Programs</u> <ul style="list-style-type: none"> • Lifeline • Regional Bike Network • Climate Protection 	<u>HOV Lanes:</u> I-80 Red Top Rd to Route 37 <u>Roadway</u> <ul style="list-style-type: none"> • Single, direct HOV connectors/ramps • Upgrade SR4 West to freeway

Best Practice Example: Metropolitan Transportation Commission

Figure 5: Vehicle Miles Traveled (VMT)

	Millions VMT Reduced in 2035	Cost per Million VMT Reduced
Most Effective/Most Cost-Effective		
HOT networks with express bus	200 to 800	\$0.1 to \$0.5
Transportation for Livable Communities	200	\$0.5 to \$0.8
Limited Impact/Less Cost-Effective		
Regional Bike Network	60	\$1
High volume transit (e.g., transit priority, San Francisco bus rapid transit, BART to Livermore)	7 to 50	\$0.2 to \$7
Roadway projects that provide direct routing (e.g., I-80 reliever, SR84)	6 to 8	\$0.5 to \$1
Increase Vehicle Miles Driven		
Most roadway expansion projects	-1 to -40	NA
Freeway Performance Initiative	- 66	NA

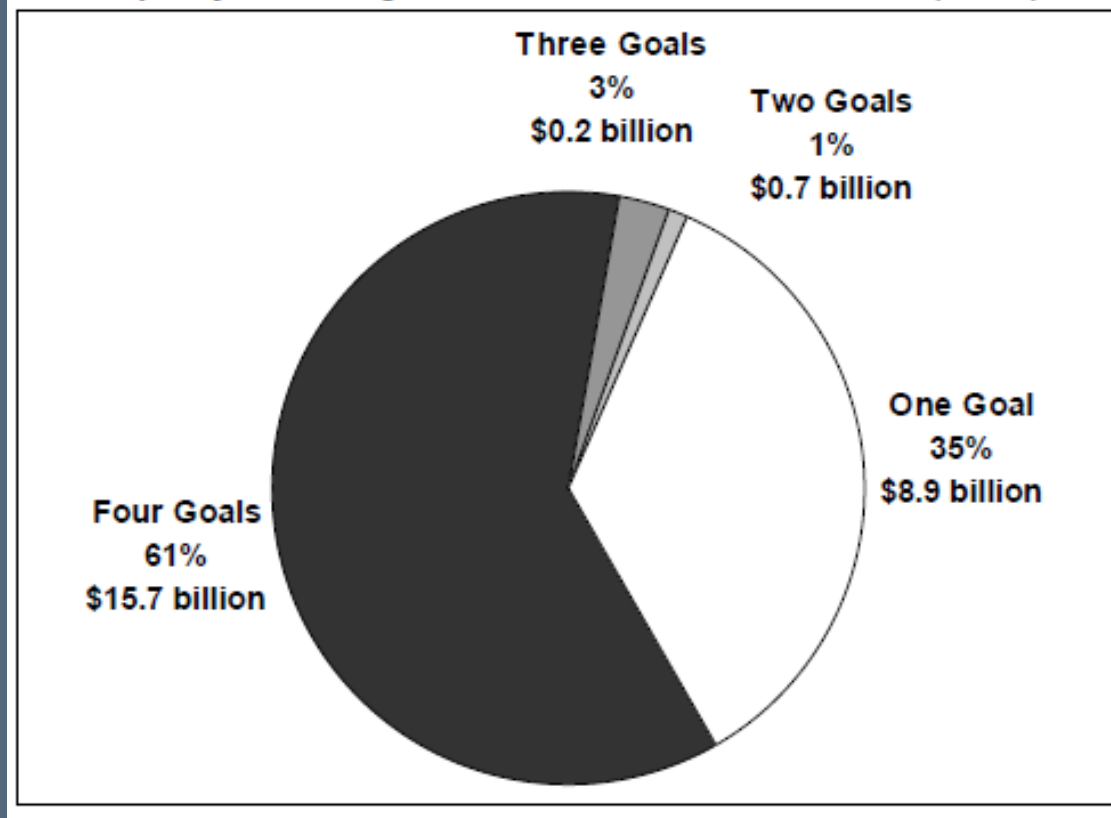
Best Practice Example: Metropolitan Transportation Commission

Figure 7: Cost per Low-Income Households Served by Transit*

Cost per low-income household served < \$1,000	
<u>Transit Efficiency</u> <ul style="list-style-type: none"> • AC Transit priority measures • San Francisco Muni transit priority measures 	<ul style="list-style-type: none"> • Van Ness bus rapid transit • Geary bus rapid transit <u>Transit Expansion:</u> I-80 express bus
Cost per low-income household served \$1,000 to \$5,000	
<u>Transit Efficiency</u> <ul style="list-style-type: none"> • Marin County transit priority measures • Geneva Harney bus rapid transit 	<u>Transit Expansion:</u> San Francisco historic streetcar
Cost per low-income household served \$5,000 to \$40,000	
<u>Transit Expansion</u> <ul style="list-style-type: none"> • Marin County transit • I-680 express bus 	<ul style="list-style-type: none"> • I-580 express bus • Capital Corridor expansion in Contra Costa and Solano counties
Higher than \$40,000: BART to Livermore (no low-income households within walking distance of proposed alignment)	
* Transit riding households within ½ mile walking distance of transit stops or stations	

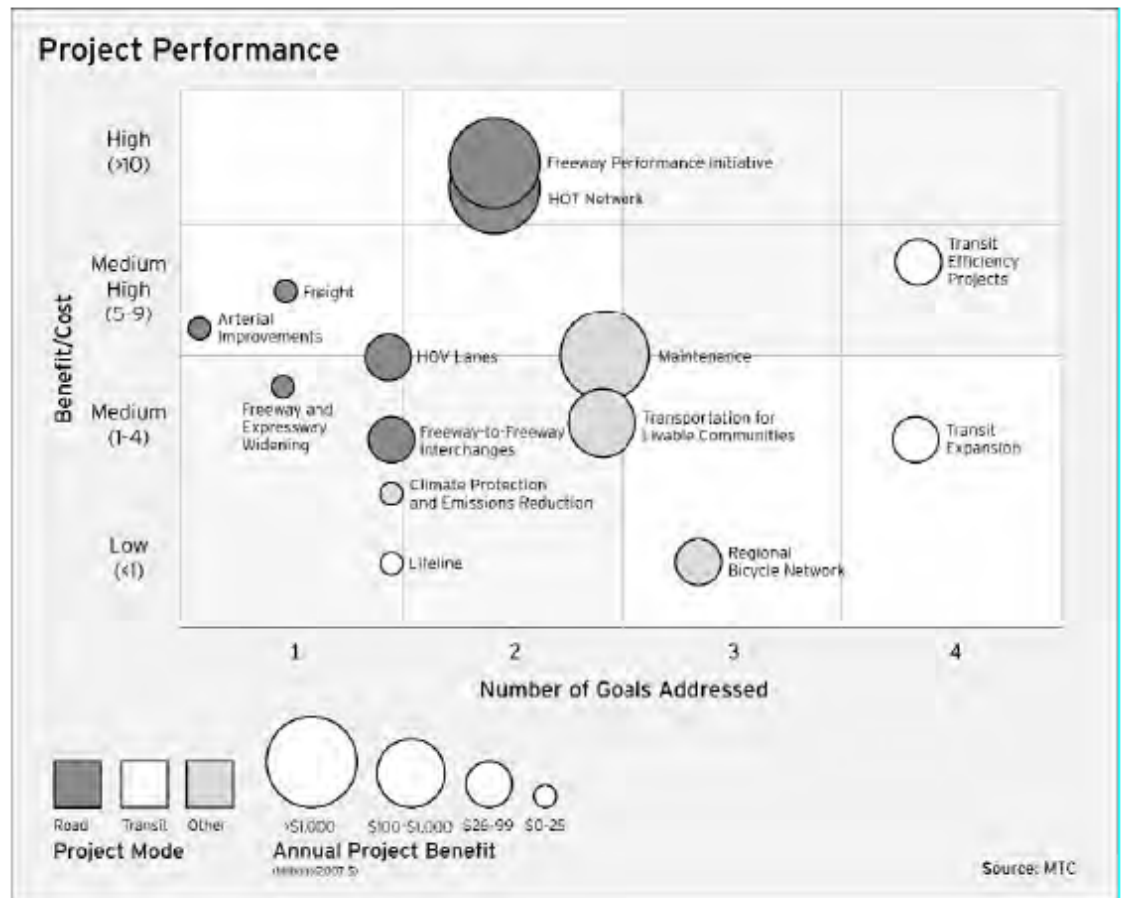
Best Practice Example: Metropolitan Transportation Commission

**Figure 10: Committed Projects by Number of Goals Supported
Capacity Increasing, with Cost Greater than \$50 billion (2007\$)**



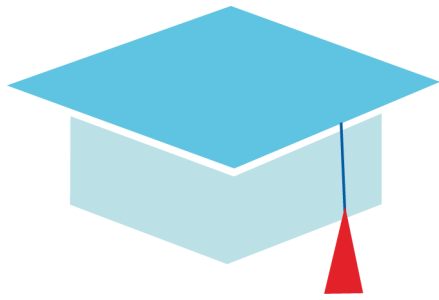
Best Practice Example: Metropolitan Transportation Commission

Figure 11: Project-Level Performance Assessment Synthesized Results



QUESTIONS AND DISCUSSION





TRANSPORTATION LEADERSHIP ACADEMY



Transportation
for America



U.S. Department of Transportation
**Federal Highway
Administration**

QUESTIONS & COMMENTS
#indyTLA