



Interdependencies Between Land Use and Transport:

Case study of the First Sustainable Communities Strategy
for the San Francisco Bay Area

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In collaboration with the Association of Bay Area Governments and the
Metropolitan Transportation Commission



BayArea Plan

- First regional plan to integrate transportation, land use, and housing (*Sustainable Communities Strategy*)
- Initiated by California Senate Bill 375

Why Connecting Land Use and Transport is Essential (even if it were not legally required)

Highway Project

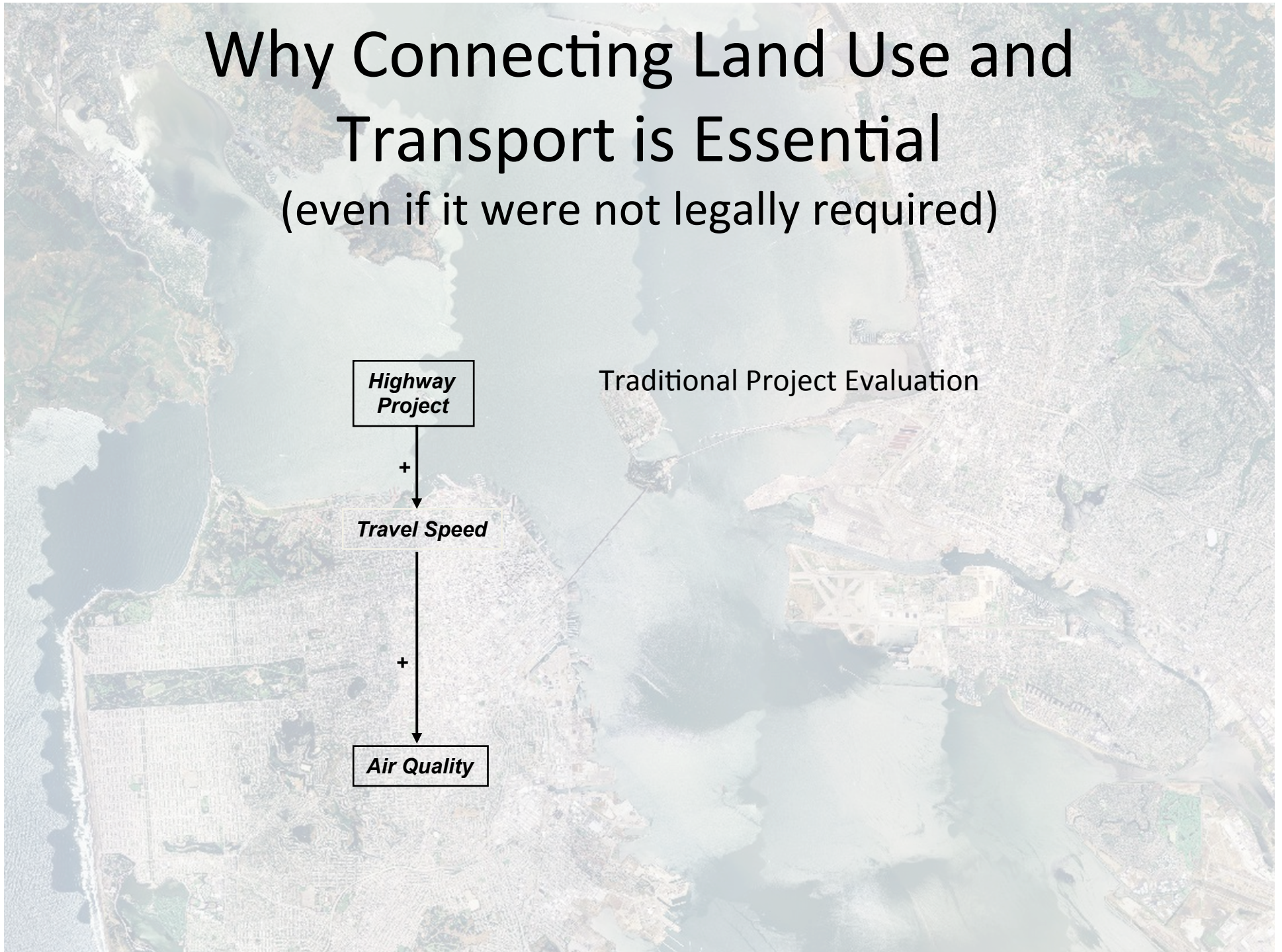
+

Travel Speed

+

Air Quality

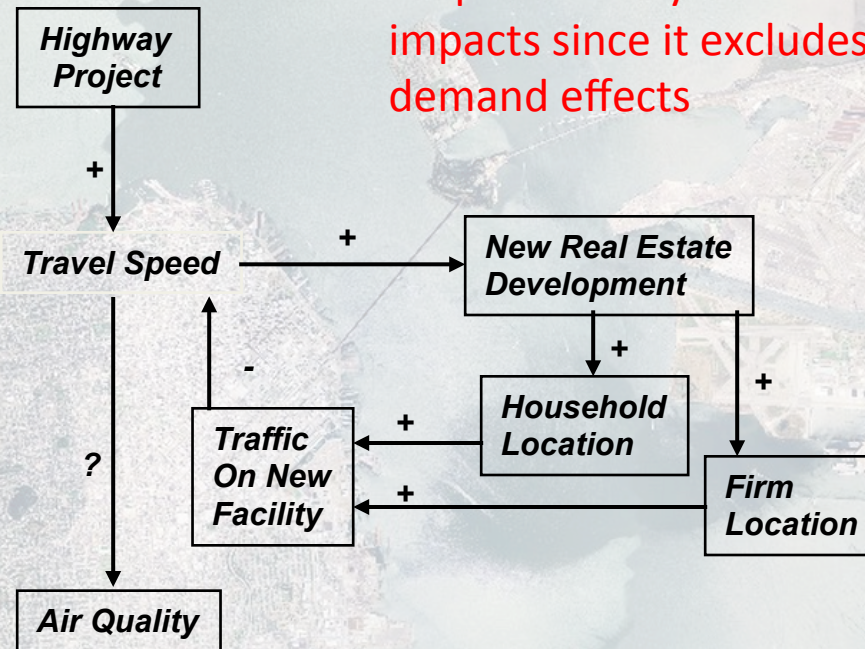
Traditional Project Evaluation



Why Connecting Land Use and Transport is Essential

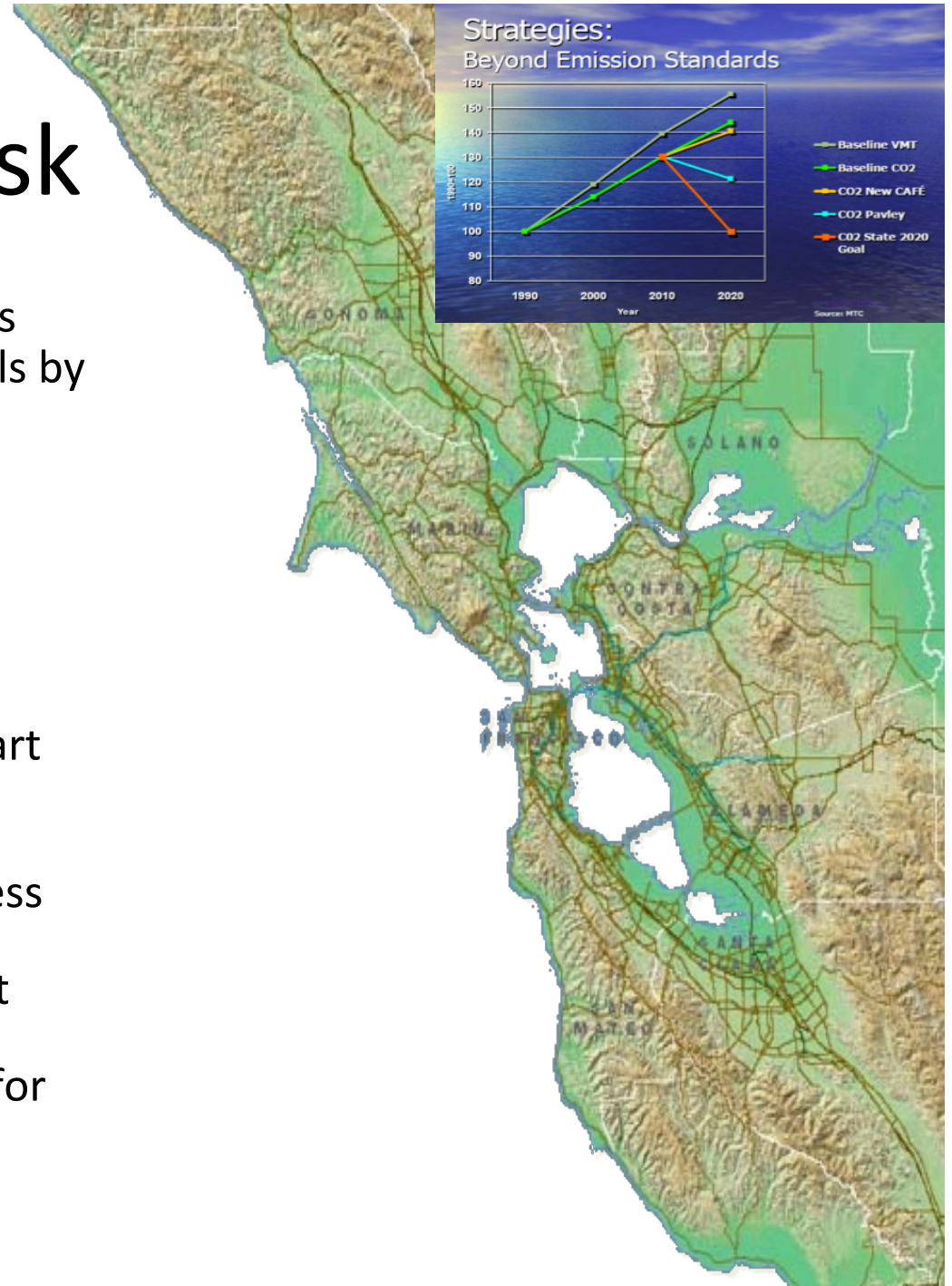
(even if it were not legally required)

Traditional Project Evaluation is optimistically biased about project impacts since it excludes induced demand effects

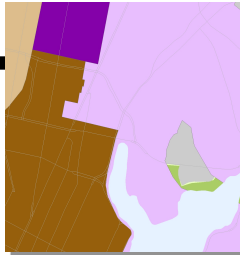


The Regional Task

- Reduce per capita greenhouse gas emissions by 15% from 1990 levels by 2035
- House the region's population at all income levels
- Embody local visions
- Stretch tax revenues through smart investments
- Increase economic competitiveness
- Preserve the natural environment
- Sustain a healthy, vibrant region for our children and grandchildren

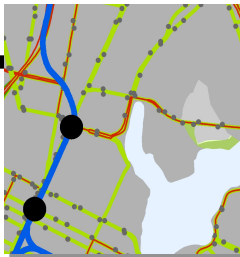


Plan Bay Area: Integrated Regional Planning



Land Use

Jobs-Housing Connection Strategy



Transportation

Regional Transportation Plan (RTP)
One Bay Area Grant (OBAG)



Housing

Regional Housing Need Allocation (RHNA)

Coordinated Planning

Air Quality: Bay Area Air Quality Management District

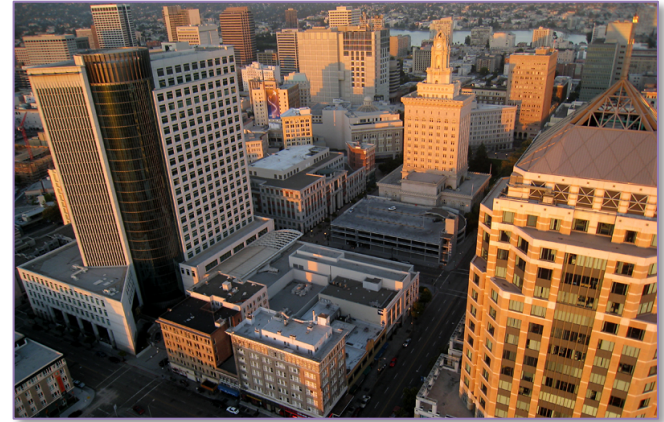
Resilience: Regional Disaster Resilience Initiative

Sea Level Rise: Bay Conservation and Development Commission

Regional Growth Strategy

Priority Development Areas

- Nearly 170 city nominated-areas in over 60 cities and counties
- Within an existing community / Infill development area
- Near existing/planned transit
- Providing housing and/or jobs
- Diversity of densities and community identities



Regional Growth Strategy







Priority Conservation Areas

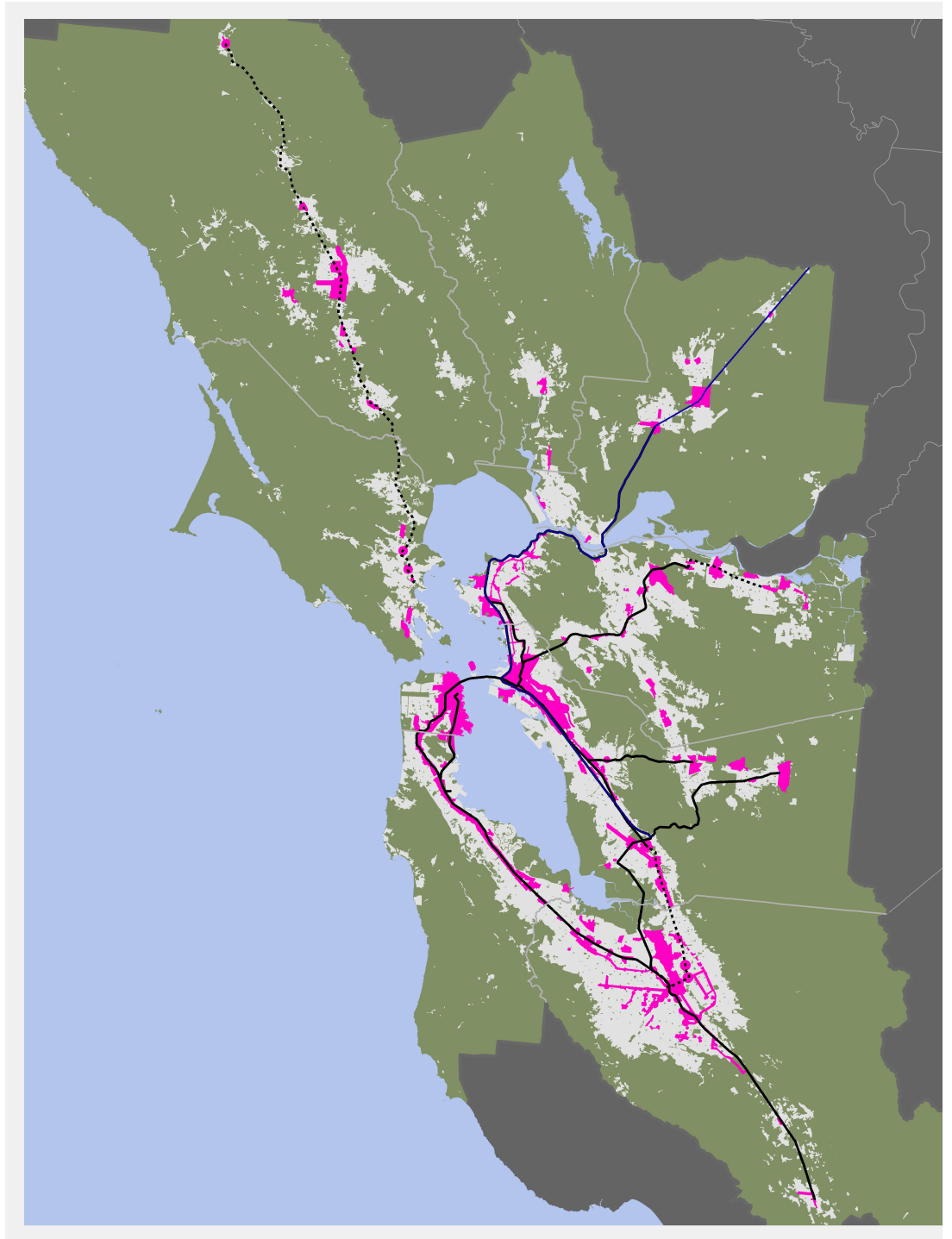
- Areas to be retained for open space or farmland to maintain quality of life
- More than 100 locally nominated areas



Regional Growth Strategy:

Focused Growth

-  Non-urbanized land
-  Urbanized land
-  PDAs
 -  Less than 5% of region's land
 -  Nearly 80% of new homes
 -  Over 60% of new jobs



Six Investment Strategies

1. Maintain the Existing Transportation System
2. Support Focused Growth — OBAG Grants
3. Build Next Generation Transit
4. Boost Freeway and Transit Efficiency
5. County Investment Priorities
6. Protect Our Climate

Draft Investment Summary

Total Transportation Investments

Total Revenue — \$289 Billion

Road and Bridge:

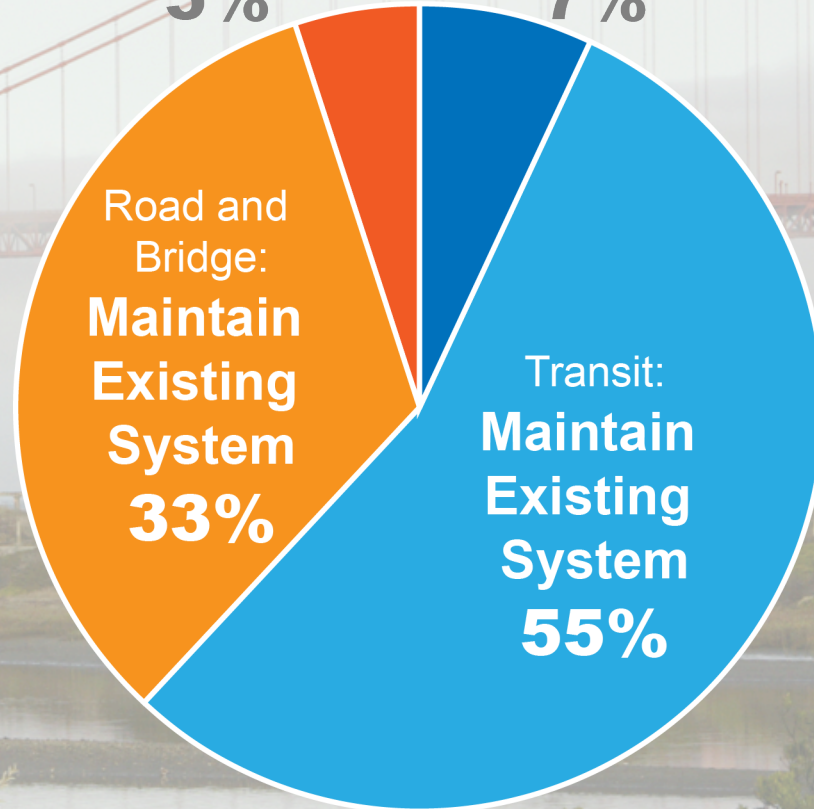
Expansion

5%

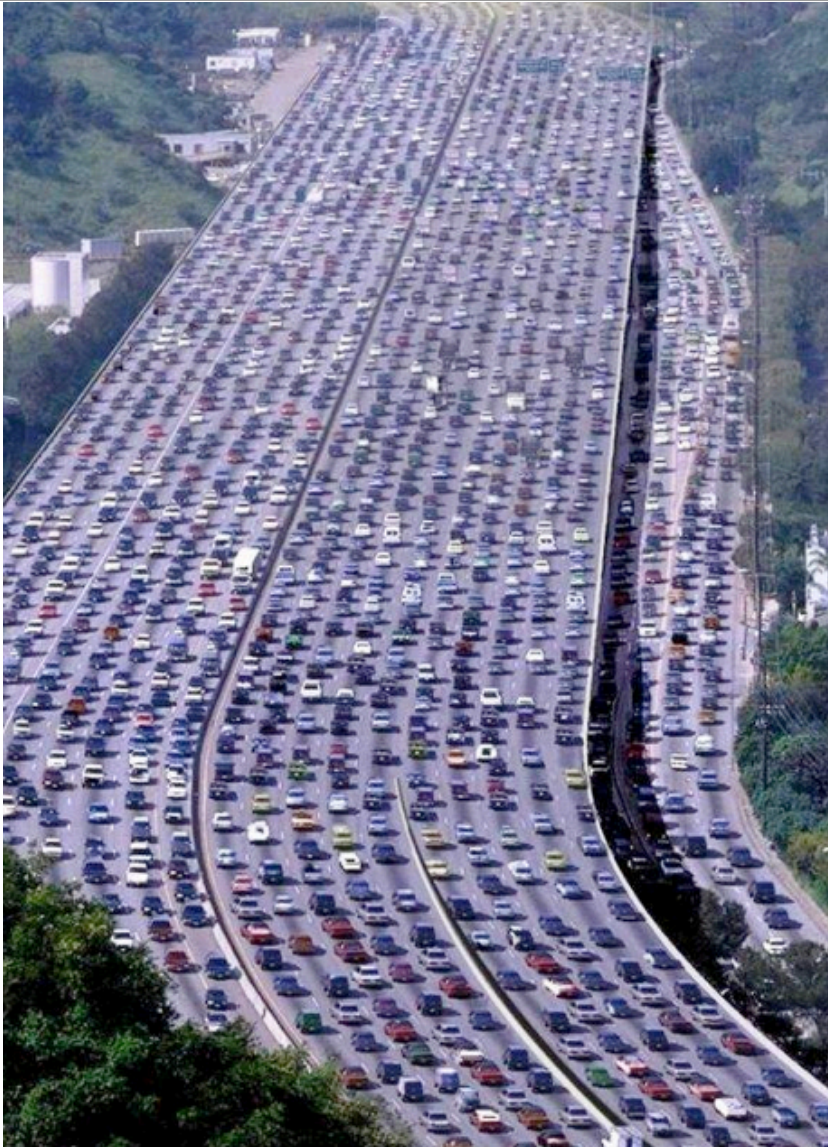
Transit:

Expansion

7%

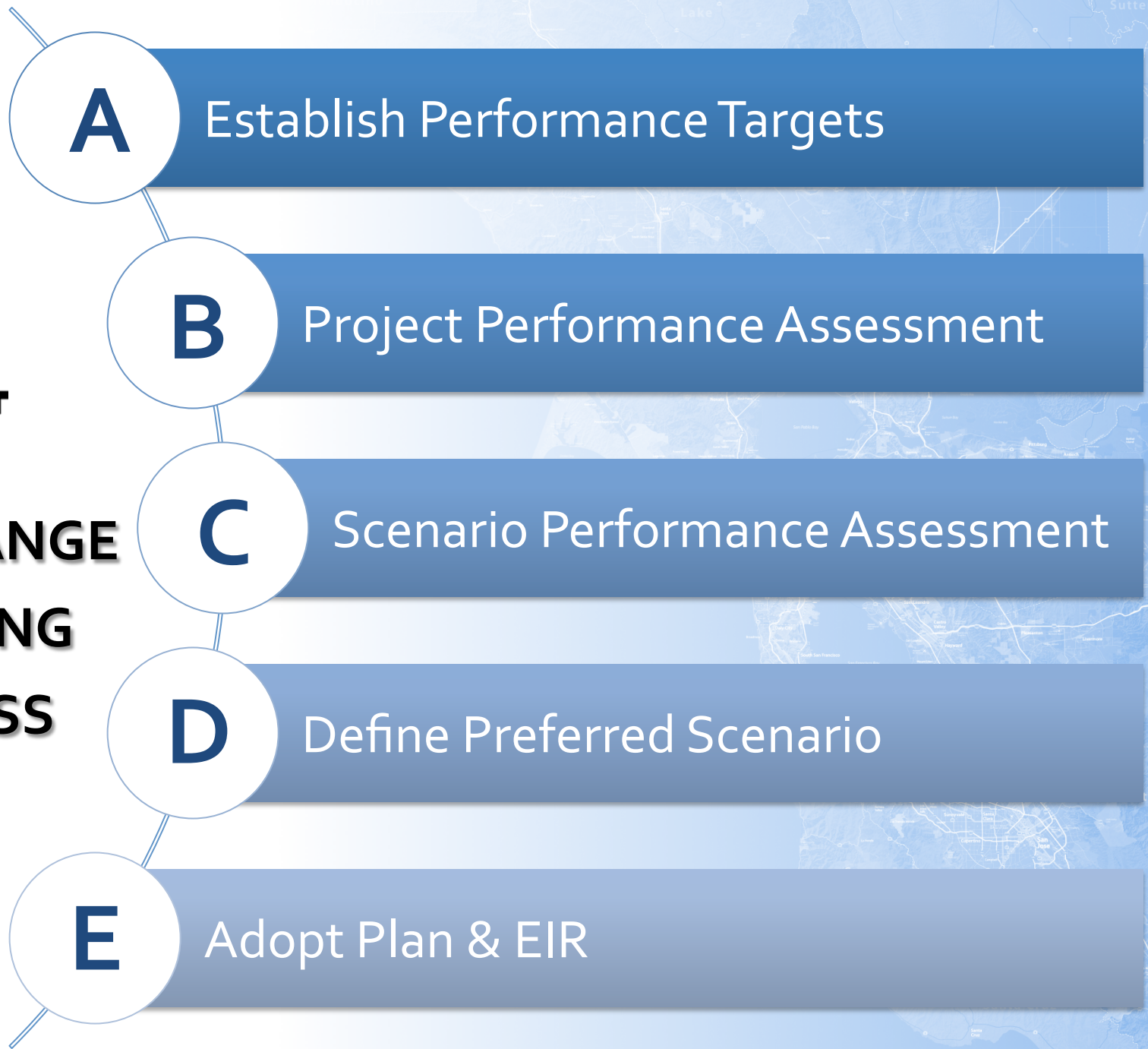


Plan Reflects Shifting Paradigm: Mobility to Accessibility

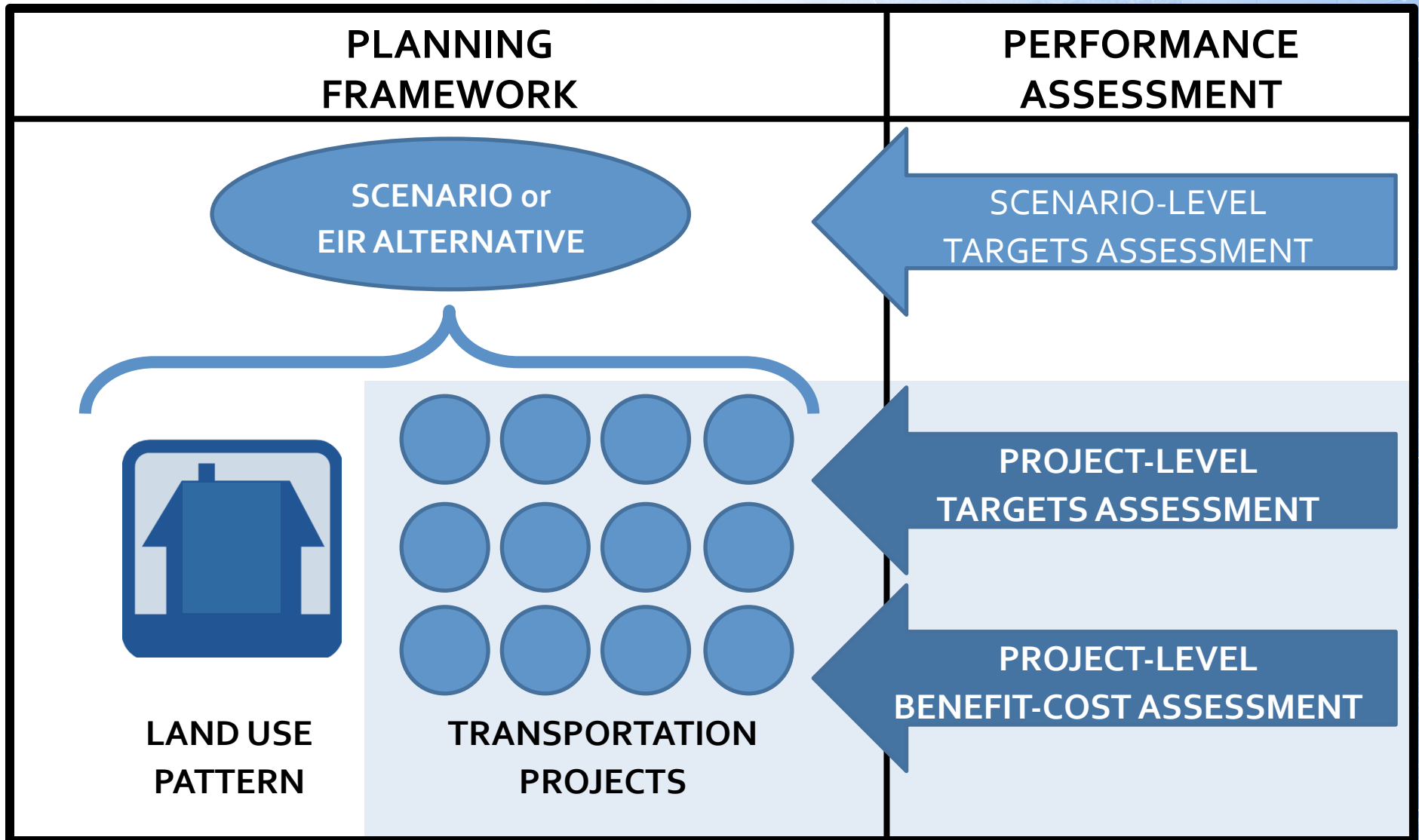




**LONG-RANGE
PLANNING
PROCESS**



Performance Assessment Framework



Shifting Approaches: Policy-Based Approach for Defining EIR Alternatives

Vision-Based Approach

1. Identify desired land use outcomes
2. Establish regional factors to distribute housing and job growth, and use sketch planning analysis to determine future land use development pattern
3. Adjust growth distributions based on local input
4. Assess resulting land use and transportation impacts based on MTC travel model outputs and sketch planning analysis

Policy-Based Approach

1. Explicitly identify land use and transportation policies
2. Use integrated land use and travel model to determine future land use development patterns, taking into account interactions in marketplace
3. Assess resulting land use and transportation outcomes and impacts based on integrated model outputs

S

SPECIFIC

M

MEASURABLE

A

ACHIEVABLE

R

RELEVANT

T

TIME-BOUND

Criteria for Establishing Performance Targets

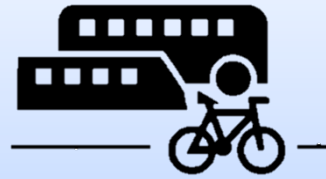


ECONOMY



**ECONOMIC
VITALITY**

Increase gross regional product



**TRANSPORTATION
SYSTEM EFFECTIVENESS**

Increase non-auto mode share
Reduce VMT per capita
Maintain the transportation system

ENVIRONMENT



**CLIMATE
PROTECTION**

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



**OPEN SPACE AND
AGRICULTURAL
PRESERVATION**

Direct all non-agricultural development within the urban footprint



**HEALTHY
AND SAFE
COMMUNITIES**

Reduce premature deaths from exposure to particulate emissions
Reduce injuries and fatalities from collisions
Increase average daily time spent walking or biking

EQUITY



**ADEQUATE
HOUSING**

House all of the region's projected housing growth



EQUITABLE ACCESS

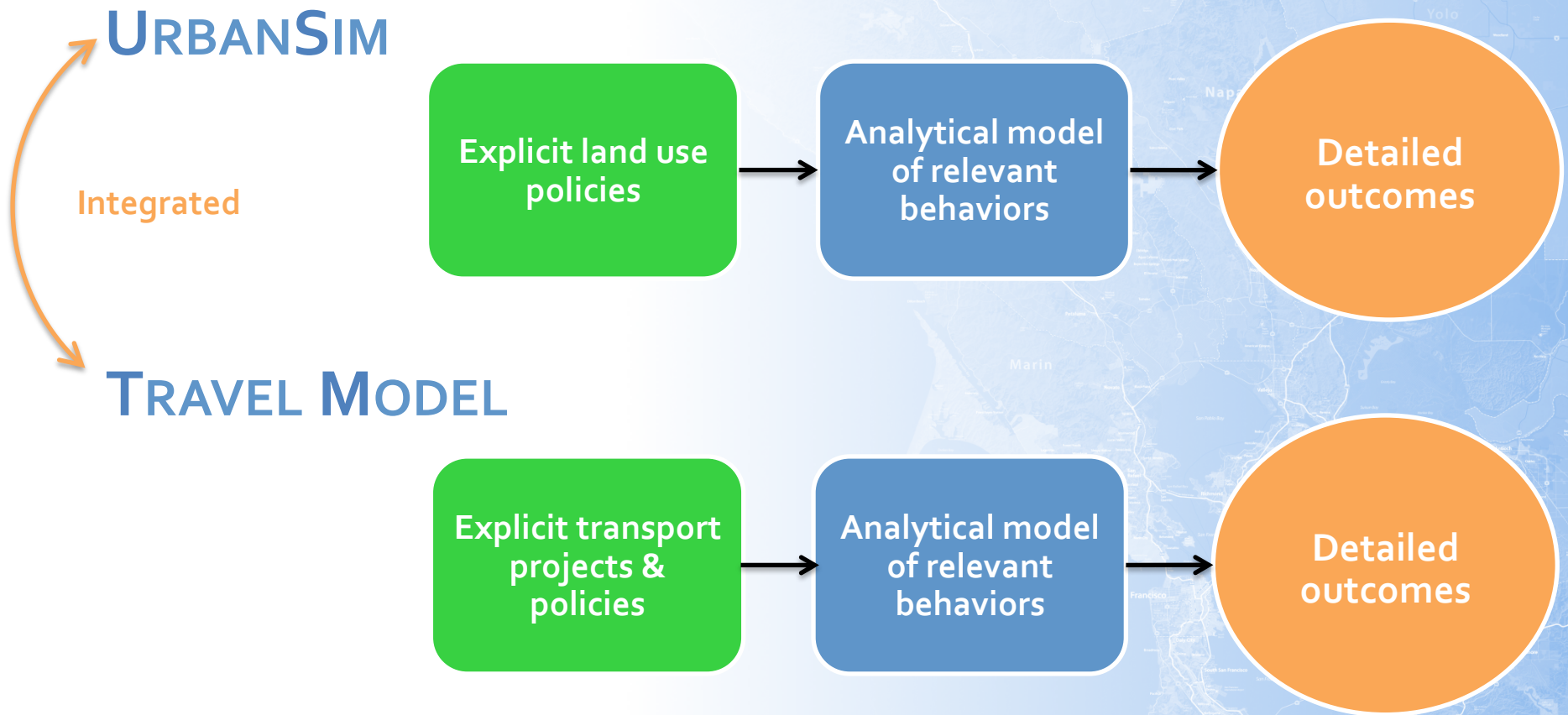
Decrease housing and transportation costs as a share of low-income household budgets

- **Purpose**
 - Identify the Plan's significant impacts on the environment
 - Evaluate a range of reasonable alternatives to the Plan
 - Determine how the Plan can avoid or mitigate significant impacts
- **Scope**
 - Presents region-wide assessment of the proposed Plan and alternatives
 - Provides CEQA streamlining opportunities for:
 - transportation projects and programs included in the financially constrained Plan
 - development projects as defined by SB 375



New Analytical Tools

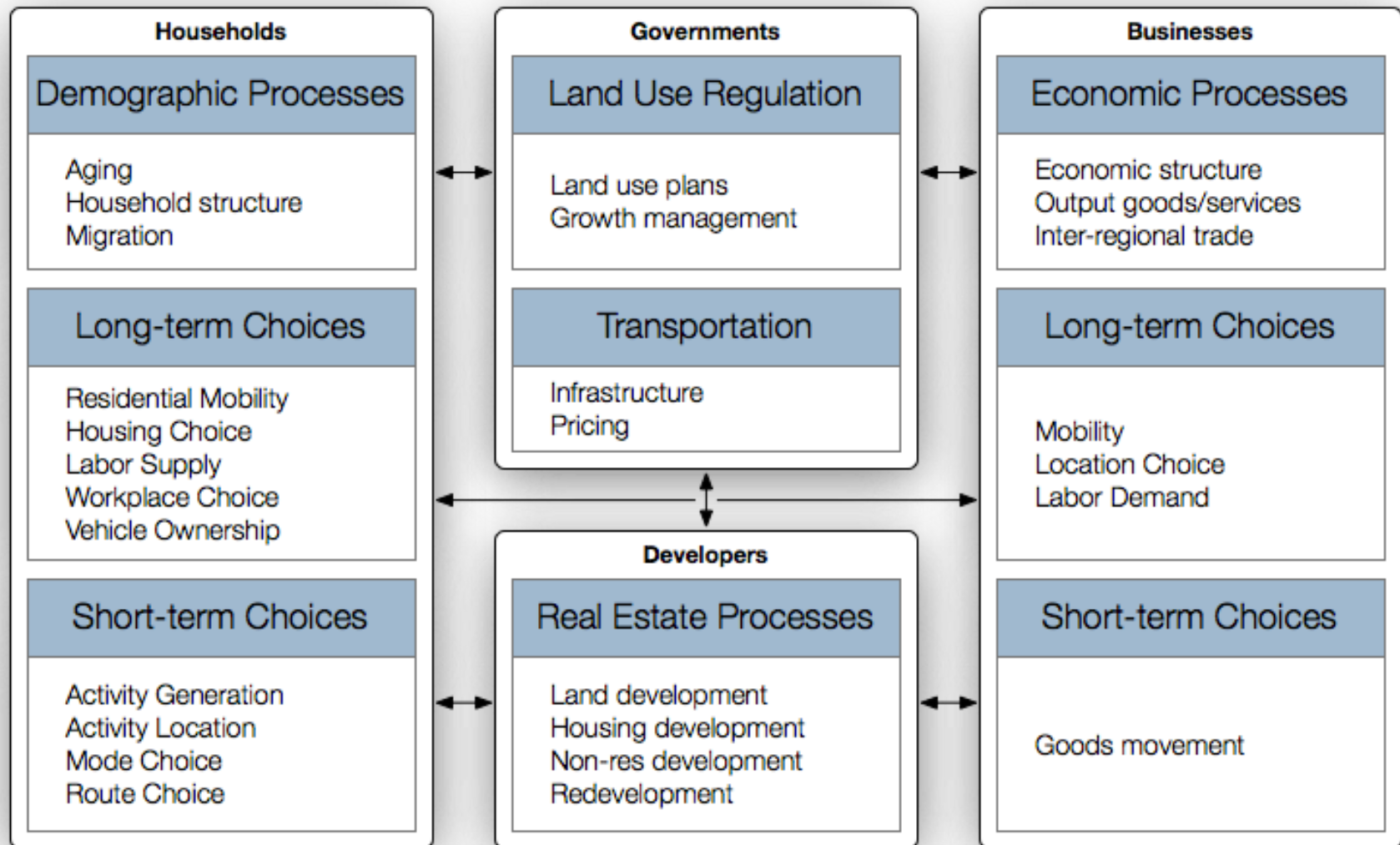
- **Starts with policies and projects as inputs into the models**
- **Examines potential consequences of policies/projects on outcomes such as land use patterns, land use mix, density, and travel patterns**
- **Allows interactive testing of how different policy strategies fare in achieving an outcome**
- **Assesses growth inducing and cumulative impacts – two key areas for SB 375 CEQA streamlining**



Largest MPOs should “build formal microeconomic land use models, as soon as is practical, so that they can be used to analyze and evaluate the effects of growth scenarios on economic welfare (utility), including land prices, home affordability, jobs-housing fit, the combined housing-transportation cost burden, and economic development (wages, jobs, exports).”

Source: *California Transportation Commission’s 2010 RTP Guidelines*

Analytical Framework: UrbanSim+Activity Based Travel Model



Policy Inputs to Model System

- **Transportation**
 - Transit investments (Rail, Bus)
 - Roadway investments (GP, HOV, HOT, Bike, Pedestrian)
 - Pricing (Tolls, Congestion)
- **Land Use Regulations**
 - City comprehensive Plans
 - Transit Oriented Development, Urban Villages & Centers
 - Subsidies, Impact Fees
 - Urban Growth Boundaries
 - Protection of Environmentally-sensitive Areas

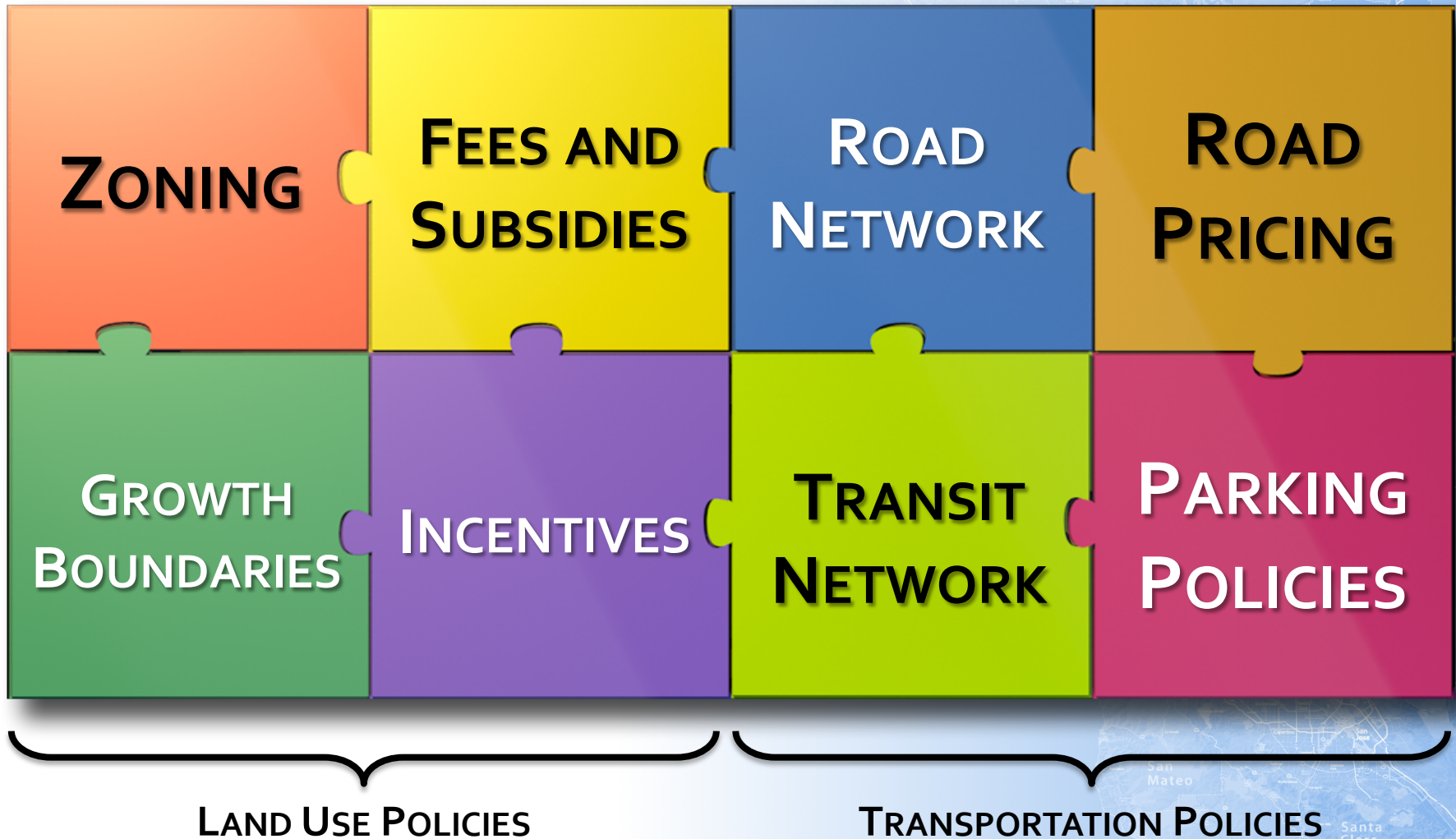


Outputs from Model System



- **Land and Development**
 - Housing units by type, density, price (affordability)
 - Non-residential buildings by type, density, price
 - Acreage in agricultural land, forest, open space
- **Demographics:** households by income, size, life cycle
- **Economics:** employment by sector and building type
- **Transportation**
 - Accessibility, Mode Shares, Vehicle Miles Traveled, Congestion Delay
- **Environment**
 - Greenhouse Gas Emissions
 - Pollution

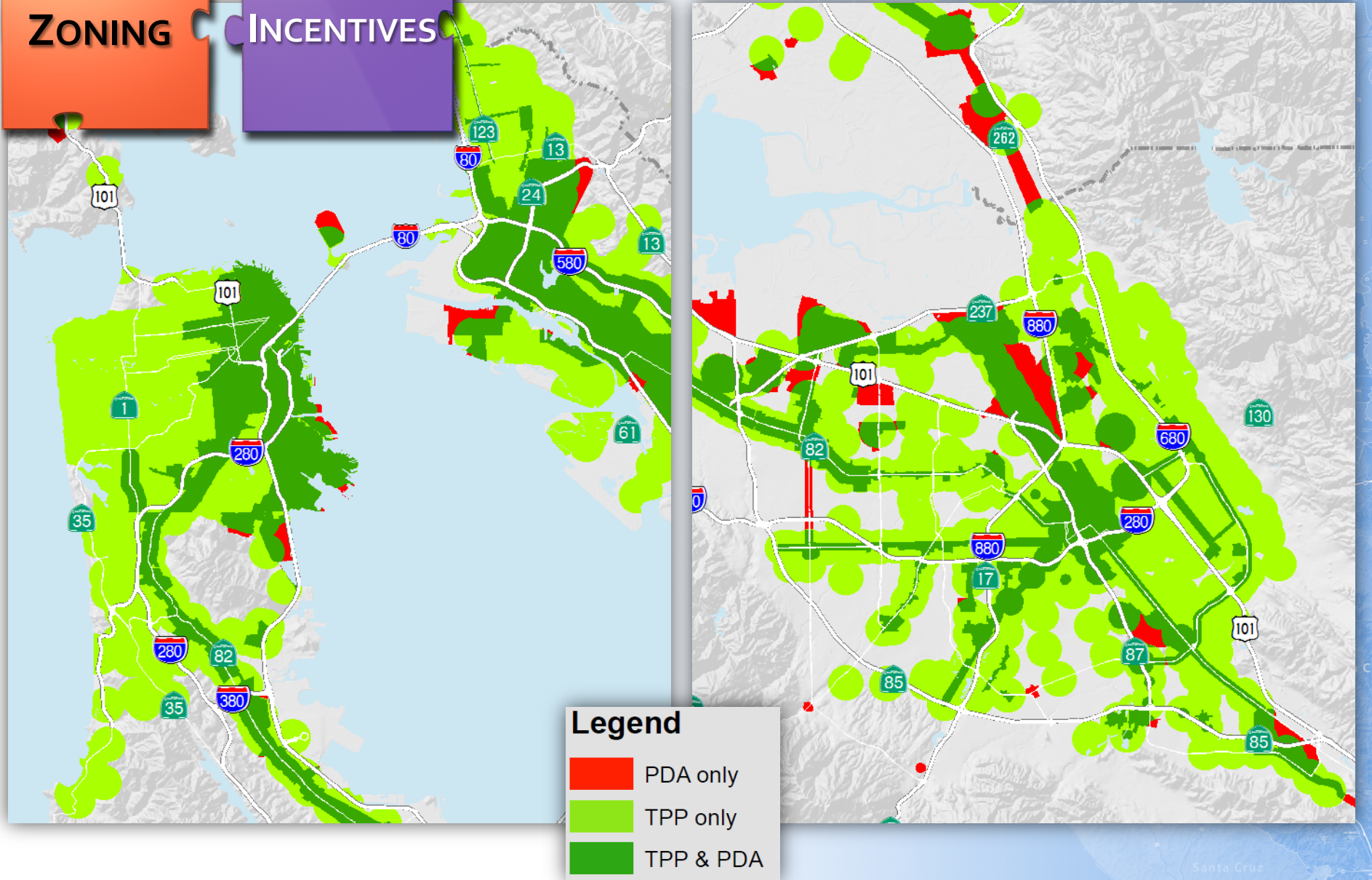
Constructing an EIR Alternative



Comparison of TPPs and PDAs

ZONING

INCENTIVES



**EXISTING
GENERAL
PLANS**

**NO NEW
FEES**

**COMMITTED
ROAD
NETWORK**

**NO
PRICING**

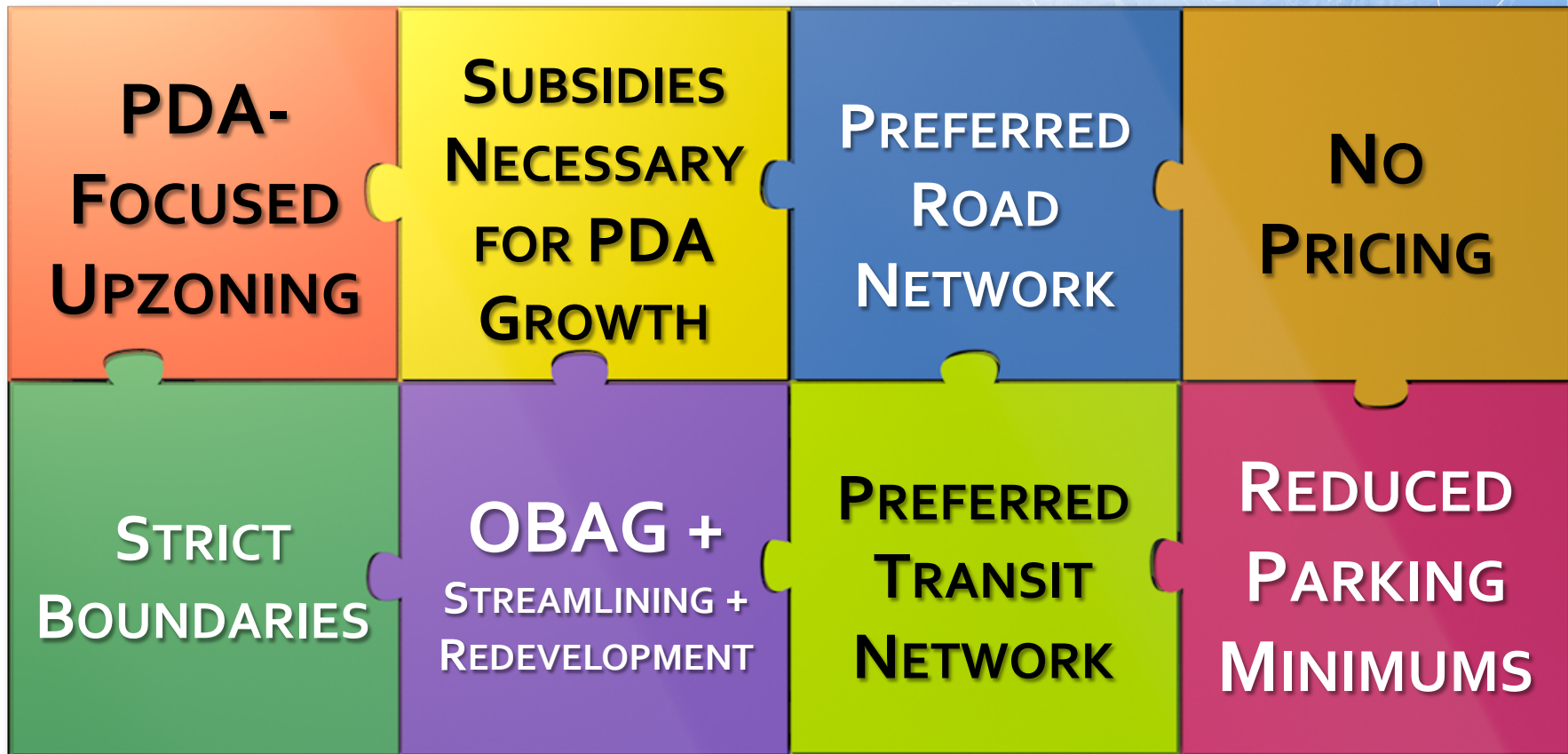
TREND

**NO
INCENTIVES**

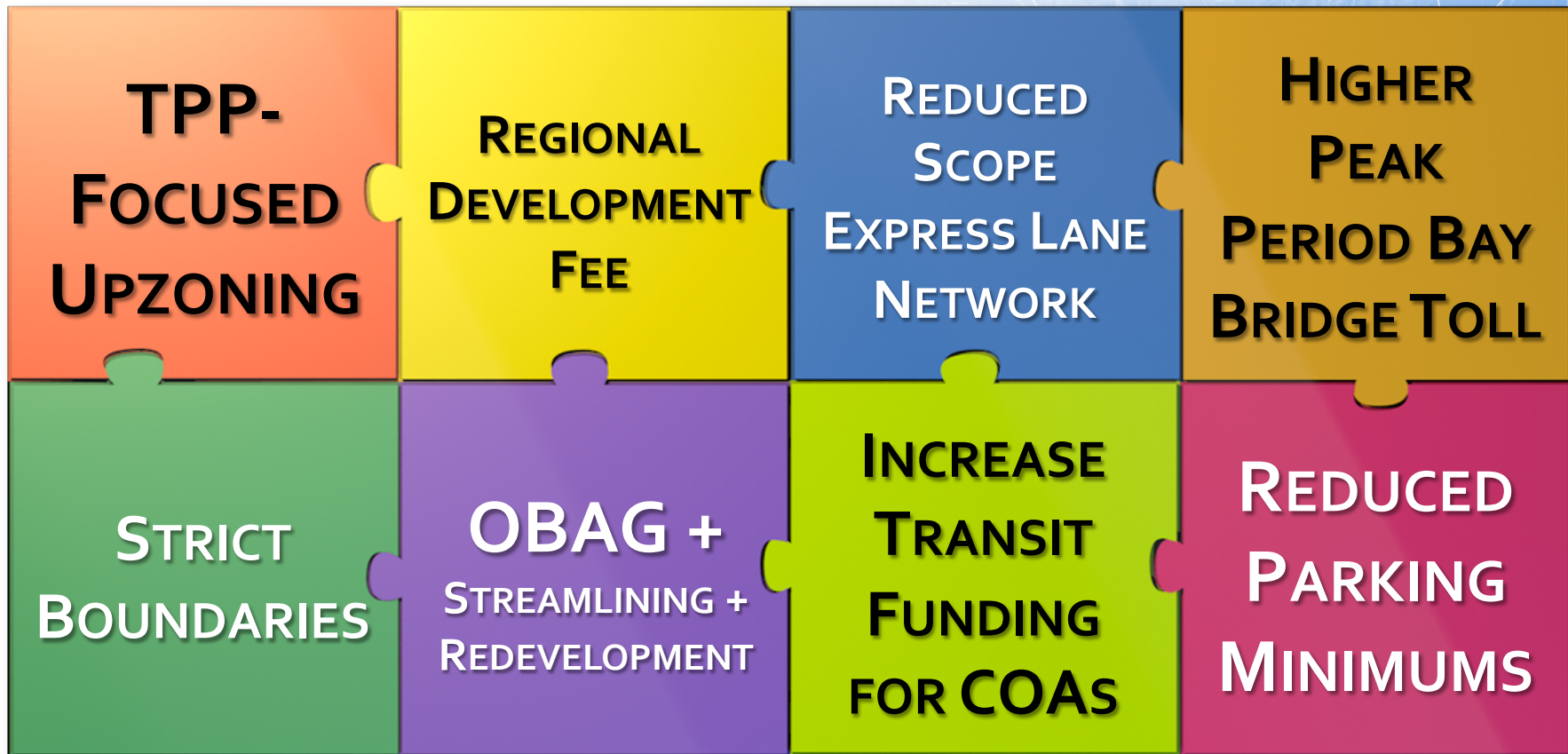
**COMMITTED
TRANSIT
NETWORK**

**PARKING
STATUS
QUO**

- Required by CEQA
- Assumes the continuation of locally-adopted general plans



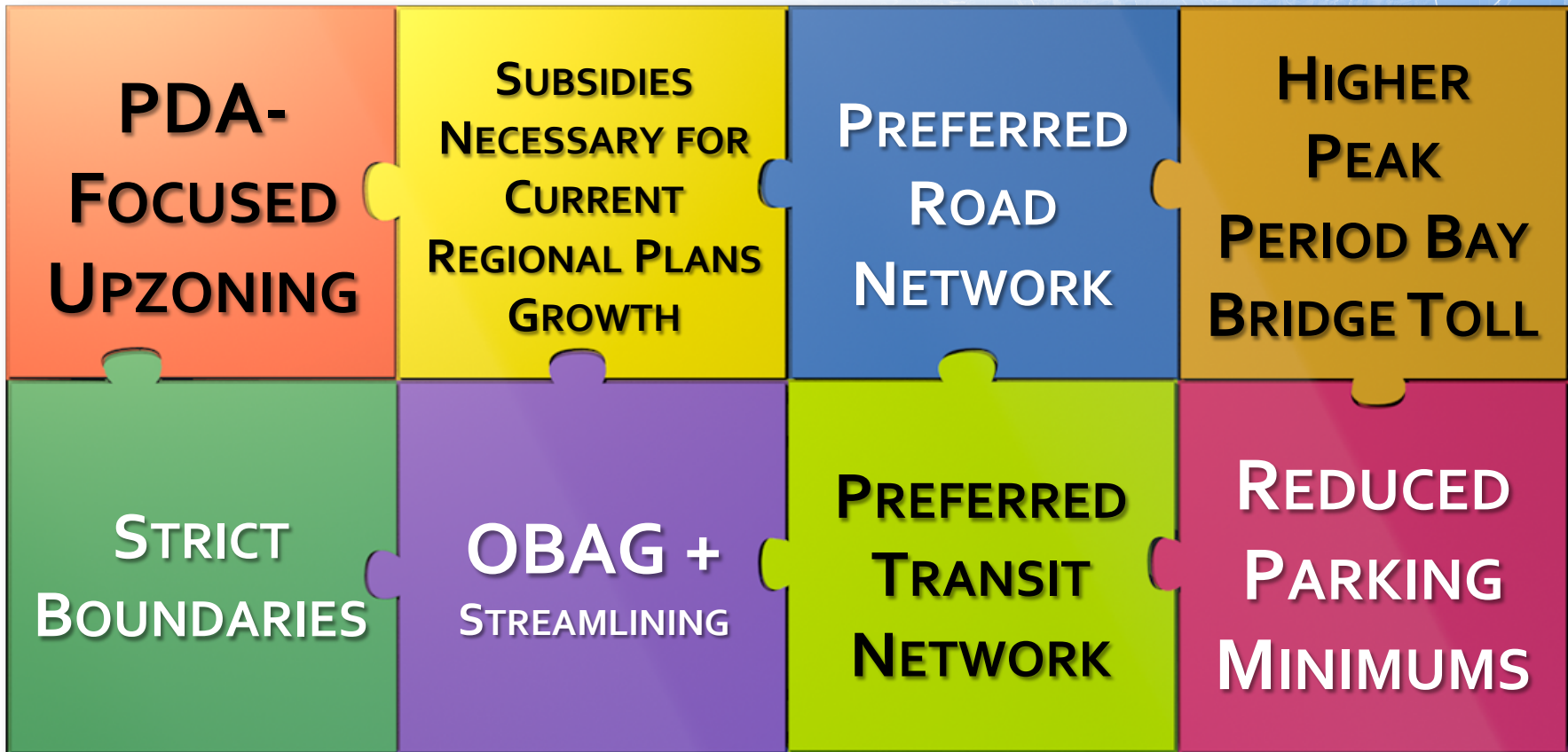
- Approved as the Preferred Scenario for Plan Bay Area by MTC & ABAG in May 2012



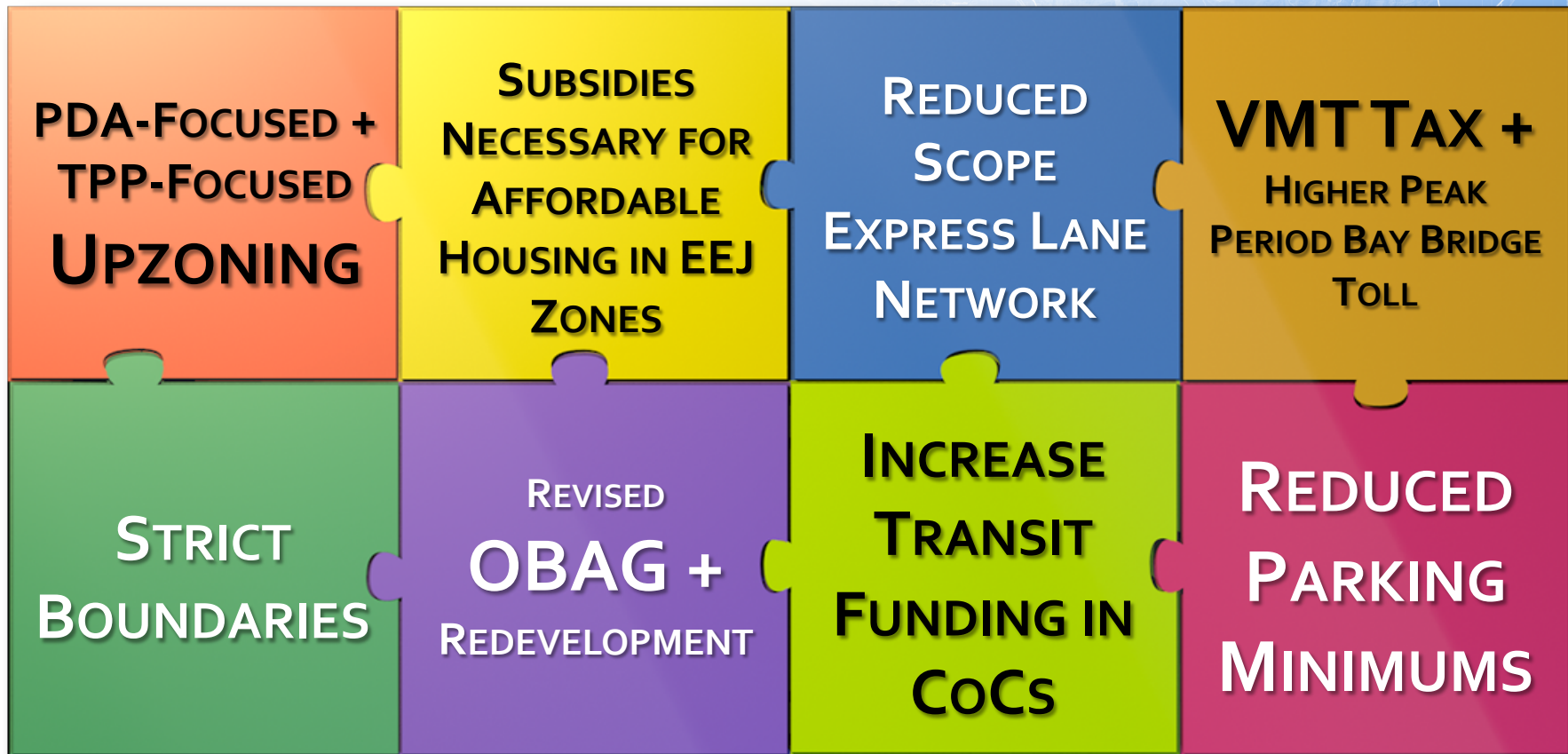
- Leverage policy toolbox of SB 375 – emphasize focused growth via TPP framework, CEQA streamlining, and potential redevelopment funding

4

ENHANCED NETWORK OF COMMUNITIES



- Relies on higher regional control totals for population & jobs
- Developed by the business community to emphasize more dispersed growth pattern



- Includes affordable housing policies tied to most policy levers
- Developed by equity & environmental advocates to emphasize growth in jobs-rich, high-opportunity areas

GEOGRAPHIC DISTRIBUTION
OF HHS AND JOBS

1

2

3

4

5

SHARE OF TOTAL HHS	2010	NO PROJECT	PREFERRED	TRANSIT PRIORITY	ENHANCED NETWORK	EEJ
... IN PDAS	22%	28%	37%	34%	30%	33%
... IN TPPS	57%	57%	64%	66%	59%	60%

1

2

3

4

5

SHARE OF TOTAL JOBS	2010	NO PROJECT	PREFERRED	TRANSIT PRIORITY	ENHANCED NETWORK	EEJ
... IN PDAS	47%	49%	52%	50%	49%	49%
... IN TPPS	68%	68%	69%	69%	68%	69%

EIR Alternatives Analysis: Performance Targets

- achieves or exceeds performance target
- falls short of performance target
- moving in the wrong direction

Target	Goal	No Project	Preferred	Transit Priority Focus	Network of Communities	Equity, Environment & Jobs
1 Reduce per-capita CO ₂ emissions from cars and light-duty trucks	-15%	-8%	-18%	-16%	-16%	-17%
2 House the region's projected growth	100%	100%	100%	100%	118%	100%
3a Reduce premature deaths from exposure to fine particulates (PM _{2.5})	-10%	-71%	-71%	-72%	-69%	-72%
3b Reduce coarse particulate emissions (PM ₁₀)	-30%	-16%	-17%	-17%	-14%	-18%
3c Achieve greater particulate emission reductions in highly impacted areas	Yes	Yes	Yes	Yes	No	Yes
4 Reduce the number of injuries and fatalities from all collisions	-50%	+18%	+18%	+17%	+23%	+16%
5 Increase the average daily time walking or biking per person for transportation	+70%	+12%	+17%	+18%	+13%	+20%

EIR Alternatives Analysis: Performance Targets

- achieves or exceeds performance target
- falls short of performance target
- moving in the wrong direction

6	Direct all non-agricultural development within the year 2010 urban footprint	100%	53%	100%	100%	100%	100%
7	Decrease the share of low-income and lower-middle income residents' household income consumed by transportation and housing	-10%	+8%	+3%	+5%	+3%	+2%
8	Increase gross regional product (GRP)	+110%	+118%	+119%	+118%	+123%	+118%
9a	Increase non-auto mode share	26%	19%	20%	20%	19%	21%
9b	Decrease automobile vehicle miles traveled (VMT) per capita	-10%	-5%	-9%	-8%	-9%	-9%
10a	Increase local road pavement condition index (PCI)	75	50	68	68	68	71
10b	Decrease share of distressed lane-miles of state highways	10%	44%	44%	44%	30%	41%
10c	Reduce share of transit assets exceeding useful life	0%	36%	24%	24%	24%	24%

EIR Alternatives Analysis: Equity Measures

1 Housing and Transportation Affordability		2010 Base Year	1	2	3	4	5	
			No Project	Project	Transit Priority	Network of Communities	Equity, Environment and Jobs	
	Households <\$38,000/year	H+T %	72%	80%	74%	77%	74%	73%
	Households >\$38,000/year	H+T %	41%	44%	43%	43%	42%	43%
2 Potential for Displacement	Communities of Concern	n/a	21%	36%	25%	31%	21%	
	Remainder of Region	n/a	5%	8%	7%	9%	6%	
	Regional Average	n/a	12%	18%	13%	17%	12%	
3 VMT Density	Communities of Concern	9,737	11,447	11,693	11,536	12,123	11,259	
	Remainder of Region	9,861	11,717	11,895	11,804	12,261	11,626	
	Regional Average	9,836	11,664	11,855	11,751	12,234	11,554	
4 Commute Time	Communities of Concern	25	26	26	25	26	25	
	Remainder of Region	27	29	27	26	27	27	
	Regional Average	26	28	27	26	27	27	
5 Non-commute Travel Time	Communities of Concern	12	13	13	13	13	13	
	Remainder of Region	13	13	13	13	13	13	
	Regional Average	13	13	13	13	13	13	

An aerial photograph of a coastal city, likely San Francisco, showing a large bay with a prominent bridge. The city is densely packed with buildings, and the water is a deep blue-green. The text is overlaid on the left side of the image.

**How would you
determine which
transportation
projects to build?**

**BART
Extension
from Fremont
to San Jose**

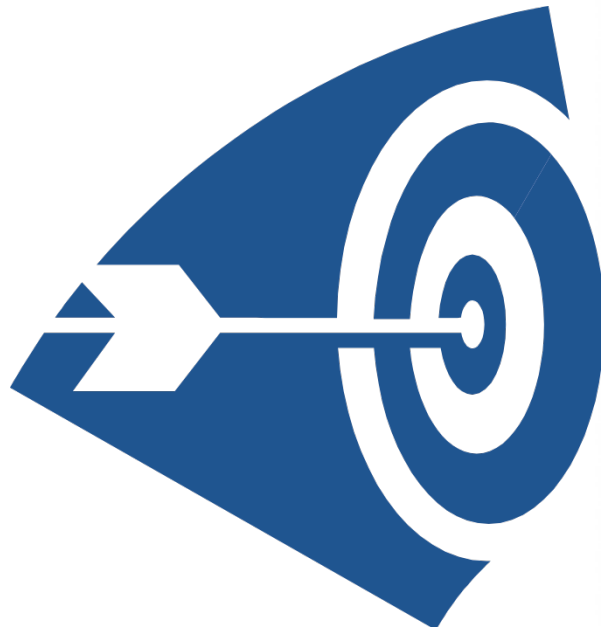


VS.

**Caltrain
Electrification
& Frequency
Improvements**



Two Elements of Project Performance Assessment



TARGETS ASSESSMENT

*Determine impact on targets
adopted by MTC and ABAG*

Analyzed all **1000** uncommitted projects



BENEFIT-COST ASSESSMENT

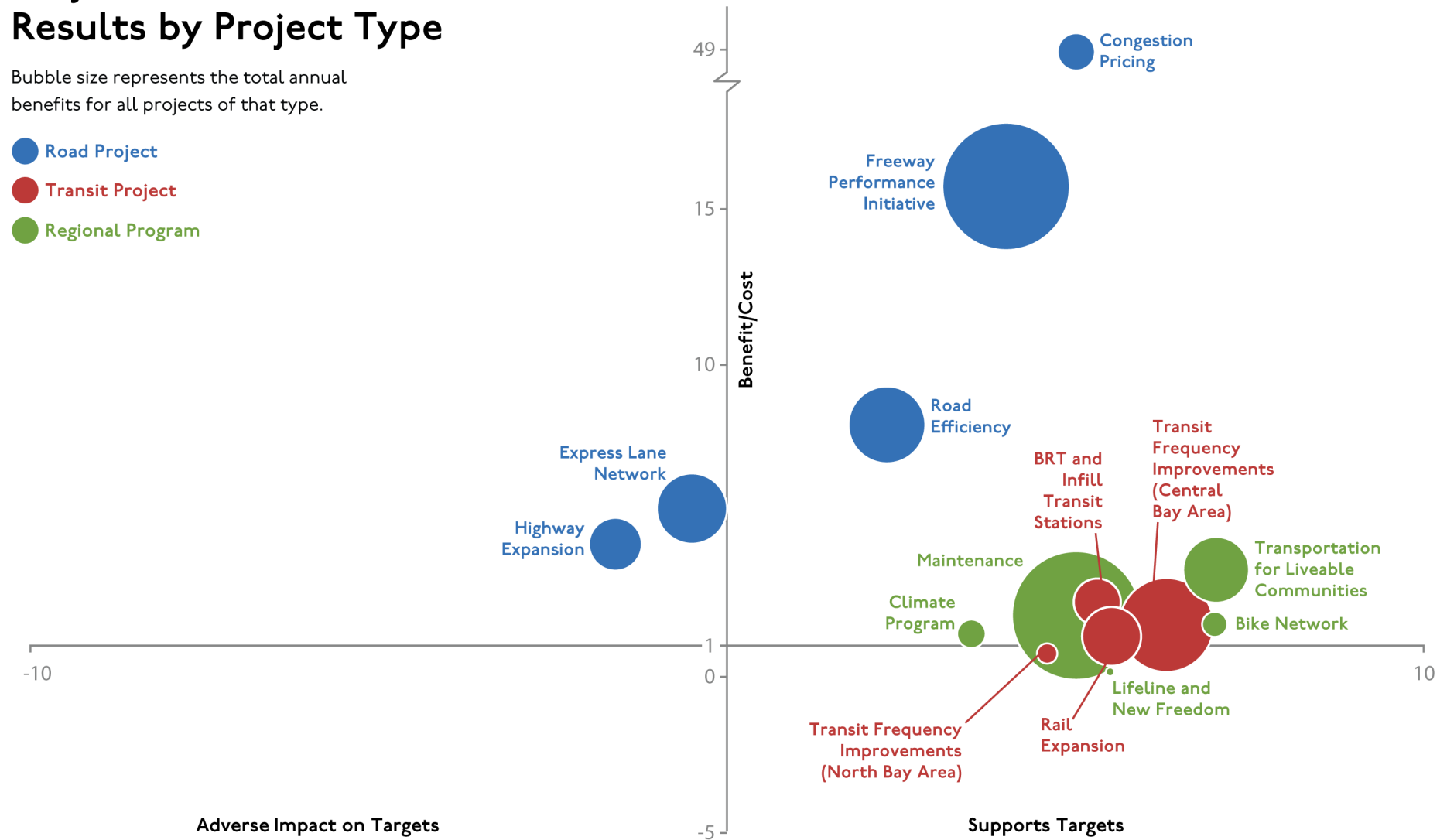
Compare benefits & costs

Analyzed most significant projects
(approximately **100** in total)

Project Performance Assessment: Results by Project Type

Bubble size represents the total annual benefits for all projects of that type.

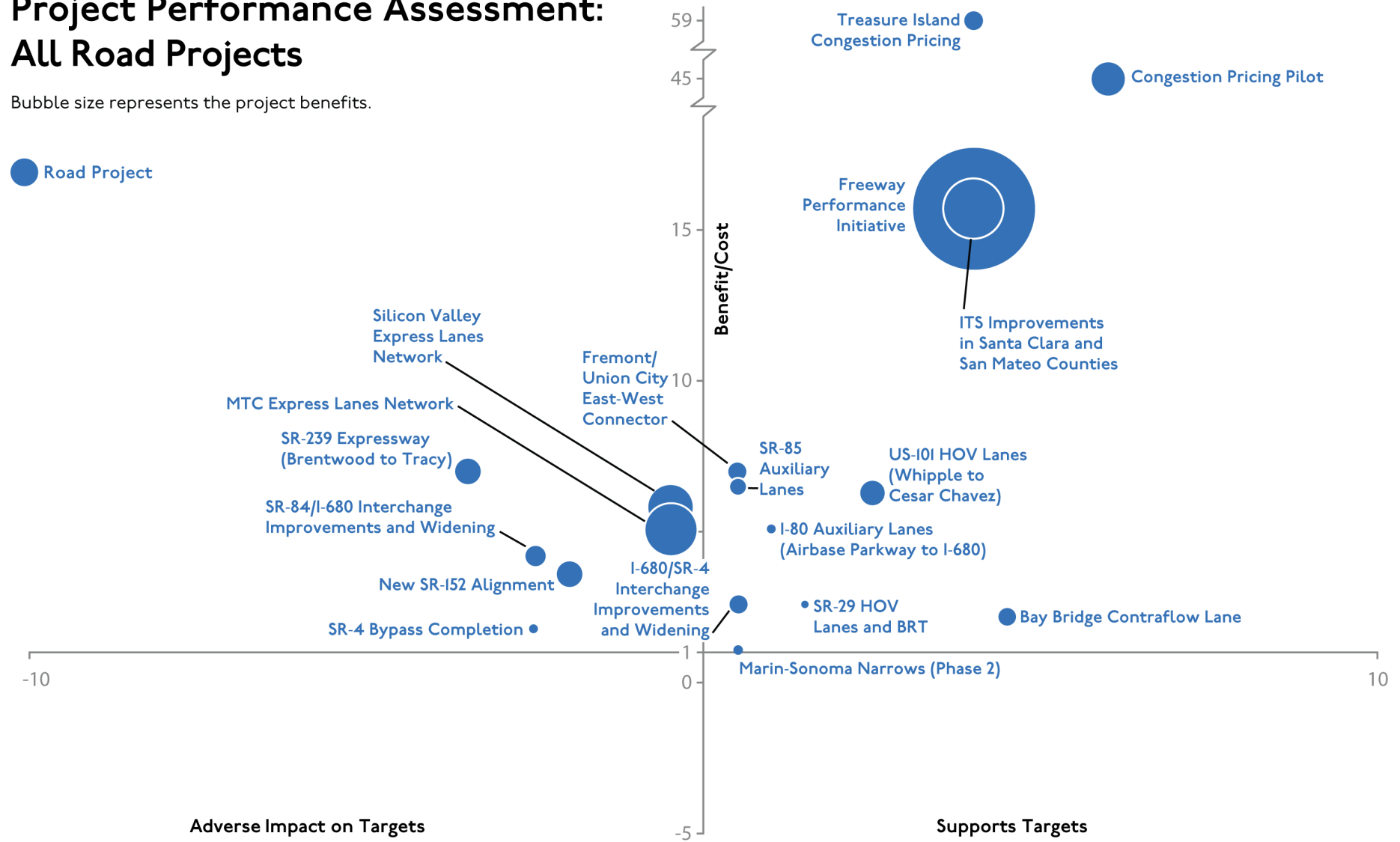
- Road Project
- Transit Project
- Regional Program



Project Performance Assessment: All Road Projects

Bubble size represents the project benefits.

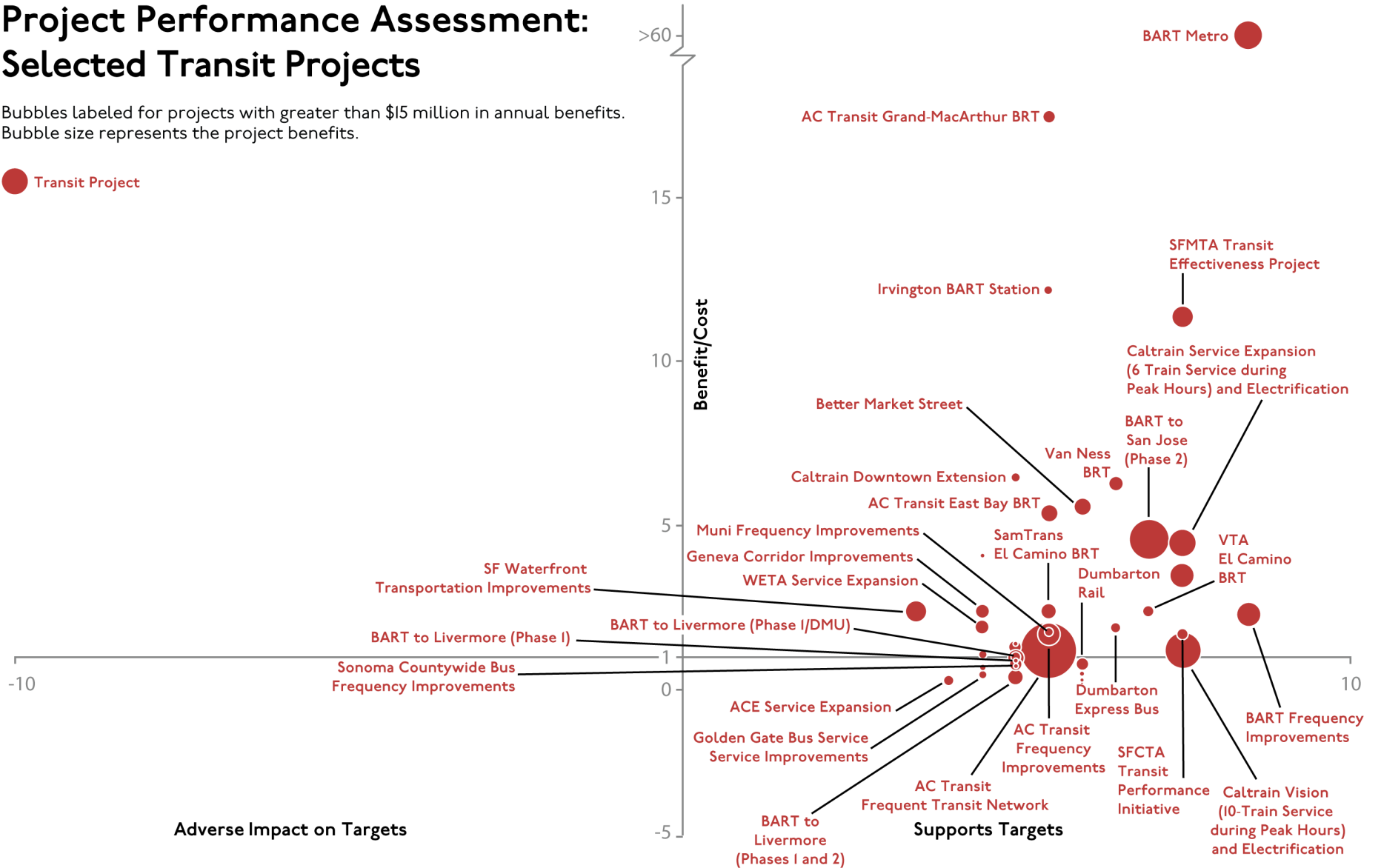
● Road Project



Project Performance Assessment: Selected Transit Projects

Bubbles labeled for projects with greater than \$15 million in annual benefits. Bubble size represents the project benefits.

● Transit Project



Key Findings

- **Efficiency versus Expansion**
 - Improving existing assets is more cost-effective than building capital-intensive expansions.
 - Pricing, ITS, BRT, and infill station projects performed well.
- **Urban Focus versus Dispersed Growth**
 - Projects serving the urban core were significantly more cost-effective than projects serving suburban or rural areas.
 - Projects at the edge of the region showed adverse impacts on the targets, due to their potential to encourage sprawl and induce long-distance travel.



HIGH-PERFORMING PROJECTS
Prioritized for Regional Funding

BART Metro



**Caltrain Electrification
& Frequency
Improvements**



**Bus Rapid Transit
Systems in San
Francisco and Oakland**



HIGH-PERFORMING PROJECTS
Prioritized for Regional Funding



**San Francisco
Congestion Pricing**



**BART Extension to
San Jose**



**Freeway
Performance
Initiative**

Ongoing MTC Efforts in Performance Assessment

1. Performance assessment for **state of good repair** investments
2. Implementation of a **stream-based** benefit-cost approach
3. Integration of UrbanSim **land use impacts** into project-level model-based assessments
4. Evaluation of **risk impacts** on project and scenario performance results



UrbanCanvas:

A New Platform for Creating and Visualizing Modeled Scenarios

- See video at www.synthicity.com/products

**QUESTIONS?
COMMENTS?**

