

IT'S ALL ABOUT THE CUSTOMER:

QUANTIFYING AND COMMUNICATING USER BENEFITS
FROM PRESERVING TRANSPORTATION INFRASTRUCTURE



Image Source: <https://www.flickr.com/photos/thomashawk/38189565>

Dave Vautin – Metropolitan Transportation Commission

STATE OF GOOD REPAIR (SGR) ISSUES AFFECT THE PUBLIC EVERY DAY.

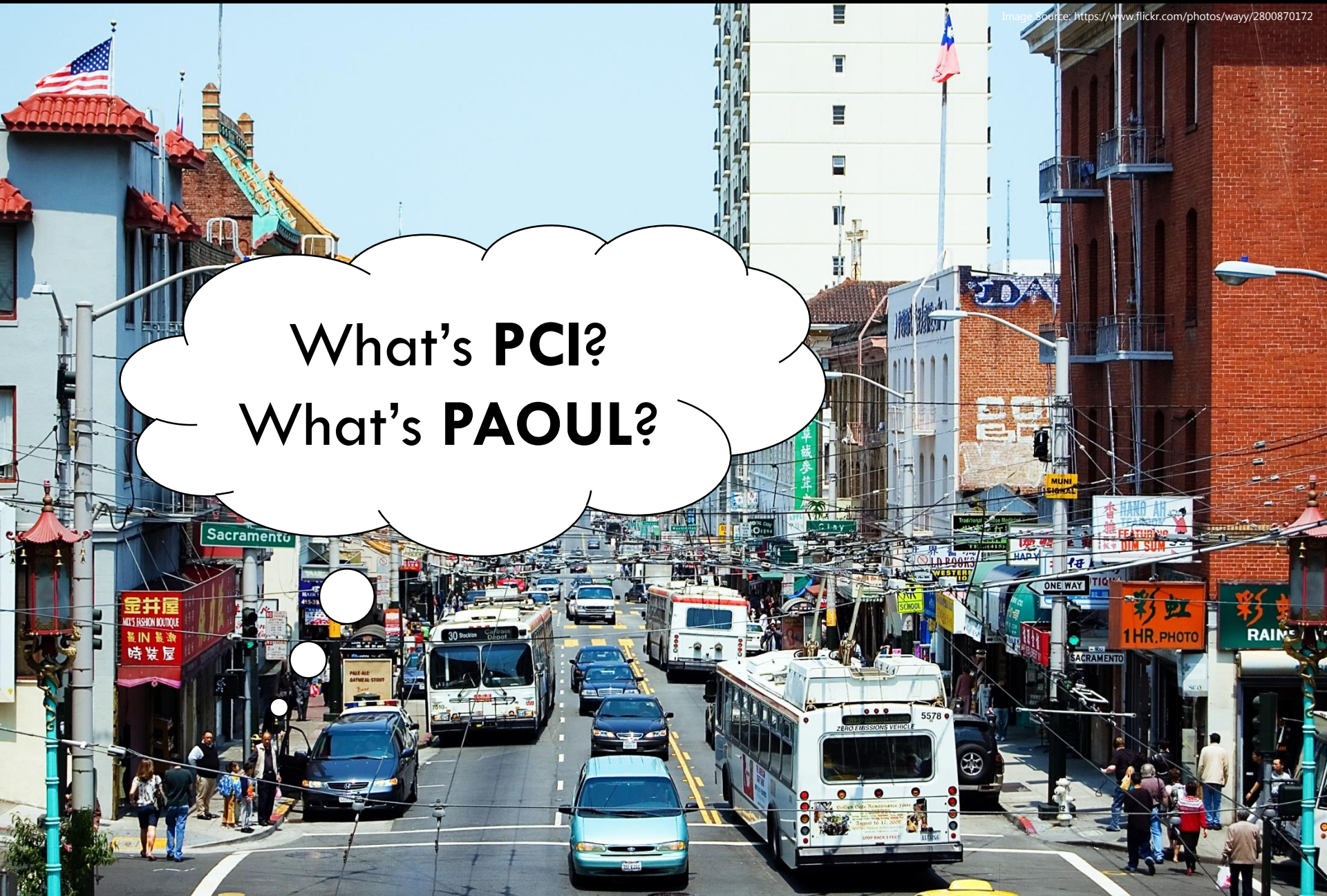
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TRANSPORTATION WORKS OFTEN CHOOSE CONFUSING MEASURES.

What's **PCI**?
What's **PAOUL**?

Image source: <https://www.flickr.com/photos/wayy/2800870172>



COMMON MEASURES MIGHT NOT ENCOURAGE "SMART" DECISIONS.

Image Source: http://www.flickr.com/photos/rao_anirudh/8732828358/sizes/o

EXAMPLE CITY:
PCI MAXIMIZATION

OBSERVED
PCI

70

EXPERIENCED
PCI

20

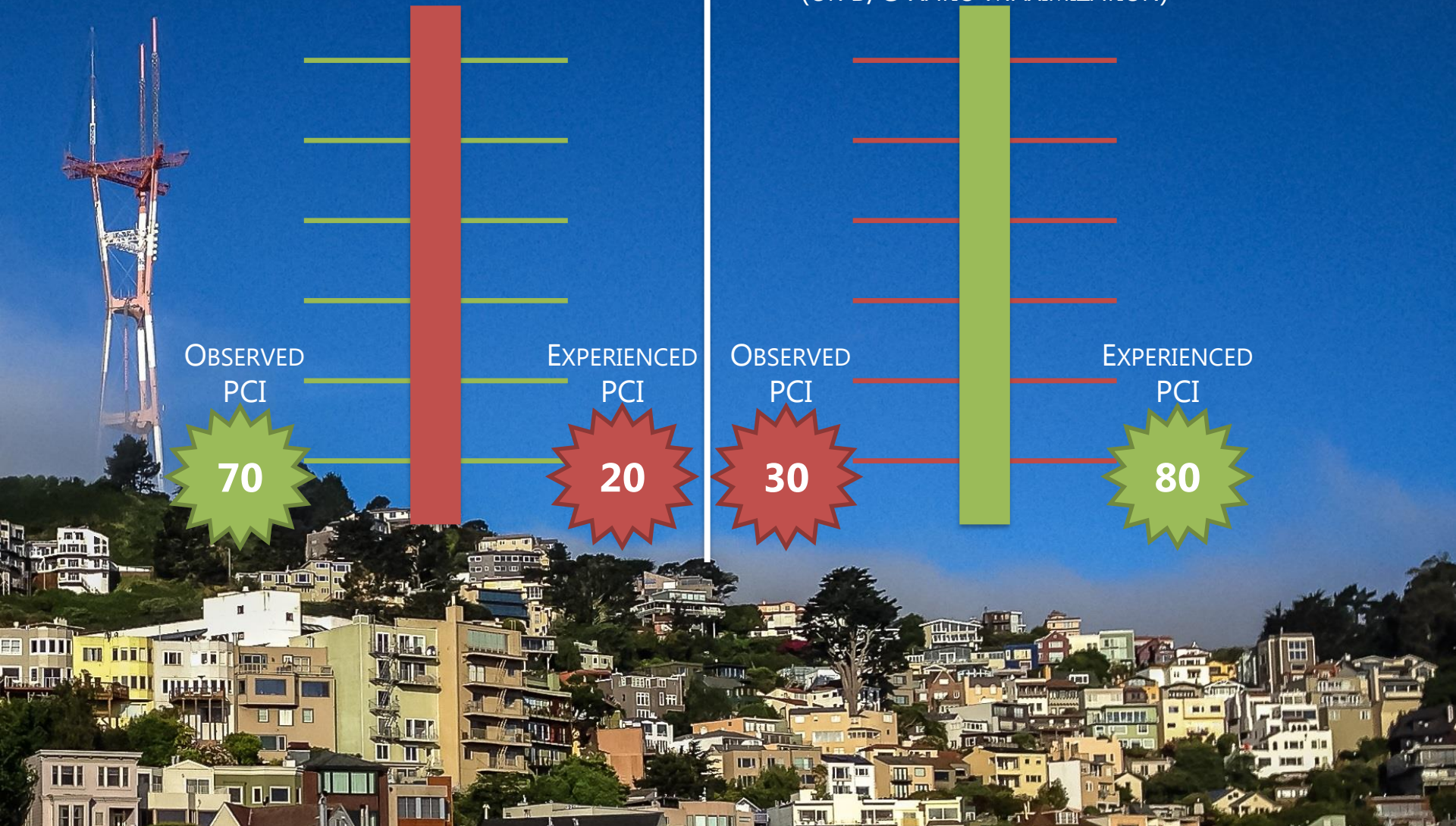
EXAMPLE CITY:
OPERATING COST MINIMIZATION
(OR B/C RATIO MAXIMIZATION)

OBSERVED
PCI

30

EXPERIENCED
PCI

80



DEVELOPING CUSTOMER-ORIENTED PERFORMANCE MEASURES

Share of highway
lane-miles congested



Congested delay in
minutes

Pavement indices
(PCI or IRI)



**Additional auto
operating and
maintenance cost
per driver**

DEVELOPING CUSTOMER-ORIENTED PERFORMANCE MEASURES

Transit vehicle
revenue-hours



Transit ridership

Percent of assets
over useful life



**Additional minutes
of delay per
boarding**

MAKING THE SHIFT TO CUSTOMER-ORIENTED MEASURES

A photograph of the Golden Gate Bridge in San Francisco at sunset. The bridge's suspension cables and towers are silhouetted against a vibrant sky of orange, red, and purple. The city skyline is visible in the distance across the water.

Performance-based plan
Integrates both
transportation + land use

Must address aging infrastructure
and add new (transit) capacity

Plan
BayArea
2040

MAKING THE SHIFT TO CUSTOMER-ORIENTED MEASURES

Transitioning to user-based measures is not for the faint of heart.

- **Infrastructure-based measures are:**
 - Easier to calculate and forecast
 - Unaffected by usage pattern changes
 - More useful for maintenance staff
 - Ingrained in organization culture
- **But the benefits of switching are worth it:**
 - Better communication with the public
 - Better prioritization of limited funds
 - Better understanding of how SGR affects other regional priorities



EXAMPLE: THREE DISTINCT SCENARIOS FOR OUR REGION'S FUTURE

Main Streets



Connected Neighborhoods

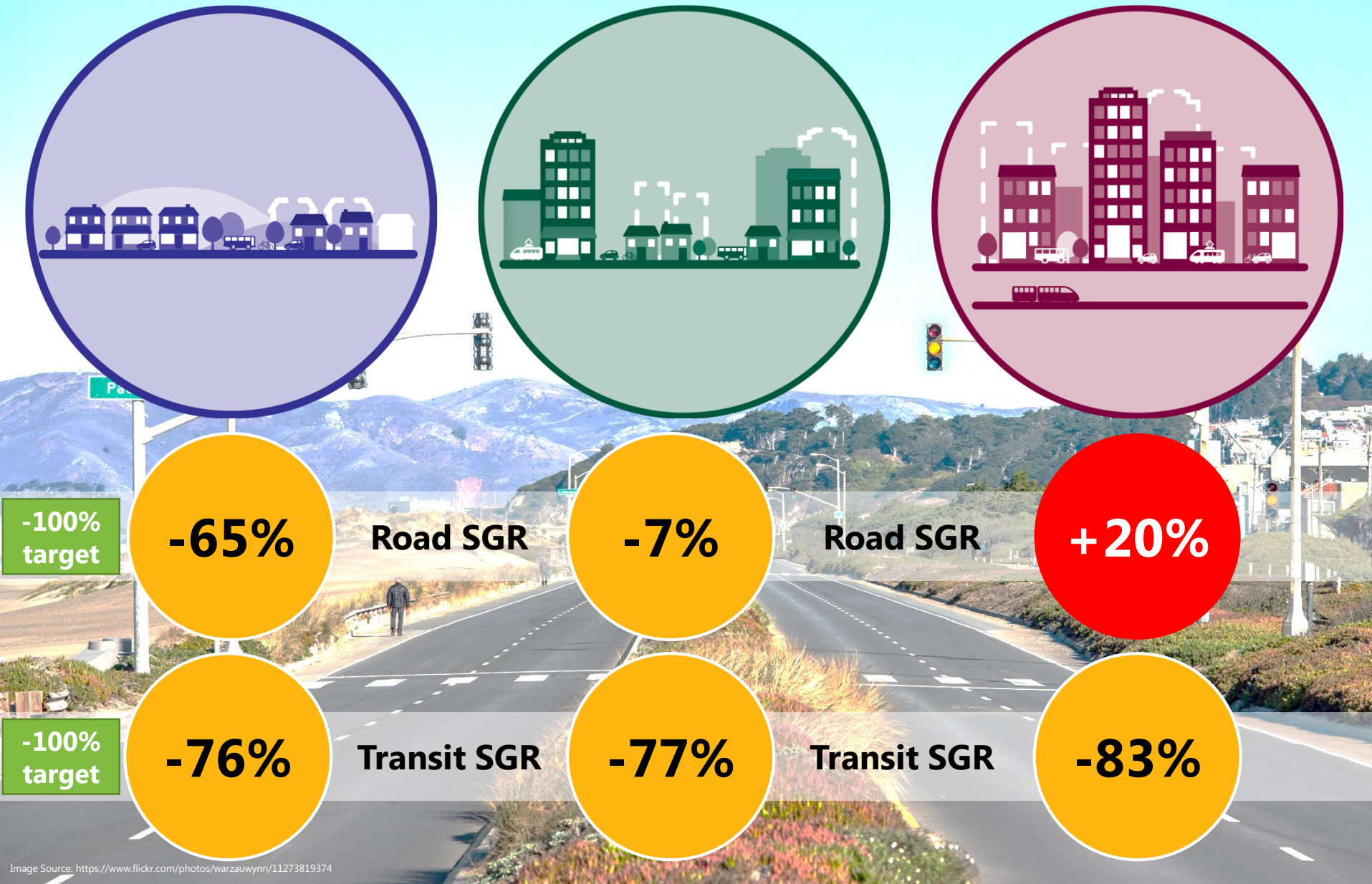


Big Cities

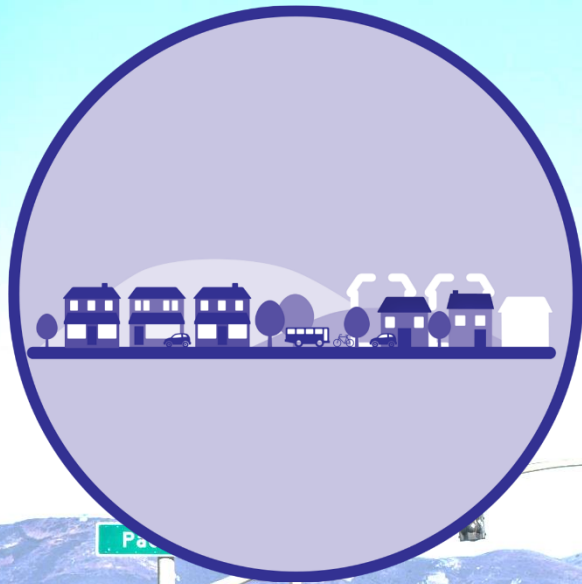


Plan
BayArea
2040

EXAMPLE: COMPARING SCENARIOS USING NEW TARGETS



EXAMPLE: COMPARING SCENARIOS USING NEW TARGETS



-\$130
per car

Road SGR

-\$14
per car

Road SGR

+\$39
per car

-6.1
hours of
annual delay
per rider

Transit SGR

-6.2
hours of
annual delay
per rider

Transit SGR

-6.7
hours of
annual delay
per rider

WHAT ABOUT MULTIMODAL PROJECT EVALUATION?



Image Source: <https://www.flickr.com/photos/johnkay/3212002248>

WE NEED TO MOVE AWAY FROM SILOED PRIORITIZATION PROCESSES.

Image Source: <https://www.flickr.com/photos/24062765@N03/3804773622>



EXPANSION PROJECTS

SGR PROJECTS

BAY AREA PROJECT PERFORMANCE ASSESSMENT FRAMEWORK



TARGETS ASSESSMENT

*Assessed qualitatively using
targets scores*

Determine impact on adopted
targets

BENEFIT-COST ASSESSMENT

*Assessed quantitatively using
MTC Travel Model*

Evaluate relative cost-
effectiveness

HOW DOES SGR INVESTMENT AFFECT ROAD USERS?



Image Sources:
<http://familydeploymenttips.files.wordpress.com/2012/02/car-in-pothole.png>
<http://db2.stb.s-msn.com/1/D0/E05E7BA4EEA5A50F1C3BC9FFB21CA.jpg>
<http://investorplace.com/2013/02/consumers-paying-record-gas-prices-for-february/>
<http://www.autoblog.com/2013/07/03/women-pay-higher-car-repair-prices-than-men-but-negotiate-bette/>

HOW DOES SGR INVESTMENT AFFECT TRANSIT USERS?



Image Sources:

<http://www.sfgate.com/bayarea/article/BART-reopens-Transbay-Tube-track-4565168.php/photo-4716257>

http://3.bp.blogspot.com/-kbwplZnmo0/UJyiuaxp3MI/AAAAAAABKs/cLZfXqtWVes/s640/Crowded+Train_crop.JPG

<http://www.sfgate.com/bayarea/article/BART-delays-data-reveals-many-causes-4343993.php>

<http://www.sfgate.com/bayarea/article/BART-service-restored-for-evening-commute-3633761.php/photo-3070614>

CONNECTING ASSET MANAGEMENT TO USER BENEFIT FORECASTING

StreetSaver

- Input: Funding scenarios
- Output: Pavement condition by jurisdiction or segment

NCHRP Report 720 Models

- Input: Pavement condition by jurisdiction or segment
- Output: Operating and fuel costs for all vehicle types

Travel Model One

- Input: Operating and fuel costs for all vehicle types
- Output: Consistent set of benefits (time/GHG/etc.)

For more
information,
see **TRB
Paper No.
15-1206**

CONNECTING ASSET MANAGEMENT TO USER BENEFIT FORECASTING

FTA TERM-Lite

- Input: Funding scenarios
- Output: Asset ages by type and system

TCRP 157 Age Decay Models

- Input: Asset ages by type and system
- Output: Failure rates for all asset types by system

TCRP/MTC Delay Models

- Input: Failure rates for all asset types by system
- Output: Delay impacts by system for frequency and in-vehicle time

Travel Model One

- Input: Delay impacts by system for frequency and in-vehicle time
- Output: Consistent set of benefits (time/GHG/etc.)

For more
information,
see **TRB
Paper No.
15-1207**

CONSISTENT BENEFIT-COST ANALYSIS FOR SGR & EXPANSION PROJECTS

Benefits (\$)

Travel time + cost

Emissions

Collisions

Health

Costs (\$)

Capital

Net operating & maintenance

Key Assumptions:

- Baseline transportation network ~ 2018
- Adopted 2040 land pattern from Plan Bay Area



Image Source: <https://www.flickr.com/photos/bike/16039884863>

CONSISTENT TARGETS ANALYSIS FOR SGR & EXPANSION PROJECTS



Climate
Protection



Affordable
Housing



Non-Auto
Mode Share



Adequate
Housing



Displacement
Risk



Road State of
Good Repair



Healthy & Safe
Communities



Access to Jobs



Transit State of
Good Repair



Open Space &
Agricultural
Preservation



Job Creation



Housing &
Transportation
Costs



Goods
Movement

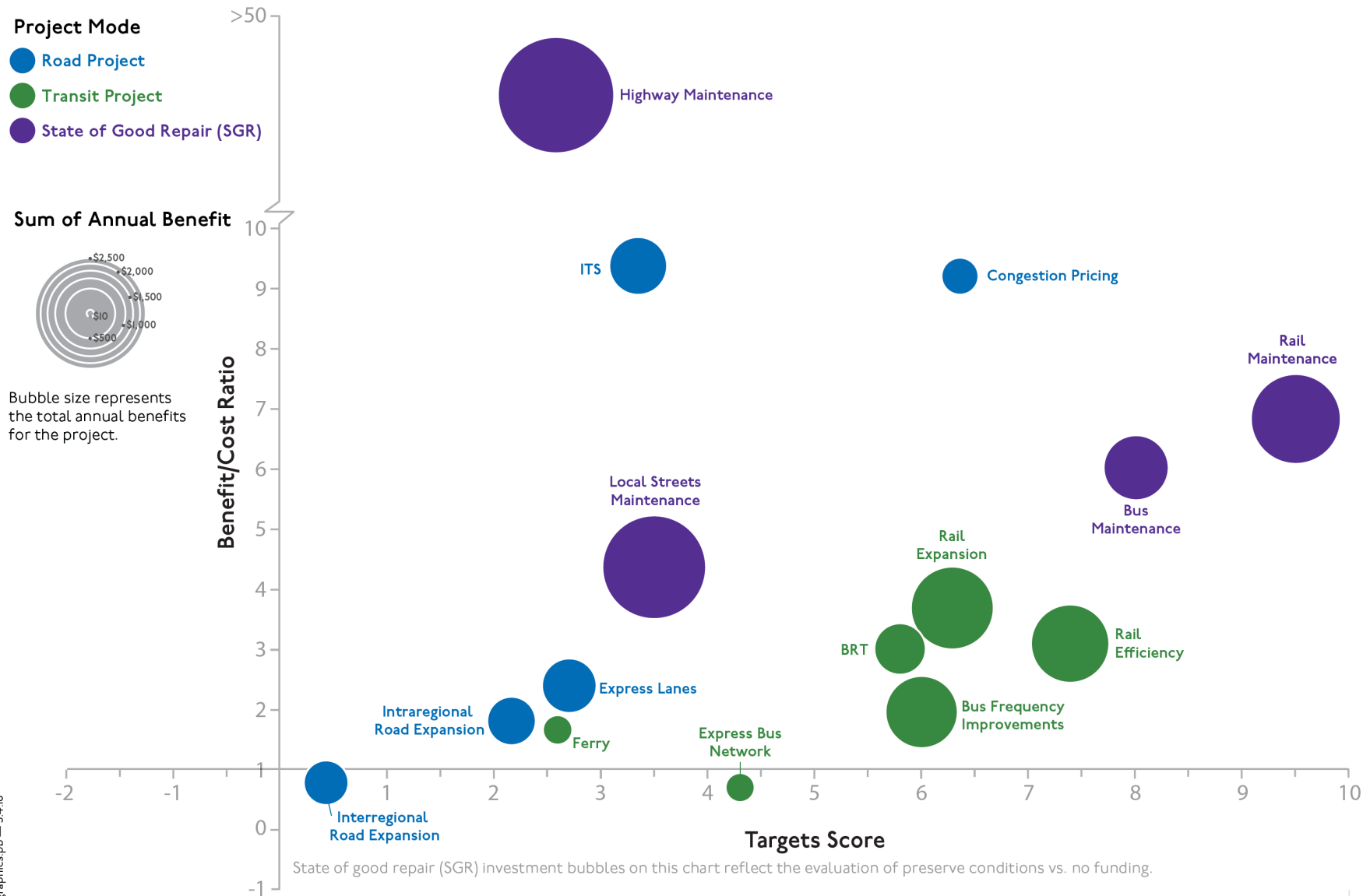
Maximum score:

13

*if the project supports
all 13 targets strongly*

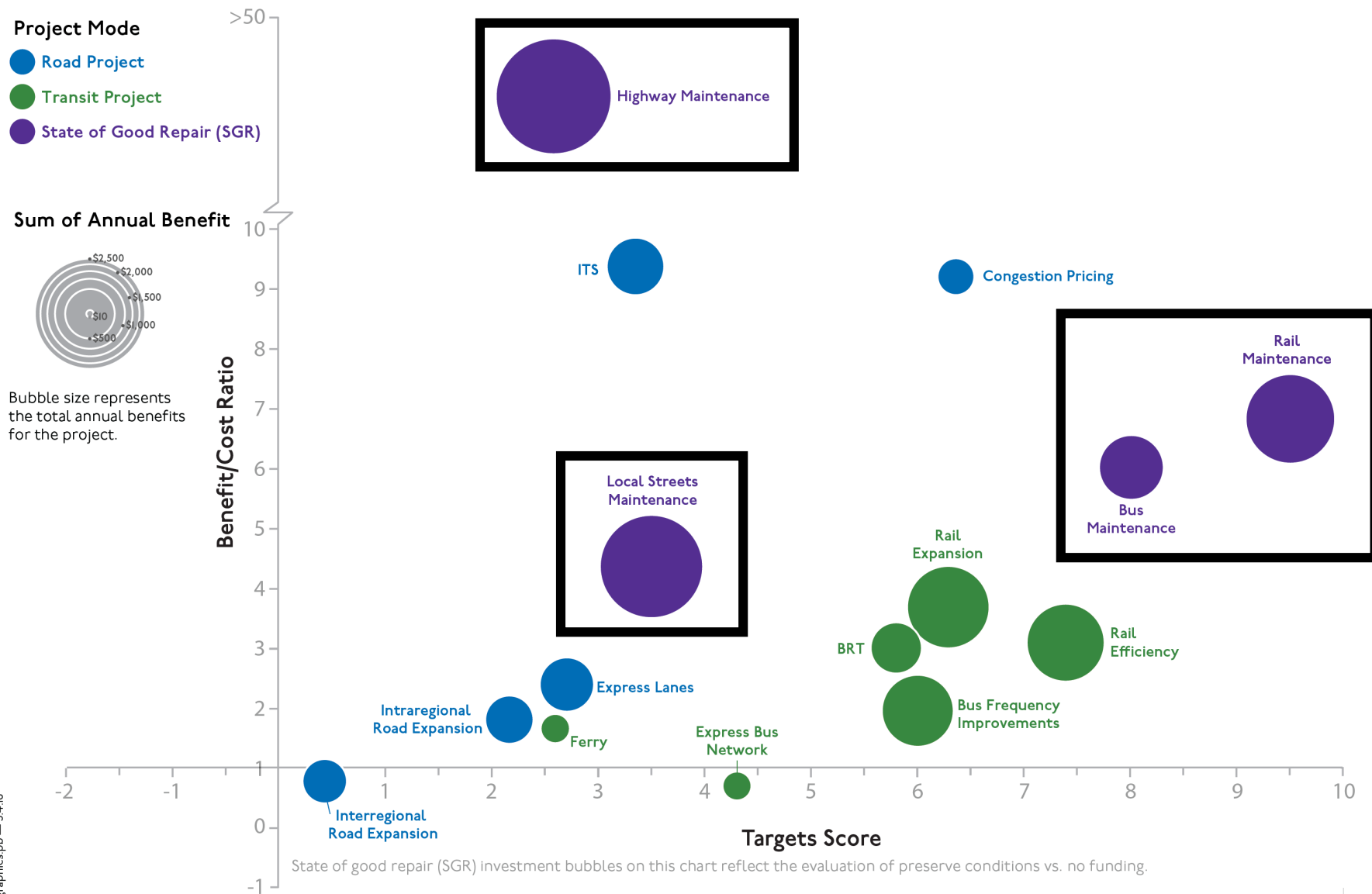
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Project Performance Assessment: Overall Results by Project Type



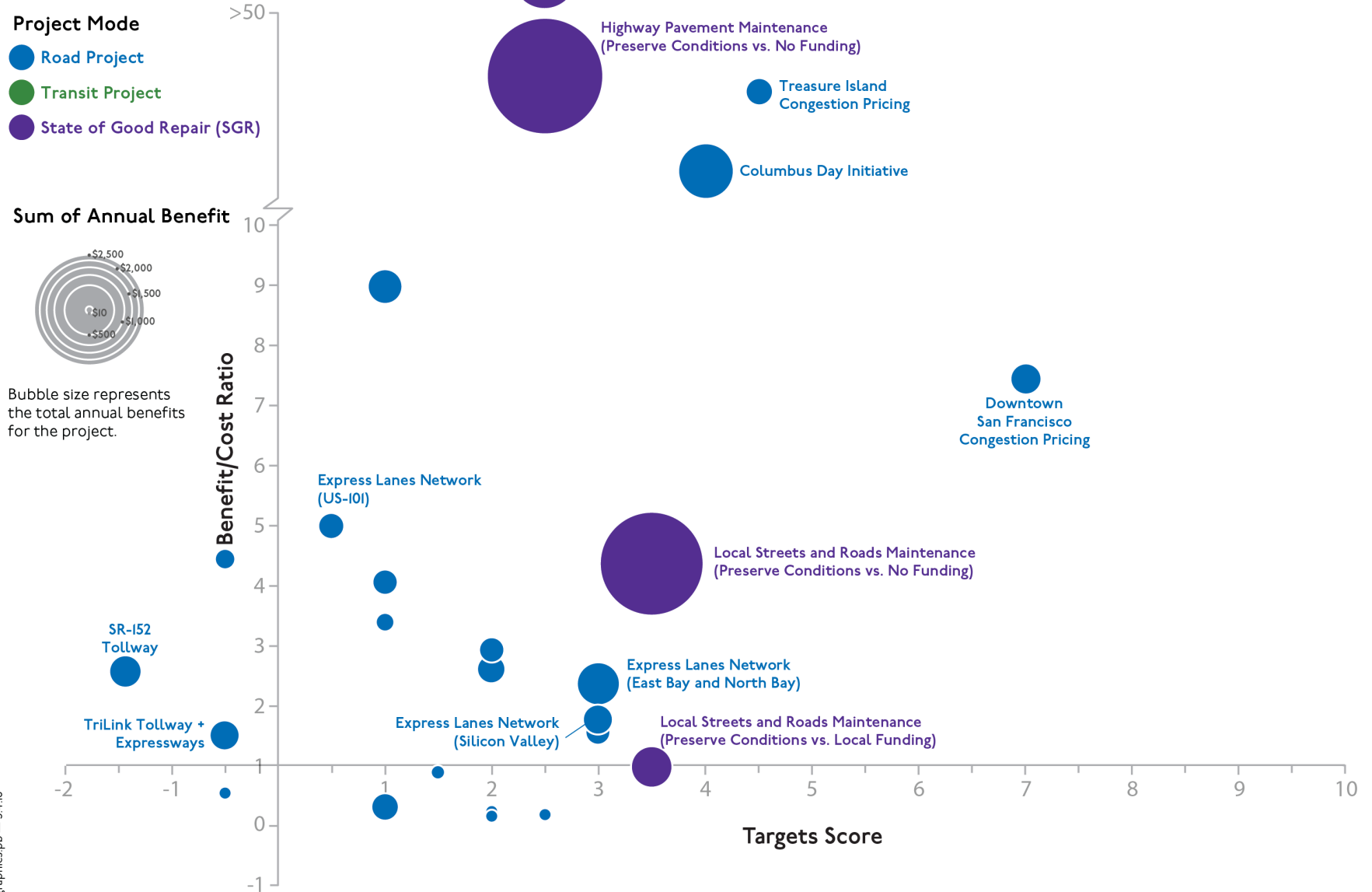
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Project Performance Assessment: Overall Results by Project Type

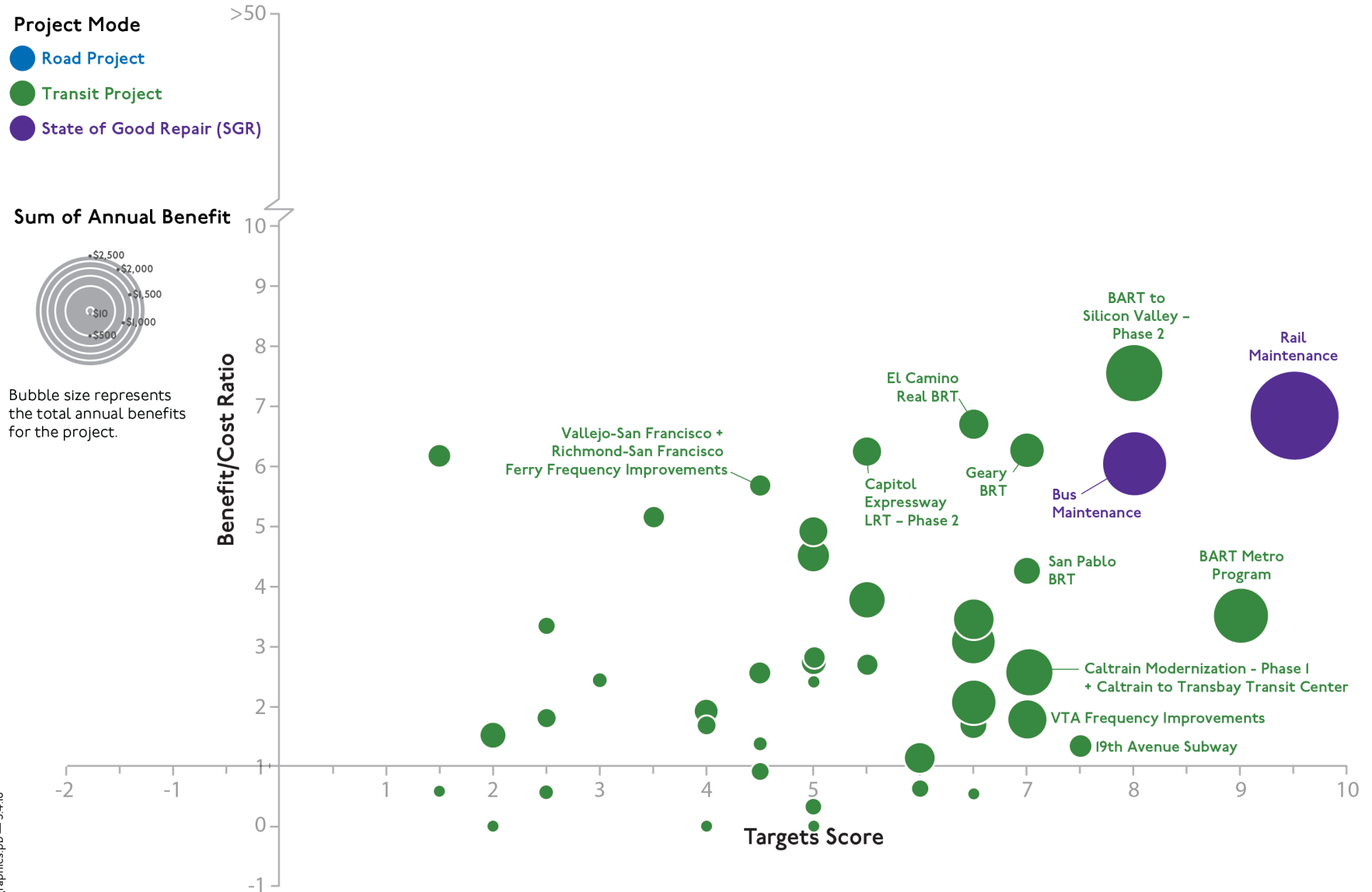


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Project Performance Assessment: Results for Road Projects



Project Performance Assessment: Results for Transit Projects



HIGH-PERFORMING INVESTMENTS – TRANSIT SGR MAKES THE CUT

1

Rail Maintenance

2

Bus Maintenance



Image Source: https://en.wikipedia.org/wiki/Sonoma_County_Transit#/media/File:Sonoma_County_Transit_245-a.jpg

3

Columbus Day Initiative

4

Downtown San Francisco
Congestion Pricing

5

Treasure Island Congestion
Pricing

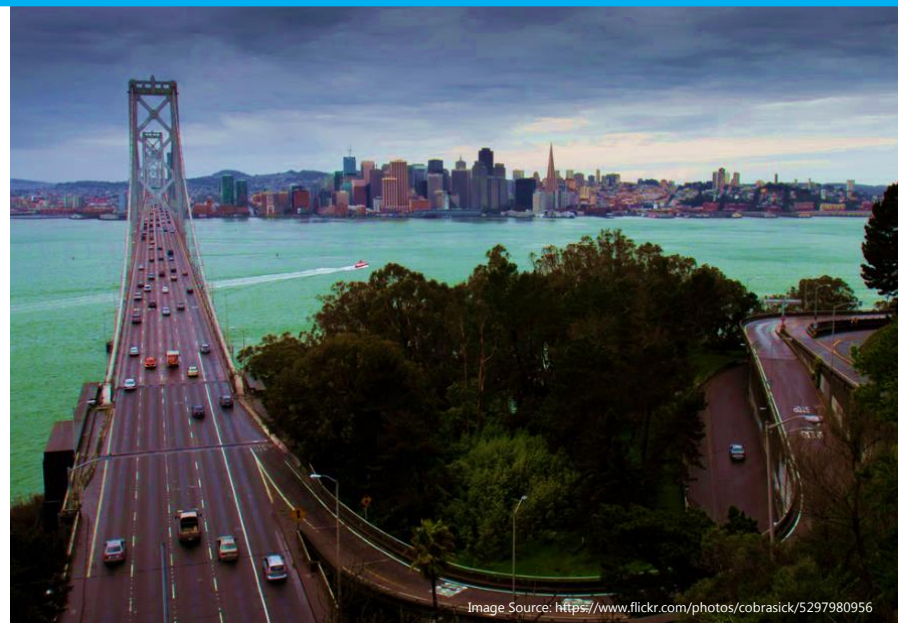


Image Source: <https://www.flickr.com/photos/cobrasick/5297980956>

HIGH-PERFORMING INVESTMENTS – TRANSIT SGR MAKES THE CUT

6

BART Metro Program

7

BART to Silicon Valley:
Phase 2

8

Caltrain Modernization +
Extension to Transbay

9

El Camino BRT

10

San Pablo BRT

11

Geary BRT



Image Source: <https://www.instagram.com/p/qexmPMLVrt/?taken-by=gocaltrain>

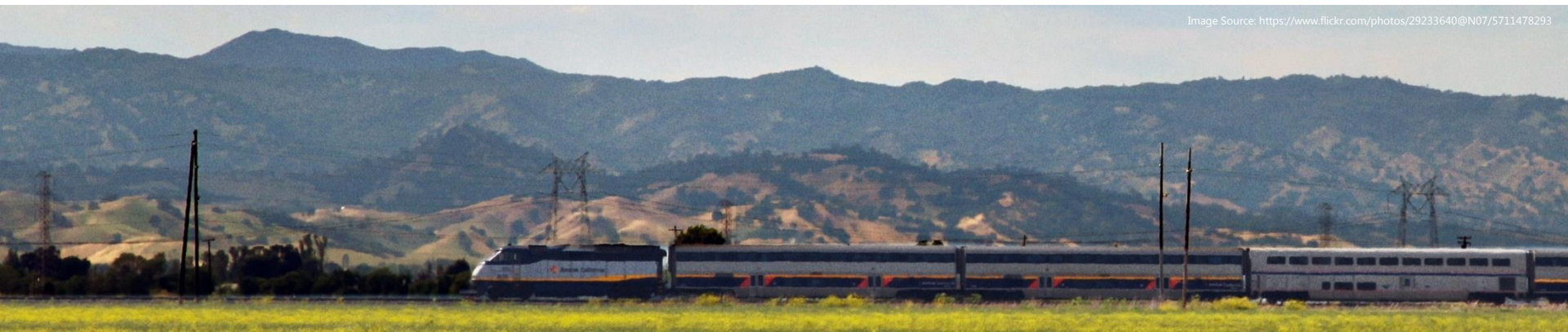


Image Source: https://www.flickr.com/photos/pfsullivan_1056/6276359727/

QUANTIFYING AND COMMUNICATING BENEFITS

Not only can we calculate benefit-cost ratios consistently with other projects, but the detailed data available on user benefits can prove helpful as well. For example:

- Achieving state of good repair for state highways will save Bay Area motorists **\$3.46 billion** every year, while maintaining local streets will save **\$2.30 billion** every year. A share of these benefits will be canceled out by adverse impacts from induced demand – but both remain quite cost-effective investment opportunities.
- Investment in the region's transit system reduces GHG emissions by between 88,000 and 114,000 metric tons annually – **roughly one per-capita GHG "point"** under SB 375. Meanwhile, overall benefits from transit maintenance are of the same order of magnitude as maintaining all regional highways – reflecting how they are equally critical in our multimodal region.



QUANTIFYING AND COMMUNICATING BENEFITS

Not only can we calculate benefit-cost ratios consistently with other projects, but the detailed data available on user benefits can prove helpful as well. For example:

- **Between 270,000 and 320,000 daily transit boardings could be lost** if we don't invest in state of good repair, or approximately one in eight transit trips (**primarily choice riders**), while millions who remain on board would be severely inconvenienced.
- All of the region's fiscally-unconstrained expansion projects combined generate just \$5.5 billion in annual benefits; our relatively conservative estimate of SGR investment demonstrates that **preserving roads and transit systems would generate at least \$6.8 billion in annual benefits** at a lower annualized cost.



CONCLUDING THOUGHTS

- **Choosing smart performance measures makes all the difference.** We must balance between communicating complex concepts and supporting strategic decision-making; customer-oriented performance measures are one path forward in this regard.
- **In a funding-constrained world, we need to continue breaking down silos.** This analysis showed that state of good repair can clearly hold its own in an “apples to apples” analysis.
- **Planners need to increasingly focus on state of good repair.** Especially in mature regions, the traditional emphasis of travel models on expansion projects needs to start shifting towards modernization and maintenance.



QUESTIONS?



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