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A High Capacity Transit and OnDemand Service

AN INTEGRATED MULTI MODAL APPROACH

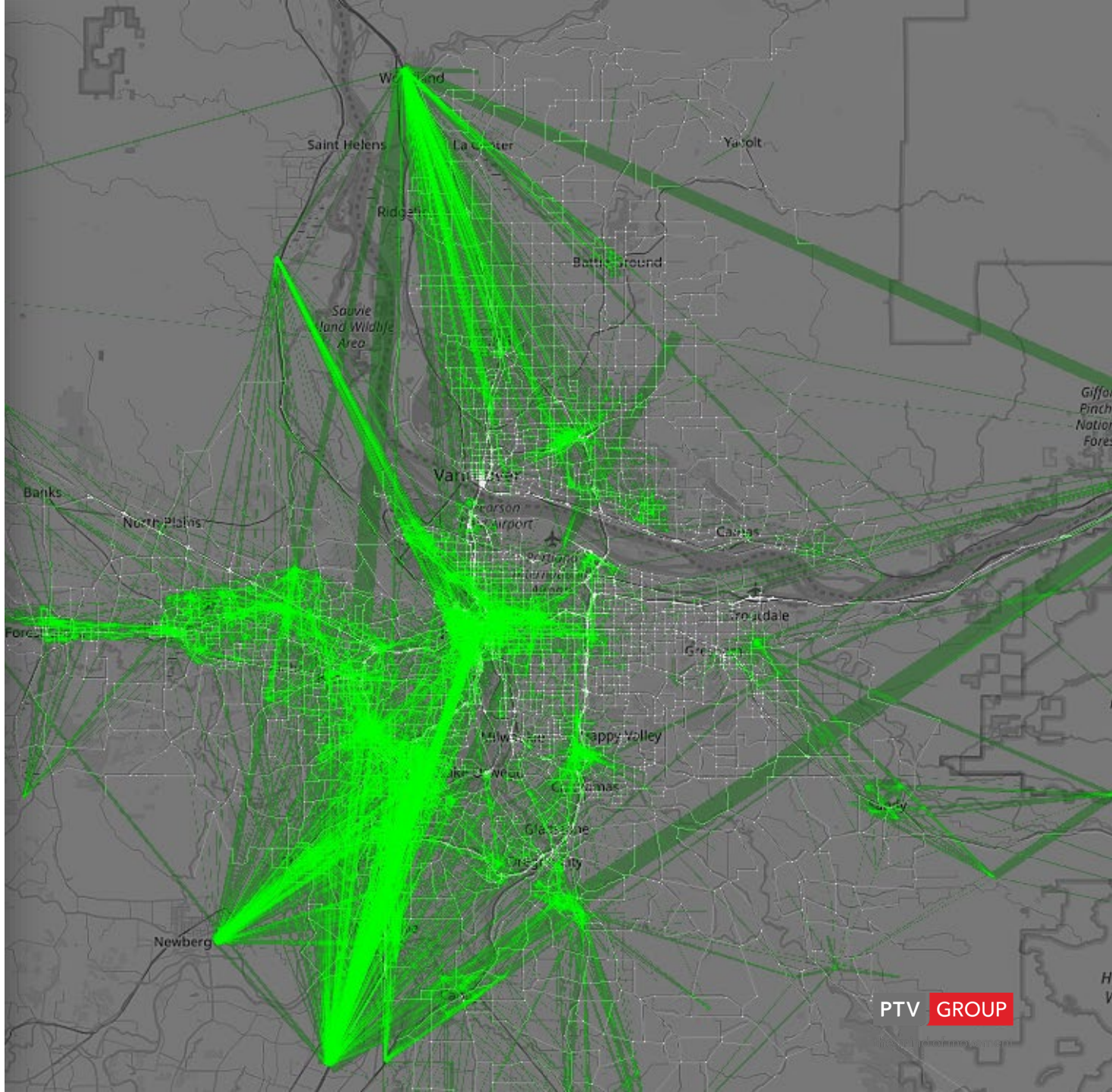
Planning for successful OnDemand is complex

Understand

- Travel demand at individual level
- Mode choice characteristics
- Urban environment and restrictions
- Travel times, congestion, convenience
- Costs, Revenues, Subsidies

How to design an integrated system?

What policy changes are needed?



Investigating

The impact of OnDemand and Transit

Together with OECD's International Transport Forum (ITF), we were part of the 'Lisbon Study' – a profound investigation into the workings and consequences of Mobility as a Service (MaaS) on society.

210 Football fields

More space

27%

Less CO_2 emissions

90%

Less car owners.

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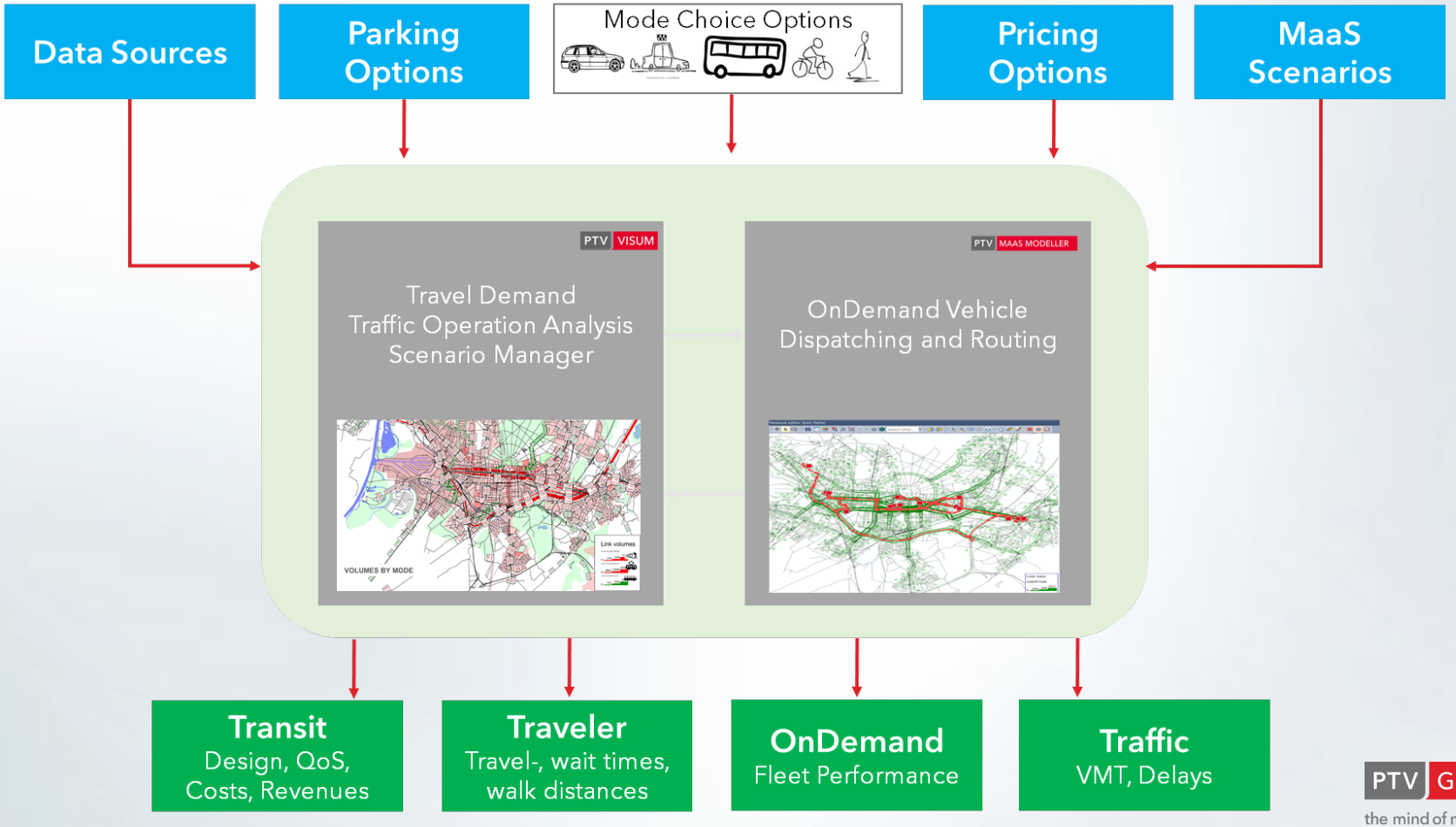
Digital Replica

- A digital model of a transportation system
- Levers can be pulled
- Use the ‘now’ to try and understand the ‘future’



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A Portland Sandbox Example:
MoD+ Mass Transit+ Private Car

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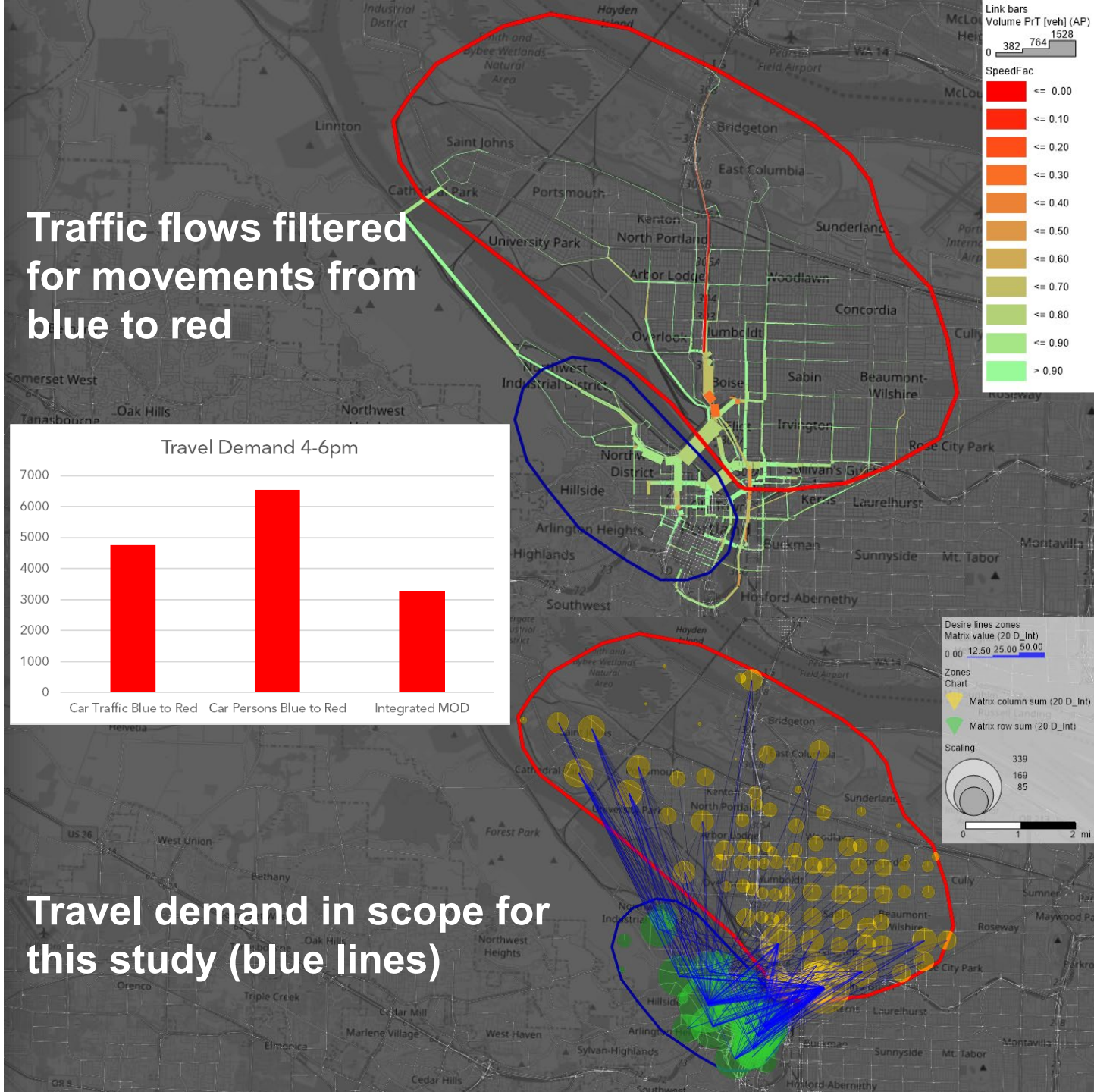
Study Objectives

Explore potential feasibility and impacts of a MOD service which integrates with mass transit in the City of Portland.

Scenario:

- 50% of existing SOV and HOV trips from the blue area to the red area will be served by a shared MOD fleet (→ approx. 25% of all SOV/HOVs moving across the bridges)
- The shared MOD service will integrate with the MAX Yellow Line in an attempt to reduce congestion whilst increasing ridership

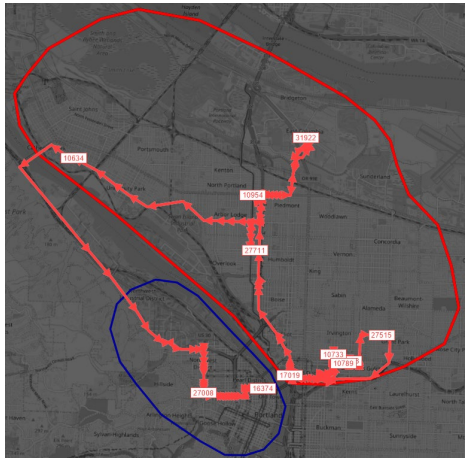


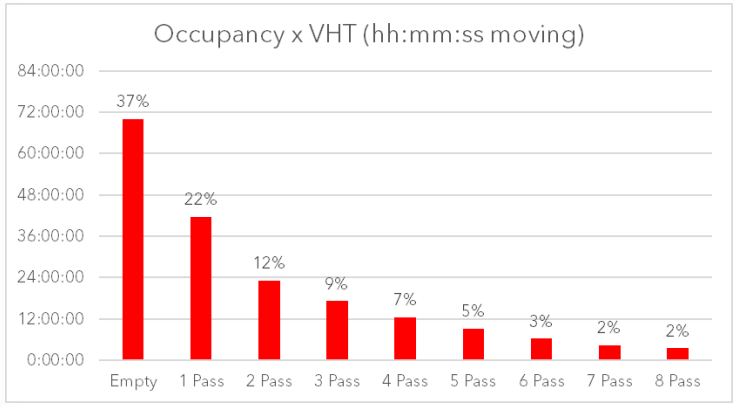
Study Method

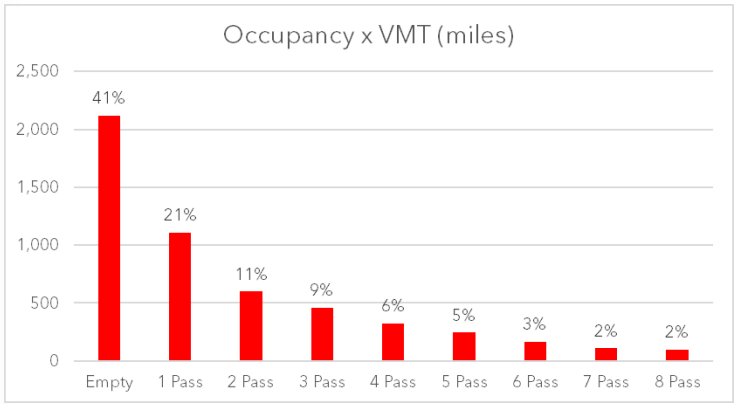
Simulate the MOD dispatcher.

- 249 vehicles
- 8 passenger seats per vehicle
- 20 seconds boarding per trip request and per passenger (short time to account for pooling)
- Sharing enabled
- Maximum detour factor: 2.5
- Maximum detour time: 30 minutes
- 15 minute planning window

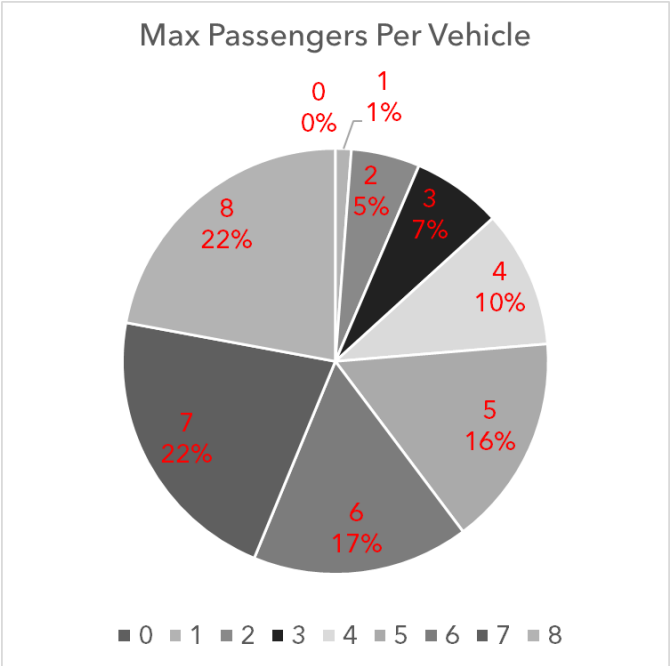
Example MOD tours:







Number of Vehicles: 249



Study Results:
MOD Operator Perspective

Fixing rental cost at $200/week:

→ $1.3-3/mile breakeven as $/mile and $/hour is varied

Removing hourly cost (e.g. self-driving):

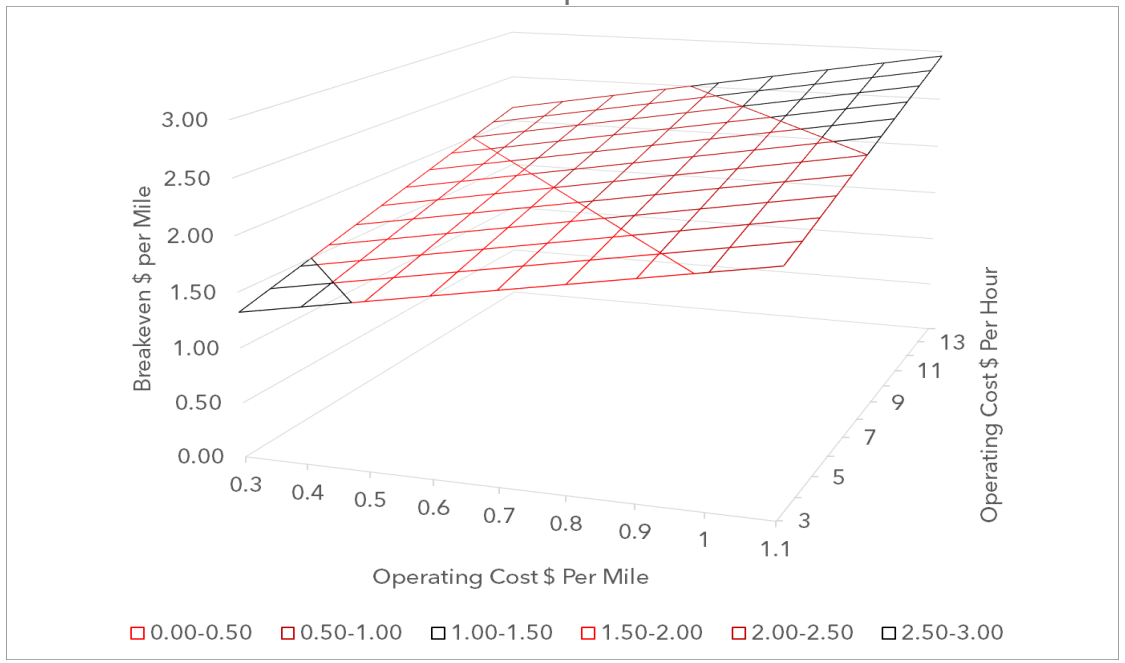
→ $0.7-2.6/mile breakeven as rental and $/mile is varied

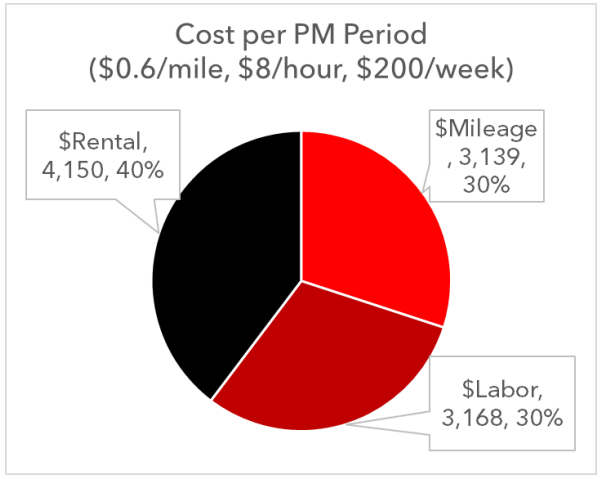
For comparison, taxi fares in Portland are currently approx. $3 + $3/mile

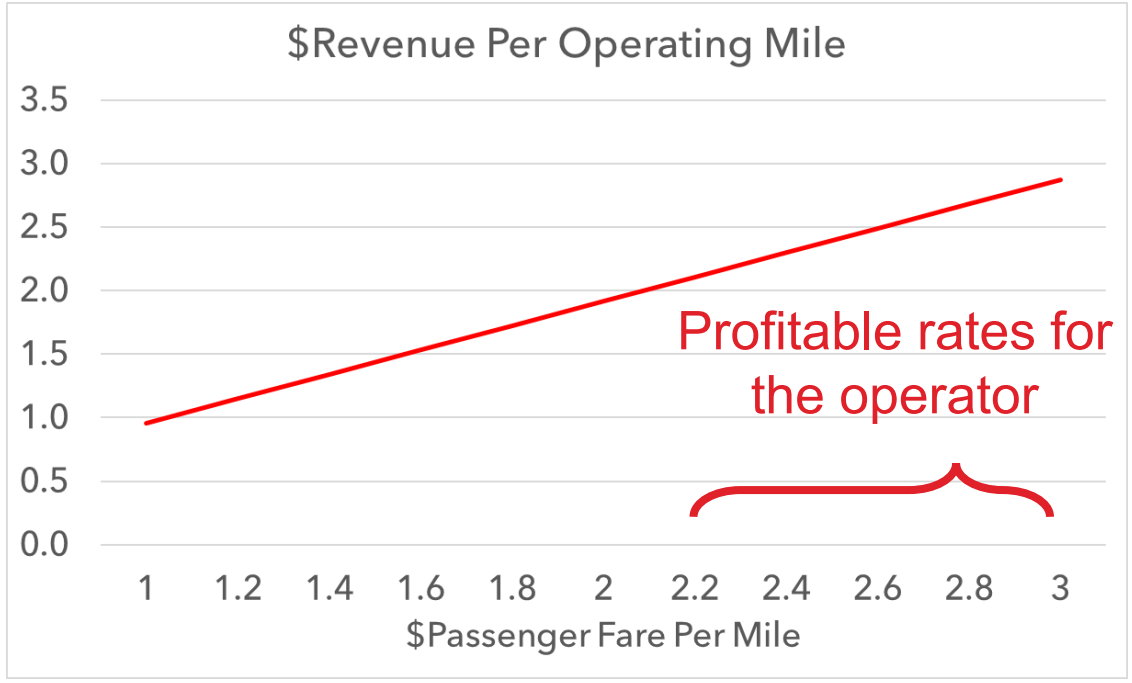
Number of Vehicles: **249**

Total Miles: **5232**

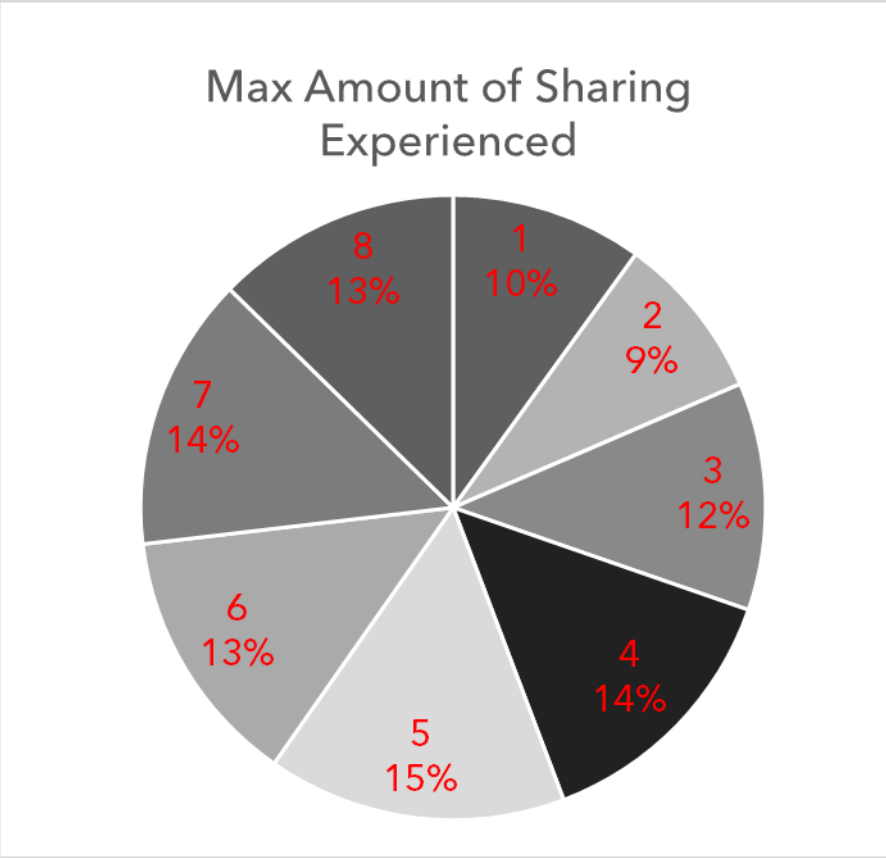
Total Hours: **396**

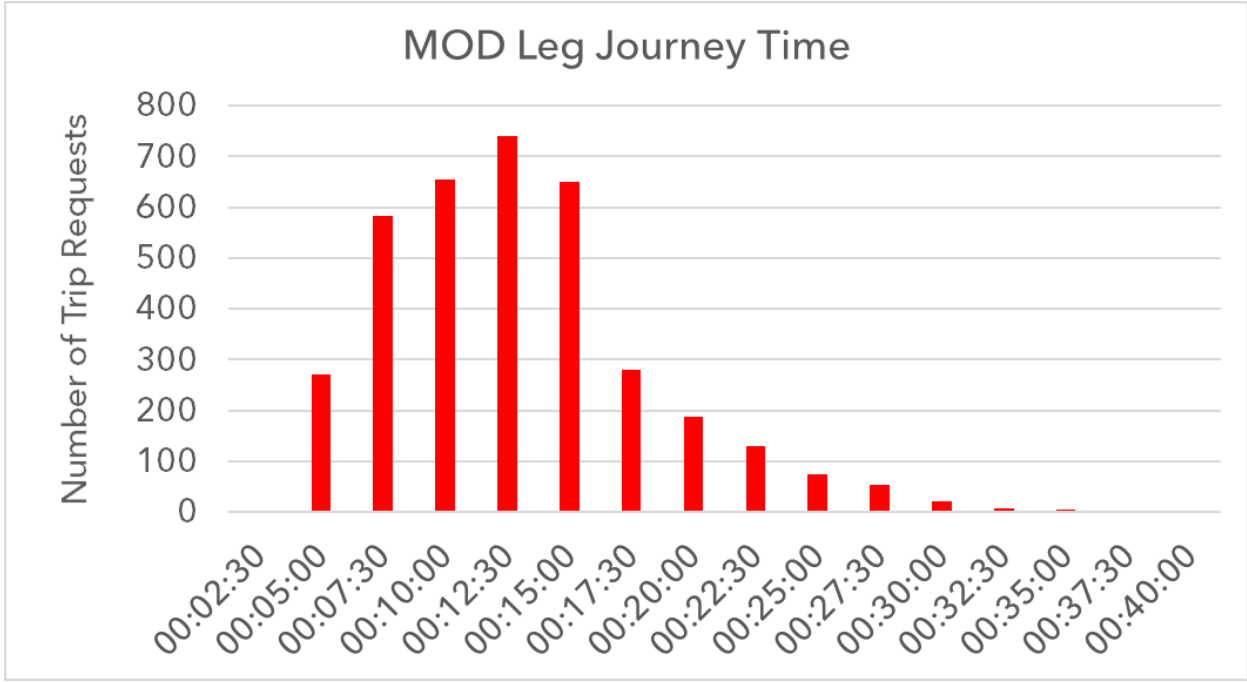


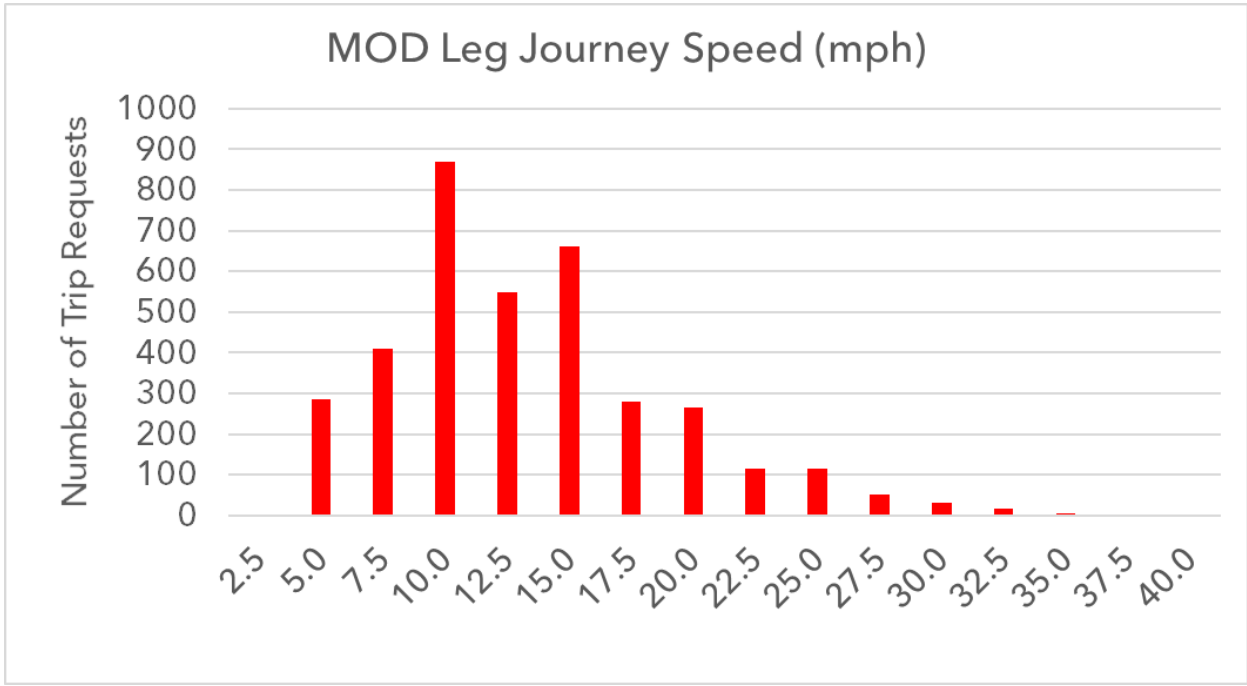




Study Results:
MOD passenger perspective







Study Results:
MOD passenger perspective

Average trip-request direct-distance is 1.4 miles

- → MOD fare per passenger is approx. $6-8 per day
- → MAX Yellow line fare is approx. $5 per day

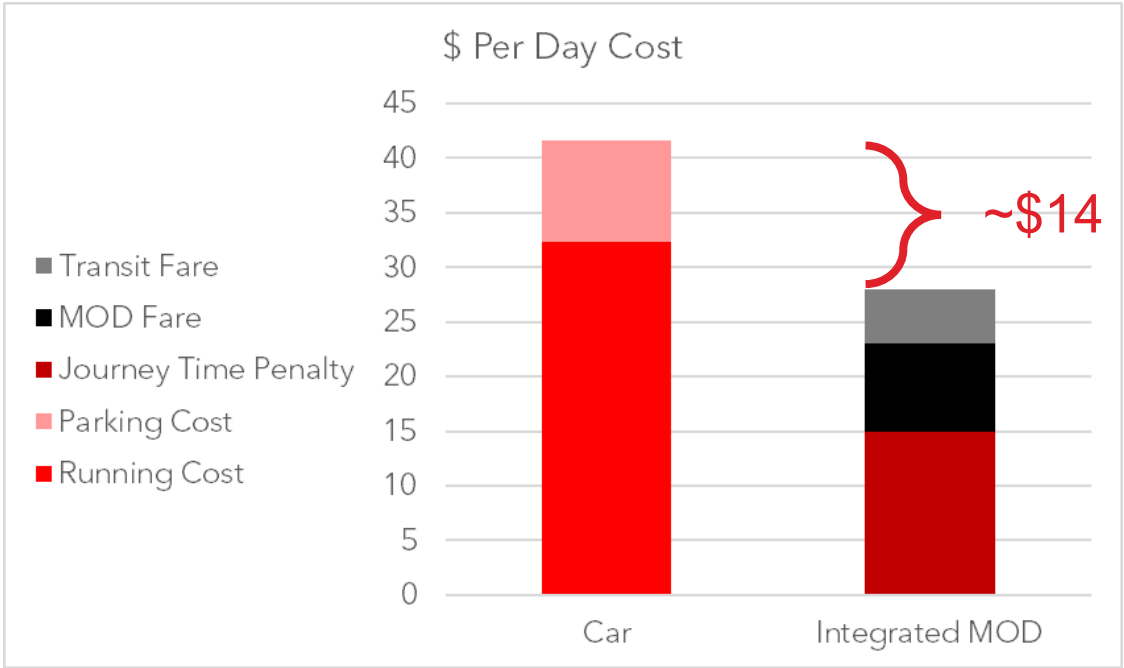
→ Remaining difference of approx. $14 per day

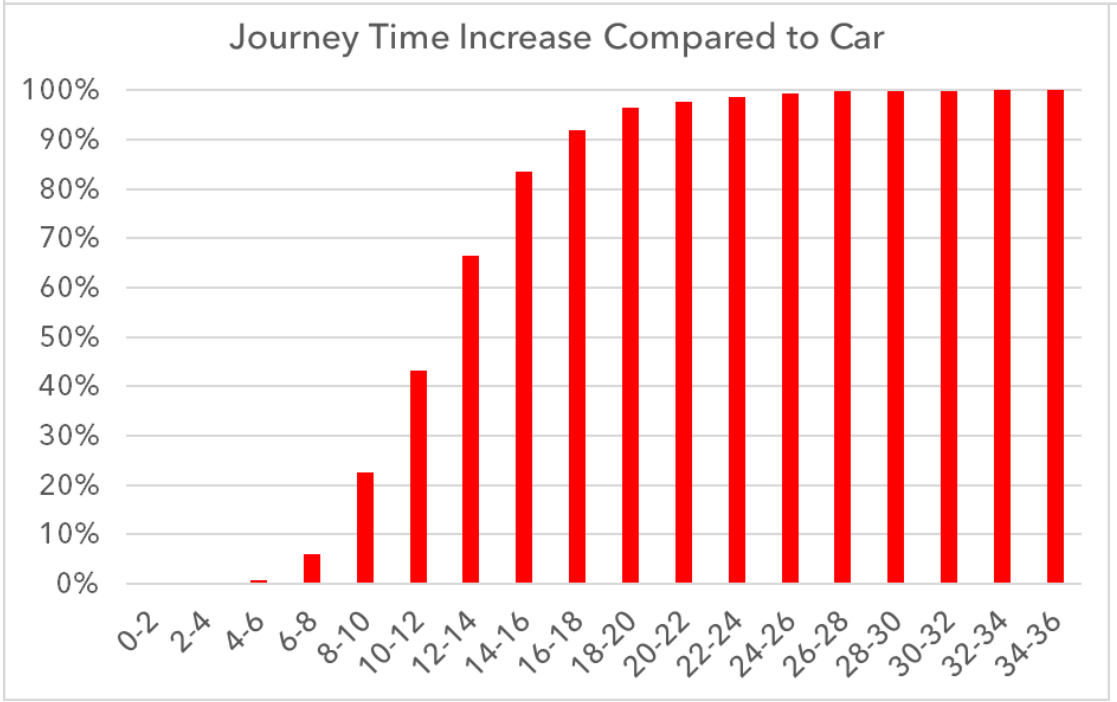
→ Variable cost car $10 vs $11-13 for MoD+ Transit

At what moment will travelers shift mode?

What policy changes stimulate mode shift?

90% of passengers experience up to 18 minutes increase in Trip time compared to car





Study Results: City perspective

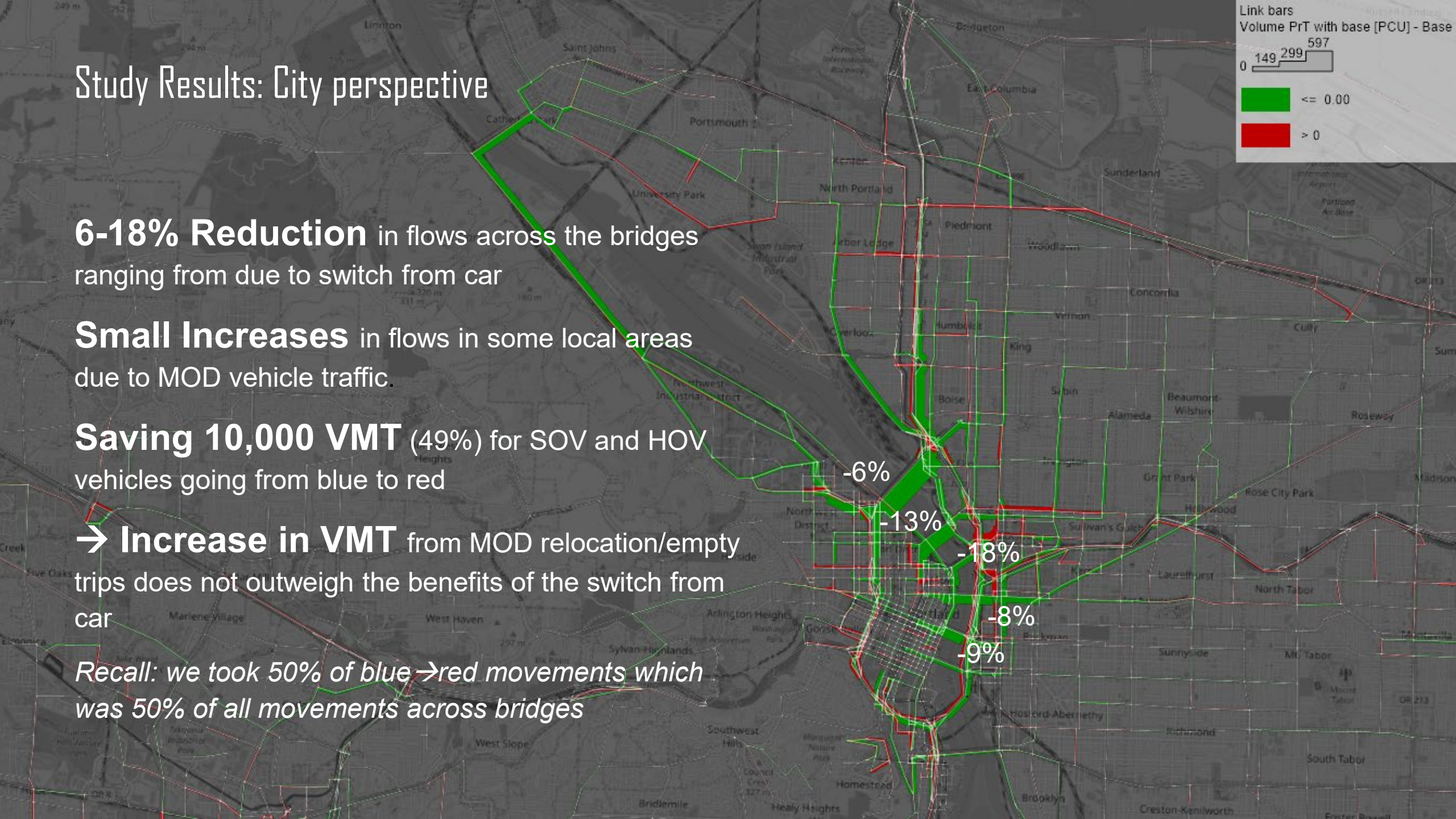
6-18% Reduction in flows across the bridges ranging from due to switch from car

Small Increases in flows in some local areas due to MOD vehicle traffic.

Saving 10,000 VMT (49%) for SOV and HOV vehicles going from blue to red

→ **Increase in VMT** from MOD relocation/empty trips does not outweigh the benefits of the switch from car

Recall: we took 50% of blue→red movements which was 50% of all movements across bridges



Study Results:
Public Transit Operator Perspective

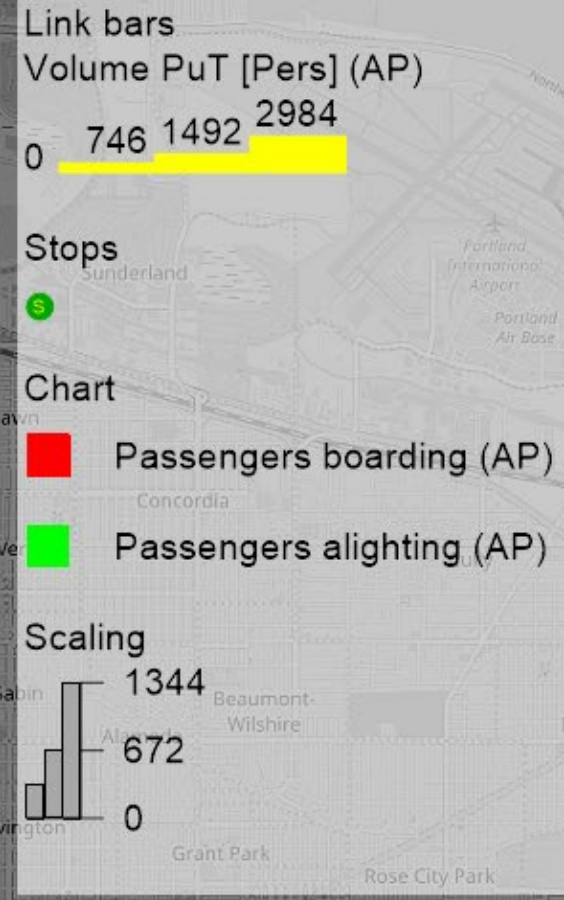
Over the 2-hour period, **maximum station boarding of approx. 1300 passengers,** and

Maximum station alighting of approx. 1000 passengers

Maximum additional ridership on Yellow Line is approx. 3000 passengers over the bridge.

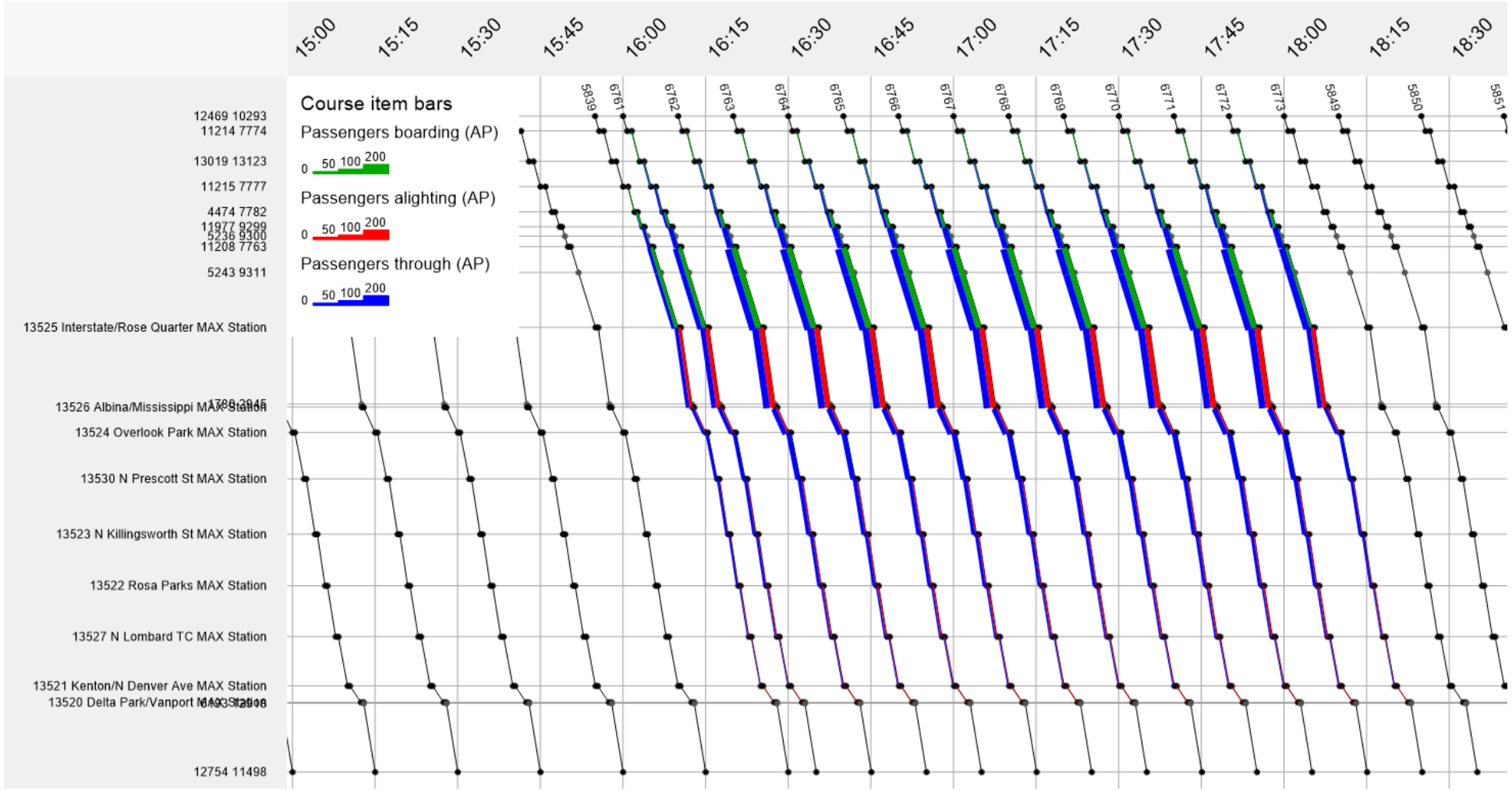
Total number of passengers is approx. 3,000. Fare is approx. $5 per day

→ **Approx. $3-4M in additional revenue per year**



Study Results

Transit Operator: How this additional demand distributed across the Yellow Line runs



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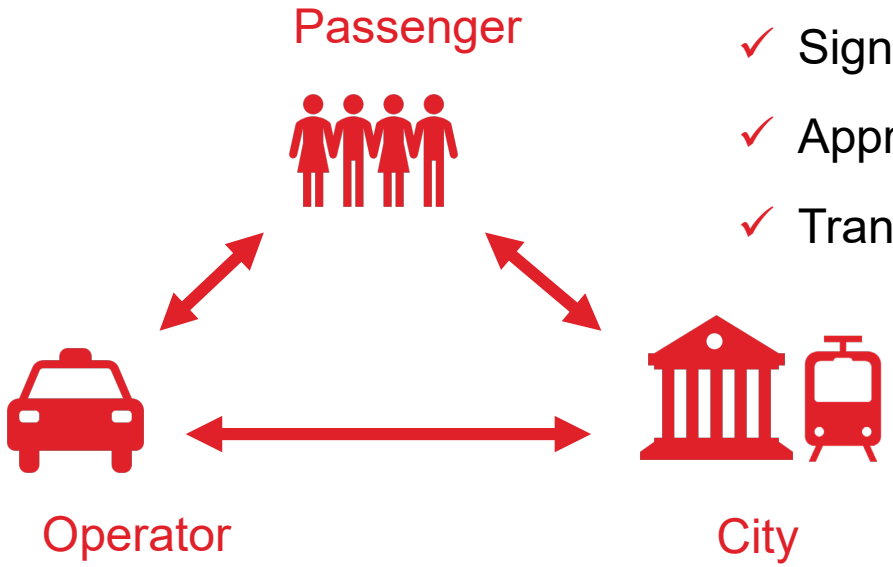
Study Summary

Objective: Explore potential feasibility and impacts of a MOD service which integrates with mass transit

Impacts are inter-related, and for this experiment the integrated services appears feasible

- ✓ Generalised cost is competitive with car*
- ✓ Massive accessibility improvement for non-car drivers

- ✓ Profitable
- ✓ Competitive with existing taxi



- ✓ Up to 18% reduction in volume on key bottlenecks
- ✓ Significant VMT reduction
- ✓ Approx. $1.5m travel time savings*
- ✓ Transit operations?

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*very rough assumptions have been used for demonstration purposes!

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Passenger

→ Critical input assumption: 50% of the car demand in question will switch

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*very rough assumptions have been used for demonstration purposes!

Study Summary

Objective: Explore potential feasibility and impacts of an MOD service which integrates with mass transit

What affects how people choose? We can model many, but not all of the influences….

Passenger

Choice influencers	Decision support
❑ Travel+wait time	→ MOD modelling
❑ Pricing	→ MOD modelling
❑ Reliability	→ Design and simulation
❑ Service quality	→ Design and simulation
❑ Marketing	→ Implementation
❑ Security	→ Implementation
❑ Environment	→ Implementation

Study Summary

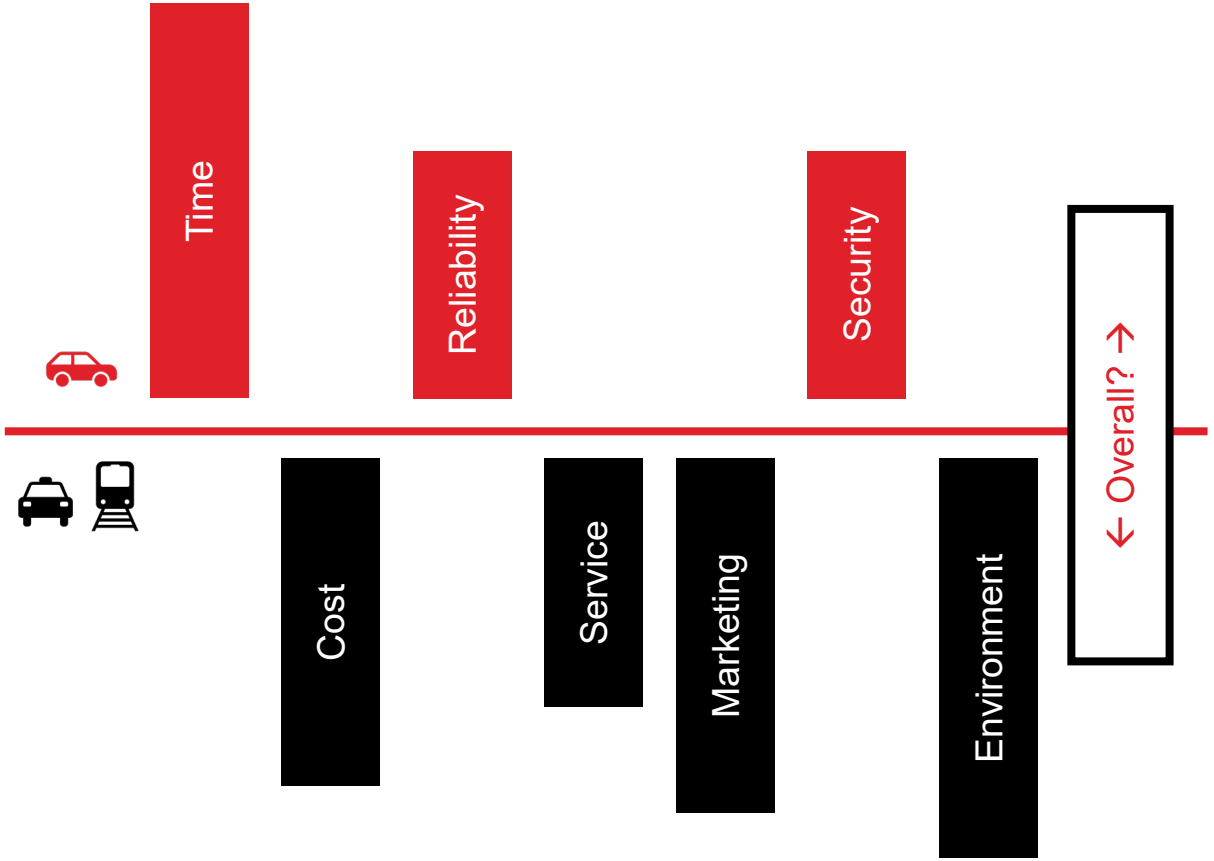
Objective: Explore potential feasibility and impacts of an MOD service which integrates with mass transit

…but what we can model can support decision makers with conceptualization and insight

Passenger

Choice influencers

- ❑ Travel+wait time
- ❑ Pricing
- ❑ Reliability
- ❑ Service quality
- ❑ Marketing
- ❑ Security
- ❑ Environment



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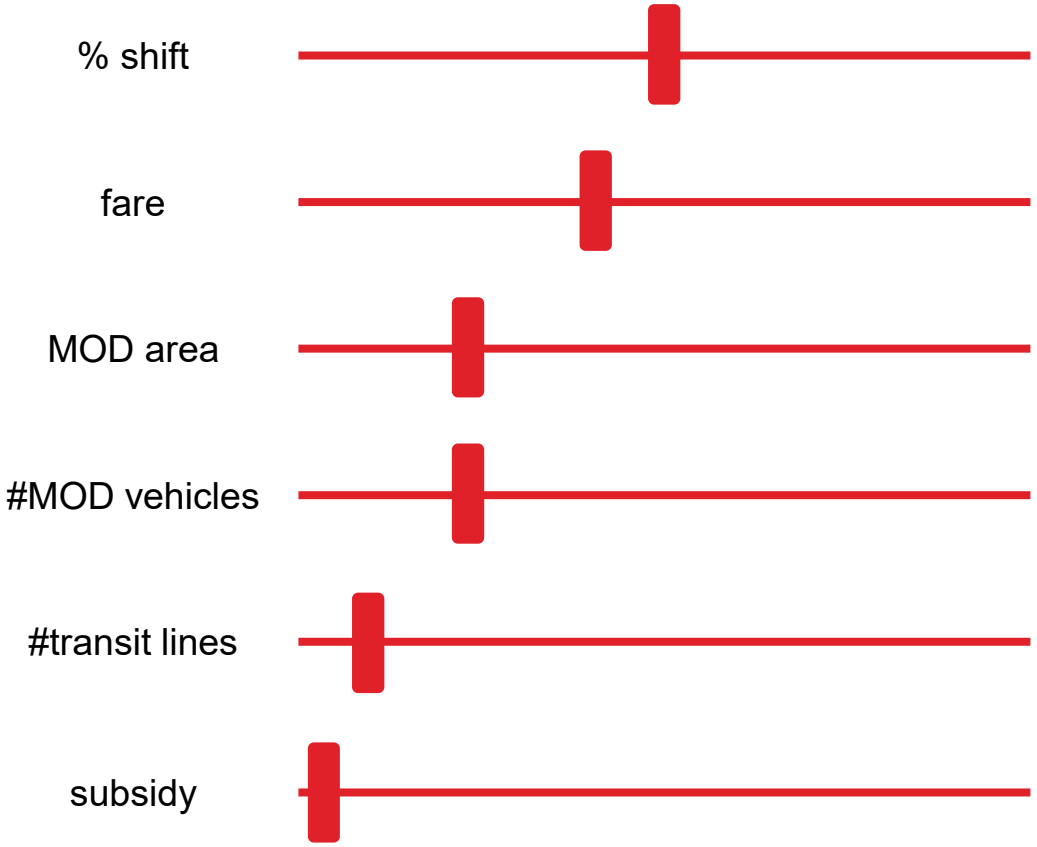
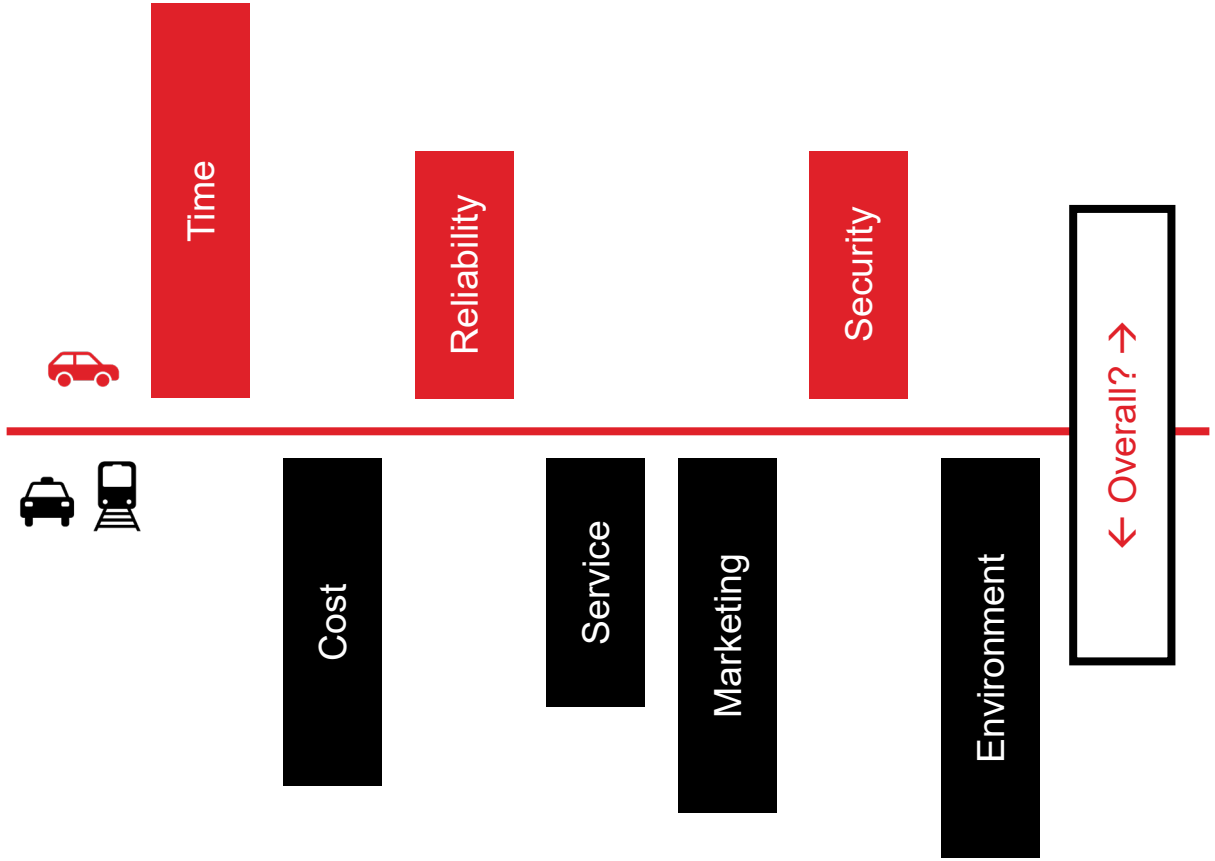
Study Summary

Objective: Explore potential feasibility and impacts of an MOD service which integrates with mass transit

Through scenario exploration we can understand which aspects are most critical to success





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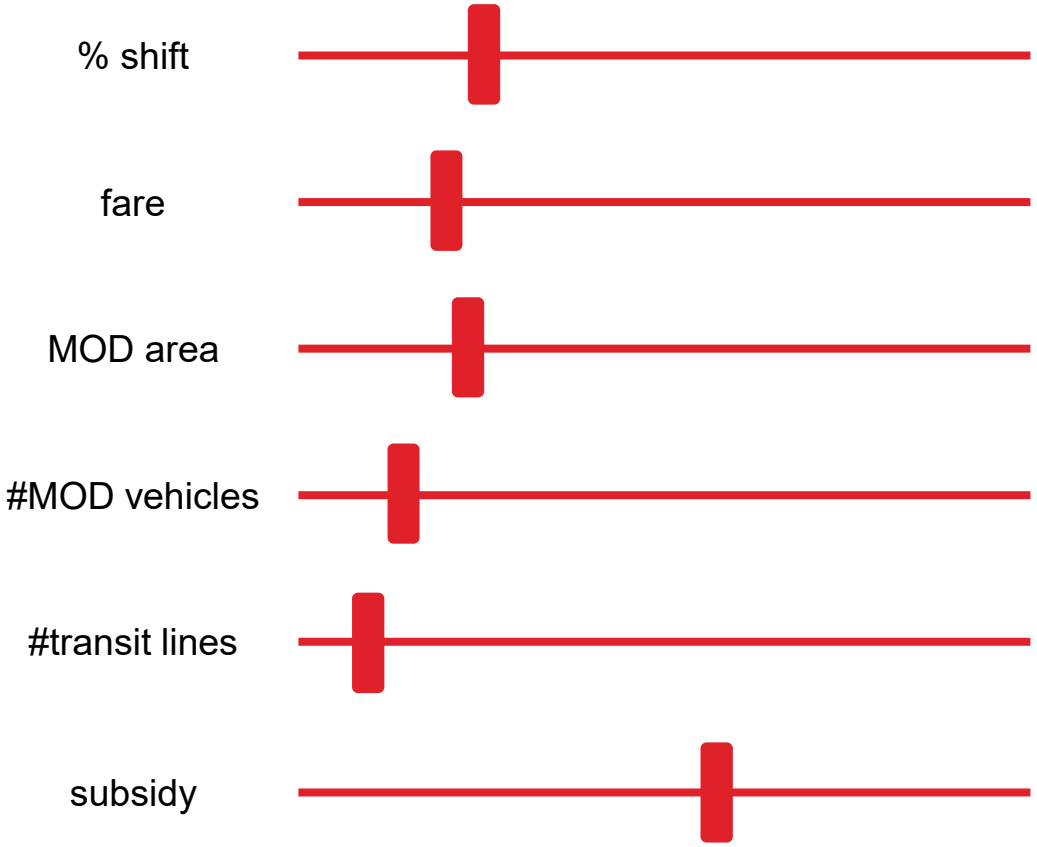

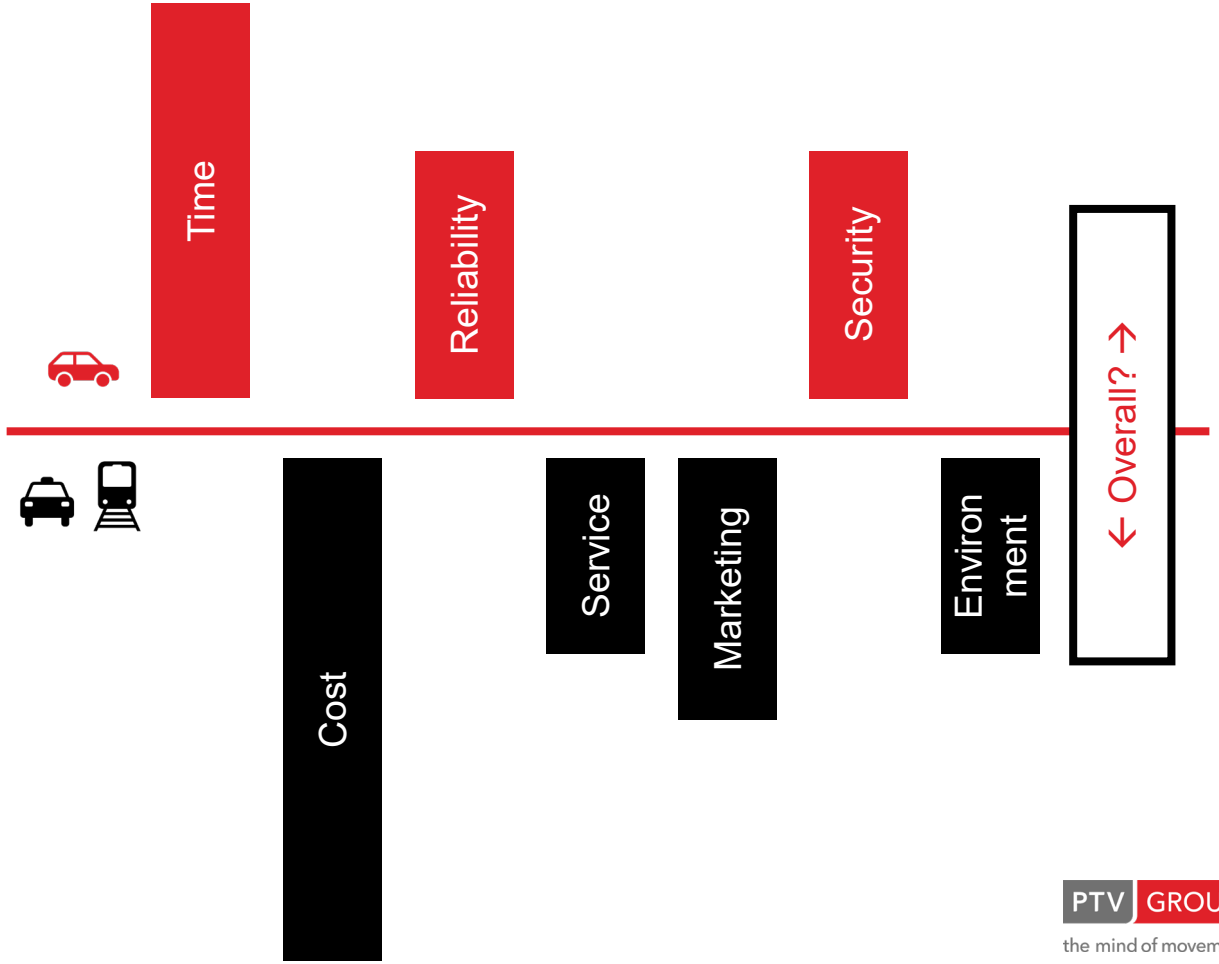

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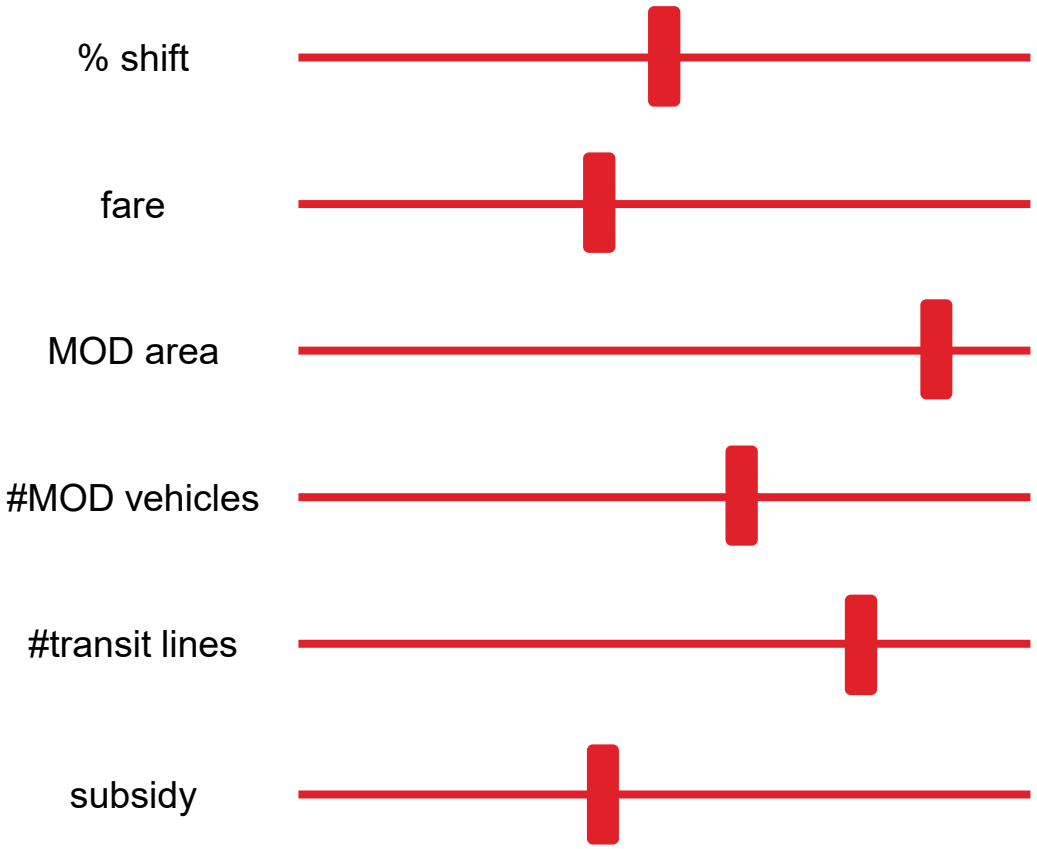

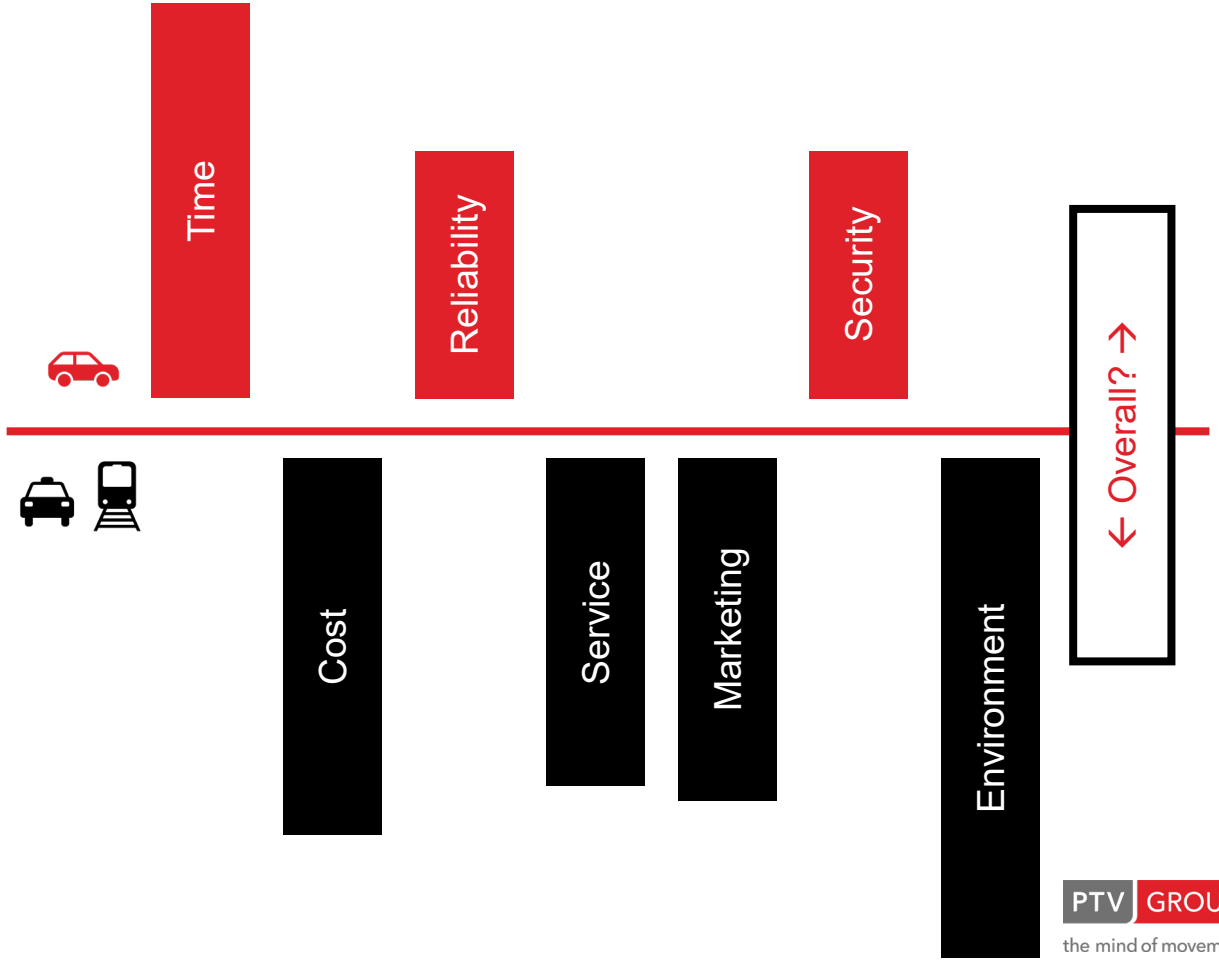

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Conclusions

An integrated and multi-modal modeling approach can assist to :

- ✓ Determine the optimal fleet size and configuration for OnDemand
- ✓ Expand first/last mile services to larger or other service areas
- ✓ Compare low performing fixed route bus service with a possible replacement of OnDemand Services
- ✓ Combine paratransit and general public DRT service
- ✓ Optimize the current fixed route services based on individual travel demand and road infrastructure and capacity limitations
- ✓ Evaluate percentage of mode shift necessary to make MaaS successful
- ✓ Reduce congestion
- ✓ Increase accessibility

APRIL 2019
RUTER

THE OSLO STUDY – HOW AUTONOMOUS CARS MAY CHANGE TRANSPORT IN CITIES

REPORT

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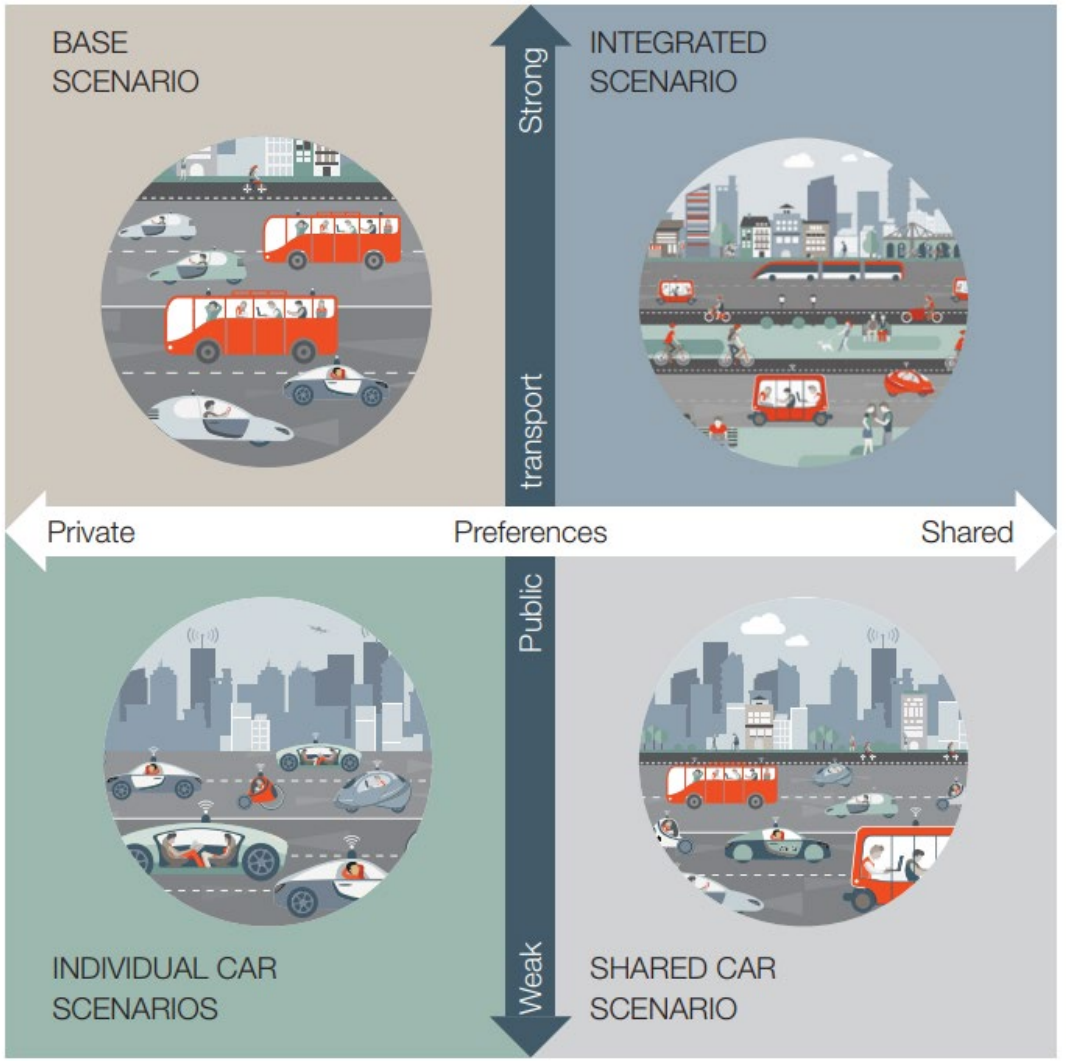

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