ACCESSIBILITY AND BEHAVIOR IMPACTS OF BUS-HIGHWAY SYSTEM INTERACTIONS

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ACCESSIBILITY OBSERVATORY

UNIVERSITY OF MINNESOTA

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PROJECT BACKGROUND

- **Project Goal:** To improve accessibility calculation capabilities by integrating data about highway bus operations, park-and-ride facilities, and travel + parking costs for automobile and transit modes.
- **Project Outcome:** A deeper understanding of auxiliary transportation facilities and how they affect time-based and cost-based accessibility for the Twin Cities region.

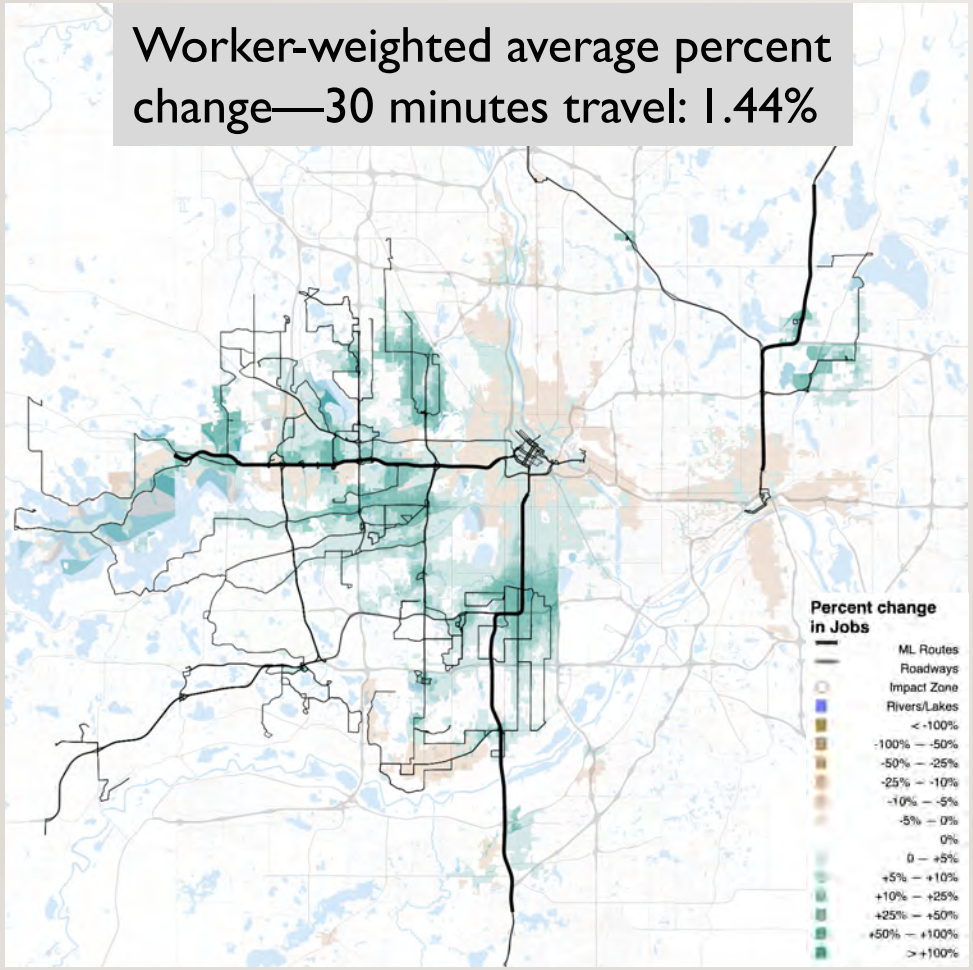
ACCESSIBILITY AS A PERFORMANCE MEASURE

- Accessibility is a measure of the ease of reaching destinations and activities.
- Accessibility accounts for the cost of travel (time, money, lost opportunity) AND the benefits (reaching valuable destinations).
- **For example:** Workers at the MnDOT central office have access to >100,000 jobs by transit within 30 minutes during the morning peak hours.

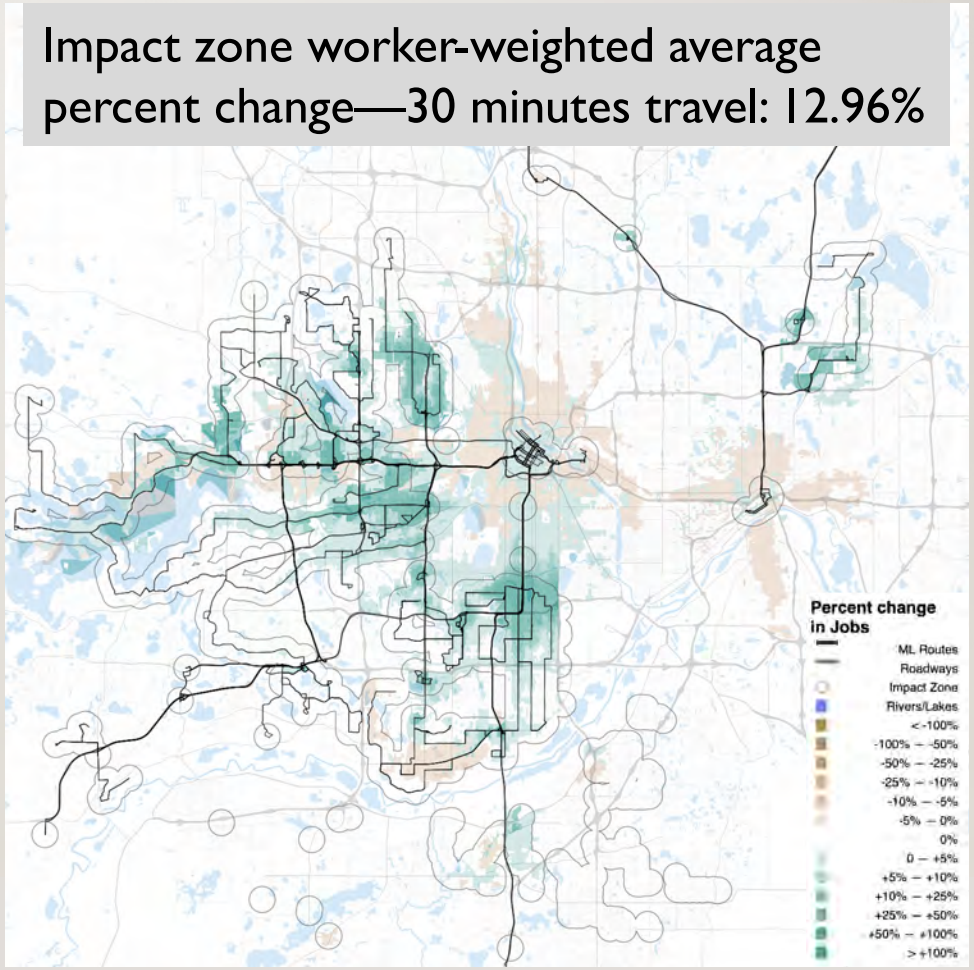
RESEARCH FINDINGS

7 EXPRESS BUS ON EXISTING MANAGED LANE NETWORK

Worker-weighted average percent change—30 minutes travel: 1.44%

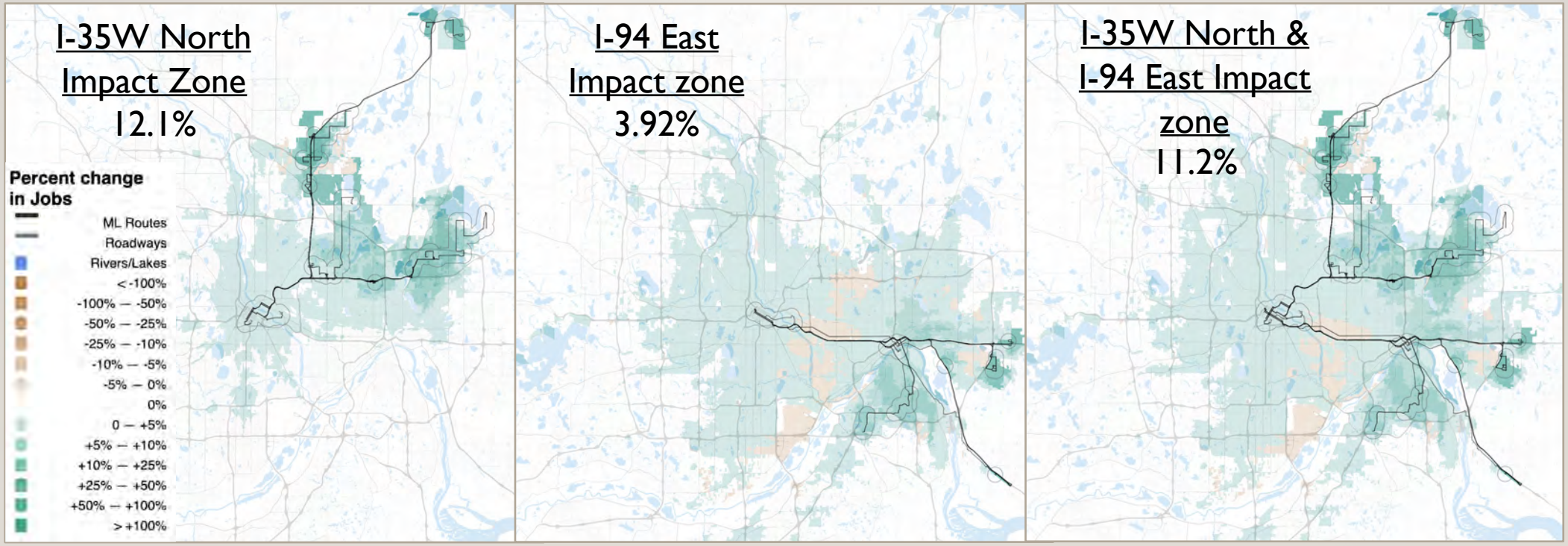


Impact zone worker-weighted average percent change—30 minutes travel: 12.96%



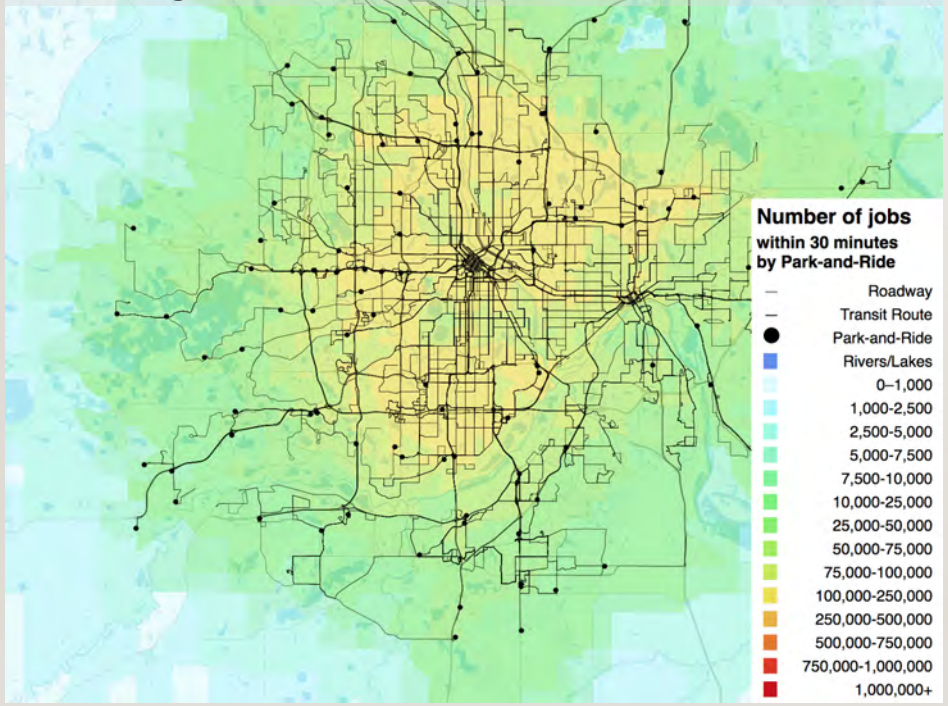
8 EXPRESS BUS ON FUTURE MANAGED LANE NETWORK

Worker-weighted average percent change – 60 minutes

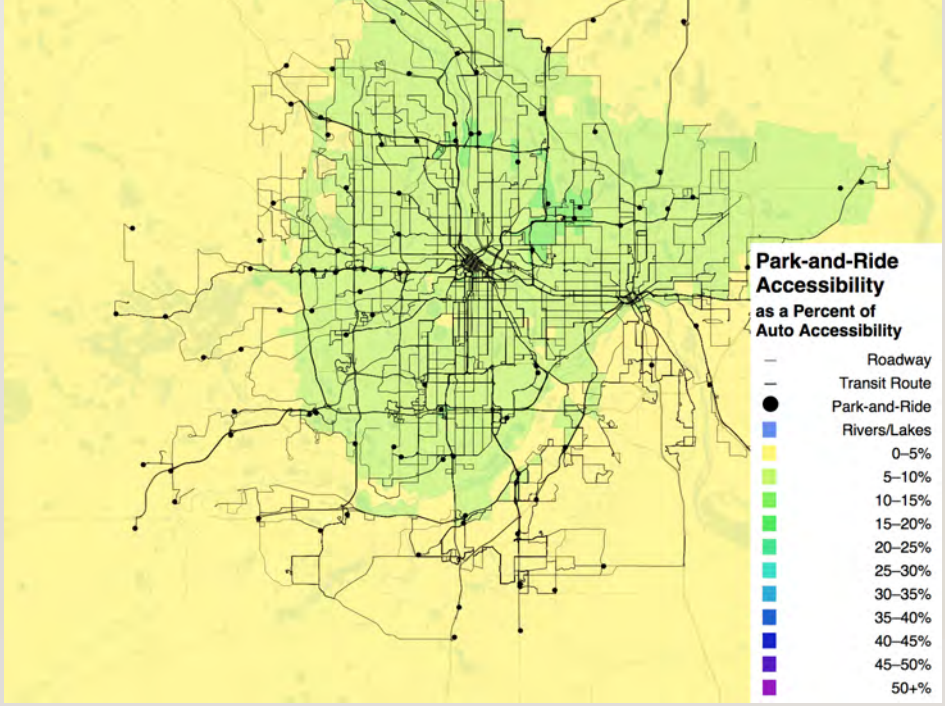


10 PARK-AND-RIDE ACCESSIBILITY RESULTS

- Worker-weighted average access: 51,900 jobs
- 3x the access of walk-up transit for the average commuter.

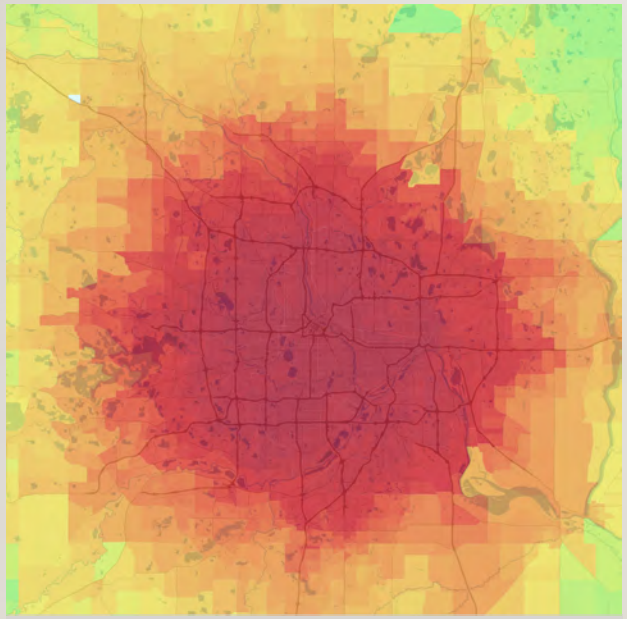


- Worker-weighted PNR accessibility as a percent of auto accessibility – 30 minutes travel: 4.47%

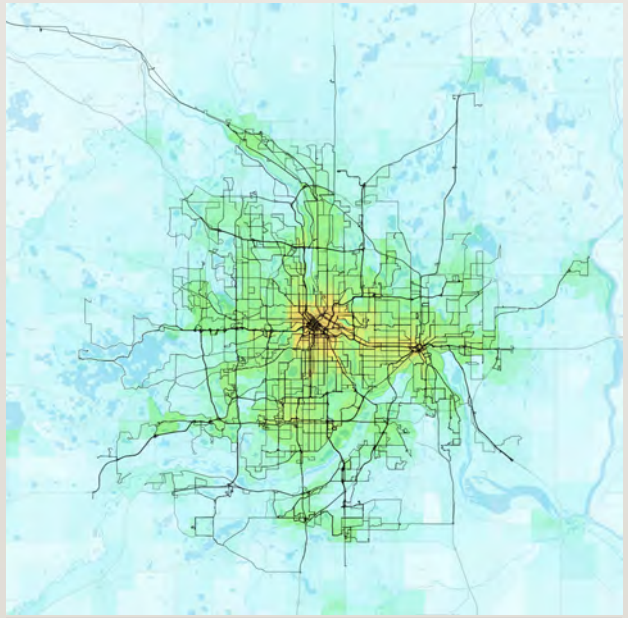


CONCLUSIONS FROM TIME-BASED ACCESSIBILITY ANALYSES

- The Park-and-Ride accessibility profile is a blend of auto and transit profiles. See 30 minute examples below.

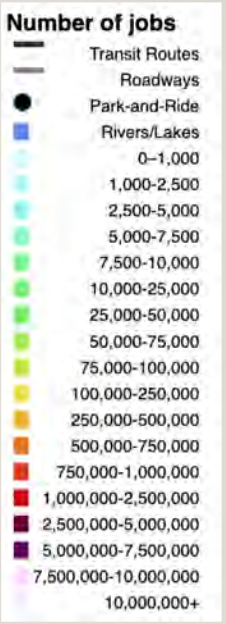


Auto



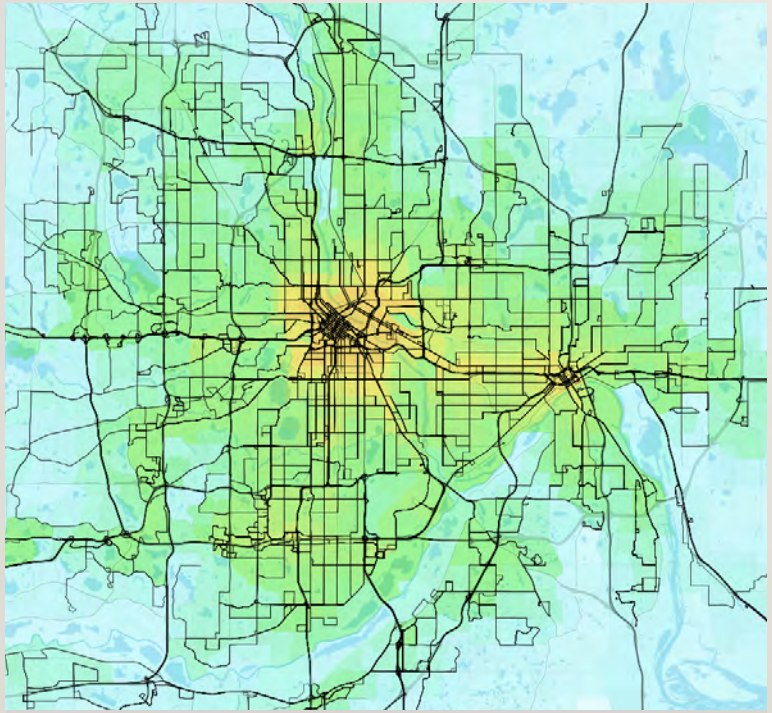
Transit

Park-and-Ride

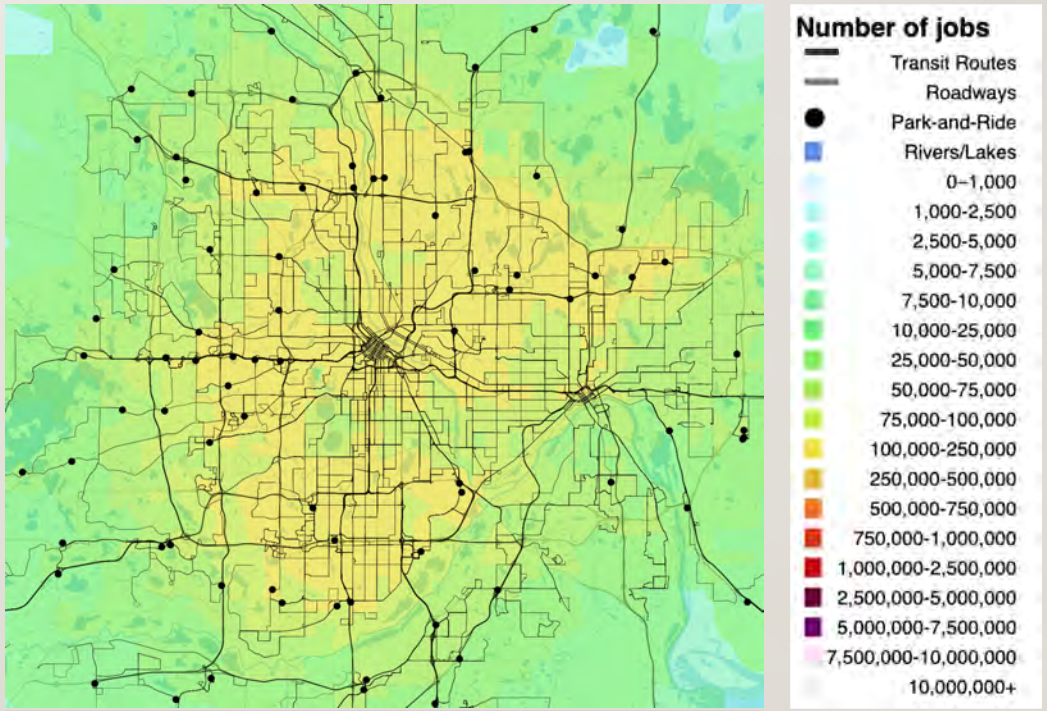


CONCLUSIONS FROM TIME-BASED ACCESSIBILITY ANALYSES

- Suburbs near dense park-and-ride zones have greater job accessibility by park-and-ride mode compared to transit.



Transit



Park-and-Ride

CONCLUSIONS FROM TIME-BASED ACCESSIBILITY ANALYSES

- Park-and-ride is more competitive than transit at every travel time threshold due to increased suburban and exurban access to transit.
  - Access to a vehicle improves access to transit.

	15min	30min	45min	60min	75min	90min
Transit	0.58%	1.15%	3.65%	7.76%	8.06%	7.98%
Park-and-ride	0.71%	4.47%	16.15%	26.01%	30.67%	32.78%

Table 1. Transit and park-and-ride accessibility as a percent of automobile accessibility.

COMPREHENSIVE ACCESSIBILITY IMPACTS OF BUS-HIGHWAY FACILITIES

COMBINED ML AND PNR SCENARIOS

- Scenario shows how bus-highway facilities impact the transit accessibility profile as a whole

	10min	20min	30min	40min	50min	60min	Time-weighted Avg
Walk-up Transit	469	3,856	15,868	42,628	84,894	140,086	5,123
Walk-up Transit + ML	469	3,873	16,297	44,431	88,504	146,220	5,305
PNR	162	6,581	51,902	180,053	340,666	459,408	17,948
PNR + ML	196	7,609	57,987	197,553	359,499	473,474	19,277

Table 1. Worker weighted average job accessibility for bus-highway facilities during the morning peak hours 6 – 9 AM.

Example interpretation

The average worker can reach 57,987 jobs in 30 minutes of travel by park-and-ride and use of managed lanes.

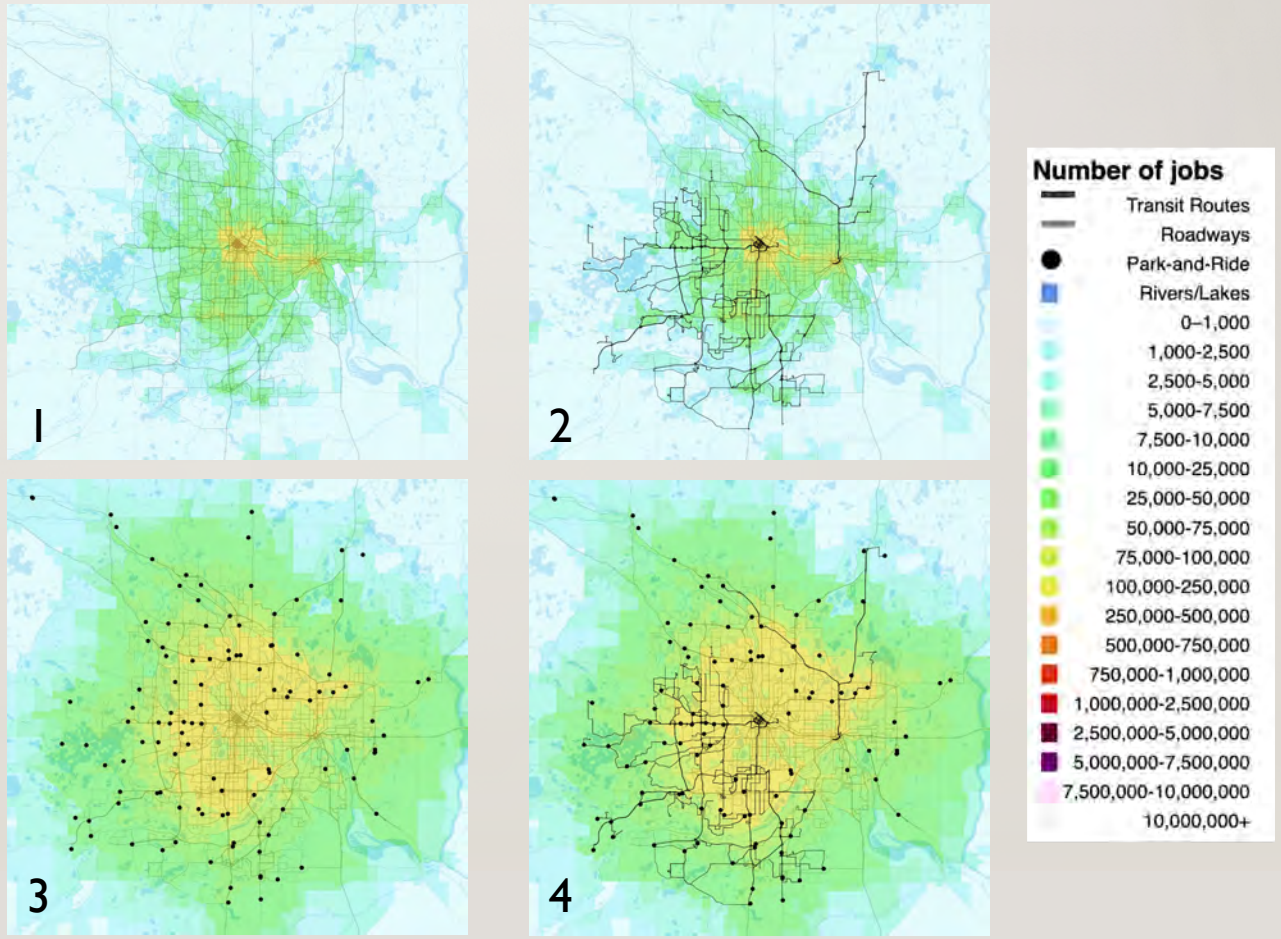
ACCESSIBILITY AT 30 MINUTES TRAVEL TIME

1. Baseline walk-up transit

2. Walk-up transit + managed lanes

3. Park-and-ride

4. Park-and-ride + managed lanes



MEASURING ACCESSIBILITY COMPETITIVENESS

Competitiveness ratio =

$$\frac{Mode\ X\ Accessibility}{Auto\ Accessibility}$$

	10min	20min	30min	40min	50min	60min
Walk-up Transit	0.58%	0.62%	1.15%	2.59%	4.87%	7.76%
Walk-up Transit + ML	0.58%	0.62%	1.18%	2.70%	5.08%	8.10%
PNR	0.28%	1.38%	4.47%	11.69%	20.19%	26.01%
PNR + ML	0.33%	1.54%	4.97%	12.84%	21.35%	26.85%

Figure 2. The minimum worker weighted average job accessibility of bus-highway facilities as a percent of automobile accessibility during the morning peak hours of 6 – 9 AM.

Example interpretation

The average worker traveling by walk-up transit can reach 1.15% of the jobs that automobile can reach in 30 minutes.

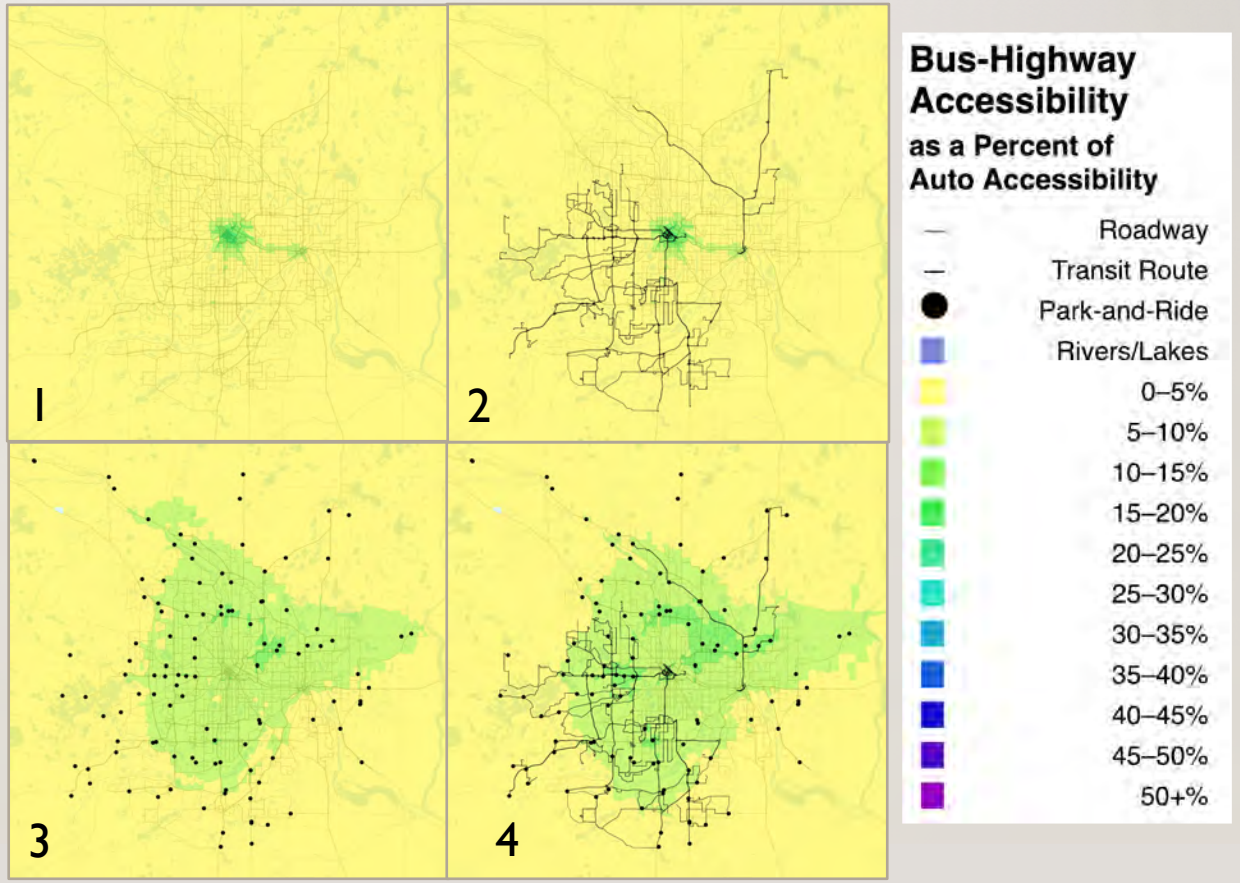
ACCESSIBILITY COMPETITIVENESS RATIO AT 30 MINUTES OF TRAVEL TIME

1. Baseline walk-up transit

2. Walk-up transit + managed lanes

3. Park-and-ride

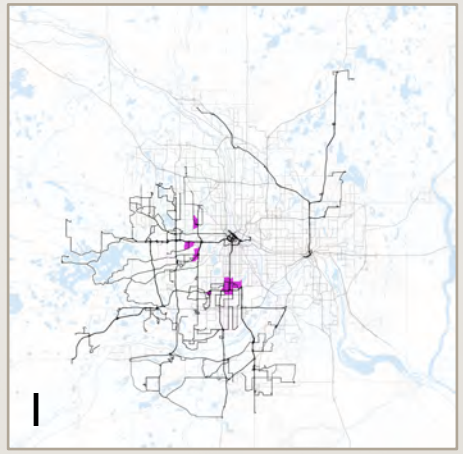
4. Park-and-ride + managed lanes

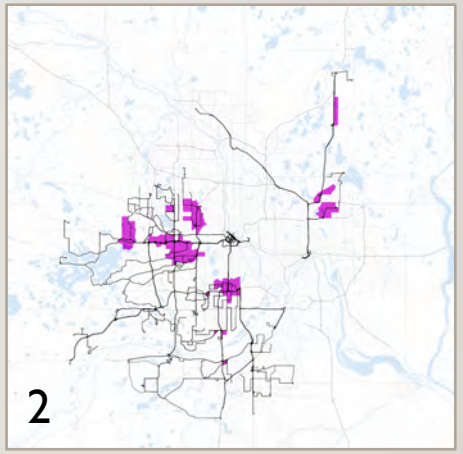


MANAGED LANE IMPACT ZONES

Impacts of MLs on walk-up transit accessibility – 30 minutes

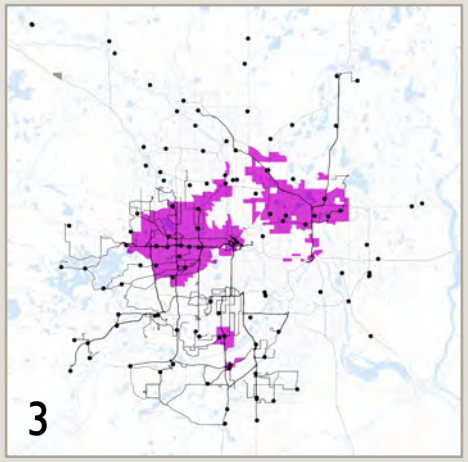
1. Zones that gained at least 15,000 jobs
2. Zones that increased accessibility by 25%

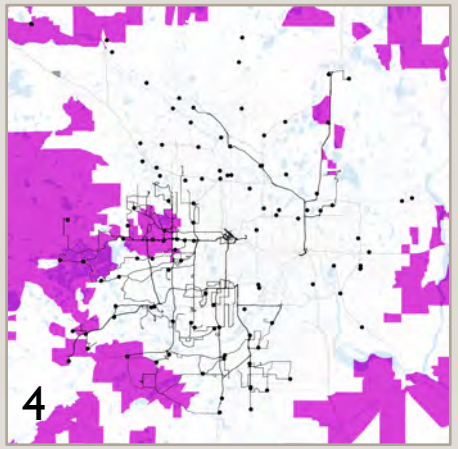




Impacts of MLs on park-and-ride accessibility – 30 minutes

3. Zones that gained at least 15,000 jobs
4. Zones that increased accessibility by 25%





TAKEAWAYS

TAKEAWAYS

- Managed lane use by transit vehicles improves accessibility for those living within a half-mile of a transit stop.
- The regional park-and-ride system improves transit accessibility for those with access to a vehicle.
- Park-and-ride clusters that are easily accessed from the freeway and give riders multiple transit route options have greater transit accessibility compared to surrounding areas.
- Park-and-ride facilities make public transit more competitive with automobile commuting in the suburbs when considering access to jobs.
- The park-and-ride accessibility profile is a blend of automobile and transit accessibility patterns across the Twin Cities metropolitan region.
- Coupling park-and-rides with express bus on managed lanes offers a substantial accessibility improvement for Twin Cities workers compared with walk-up transit alone.
- Monetary accessibility reveals areas where transit is more more competitive with auto when money and time are considered independently and together.

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