

# Memorandum

TO: Chicago RTA Strategic Plan team

FROM: Cambridge Systematics project team

DATE: December 1, 2022

RE: Chicago Regional Transit System Sketch Economic Impact Analysis

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This memorandum contains documentation of the sketch-level estimate of the economic value that the transit systems in the Regional Transportation Authority region provides to the Chicago region that Cambridge Systematics (CS) provided to RTA as part of the Strategic Plan process in 2022.

## ***Literature Review***

To produce the economic impact analysis, the CS project team reviewed a wide array of literature on the impacts and benefits of public transit. This research enabled the project team to identify the range of benefit types and to establish benchmark values for estimating the benefits of transit systems in the RTA region.

The CS project team used the industry scan from research organizations to offer a regional or national overview of the transit sector and relied on agency-developed reports estimating service impact within the localized service area to assist quantifying potential benefits. This breadth of research allowed the team to augment Federal guidance on benefit-cost analysis with more specialized estimates of transit benefits, such as the healthcare cost savings that come from providing reliable public transit to people with chronic health conditions or the reduce roadway maintenance costs that come from shifting travelers from Single-Occupancy Vehicles (SOVs) to public transit.

Table 1 provides an overview of the different reports incorporated into the literature review for the economic impact analysis. All titles are hyperlinked to their source.

Table 1: List of Reviewed Reports

Level		Agency / Institution	Title	Year
<b>Agency-Level Reports</b>		WMATA	<a href="#">Making the Case for Transit: WMATA Regional Benefits of Transit</a>	2011
		New Jersey DOT	<a href="#">Benefits of Transit: Making the Case that NJ TRANSIT Brings Real Value to New Jersey's Citizens</a>	2018
		LA Metro	<a href="#">Understanding How Women Travel</a>	2019
<b>State-Level Reports</b>		California DOT (Caltrans)	<a href="#">The California Life-Cycle Benefit/Cost Analysis Model (Cal-B/C)</a>	2017
<b>National Reports</b>	Agency/Region-Targeted Reviews	Urban Institute	<a href="#">Access to Opportunity through Equitable Transportation: Lessons from Four Metropolitan Regions</a>	2020
		Journal of Comparative Urban Law and Policy	<a href="#">Inequities of Transit Access: The Case of Atlanta, GA</a>	2020
		EBP	<a href="#">Access to Opportunity and Pandemic Trends – Transit in the Atlanta Region</a>	2021
		Health Services Research	<a href="#">The Effect of a Public Transportation Expansion on No-Show Appointments</a>	2021
	State-Level Reviews	Medical Transportation Access Coalition	<a href="#">Non-Emergency Medical Transportation: Findings from a Return on Investment Study</a>	2018
	Industry Perspectives	TCRP	<a href="#">Report 20: Measuring and Valuing Transit Benefits and Disbenefits</a>	1996
		NCHRP	<a href="#">Selected Indirect Benefits of State Investment in Public Transportation</a>	2015
		APTA	<a href="#">Supporting Late-Shift Workers: Their Transportation Needs and the Economy</a>	2019
		APTA	<a href="#">Economic Impact of Public Transportation Investment</a>	2020
		TCRP	<a href="#">Report 226: An Update on Public Transportation's Impacts on Greenhouse Gas Emissions</a>	2021
		VTPI	<a href="#">Evaluating Public Transit Benefits and Costs: Best Practices Guidebook</a>	2022
	Federal Guidance	USDOT	<a href="#">Benefit-Cost Analysis Guidance for Discretionary Grant Programs</a>	2022

## **Quantitative Analysis of Economic Value of Transit Systems in the RTA Region**

### **RTA Transit System Value Estimation Methodology**

The RTA Sketch-Level Economic Impact Model provides **high-level, short-term, order-of-magnitude estimates** of the economic impacts of transit systems in the RTA region funding changes on the economy of the Chicago area. This model was adapted to estimate the overall value of regional transit services.

As a caveat, the estimated value of transit systems in the RTA region is based on broad assumptions and impacts available from the literature. While these are adequate for general discussion, it is recommended that a more detailed analysis to be conducted, potentially using ridership surveys to understand how, when, and for what purpose riders travel<sup>1</sup> and more sophisticated economic impact modeling tools such as [IMPLAN](#) or [REMI](#) impact models. This notwithstanding, the sketch model demonstrates that transit systems in the RTA region provide significant benefits to the Chicago metropolitan region.

The sketch model uses relevant data from the Chicago-area transit agencies such as transit ridership, passenger miles of travel and travel times, vehicle revenue miles, vehicle revenue hours, average transit fares by transit mode, as well as information from a literature review. The model converts changes in direct transit spending on capital and operations into expected changes in travel mode between transit and passenger vehicles. These changes result in an estimation of changes to the region's economy, and monetized estimates of the impact of mode shift across a range of categories, including environmental and social impacts. The value of the RTA region's transit systems is analyzed through six categories:

1. **Enterprise Benefits.** The enterprise spending of the RTA region's transit systems reverberates through the region's economy each year. These transit systems employ residents and purchase goods and services. Through this direct payroll, nonpayroll, and capital spending rippling through the region's economy, transit systems in the RTA region generate significant economic activity by creating jobs and spurring purchases of goods as well as services.
2. **Roadway and Transit User Benefits.** The RTA region's transit systems reduce trips on roadways throughout its service area because transit services are present as an alternative option. Riders who choose to use transit instead of auto and other motorized modes reduce congestion and lead to reduced travel times and costs for roadway users.

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<sup>1</sup> Understanding rider travel purpose and time can refine the share of riders who travel during peak-period times, when congestion would be higher and travel cost savings would be greater, and can clarify trip purposes, which would refine the estimates of social benefits for work travel, healthcare travel, and education travel.

3. **Net Traffic Crash Cost Benefits.** The use of transit instead of auto and other motorized modes reduces the number of vehicles on roadways throughout the RTA service area, and lowers the risk of vehicle collisions and incidents.
4. **Environmental Sustainability Benefits.** The quantity of vehicular emissions entering the atmosphere is tied to the amount and type of fuel consumed by every vehicle in the transportation sector. Though some transit vehicles are currently less fuel efficient than automobiles on a per-mile basis, transit modes as a whole have consumed less fuel and have emitted less pollutants than personal vehicles because transit vehicles displace a larger number of automobiles due to their higher passenger capacity. The smaller number of transit vehicles needed to carry a comparable number of passengers reduces total emissions. This analysis determined the benefits of transit service in the RTA region reducing vehicle emissions.
5. **Affordable Mobility Benefits.** The affordable mobility benefits from transit service in the RTA region promote better health outcomes and educational opportunities resulting from more reliable access to education and health care through transit.
6. **State of Good Repair (SOGR) of the Roadway Infrastructure.** Since transit services reduce roadway trips, the annual cost of maintaining the road network in a state of good repair is reduced. While a transit vehicle is larger and heavier than an automobile and therefore causes greater wear-and-tear on a per-mile basis, transit vehicles displace a larger number of automobiles due to their higher passenger capacity. The smaller number of transit vehicles needed to carry a comparable number of passengers reduced total wear and tear on roadway infrastructure. Additionally, rail transit users generate zero costs to roadway maintenance, further reducing the roadway impacts compared to automobiles.

The first two categories examine regional economic impacts from transit system expenditures and from direct travel costs avoided by households (riders). These are used as inputs to calculate the regional economic impacts, which are explained in more detail in the following sections.

Categories 3 through 6 represent broader direct impacts to the region associated with a lack of transit services. These are broad-based direct impacts, not associated with particular economic sectors, but rather affect the whole region.

The CS project team identified a set of benefit types, metrics, and Unit Costs for Categories 2 through 6 to incorporate into the economic impact analysis sketch model. Category 1 benefits are based on capital and operating expenditures from the RTA transit service agencies as well as sector-specific economic multiplier values taken from the U.S. Bureau of Economic Analysis's Regional Input-Output Modeling System (RIMS II).

These figures are presented in Table 2 below. All Unit Cost values were adjusted for inflation to conduct the analysis in 2022 dollars. The Inflation-Adjusted Value column reflects the final values incorporated into the model. If Unit Costs were based in 2022 dollars, the Inflation-Adjusted Value is listed as “N/A.”

Table 2: Economic Impact Analysis Model Benefits

Benefit Category	Benefit Type	Unit Cost	Metric	Year of Estimate	Inflation-Adjusted Value	Source
<b>Roadway and Transit User Benefits</b>	Reduced vehicle operating costs	\$0.45	Passenger Mile Traveled	2020	\$0.51	USDOT 2020
	Reduced parking costs	\$30.00	Transit trip	2022	N/A	Metra
<b>Net Traffic Crash Cost Benefits</b>	Avoided Incapacitating Injury	\$554,800	Incident	2022	N/A	USDOT 2022
	Avoided Non-Incapacitating Injury	\$151,100	Incident	2022	N/A	USDOT 2022
	Avoided Fatality	\$11,600,000	Incident	2022	N/A	USDOT 2022
<b>Environmental Sustainability Benefits</b>	CO Emissions Reduction	\$170.00	Metric ton	2017	N/A	Caltrans 2017
	CO2 Emissions Reduction	\$53.00	Metric ton	2022	N/A	USDOT 2022
	NOx Emissions Reduction	\$15,800	Metric ton	2022	N/A	USDOT 2022
	PM10 Emissions Reduction	\$566,800	Metric ton	2017	N/A	Caltrans 2017
	SOx Emissions Reduction	\$42,300	Metric ton	2022	N/A	USDOT 2022
	VOC Emissions Reduction	\$4,300	Metric ton	2017	N/A	Caltrans 2017
	PM2.5 Emissions Reduction	\$761,600	Metric ton	2022	N/A	USDOT 2022
<b>Affordable Mobility Benefits</b>	Public assistance savings - min	\$1.55	Transit trip	2003	\$2.500	NCHRP 2015

Benefit Category	Benefit Type	Unit Cost	Metric	Year of Estimate	Inflation-Adjusted Value	Source
	Public assistance savings - max	\$5.71	Transit trip	2008	\$7.732	NCHRP 2015
	Healthcare cost reductions - min	\$5.66	Transit trip	2003	\$9.130	NCHRP 2015
	Healthcare cost reductions - max	\$11.08	Transit trip	2008	\$15.005	NCHRP 2015
	Education-related trip benefits - min	\$4.03	Transit trip	2003	\$6.500	NCHRP 2015
	Education-related trip benefits - max	\$5.85	Transit trip	2008	\$7.922	NCHRP 2015
State of Good Repair of the Roadway Infrastructure	Reduced roadway maintenance costs (Min)	\$0.01	Passenger-miles traveled (bus, assuming 10 travelers per vehicle)	2001	\$0.017	VTPI 2022
	Reduced roadway maintenance costs (Max)	\$0.09	Passenger-miles traveled (bus, assuming 10 travelers per vehicle)	2001	\$0.150	VTPI 2022

All estimated benefits presented in this memo represent annual values derived from the transit systems' annual expenditures. However, these impacts may not scale in a linear manner when aggregated over multiple years, since people would likely change their travel behaviors and economic conditions would shift in the long-term.

### Results of Direct Enterprise Impacts

The direct impacts of transit service in the RTA region include the expenditure of **\$3.4 billion** in operating expenses and **\$1.1 billion** in capital investments annually (2022).

### Results of Direct Roadway and Transit User Benefits Analysis

These benefits are those directly felt by roadway and transit users. They include the foregone expenses of using transit rather than automobiles (operating costs and parking) less transit fares.

The benefits also include the foregone costs of congestion that would be experienced by all travelers in the absence of transit service in the RTA region. These direct benefits are estimated at **\$1.0 billion**. The direct Roadway and Transit User impacts are calculated using operational statistics available in the National Transit Database annual reports for the transit systems in the RTA region<sup>2</sup> to develop expected shifts in passenger miles traveled to automotive vehicle miles traveled in the absence of all transit services in the RTA service region. Using secondary sources for vehicular emissions such as the Caltrans Cal-BC model,<sup>3</sup> vehicle occupancy rates and travel costing,<sup>4</sup> the net cost of passenger shifts to automobile travel are calculated. The benefit of RTA services is avoiding these additional travel costs by using regional transit services.

## Results of Total Economic Impacts Analysis

The total regional impacts associated with the RTA services are estimated using the Regional Input-Output Modeling System (RIMS II) multipliers for the six-county RTA region obtained from the U.S. Bureau of Economic Analysis (BEA). The RIMS II multipliers provide a measure of the effects of local demand shocks on total gross output, value added, earnings, and employment. RIMS II multipliers are developed by the BEA as a tool to help economists analyze the potential impacts of economic activities on regional economies. They are now used by investors, planners, and elected officials to objectively assess potential economic impacts of various projects within a single region.

The RIMS II multipliers are used to estimate the total (combined direct, indirect, and induced) economic impacts of transit service in the RTA region in terms of jobs, labor income, value added (Gross Domestic Product or GDP), and tax revenues generated. The job impacts were the final demand impacts of transit expenditures. They represent the transit workers; workers for companies that provide materials, products, and services to transit; companies that supply those companies; household expenditure of wages from all those workers creating jobs based on meeting those purchases. These total approximately 28+/- jobs per \$1 million in transit expenditures. The changes in transit expenditures and any impacts changes in transit service may have on household spending ripple through the economy, and through “multiplier effects” create impacts to the region’s economy several times the original transit expenditure amount.

The impacts of transit systems in the RTA region on the Chicago region include:

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<sup>2</sup><https://www.transit.dot.gov/ntd/transit-agency-profiles/chicago-transit-authority>;  
<https://www.transit.dot.gov/ntd/transit-agency-profiles/pace-suburban-bus-division>;  
<https://www.transit.dot.gov/ntd/transit-agency-profiles/northeast-illinois-regional-commuter-railroad-corporation>

<sup>3</sup> Caltrans Transportation Economics Branch. <https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/data-analytics-services/transportation-economics>

<sup>4</sup> U.S. DOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs, March 2022. <https://www.transportation.gov/sites/dot.gov/files/2022-03/Benefit%20Cost%20Analysis%20Guidance%202022%20%28Revised%29.pdf>

- **Jobs** – The RTA supports **126,000 jobs** out of 3.86 million in the six-county RTA service region, representing 3.3% of total employment
- **Wages** – These jobs are worth **\$3.5 billion**
- **GDP** – Transit service in the RTA region increases the economy of the Chicago region by **\$5.6 billion**
- **Taxes** – The increased economic activity generates nearly **\$1.3 billion** in state and federal taxes.

### Results of State of Good Repair of the Roadway Infrastructure, Net Traffic Crash Cost, Environmental Sustainability, and Affordable Mobility Impacts Analysis

The RTA region’s transit services also provide **potential** benefits to the Chicago region in terms of reducing vehicular miles travel (**VMT**) and resulting emissions as well as lowering crash and roadway maintenance costs. Transit service in the RTA region also improves access to jobs and health and educational opportunities. In total, the broader societal benefits of transit systems in the RTA region in 2022 total **\$8.1 billion**. To summarize, transit systems in the RTA region in 2022 are estimated to:

- Reduce automobile vehicle miles traveled by **1.7 billion vehicle miles**
- Reduce crash-related deaths by **18** and injuries by **1,500**, saving **\$490 million in costs**
- Reduce greenhouse gas emissions by **375,000 tons** valued at **\$20 million**
- Reduce roadway maintenance costs by **\$162 million**
- Lower potential health care costs by **\$3.7 billion**
- Increase the value of educational opportunities are **\$2.2 billion**
- Reduce potential public assistance costs by **\$1.6 billion**

The first four bullets are derived from the shift of passengers from transit services to automobiles. Using transit vehicle and automobile occupancy rates from the RTA Annual Agency Reports and U.S. Department of Transportation (USDOT) benefit-cost guidance<sup>5</sup>, the passenger miles of transit are shifted to “new” automobile vehicle miles traveled (VMT) on the region’s roadways. These are used to calculate potential new automobile crashes based on published per-mile crash rates<sup>6</sup> providing estimates of increased crashes, fatalities, and injuries in the absence of transit service in the RTA region. Providing transit service in the RTA region helps avoid these crashes and consequences which benefits the region and all travelers. The value of these avoided crashes determined by using crash valuations provided by the USDOT.

<sup>5</sup> NTD Annual Transit Agency Profiles. <https://www.transit.dot.gov/ntd/transit-agency-profiles>

<sup>6</sup> IDOT Illinois Roadway Crash Data. <https://idot.illinois.gov/transportation-system/safety/Illinois-Roadway-Crash-Data>. State-level data provides a more conservative analysis of benefits since crash rates are higher in the more congested Chicago region.



The reduction in greenhouse gas emissions (GHG) associated with RTA services is based on the VMT shift from transit to automobile in the absence of transit service in the RTA region, assuming average automobile occupancy of 1.15 persons per vehicle. The emissions values by vehicle type from the Caltrans Cal-B/C model is used to determine the increase in GHG gas emissions the increased automobile travel would create. The societal cost of such emissions is calculated using Caltrans and USDOT valuations for GHG emissions.

The added automobile traffic on the region's roadways without transit service in the RTA region would have a detrimental effect on the State of Good Repair (SOGR) of roads. This has a cost to society and avoiding such a cost by providing transit services is a benefit of the transit systems. The increased cost of roadway maintenance from added automobile VMT in an absence of transit services are valued using cost reduction values for Bus and rail travel versus automobile from Victoria Transport Policy Institute, *Evaluating Public Transit Benefits and Costs*, July 2022 (Revised), adjusted for inflation using the consumer price index (CPI).<sup>7</sup>

The societal employment (reduced public assistance costs), health, and education benefits of the transit services in the RTA region are based on review of existing literature which provides guidance for evaluating the indirect benefits of transit investment. Improved transit access is hypothesized to lead directly to reduced unemployment (through access to jobs), as well as to increased educational opportunities, which can also reduce unemployment and produce higher incomes in the long run. Reduced unemployment can lead to lower costs for public assistance programs. In addition, improved access to health care provided by transit can reduce public and private sector costs for health care services, particularly for people with chronic health conditions requiring regular care = to prevent more severe health emergencies.

The literature provides generalized ranges of benefits across many transit scenarios (geographic layouts, populations, and demographics served; or types of transit services (fixed route, on-demand, bus/rail, etc.). Based on the literature, ranges of values are consolidated into generalized benefit values per trip and used to monetize the travel impacts of transit systems in the RTA region. A key assumption of this analysis is regional transit's impact on employment and educational opportunities as well as access to health care, applies equally to all transit riders. In other words, without transit service in the RTA region, these opportunities would be unavailable to all.

## Value of Transit Service in the RTA Region

The potential value of transit service in the RTA region in 2022 is estimated to be \$17.2 billion, consisting of transit-stimulated wages and GDP (\$9.1 billion) plus the broader societal impacts

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<sup>7</sup> Victoria Transport Policy Institute. *Evaluating Public Transit Benefits and Costs*. <https://www.vtppi.org/tranben.pdf>. Although the VTPI document has been updated in 2022, the values used to estimate reduced maintenance costs are based on 2001 analyses.

(\$8.1 billion). **Transit systems in the RTA region return \$3.86 in value to the Chicago region** for every dollar spent on operations and capital investments. At the household level, by promoting mobility and reducing travel costs, **regional transit service** benefits a typical household by \$3,800 per year.

It is again emphasized that these results come from a sketch-level economic model, and should be considered **high-level, short-term, order-of-magnitude estimates** of the economic impacts that transit provides to the Chicago region.