Mass Transit Sustainability in the Saint Louis Region

Final Report
October 2015

Sponsored by
Midwest Transportation Center
U.S. Department of Transportation
Office of the Assistant Secretary for
Research and Technology

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.

4. Title and Subtitle	5. Report Date
Mass Transit Sustainability in the Saint Louis Region	October 2015
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Ray A. Mundy, Ph.D.; Daniel L. Rust, Ph.D.; Sareema Koirala Phillips, Sidra Nasser, María Gabriela Rodríguez Páez, and Elizabeth Snowden	

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Center for Transportation Studies University of Missouri – St. Louis 240 JCPN, One University Boulevard St. Louis, MO 63121-4400	**11. Contract or Grant No.** DTRT13-G-UTC37

12. Sponsoring Organization Name and Address		13. Type of Report and Period Covered
Midwest Transportation Center 2711 S. Loop Drive, Suite 4700 Ames, IA 50010-8664	U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology 1200 New Jersey Avenue, SE Washington, DC 20590	Final Report **14. Sponsoring Agency Code**

15. Supplementary Notes

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16. Abstract

It has been often suggested that the definition of insanity is doing the same thing and expecting a different outcome. Unfortunately a dispassionate evaluation of the current state of public transit in the United States would easily fit this definition. Public transportation funding continues to require federal, state, and local tax reserves in an attempt to address the needs and adapt to the trends of growing urban communities and support sustainable mass transit solutions. Fifty years of increased funding for domestic mass transit infrastructure and services has been met with overall ridership decline (as a percentage of urban population). Caught between looming deficits and a failure to attract consumers is a mangled web of inefficient operations, financially unsustainable funding commitments, and an inability to adequately modernize transit systems. Despite good intentions, investments are now contributing to an unsustainable trend.

Successful and scalable examples of ways to improve sustainability are already in place around the globe and are promoting an era of shared responsibility for mass transit between public and private sectors. Latin America, being the earliest adopter of modern and sustainable mass transit systems, operations, and infrastructure, has seen great economic and consumer success. Now other regions—China, India, South Africa, North America, and Eastern Europe—are committing to innovative and rewarding approaches to leveraging and restructuring mass transit systems.

Although still a work in progress for some cities, the partnering between government infrastructure and private investors supports a future of flexibility, accountability, and profitability for mass transit in areas with growing urban populations and is a viable solution for the transportation challenges and environmental concerns associated with large populations. This report explores alternatives implemented in various countries and the factors that contributed to their successes and failures. Most successes tend to result from the collaboration itself and lead to each sector's common triumph: government stability through a reduced dependency on public subsidies and increased private innovation.

These innovative solutions for improving mass transit are sustainable and scalable and require no additional government funding or subsidies. They may be the only viable options available for creating sustainable mass transit systems.

17. Key Words	18. Distribution Statement
mass transit innovation—program sustainability—public-private partnership—public transportation—union pensions	No restrictions.

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified.	Unclassified.	63	NA

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

MASS TRANSIT SUSTAINABILITY IN THE ST. LOUIS REGION

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The Midwest Transportation Center and
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Office of the Assistant Secretary for Research and Technology

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ACKNOWLEDGMENTS

The author would like to thank the Midwest Transportation Center and the U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology for sponsoring this research.

EXECUTIVE SUMMARY

Public transportation funding continues to require federal, state, and local tax reserves in an attempt to address the needs and adapt to the trends of growing urban communities and support sustainable mass transit solutions. Fifty years of increased funding for domestic mass transit infrastructure and services has been met with overall ridership decline (as a percentage of urban population). Caught between looming deficits and a failure to attract consumers is a mangled web of inefficient operations, financially unsustainable funding commitments, and an inability to adequately modernize transit systems. Despite good intentions, investments are now contributing to an unsustainable trend.

Successful and scalable examples of ways to improve sustainability are already in place around the globe and are promoting an era of shared responsibility for mass transit between public and private sectors. Latin America, being the earliest adopter of modern and sustainable mass transit systems, operations, and infrastructure, has seen great economic and consumer success. Now other regions—China, India, South Africa, North America, and Eastern Europe—are committing to innovative and rewarding approaches to leveraging and restructuring mass transit systems.

Although still a work in progress for some cities, the partnering between government infrastructure and private investors supports a future of flexibility, accountability, and profitability for mass transit in areas with growing urban populations and is a viable solution for the transportation challenges and environmental concerns associated with large populations. This report explores alternatives implemented in various countries and the factors that contributed to their successes and failures. Most successes tend to result from the collaboration itself and lead to each sector's common triumph: government stability through a reduced dependency on public subsidies and increased private innovation.

These innovative solutions for improving mass transit are sustainable and scalable and require no additional government funding or subsidies. They may be the only viable options available for creating sustainable mass transit systems.

PURPOSE/PROBLEM STATEMENT

The purpose of this project was to examine the financial sustainability issues faced by most transit systems in two cities as a way to explore sustainable mass transit service and financial structure. It is not implied that public transit should be demolished or abandoned, but rather that public transportation is a necessary addition to, and is supportive of, growing communities. The ultimate goal is to implement sustainable mass transit options without further burdening federal, state, or local government taxpayer funds. Public transit is essential for societal mobility, especially to low-income citizens who cannot afford the luxury of personal automobiles or multiple vehicles per family.

HISTORY OF MASS TRANSIT SYSTEMS

At the start of the 1950s, the majority of the nation's transit systems were privately owned and operated. However, due to increasing operational costs and fare limitations imposed on these transit systems, they were on the brink of fiscal and physical collapse (Currier 2010). The largest challenge faced by the privately owned transit systems in that era was that they were considered public utilities and could not change routes, increase fares, or innovate without permission from the local or state governments (O'Toole 2010). The government was slow to respond to the needs of mass transit during this period because of the arrival and increased use of automobiles. Automobiles proved to be direct competitors to mass transit in attracting local, state, and federal transportation resources; all levels of government devoted their transportation resources to the construction and improvement of highways. Then, the Urban Mass Transit Act of 1964 delivered much needed help to revitalize and expand urban mass transit systems. According to Currier (2010), the Urban Mass Transit Act authorized $375 million in capital assistance to be provided over three years. With the passage of this Urban Mass Transit Act, public agencies acquired private transit companies to ensure the security, maintenance and operation of mass transit. The objective was to stabilize failing private operations with an infusion of public funds and provide for future growth.

Following with a series of acts passed after the Urban Mass Transportation Act of 1964, the federal government continued to expand its role in the nation's mass transit systems with not only capital subsidies but also operating subsidies. For example, two years later, Congress passed the Urban Mass Transit Act of 1966 to fill in gaps and expand the programs established by the Urban Mass Transportation Act of 1964. As per Currier (2010), the Urban Mass Transit Act authorized annual appropriations of $150 million through 1969 for matching grants and loans, enabling states and localities to construct and improve mass transit facilities.

A year later, the passage of the Urban Mass Transportation Assistance Act of 1970 authorized the first long-term commitment of federal funds for mass transportation. Similarly, in 1974, in response to increased maintenance and operational costs faced by the transit agencies, the National Mass Transportation Assistance Act was passed. This act provided federal funds for mass transit operation subsidies for the first time.

According to Currier (2010), the National Mass Transportation Assistance Act authorized $11.8 billion over a six-year period for capital and operating costs. As mentioned above, the initial purpose of funding mass transit systems by the federal government was to rejuvenate these entities and run them as an extension of the government. Some believed that without the involvement of private companies, which had profit motives, mass transit systems would prosper and grow as the government made investments in them. Unfortunately, despite the investment, the mass transit systems have failed to thrive as the federal government and proponents of mass transit funding once expected. Thus, the original purpose of mass transit funding was never achieved.

In 1982, under the administration of President Ronald Reagan, the Office of Management and Budget looked into phasing out and eventually eliminating transit operating subsidies. Despite the Reagan administration's best efforts, its attempts to phase out operating assistance were thwarted by the National Conference of Mayors, the American Public Transit Association, and the transit workers' unions. As a result, the Federal Public Transportation Act of 1982 also included funds for operating assistance. As per Currier (2010), the act authorized $16.5 billion for mass transit through 1986.

The passage of the Federal Transit Act of 1991 authorized $31.5 billion for mass transit over six years. This resulted in the largest funding increase since the federal government first created funding programs for transit in 1964. Similarly, the Federal Transit Act of 1998 increased funding levels by 70%, amounting to $41 billion for transit programs (Currier 2010).

Keeping up with this trend, according to the National Transit Database, federal funding for mass transit increased by 72.5% over an 11 year period (2002–2012) to $10.8 billion. On average, the federal government provides 17.86% of the total capital and operating funding for mass transit (Table 1). Similarly, Table 1 shows that the federal funding for operating activities has increased by 40.1%, and federal funding for capital investment has increased by 32.4% over an 11 year period.

Similarly, state funding and local funding increased by 69% and 38%, respectively, over the same 11 year period (Table 2). The objective of transit stability appears to have been accomplished through these massive public investments in mass transit. However, the objective of expanding traditional transit systems has not. Transit ridership continues to languish as it currently represents approximately 5% of urban trips (Jaffe 2014).

Unfortunately, with increasing costs for operating mass transit and increasing public budget constraints, the financial sustainability of the mass transit system is uncertain. This trend highlights the problem that mass transit can no longer continue to function under the same obsolete principal that it did during the 1960–2010 period—that more financial support equals greater economic improvement. In order to change the trend, transit systems must be adapted and changed to meet the public's current needs.

Table 1. Total federal funding for mass transit, 2002 to 2012

Year	Operating Federal Funding	Capital Federal Funding	Total Federal Funding	Total Funding	Federal/Total
2002	$1,302,197,044	$4,993,714,432	$6,295,911,476	$37,096,627,731	16.97%
2003	$1,596,064,856	$5,091,974,305	$6,688,039,161	$38,764,669,696	17.25%
2004	$2,024,216,157	$4,930,228,302	$6,954,444,459	$39,980,023,555	17.39%
2005	$2,243,146,380	$4,611,752,149	$6,854,898,529	$40,924,317,277	16.75%
2006	$2,523,359,552	$5,552,125,521	$8,075,485,073	$43,493,139,290	18.57%
2007	$2,540,380,736	$5,561,325,828	$8,101,706,564	$47,305,205,161	17.13%
2008	$2,567,667,538	$6,418,647,652	$8,986,315,190	$52,565,656,846	17.10%
2009	$3,086,429,384	$7,096,218,825	$10,182,648,209	$54,289,248,536	18.76%
2010	$3,550,943,662	$6,813,141,491	$10,364,085,153	$54,354,844,811	19.07%
2011	$3,571,278,912	$6,926,281,804	$10,497,560,716	$55,412,791,386	18.94%
2012	$3,343,576,584	$7,515,782,462	$10,859,359,046	$58,466,704,589	18.57%
Percentage Increase as of Total Federal Funding	32.4%	40.1%	72.5%	**Average**	17.86%

Total funding includes funds provided by federal, state, local governments, and other sources
Percentage increase = (2012 – 2001) ÷ 2002 Total Federal Funding

Source: National Transit Database – Operating and Capital Funding: Total Funding Time Series, Operating Funding Time Series, and Capital Funding Time Series (www.ntdprogram.gov/ntdprogram/data.htm)

Table 2. Total funding for mass transit, 2002 to 2012

Year	Federal Funding	State Funding	Local Funding	Others	Total Funding
2002	$6,295,911,476	$7,549,548,335	$12,513,244,859	$10,737,923,061	**$37,096,627,731**
2003	$6,688,039,161	$7,665,491,425	$13,411,099,203	$11,000,039,907	**$38,764,669,696**
2004	$6,954,444,459	$7,792,206,949	$13,659,439,016	$11,573,933,131	**$39,980,023,555**
2005	$6,854,898,529	$8,197,154,962	$14,017,451,539	$11,854,812,247	**$40,924,317,277**
2006	$8,075,485,073	$8,570,681,969	$14,260,822,603	$12,586,149,645	**$43,493,139,290**
2007	$8,101,706,564	$9,455,804,640	$16,825,207,835	$12,922,486,122	**$47,305,205,161**
2008	$8,986,315,190	$11,388,738,326	$18,344,859,645	$13,845,743,685	**$52,565,656,846**
2009	$10,182,648,209	$11,901,631,478	$18,003,940,218	$14,201,028,631	**$54,289,248,536**
2010	$10,364,085,153	$11,788,407,359	$17,917,291,156	$14,285,061,143	**$54,354,844,811**
2011	$10,497,560,716	$11,787,905,172	$16,354,290,316	$16,773,035,182	**$55,412,791,386**
2012	$10,859,359,046	$12,759,101,661	$17,268,905,063	$17,579,338,819	**$58,466,704,589**
10 year increase	72.5%	69.0%	38.0%	63.7%	57.6%
Percentage increase as of Total Funding	12%	14%	13%	18%	57.6%
Local Funding as a percentage of Total Funding for 2012 = 30%					

Calculation of 10 year increase: (2012-2002)/2002
Percentage increase: (2012-2002)/2002 Total Funding
Local funding as a percentage of Total Funding = ($17.579 ÷ $58.466) × 100%)

Source: National Transit Database – Operating and Capital Funding: Total Funding Time Series, Operating Funding Time Series, and Capital Funding Time Series (www.ntdprogram.gov/ntdprogram/data.htm)

LITERATURE REVIEW OF U.S. MASS TRANSIT CHALLENGES

Public transit has been facing financial challenges for decades. These challenges include, but are not limited to, challenges arising from aging infrastructures, declining ridership as a percentage of urban population, labor, financial and operational burdens imposed by strong unions, increases in general operating costs, increased affluence, and use of personal vehicles. The financial challenges faced by public transit are mounting year after year, despite U.S. taxpayers pumping billions in subsidies and infrastructure into mass transit systems. This massive taxpayer investment has paid for urban public transportation systems that fewer and fewer Americans are using. Over the years, mass transit ridership has stagnated at around 5% with population growth taken into account (Jaffe 2014). Mass transit systems' failure to attract and retain transit ridership greatly impacts their financial sustainability, although the public need for urban transit remains high.

The conveniences provided by owning a personal vehicle pose one of the largest challenges for mass transit in attracting users. At times, mass transit simply cannot go where and when a rider would like to go. In addition, because of rising personal incomes, individuals are more likely to prefer the use of personal vehicles as opposed to riding mass transit. As personal incomes in the United States rise, private vehicle ownership and usage continue to grow. Additionally, individuals tend to move further out from the city centers, causing a decrease in urban density that affects the relative use of private transportation and public transit (Ong et al. 2010). Because of this trend of moving away from city centers, building urban transit systems that can compete with the conveniences provided by the automobile is an incredibly expensive and unrealistic option. As per O'Toole (2010), in 2007 Americans spent 9.2% of their personal income on driving and 0.6% on all other forms of passenger transportation. O'Toole (2010) further points out that taking higher energy prices into consideration does not change the percentage of personal income that Americans spend on driving, because urban transit requires about the same amount of energy as driving. Thus, the long-term response to high oil prices is to drive fuel-efficient cars instead of driving less or using mass transit systems. O'Toole (2010) also notes that when gasoline prices doubled in 2008, people reduced their driving by a mere 4%, but if prices had remained high, they would have purchased fuel-efficient cars and returned to prior levels of driving. With the 21st century's advances in transportation technology towards more fuel-efficient cars, the popularity and widespread use of such models as the Toyota Prius and Nissan Leaf reinforce O'Toole's views.

As discussed earlier, federal funding for mass transit has increased by 72%, for operating activities by 32.4%, and for capital investment by 40.1% over an 11 year period (2002 through 2012). The data obtained from the National Transit Database shows that mass transit systems in the United States rely heavily on federal subsidies for both operating and capital expenditures, with more and more funds coming from local tax levies. The analysis of this data shows a trend towards increasing government funding for operating activities over the years. The inability of the transit systems in the United States to recover even a small portion of their operating expenses from the fare box escalates the reliance of the transit systems on public subsidies without providing incentives for transit systems to be self-sufficient. For example, in 2013 the fare box recoveries of variable operating costs for St. Louis MetroBus, MetroLink, and Call-a-Ride were 20.80%, 27.20%, and 4.9%, respectively (Table 3).

Table 3. 2013 fare box recovery – St. Louis Metro

St. Louis Metro	Fare box recovery
MetroBus	20.80%
MetroLink	27.20%
Call-a-Ride	4.90%

Source: Bi-State Development Agency of the Missouri-Illinois Metropolitan District Comprehensive Annual Financial Report (CAFR) Fiscal Years Ended June 30, 2013 and 2012

Similarly, in 2012, the fare box recoveries for Chicago Transit Authority (CTA), Pace (suburban bus), and Metra (commuter rail) were 42.90%, 13.30%, and 47.50%, respectively (Table 4).

Table 4. 2012 fare box recovery – Chicago RTA

Chicago RTA	Fare box recovery
Chicago Transit Authority	42.90%
PACE	13.30%
Metra Rail	47.50%

Source: National Transit Database (2012) - Top 50 Agencies
www.ntdprogram.gov/ntdprogram/pubs/top_profiles/2012/Transit%20Profiles%20Top%2050%20Agencies.pdf

This is to be expected because the Chicago Regional Transportation Authority (RTA) serves a much more densely populated area. According to the Federal Transit Administration (FTA), the fare box recovery ratio for national transit systems in 2012 was 32.8% (FTA 2013) of their variable operating costs when total costs were considered by adding fixed costs of infrastructure and rolling stocks.

According to Buehler and Pucher (2011), subsidies for public transport in the United States have more than doubled from 1991 to 2007 since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA). During this period, the subsidy has increased from $14 billion to $32 billion, while vehicle kilometers of public transport supply rose by almost 20% and passenger trips increased by only 16%. However, as Buehler and Pucher (2011) note, these statistics hardly grew when controlling for population growth, and the share of operating expenses covered by farebox revenue fell from 37% in 1992 to less than 33% in 2007. The authors further explain that from 1992 to 2007 the transit agencies expanded their services at a faster rate than ridership increased, which caused the ridership to decline along with fare box revenue per vehicle-kilometer of transit service (Buehler and Pucher 2011).

Contributing to low productivity and high costs for the public transit systems, and thus putting into question the long-term sustainability of the mass transit systems, are the unions that have a restraining effect on the public sector's ability to innovate and be flexible in varying its mass transit product offerings to the riding public. As one might expect, public sector unions push for higher pay irrespective of ridership or fare box revenues, thereby increasing government spending, and give little regard for the financial viability of the mass transit system. According to Edwards (2010), on average union members had a 31% advantage in wages and a 68%

advantage in benefits as compared to their nonunion counterparts performing similar tasks in private industry. Besides raising compensation costs, public transit unions reduce government efficiency in other ways. For example, these public unions tend to protect unproductive workers, retain more staff on payroll than necessary, and discourage the use of volunteers in government activities (Edwards 2010).

One of the ways to measure the value, productivity, and progress of the mass transit systems is to measure the increase in ridership over the years. As mentioned earlier, transit ridership hovers around 5% when population growth is taken into account (Jaffe 2014). However, the productivity of the mass transit systems has remained more or less constant over the years. On the other hand, the costs of operating the mass transit systems have increased due to the wage rates and benefits that are well above the market rates. The situation here is unlike that at any private organization, because a private organization would be unable to sustain the trend of flat productivity coupled with increased labor costs. Eventually, market forces would force a private organization out of business. On the contrary, market forces are not a threat to a public mass transit system, because the increased costs of labor for the transit employees are heavily subsidized by the taxpayers.

Proponents of mass transit systems emphasize the reduction in air pollution, road congestion, and fuel consumption through the use of mass transit. They also suggest that there could be revitalization of cities and cost savings for individuals, in an effort to draw users out of their automobiles and into mass transit systems. While these elements do encourage citizens to try public transit initially, the quality of the public transit (which is affected by waiting period, aging infrastructures, and personal safety issues) determines whether or not these individuals become habitual users of mass transit. Indeed, waiting period greatly affects the quality of public transit. According to Redman et al. (2013), European Local Transport Information Service documented that a bus service about six minutes faster than a trip done by car achieved a car mode share reduction from 34% to 22% in Dublin, Ireland (Redman et al. 2013). Thus, transit services that are faster than private auto traffic will be successful in attracting riders.

Aging infrastructures are also an issue. The public transit systems in the United States have been facing problems due to lack of funds needed to make repairs. The aging transit systems are more likely to be prone to delays due to maintenance issues. Some of these systems lack state-of-the-art safety systems and are unable to meet basic operational needs. These factors ultimately reduce the quality of the transit system and could drive away transit system riders towards alternative modes of transportation. Redman et al. (2013) propose that public transport suppliers must be aware of the quality attributes that are most valued by the potential new automobile users and then perform public transport improvements addressing those preferences.

Additionally, according to Buehler and Pucher (2011), the mass transit system in the United States lacks integration of different modes of public transportation at metropolitan, regional, and national levels, while integration makes public transportation convenient and attractive to riders. The authors further point out that there is little integration of suburban bus timetables with rail transit timetables, and many transit stops are not in walking- or bicycle-friendly areas, with no sidewalks or only short portions of sidewalks (Buehler and Pucher 2011).

With the viability of modern technology and accessibility of smartphones, regional transit authorities should invest in applications (apps) that provide real-time information on transit routes and timetables and sync all the information together. In addition, the use of reloadable smart cards instead of paper tickets and transfer slips for mass transit creates value-added services, not only for the mass transit riders, but also for the transit authorities. For example, use of smart cards diminishes the need to carry cash or have exact change (Metro Transit – St. Louis 2014). Additionally, the bus operators do not have to hassle over exact change, which will ultimately lead to saved time and more efficient services provided by the mass transit system.

Most of the transit systems in the United States accept cash as a form of payment. Cash is the one asset that is most susceptible to theft. With the widespread use of smart cards, the transit system authorities are less likely to face a reduction in revenue due to theft by employees that handle the cash collected via fare box. Additionally, with the use of smart cards, the collection of fares is electronic. Thus, transit systems can reap the benefit of efficient and real-time data updates into their system.

The Transit Tale of Two Cities

In order to substantiate the hypothesis that the current financial trends of the mass transit systems are not sustainable, two transit systems are researched below: the Bi-State Development Agency of the Missouri-Illinois Metropolitan District (Bi-State) and the Chicago Regional Transportation Authority. The data analyzed were obtained from the Comprehensive Annual Financial Reports (CAFRs) from both the Bi-State Development Agency and the RTA (Bi-State Development Agency 2013, RTA 2012, and RTA 2013). The CAFRs are comprised of a set of financial statements required by state law that are audited in accordance with U.S. Generally Accepted Auditing Standards by an independent firm of public accountants.

METHODOLOGY

The methodology consisted of two steps. The first step was to analyze operating revenues, non-operating revenues, personnel data, ridership statistics, population, and pension plans over a 10 year span. The second step was to create a forecast of estimated activity over the next years if no changes are made to the system.

BI-STATE DEVELOPMENT AGENCY OF THE MISSOURI-ILLINOIS METROPOLITAN DISTRICT (BI-STATE)

Quick Facts

In 2013 MetroBus celebrated its 50th anniversary. As per the CAFR, “MetroBus is the largest part of the transit system carrying 29.4 million riders during FY 2013.” MetroBus operates 74 lines in Illinois and Missouri (Bi-State Development Agency 2013). Metro Call-A-Ride celebrated its 25th anniversary in FY 2013. That year, Call-A-Ride carried 591.2 thousand customers and operated 5.2 million revenue miles. MetroLink operates two lines: Red Line and

Blue Line. The Red Line operates from the St. Louis-Lambert Airport (north St. Louis County) to the Shiloh-Scott Station (Shiloh, Illinois). The Blue Line operates from the Shrewsbury-Lansdowne Station (Shrewsbury, Missouri) to the Fairview Heights Station (Illinois). According to annual performance indicators, the Metro service area has the indicators shown in Table 5.

Table 5. Metro service area indicators

Indicators	MetroBus	MetroLink	Call-A-Ride vans
Active fleet size-total vehicles	382	87	117
Passenger trips	29,408,800	17,054,484	591,197
Revenue miles	18,478,303	3,118,537	5,246,725
Fare box recovery	20.8%	27.20%	4.9%

Source: Bi-State Development Agency 2013

The trends for selected datasets from the CAFR, years ending June 30, 2013 and June 30, 2012, from Bi-State were examined. The purpose of the analysis was to look at possible data trends that may give a better idea of the current and future standing of the public transportation system in Missouri-Illinois in terms of financial sustainability, ridership, and funding. The reviewed data makes reference to the multi-modal mass transit system that goes by the name Metro. The Metro system includes three modes of transportation: MetroBus, MetroLink, and Metro Call-A-Ride. The data collected from the CAFR from Bi-State are available in Table 6.

Most of the data has been fitted using a linear regression to account for the goodness of fit of the model or R^2 (the amount of the variance in the observed dependent variable that can be explained by the model, in this case, by the trend across the years) and has been projected 10 years ahead in order to look at future trends based on actual data.

Table 6. Information available on CAFR Bi-State years ended June 30, 2013 and 2012

INFORMATION FOR LAST 10 FISCAL YEARS IN 2013 CAFR - FY 2004 TO FY 2013
Annual Average Unemployment Percent Rate In Bi State Service Areas
Bi State Service Area Population
Capital Assets Stats By Function And Program
Capital Assets
Executive Services- Operating Revenues, Expenses, Net Income
Mass Transit Sales Tax Bonds- Operating Budget
Mass Transit Sales Tax Bonds- Sources And Uses For Operations
Net Position By Operating Org
Operating Data- Gateway Arch Parking Facility
Operating Data- Gateway Arch Riverfront Attractions
Operating Data- Gateway Arch Tram System
Operating Data- Metro Transit
Operating Data- St Louis Downtown Airport
Operating Revenues, Expenses, Net Income
Per Capita Personal Income By Region
Personnel Data
Ratio Of Outstanding Debt By Type
Ridership Stats
Transit System Mileage Statistics
Transp Sales Tax Collections & Receipts
Use Of Proposition M Sales Tax

INFORMATION FOR FY 2012 IN 2013 CAFR
Assets By Org -In 2013 Cafr
Cash Flow From Operating Act- In 2013 Cafr
Cash Flows By Org & Net Increase In Cash Equivalents- In 2013 Cafr
Liabilities By Org & Net Position- In 2013 Cafr
Net Cash Provided Used For Operating Activities- In 2013 Cafr
Operating Revenues & Non Operating Rev By Org- In 2013 Cafr

Table 6. Information available on CAFR Bi-State years ended June 30, 2013 and 2012 (continued)

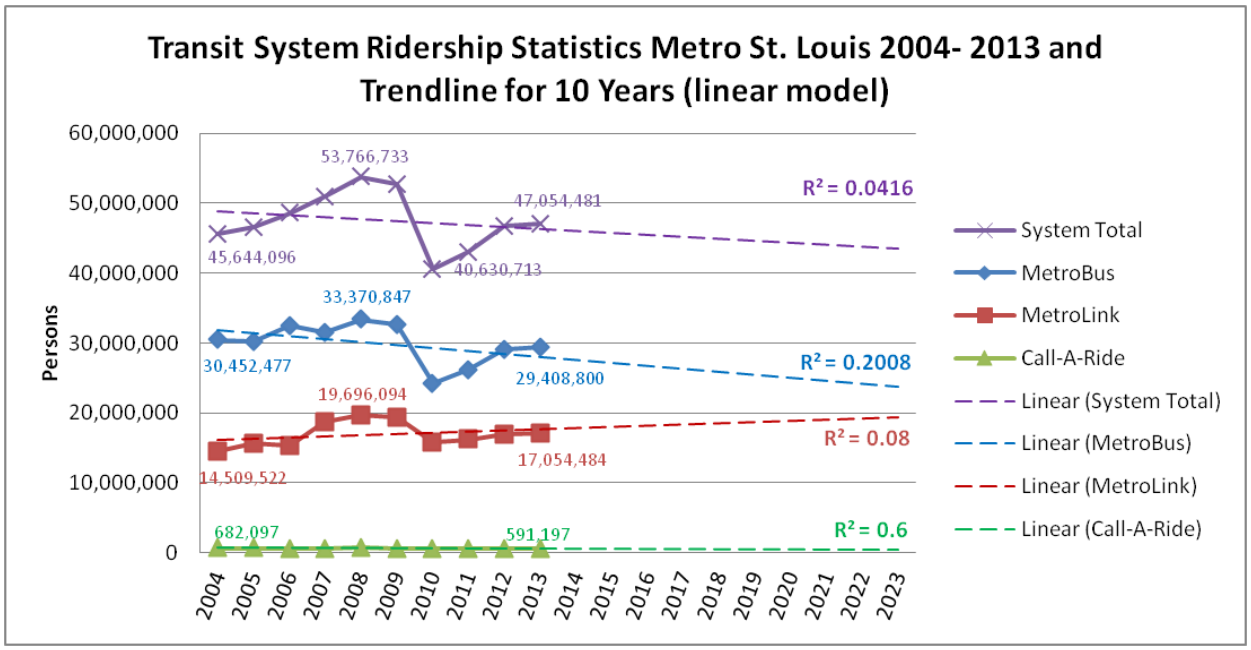
INFORMATION FOR FY 2013 IN 2013 CAFR
Assets By Org
Assets
Bi State Region Top Businesses By Employee
Capital Assets
Cash & Cash Equivalents End Of Year
Cash Flows By Org And Net Increase In Cash Equivalents
Cash Flows
Covered Salaried Plans & Unions
Liabilities By Org & Net Position
Liabilities
Net Cash Provided-Used For Operating Activities
Operating & Non Operating Revenues By Org
Operating & Nonoperating Revenues
Pension Plans By Contributor
Pension Plans Trend 3 Years
Reconciliation Of Operating Loss
Schedule Of Funding Progress Pensions
Transit Fares
Combined Statement Net Position 2012 2013

Source: Bi-State Development Agency 2013

Transit System Ridership Statistics from the Years 2003 to 2012

The first set of data analyzed is the transit system ridership statistics from the years 2003 to 2013 (Bi-State Development Agency 2013). A data trend line was estimated for each of the ridership modes (MetroBus, MetroLink, Call-A-Ride, and system total) as well as a 10 year projection. Current and future trends of the data estimating the models using different methods were looked at, including a linear model and a polynomial model.

As for the linear model, it does not fit the data well: most of the R^2 values range from 0.04 to 0.2, except for the Call-A-Ride trend line (Figure 1), which has an R^2 of 0.6.

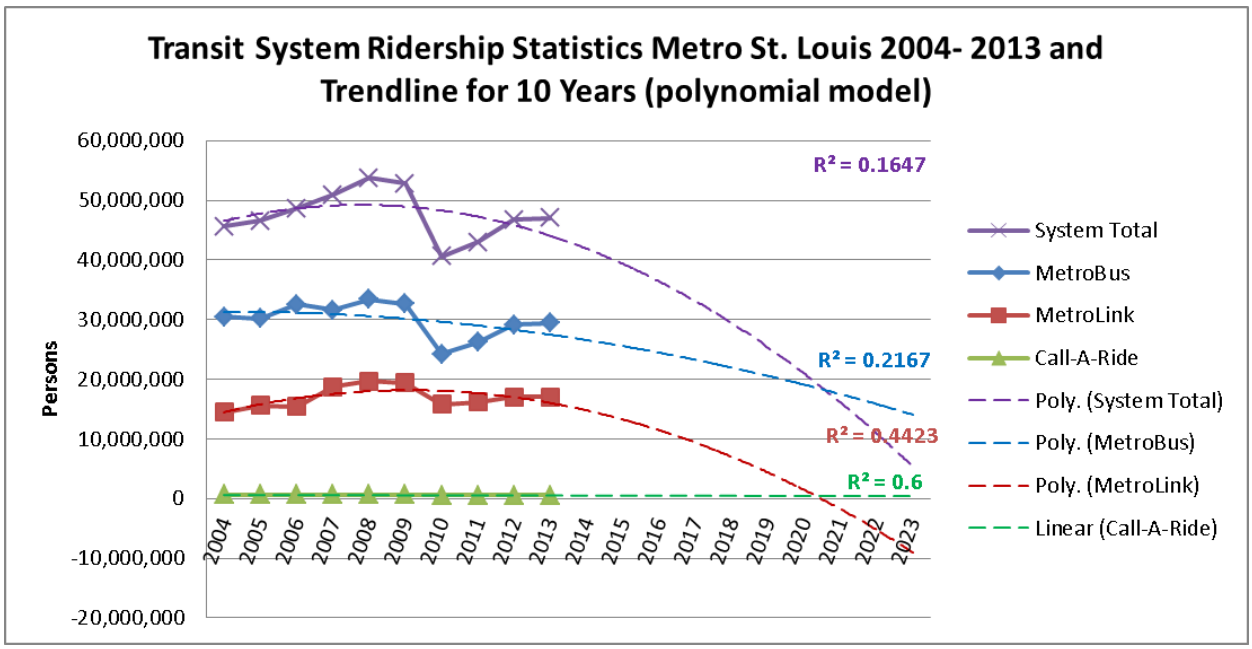


Source: Bi-State Development Agency 2013

Figure 1. Transit system ridership statistics, 2004 through 2013 and trend line for 10 years (linear regression)

The Call-A-Ride ridership trend line is stable over time and during the 10 year projection, but this service is heavily subsidized. For the period 2004–2012, transit ridership for MetroBus and MetroLink experienced an inflexion point in 2010. Unfortunately, because of the great variation of the data in such a short period, it is complicated to estimate a regression model that would predict future trends with accuracy. To attempt to find a model that fits the data better, a polynomial trend line for the data set (except for Call-A-Ride data) was used; the polynomial trend line shows higher R^2 values for the system (before 0.04; now 0.16), MetroBus (before 0.20; now 0.22), and MetroLink (before 0.08; now 0.44) (Figure 2). The only inconvenience in using a polynomial model is that the regression lines are now not as smooth as before, even if they have a better fit compared to the linear model. As seen, the decline in ridership by mode (except for Call-A-Ride) is steady and shows a very pessimistic scenario (Figure 2).

Therefore, the optimal model is ambiguous because of the variation of the data. Nevertheless, the general conclusion is that there is a decline in the system's total ridership driven by a decline in MetroBus ridership.



Source: Bi-State Development Agency 2013

Figure 2. Transit system ridership statistics, 2004 through 2013 and trend line for 10 years (polynomial regression)

Table 7 shows the percentage change in the system total statistics with respect to previous years (millions of persons), the system total percent change with respect to the previous year, and the system total change with respect to 2004.

As seen in the table, from the period 2004–2005, there was an increase in ridership of 1.9%, and the ridership statistics kept increasing at a rate of 4.5% (2005–2006) to 5.5% (2007–2008), which was pretty good. This trend can be seen in Figure 1 as well. However, the ridership decreased by 23% from 2009–2010 (Table 7). As explained above, the decline was mostly driven by a decrease in ridership of MetroBus (Figure 1). After this episode, the system had a slow recuperation, increasing ridership to 8.6% from 2011–2012 followed by a slight increase in the next period (0.7% from 2012–2013). With respect to 2004, the ridership increased by only 3.1% in 2013. In comparison to 2013, the ridership in 2007 and 2008 increased by double digits (17.8% and 15.6%, respectively).

Table 7. Transit system ridership statistics: system total and percentage change, 2005 to 2013

Years	2005	2006	2007	2008	2009	2010	2011	2012	2013
System Total Change (with respect to previous year)	861,411	2,080,141	2,357,548	2,823,537	-997,877	-12,138,143	2,361,943	3,712,194	349,631
System Total Percent Change (with respect to previous year)	1.9%	4.5%	4.9%	5.5%	-1.9%	-23.0%	5.8%	8.6%	0.7%
System Total Percent Change (with respect to 2004)	1.9%	6.4%	11.6%	17.8%	15.6%	-11.0%	-5.8%	2.3%	3.1%

Source: Adapted from Bi-State Development Agency 2013

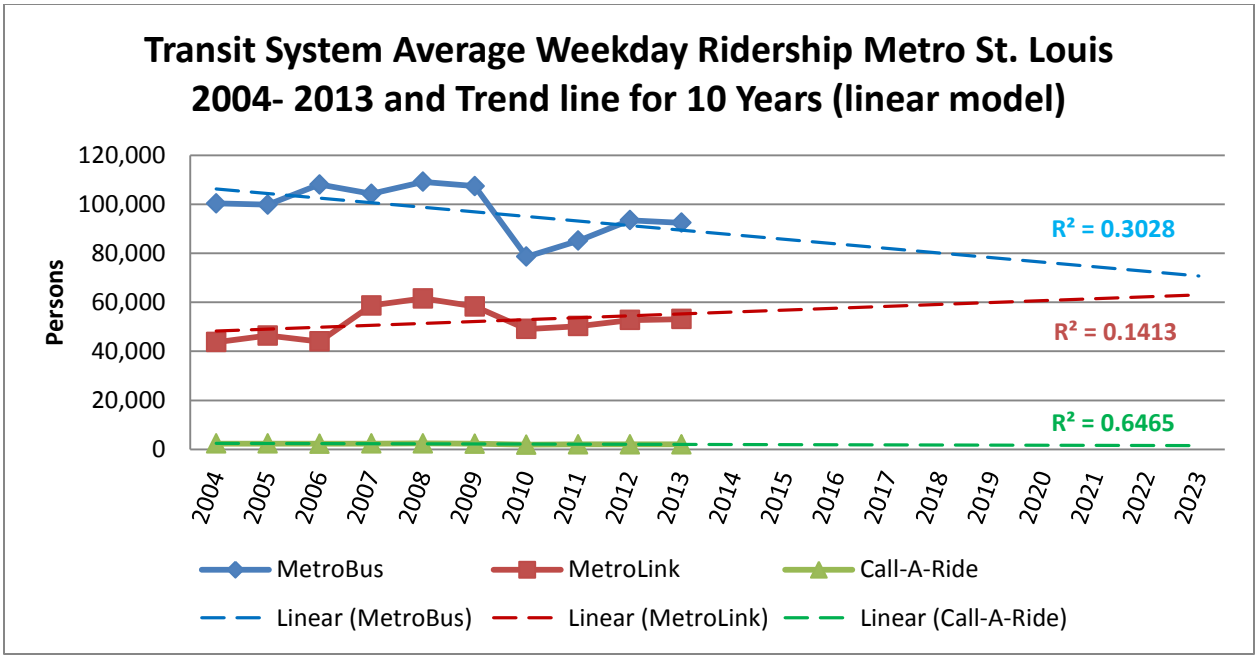
Table 8 shows the transit system average weekday ridership for the years 2004 to 2013.

Table 8. Transit system average weekday ridership, 2005 to 2013

System/avg. weekday	2005	2006	2007	2008	2009	2010	2011	2012	2013
MetroBus % Change (with respect to previous year)	-0.6%	8.3%	-3.5%	4.7%	-1.7%	-26.8%	8.3%	9.8%	-1.1%
MetroBus % Change (with respect to 2004)	-0.6%	7.6%	3.9%	8.8%	7.0%	-21.7%	-15.2%	-6.9%	-7.9%
MetroLink % Change (with respect to previous year)	6.1%	-5.2%	33.3%	5.0%	-5.4%	-15.8%	2.4%	4.9%	0.8%
MetroLink % Change (with respect to 2004)	6.1%	0.6%	34.2%	40.8%	33.3%	12.2%	15.0%	20.6%	21.5%
Call-A-Ride % Change (with respect to previous year)	-1.2%	-1.3%	0.7%	3.5%	-3.8%	-17.2%	4.0%	1.3%	0.3%
Call-A-Ride % Change (with respect to 2004)	-1.2%	-2.5%	-1.8%	1.6%	-2.2%	-19.1%	-15.8%	-14.8%	-14.5%

Source: adapted from Bi-State Development Agency 2013

Percent change with respect to the previous year and with respect to a baseline year (2004) were computed. As seen in the table, for the year 2010 most of the statistics decreased significantly. The weekday ridership for MetroBus declined 7.9% in 2013 with respect to 2004, whereas the weekday ridership for MetroLink increased by a staggering 21.5% with respect to 2004. Despite a steady trend line for Call-A-Ride (Figure 3), the average weekday ridership declined by 14.5% with respect to 2004.



Source: Bi-State Development Agency 2013

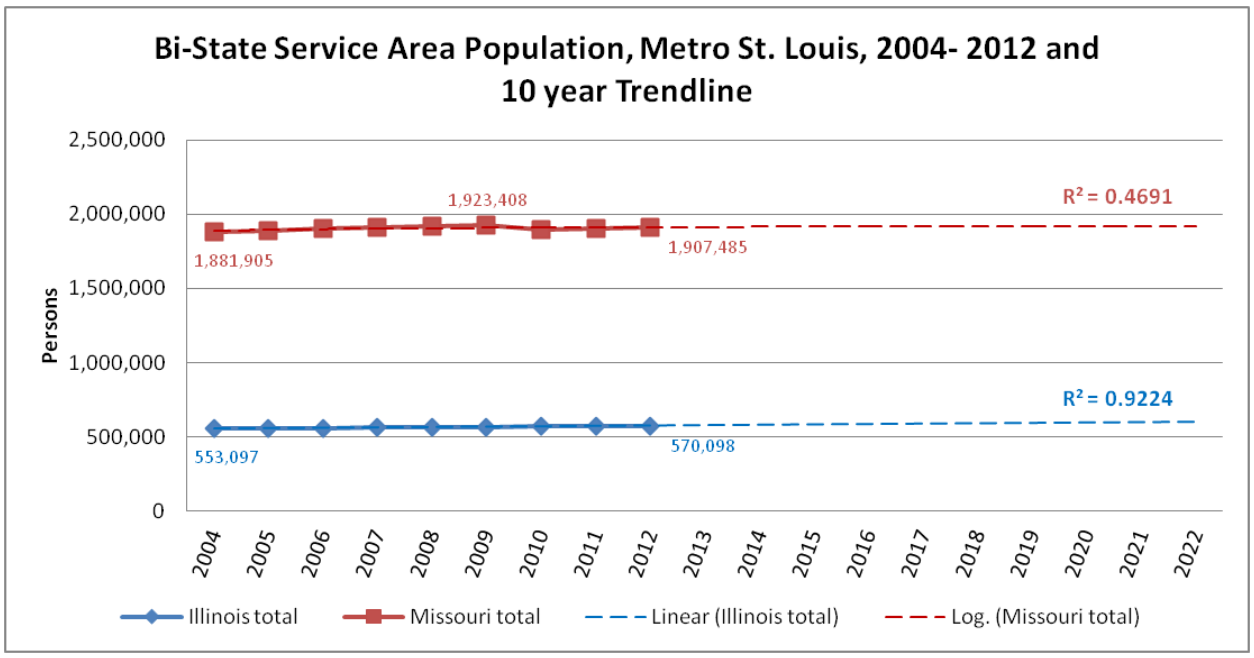
Figure 3. Transit system average weekday ridership, 2004 to 2013 and trend line for 10 years

The linear trend line for the ridership (Figure 1) as well as the linear tread line for average weekday ridership (Figure 3) projects that the ridership for MetroLink is expected to increase in the future and the ridership for MetroBus is expected to decline. The decline in ridership for MetroBus is projected to occur at a much faster rate, therefore causing the entire system ridership to decline in the future.

Bi-State Service Area Population

It's very interesting to contrast ridership statistics with the Bi-State service area population, which includes St. Clair County, Madison County, and Monroe County in Illinois and St. Louis City, St. Louis County, St. Charles County, and Jefferson County in Missouri. Due to the decline in total ridership in 2010, one could extrapolate that a similar pattern is expected for the service area's population in 2010 (that is, a decline in population of the service area causing the ridership to decline). However, this is not the case, because the service area population over the years (2004–2012) has been more or less consistent. Therefore, ridership decline for St. Louis Metro was caused by factors other than the decline in service area population.

As seen in Figure 4, the trend line for Missouri fits the data well: using a log model, the R^2 is 0.47, which means that about 47% of the variation of the variable served population is explained by time.



Source: Bi-State Development Agency 2013

Figure 4. Bi-State service area population, 2004 to 2012 and trend line for 10 years

The trend line for Illinois also fits the data well: using a linear model, the R^2 is 0.92, which means that around 47% of the variation of the dependent variable served population is explained by time. As seen, there is not much variation, because the population served in Illinois hovers around 500,000 persons, and the population served in Missouri ranges between 1,880,000 and 1,908,000 from 2004 to 2012. Actually, the total percent change increase in the Bi-State service area population was 3.1% for Illinois and 1.4% for Missouri, for a total of 1.7% for the total Bi-State service area in the years 2004 to 2012 (Table 9).

Table 9. Bi-State service area population, 2004 to 2012

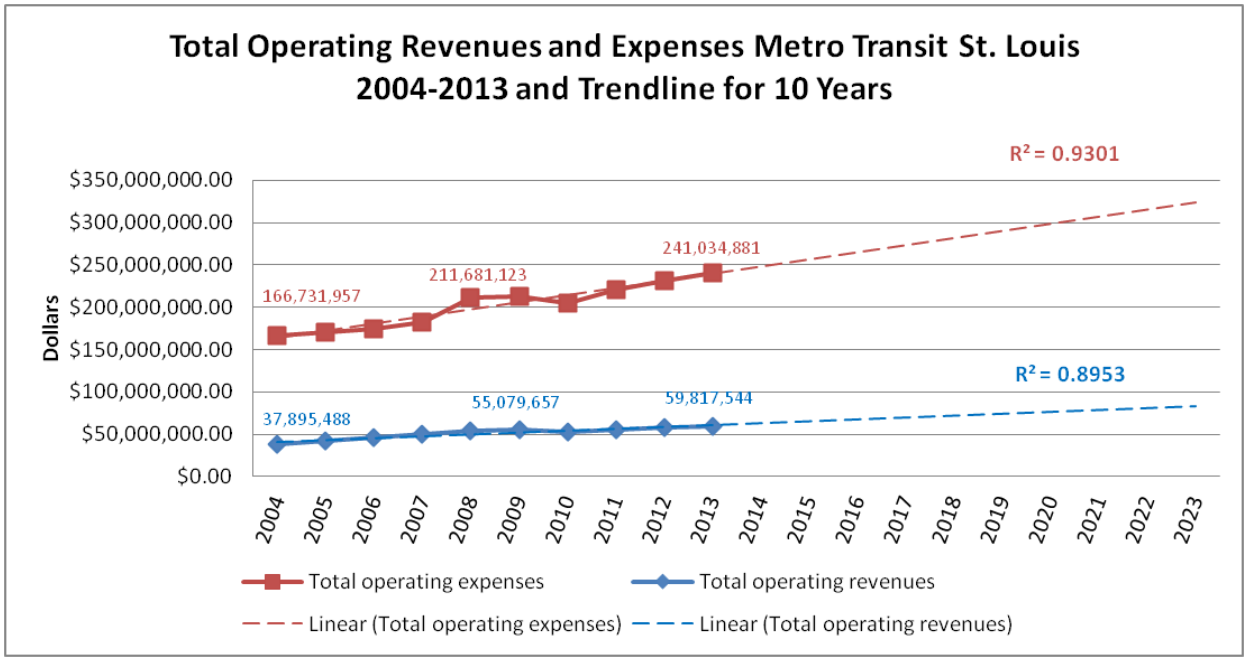
	2004	2005	2006	2007	2008	2009	2010	2011	2012	Percent Change 2004-2012
Illinois										
St. Clair County	258,406	258,849	260,503	261,238	262,131	263,617	270,399	270,259	268,858	4.0%
Madison County	264,032	264,911	266,119	267,105	267,839	268,457	269,314	268,459	267,883	1.5%
Monroe County	30,659	31,300	31,944	32,441	32,871	33,236	33,009	33,306	33,357	8.8%
Illinois total	**553,097**	**555,060**	**558,566**	**560,784**	**562,841**	**565,310**	**572,722**	**572,024**	**570,098**	**3.1%**
Missouri										
St. Louis City	350,705	352,572	353,837	355,663	356,730	356,587	319,008	318,069	318,172	-9.3%
St. Louis County	1,004,271	999,523	996,664	993,690	992,331	992,408	998,772	998,692	1,000,438	-0.4%
St. Charles County	318,743	327,594	336,422	343,833	349,595	355,367	361,725	365,151	368,666	15.7%
Jefferson County	208,186	210,615	213,768	215,904	217,599	219,046	219,056	219,480	220,209	5.8%
Missouri total	**1,881,905**	**1,890,304**	**1,900,691**	**1,909,090**	**1,916,255**	**1,923,408**	**1,898,561**	**1,901,392**	**1,907,485**	**1.4%**
Total Bi-State Service Area	**2,435,002**	**2,445,364**	**2,459,257**	**2,469,874**	**2,479,096**	**2,488,718**	**2,471,283**	**2,473,416**	**2,477,583**	**1.7%**

Source: adapted from Bi-State Development Agency 2013

It is interesting to look at the percent change from 2004 to 2012 for Illinois and Missouri. Illinois saw an increase of 3.1% of served population for the period 2004–2012, mainly driven by an 8.8% increase in Monroe County in the same period. In contrast, Missouri saw an increase of just 1.4%, partly driven by a decline of 9.3% in St. Louis City. Surprisingly, there was an increase of 15.7% in the service area of St. Charles County for that period. In conclusion, the Bi-State service area population has slightly increased during the period 2004 to 2012, but the projections demonstrate that the trend will remain stable; as seen, there has been a decline in the statistics for St. Louis City, contrasting with an increase in the statistics for St. Charles County (Table 9).

Metro Transit Operating Data

Metro Transit operating revenues consist of operating revenues, operating expenses, operating income (or loss), non-operating revenue (or expense), total non-operating revenue (or expense), net income (or loss) before transfers, net income (or loss), and total debt. As seen in Figure 5, it is evident that total operating expenses need to be tamed not only at present but also for the next 10 years.

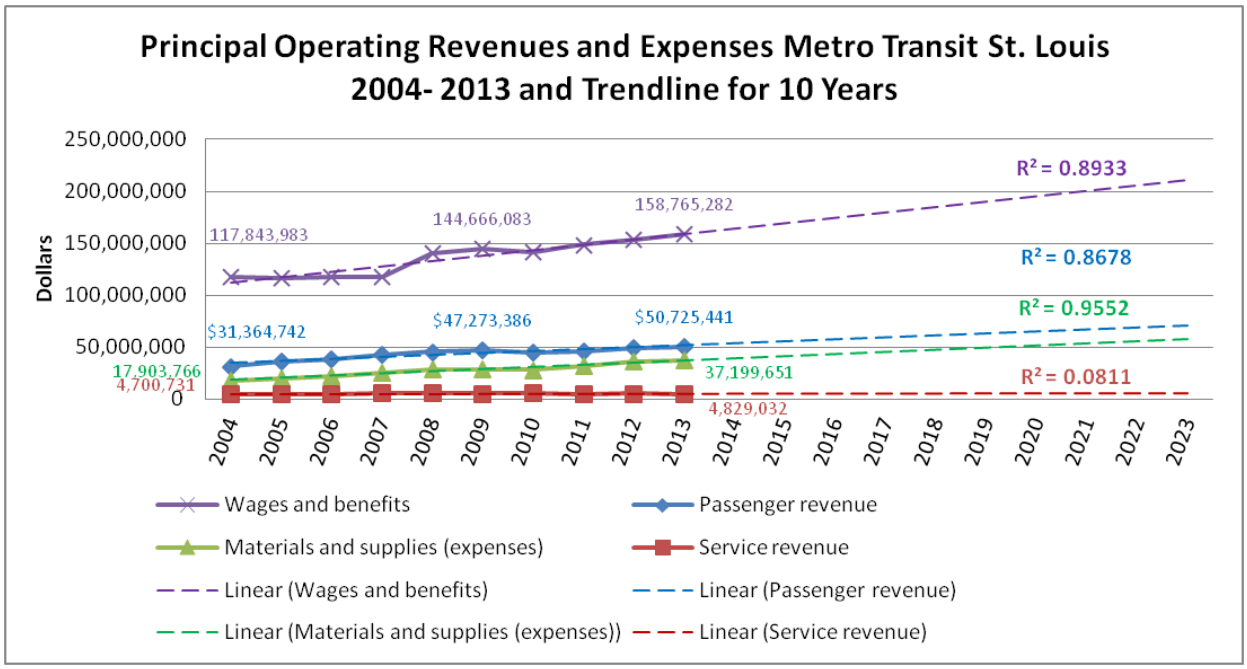


Source: Bi-State Development Agency 2013

Figure 5. Total operating revenues and expenses for Metro St. Louis, 2004 to 2013 and trend line for 10 years

The R^2 for total operating expenses is 0.93, and the R^2 for total operating revenues is 0.89, which means that around 90% of the variation of the dependent variable is explained by the model. This allows us to confirm that the trend will continue as depicted in Figure 5. For example, expenses will continue to overrun revenues if immediate measures are not taken to curtail the expenses.

Figure 6 shows the principal operating revenues and expenses for the Metro system.



Source: Bi-State Development Agency 2013

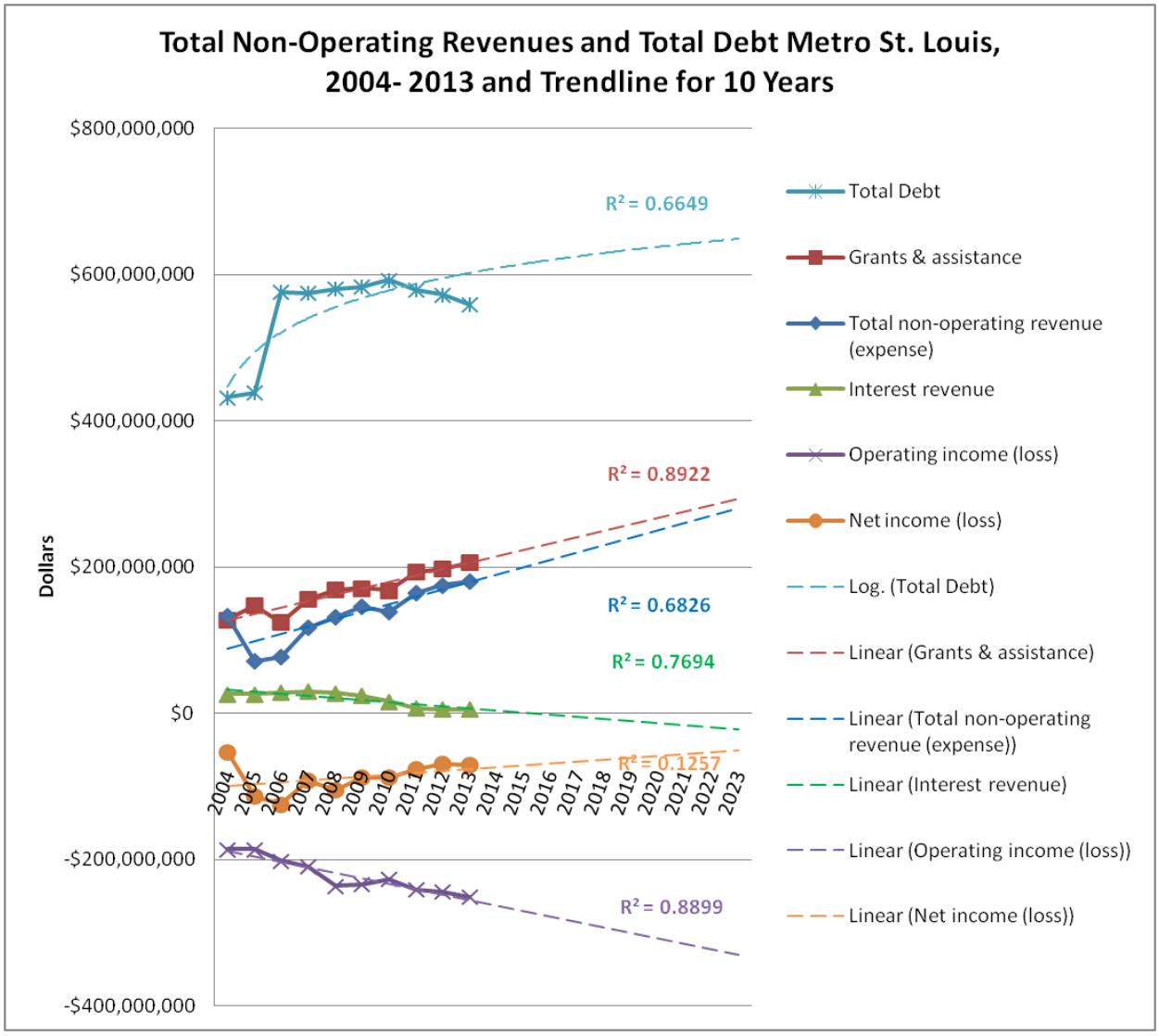
Figure 6. Principal operating revenues and expenses for Metro St. Louis, 2004 to 2013 and trend line for 10 years

We used a linear model to fit the data, and, as shown by the R^2, the model is a good fit for the data (R^2 values are between 0.86 and 0.95, except for the variable service revenue). Wages and benefits make up the biggest operating expense for the St. Louis Metro system. The dollar amount spent on wages and benefits is three times the amount collected from passenger revenue (wages and benefits account for $158,765,282 in 2013 compared to $50,725,441 for passenger revenue in the same year).

The trend shown in Figure 6 is alarming because it projects wages and benefits increasing at a faster rate than either of the operating revenue sources, which puts into question the financial sustainability of the Metro system. For instance, wages and benefits represent 66% of total operating expenses in 2013; expenses in materials and supplies constitute the second most important expense for 2013, accounting for 15.4% of total operating expenses; services constitute 11.8% of the total; and finally casualty and liability, combined with other operating expenses, together constitute 6.8% of the total.

The bulk of non-operating revenues are grants and assistance (Bi-State Development Agency 2013), which usually offset total non-operating revenue (expense). According to the information retrieved from the CAFR, grants and assistance in FY 2004 and 2005 were respectively 0.96 and 2 times as large as total non-operating revenue. For FY 2004, grants and assistance were equal to $127,982,771 compared to $133,126,164 for total non-operating revenues (so, grants were 96% of that proportion). For FY 2005, grants and assistance were equal to $147,476,596 compared to

$71,785,841 dollars for total non-operating revenues (so, grants were more than twice the amount of non-operating revenues). Despite this, the operating loss of the system (which is equal to operating revenues minus operating expenses and depreciation or amortization) exceeds total non-operating revenue, generating a net income loss (equal to total non-operating revenue plus operating loss) that is progressing (Figure 7).

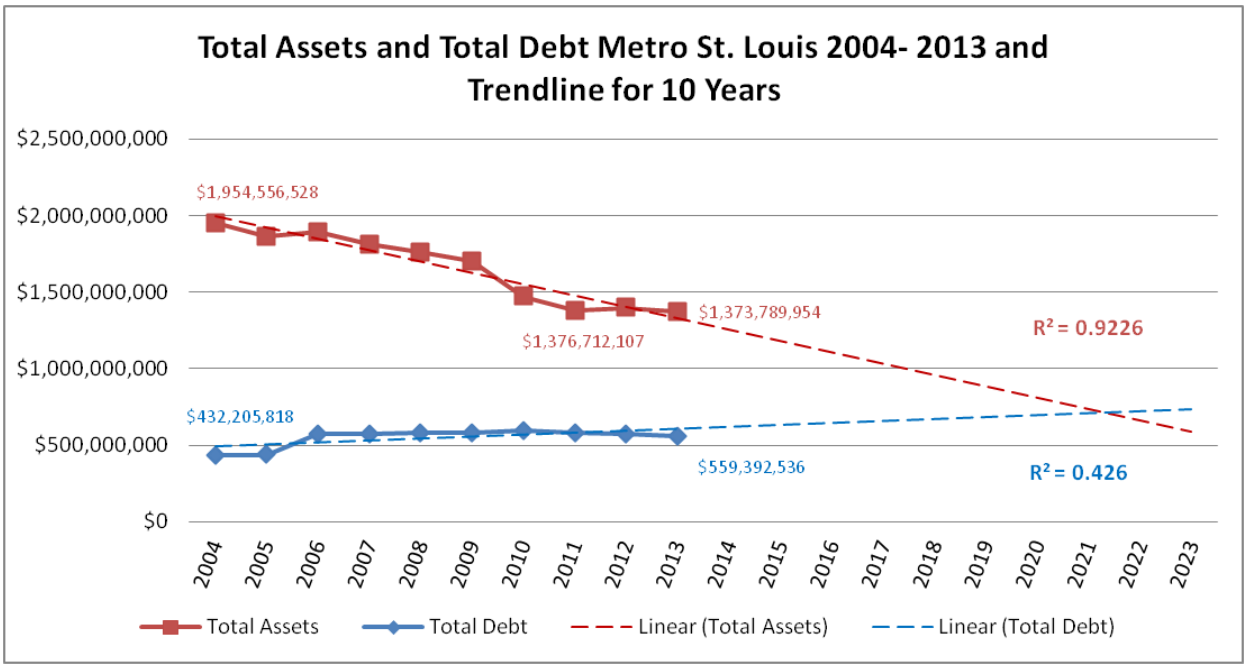


Source: Bi-State Development Agency 2013

Figure 7. Total non-operating revenues and total debt for Metro St. Louis, 2004 to 2013 and trend line for 10 years

Finally, total debt is increasing at a staggering pace, as seen in Figure 7, reaching $559,392,536 in 2013, which represents an increase of 29.4% with respect to 2004 (in that fiscal year, total debt was equal to $432,205,818).

Figure 8 shows the current situation and a 10 year trend line for the variables total assets and total debt: when using a linear model, the R^2 for total debt is a modest 0.43, but it is equal to 0.92 for total assets, which means that the variation in the variable is almost fully explained by time.



Source: Bi-State Development Agency 2013

Figure 8. Total assets and total debt for Metro St. Louis, 2004 to 2013 and trend line for 10 years

The graph shows a steady decline in total assets while total debt slowly climbs. Thus, the picture in the future is not promising: as total debt increases, total assets decline to a point where they are insufficient to cover the total debt (year 2021), all other things equal. Overall, wages and benefits constitute the bulk of the operating expenses of the Metro system, and they are playing a detrimental role in the financial sustainability.

It is worth pointing out that most operating revenues and expenses are generated by the Metro Transit System: total operating revenues were $59,817,544 in 2013, compared to $71,622,808 (after eliminations) generated by the whole system (executive services, Gateway Arch Tram System, Gateway Arch Parking Facility, Gateway Arch Riverfront Attractions, St. Louis Downtown Airport, and the Metro Transit System). Total operating expenses were $324,770,572 for the Metro Transit System (including amortization), compared to $321,137,278 for the whole system (including amortization and after eliminations). Finally, wages and benefits constituted $158,765,282 of expenses for the Metro Transit System in 2013, compared to $164,549,736 for the whole system (Bi-State Development Agency 2013).

Pension Plans

As one might expect, generous public sector pension plans are a major contribution to mass transit unsustainability. As stated in the 2013 CAFR from Bi-State (2013), the agency sponsors four defined-benefit pension plans, which are funded to the fullest extent possible through investments and contributions from the entity:

- The Pension Plan for Salaried Employees or Salaried Plan
- The "788 O&M" Plan (Bi-State Development Agency Missouri-Illinois Metropolitan District and Division 788 Amalgamated Transit Union, AFL-CIO Employees' Pension Plan and Agreement. This union represents MetroBus, MetroLink, and Metro Call-A-Ride van operators. It is Metro's largest union.)
- The 788 Clerical Plan (Bi-State Development Agency Missouri-Illinois Metropolitan District and Division 788, Clerical Unit Amalgamated Transit Union, AFL-CIO Employees' Pension Plan and Agreement)
- The IBEW Plan (Bi-State Development Agency Missouri-Illinois Metropolitan District and Locals No. 2 and No. 309 of the International Brotherhood of Electrical Workers Employees' Pension Plan and Agreement)

Table 10 provides a brief description of the four plans' eligibility for full and reduced retirement benefits.

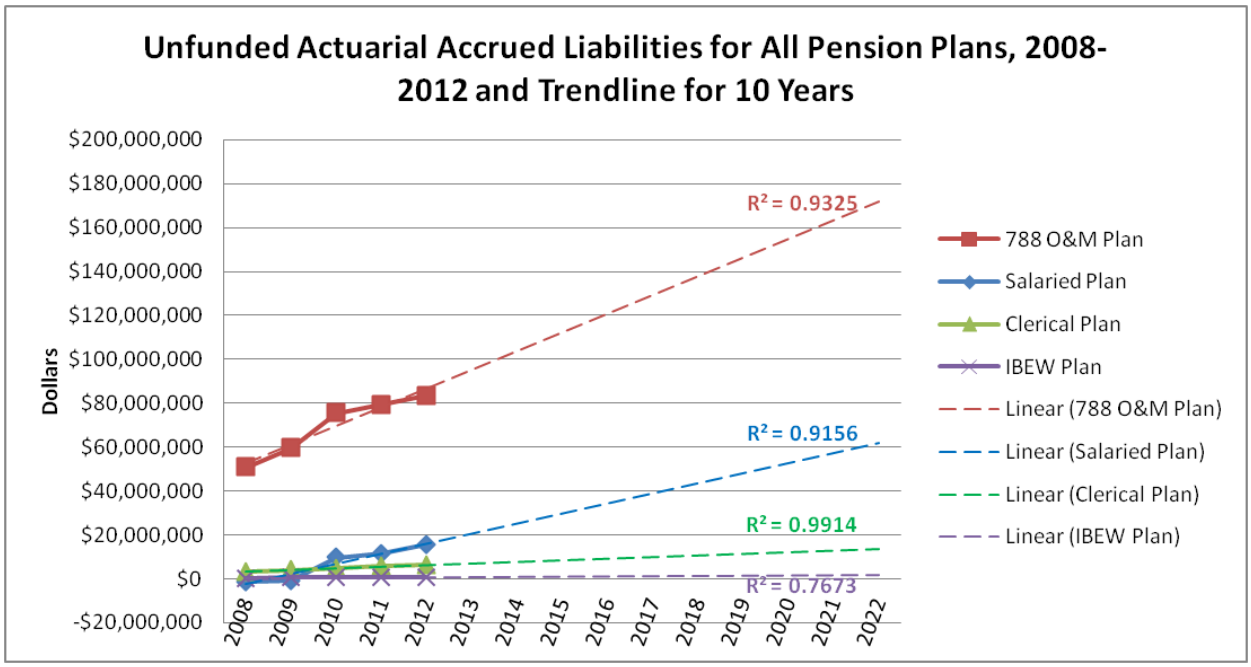
Table 10. Bi-State development pension plans and eligibility for full and reduced retirement benefits

<table>
<tr><th></th><th>Salaried Plan</th><th>788 O&M</th><th>788 Clerical</th><th>IBEW</th></tr>
<tr><td rowspan="3">Eligibility for full retirement benefits</td><td rowspan="3">Employees retiring after attaining the normal service retirement age as defined in the plan. Must have 5 years of credited service.</td><td>(a) age 65 with 10 or more years of credited service or</td><td>(a) age 65 with 10 years of credited service or</td><td>(a) age 65 with 12 or more years of credited service or</td></tr>
<tr><td>(b) the completion of 25 years of credited service or</td><td>(b) the completion of 25 years of credited service</td><td>(b) the completion of 25 years of credited service</td></tr>
<tr><td>(c) age 55 with 20 or more years of credited service</td><td></td><td></td></tr>
<tr><td rowspan="3">Eligibility for reduced retirement benefits</td><td rowspan="3">Retirement benefits are payable monthly for life</td><td rowspan="2">Participants who have attained age 55 with 15 years of credited service</td><td>(a) age 62 with 10 or more years credited service or</td><td rowspan="2"></td></tr>
<tr><td>(b) age 54 to 62 with 15 years or more of service</td></tr>
<tr><td colspan="3">All Union employees must make plan contributions by payroll deduction each week.
Upon retirement, employees are entitled to a monthly pension benefit, payable for life.</td></tr>
</table>

Source: Source: Bi-State Development Agency 2013

As seen, each plan has a set of different eligibility terms for full retirement benefits as well as for reduced retirement benefits.

The schedules of the funding progress for pension plans (Bi-State Development Agency 2013) provide useful information regarding unfunded actuarial accrued liabilities (UAAL), usually referred to as the unfunded pension liability, from 2008 to 2012. Figure 9 provides a linear trend line for 10 years for each of the four pension plans.



Source: Bi-State Development Agency 2013

Figure 9. Unfunded actuarial accrued liabilities for all pension plans, 2008 to 2012 and trend line for 10 years

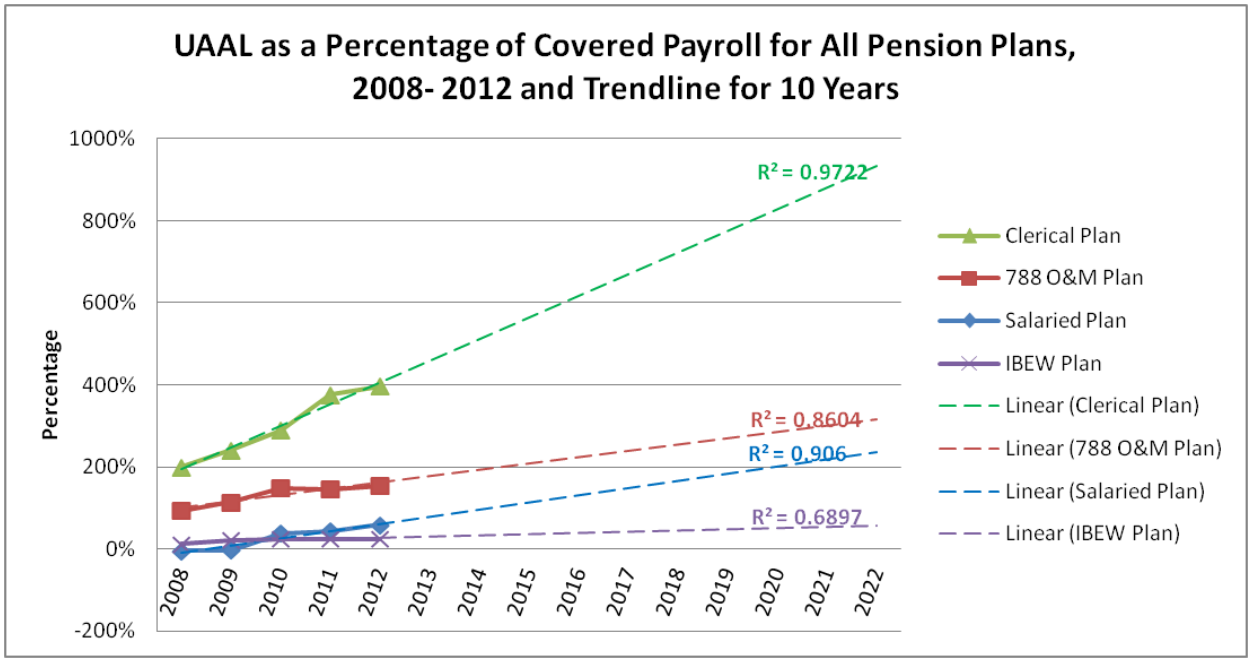
As per the graph, the unfunded pension liability is expected to increase for all four pension plans. The R^2 for all four plans is very high, ranging between 0.76 and 0.99, which means that a great proportion of the variation in each of the four variables is explained by time.

The actuarial accrued liability (AAL) for each of the four pension plans outweighs the actuarial value of assets, which means that the value of assets accumulated to finance pensions are insufficient to cover the obligations. As seen in the table "Schedules of Funding Progress - Pension Plans" (Bi-State Development Agency 2013), the UAAL for the 788 O&M Plan was $83 million for 2012, which is the highest UAAL of all four pensions, followed by the UAAL of the Salaried Plan ($15 million for 2012). At the bottom are the UAAL for the 788 Clerical Plan ($6 million for 2012) and the IBEW Plan ($700,000 for 2012).

The projections show that it is likely that the UAAL for the 788 O&M Plan will double within the next 10 years, arriving at a staggering $160 million. The same is true for the three remaining

pension plans: the UAAL for the Salaried Plan will round up to $60 million, or four times what is was in 2012. The UAAL for the Clerical Plan and the IBEW Plan will not experience such a dramatic increase because they will stay below $20 million. If nothing is done to either decrease the AAL or boost the actuarial value of assets, the scenario will be very unfavorable to the transit system. Future revenues generated will be tied up to pay for the benefits promised to the current and past employees, depicting a gloomy picture for Metro's financial future.

In addition to providing data on unfunded actuarial accrued liabilities, CAFR for Bi-State Development Agency provides data on UAAL as a percentage of covered payroll. This percentage is derived by dividing the ratio of the UAAL by active employee payroll. The smaller the proportion, the better the system is in financial terms. This information is concerning because all of the UAAL as a percentage of covered payroll has been increasing from 2008 to 2012 and is very high. For example, the UAAL as a percentage of covered payroll for the 788 Clerical Plan ranges from 199.2% to 395.6%. The situation is alarming for the 788 O&M Plan as well because the proportion ranges from 93.4% to 154%. Similarly, the proportion for the Salaried Plan increased from -5.1% to 58.6% in 2012. Finally, the IBEW Plan experienced an increase from 11.3% to 24.2%. The trend line in Figure 10 shows that if nothing is done to improve the situation, the proportion for the Clerical Plan will increase up to 900% in the next 10 years.



Source: Bi-State Development Agency 2013

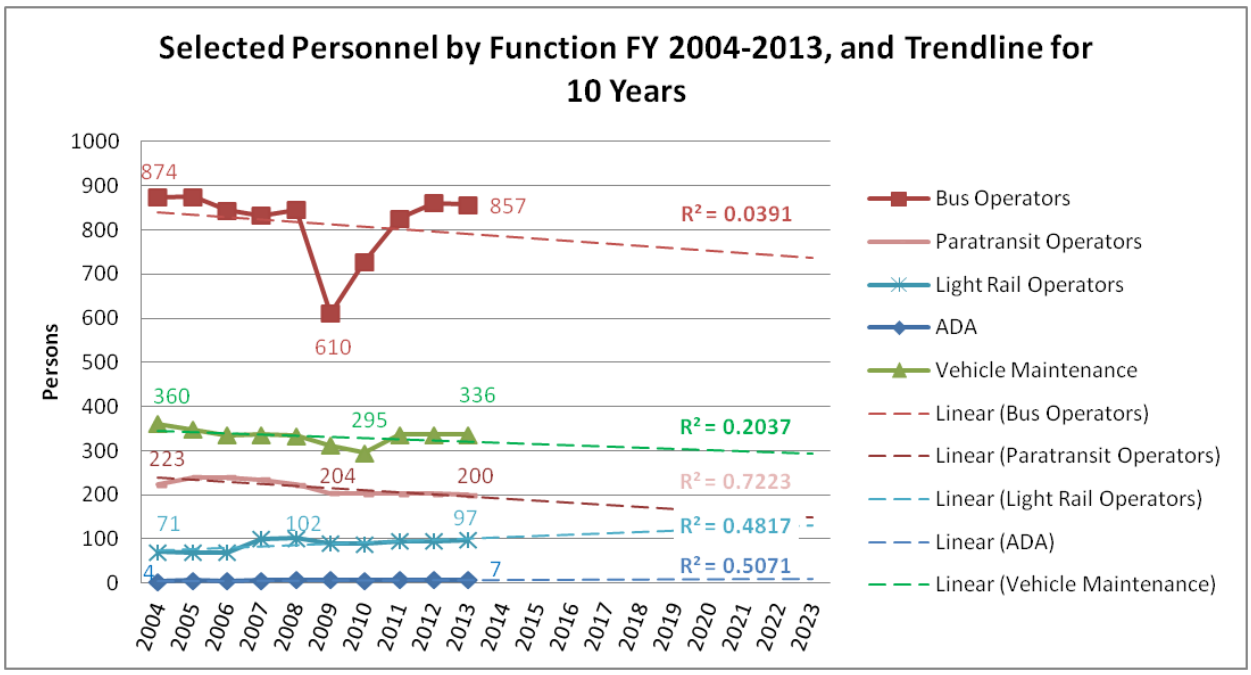
Figure 10. Unfunded actuarial accrued liability as a percentage of covered payroll for all pension plans 2008 to 2012, Bi-State, and trend line for 10 years

The proportions for the three other plans (788 O&M Plan, Salaried Plan, and IBEW Plan) are also projected to increase in the next 10 years, but will not attain the same percentage increase as the Clerical Plan. They are projected to remain below 300%. Regardless, the increase in proportion questions the financial sustainability of the Metro system.

Unfortunately, information regarding the link between wages and benefits (as part of operating expenses) and the covered payroll that figures in the Schedules of Funding Progress – Pension Plans (Bi-State Development Agency 2013) was not provided in the CAFR. For example, whether the covered payroll is part of wages and benefits or is a liability set aside in another fund is unknown.

Personnel Data

It is not surprising to know that the vast majority of employees of the whole transport system come from the Metro Transit System: for FY 2013, Metro Transit System employees represented 97.2% of the total (2,131 versus 2,192 persons). Employees from the Metro Transit System can be divided into two groups: employees from transit operations (1,903 for FY 2013) and supporting members (including finance, engineering and development, marketing, and IT, among others), for a total of 2,131. More detailed information can be found in the table Personnel Data (Bi-State Development Agency 2013). Figure 11 shows the details of selected personnel by function: bus operators, paratransit operators, light rail operators, and Americans with Disabilities Act (ADA) operators.



Source: Bi-State Development Agency 2013

Figure 11. Selected personnel by function, FY 2004 to 2013 and trend line for 10 years

As seen, bus operators constitute the majority of the selected personnel, experiencing a decrease of 14 employees from 2004 to 2013. In 2009, there was a sudden decrease of bus operators, bringing the number of bus operators to 610. The decreasing trends in personnel are evident for bus operators and paratransit operators, the latter experiencing a decrease of 17 people from 2004 to 2013. Light rail and ADA operators have experienced a slight increase in the number of

operators: 26 for light rail operators and 3 for ADA operators, which represents an increase of 37% and 75%, respectively.

Vehicle maintenance is another important part of transit operations, constituting around 18% of the Metro operations. As seen in Figure 11, the number of employees in vehicle maintenance decreased slightly in 2010. As per the projections, the number of bus operators will decline over time. As for R^2, some values are high (paratransit operators, ADA operators, and light rail operators), and others are very low (vehicle maintenance and bus operators). As Figure 11 shows, R^2 for the variable bus operators is indeed very low, which means that the variation in the variable is poorly explained by time.

CHICAGO REGIONAL TRANSPORTATION AUTHORITY

Quick Facts

The Chicago RTA was created in 1974 to provide financial assistance to the then-existing public transportation operators. Over the years, the RTA acquired and operated these public transportation providers, as well as contracted with private operators, to provide service through the purchase of service agreements. In 1983, the act passed by the Illinois General Assembly (the RTA Act) assigned RTA as a financial and oversight body for the three transit agencies: Chicago Transit Authority, Commuter Rail Division (Metra), and the Suburban Bus Division (Pace). Collectively, the RTA, the CTA, Metra, and Pace are referred to as the RTA system (RTA 2012). See Table 11.

Table 11. RTA service boards and operating characteristics

	Chicago Transit Authority		Metra Commuter Rail Division*	Pace Suburban Bus Division			
	Rapid Transit	**Motor Bus**		**Fixed Route Bus**	**ADA Paratransit**	**Dial-A-Ride**	**Vanpool**
Routes	8 rail routes	129 bus routes	11 rail routes	138 regular routes 35 feeder routes 14 shuttle routes 7 seasonal routes		68 local services	
Stations served	145 stations		241 stations			210 communities served	
Riders per year (millions)	231.1	314.4	81.3	32.1	3.8	1.3	2
Total Vehicles	1,200 transit cars	1,781 buses	146 locomotives 839 passenger cars	687 buses	234 lift-equipped buses	176 lift-equipped buses	694 vanpool vehicles

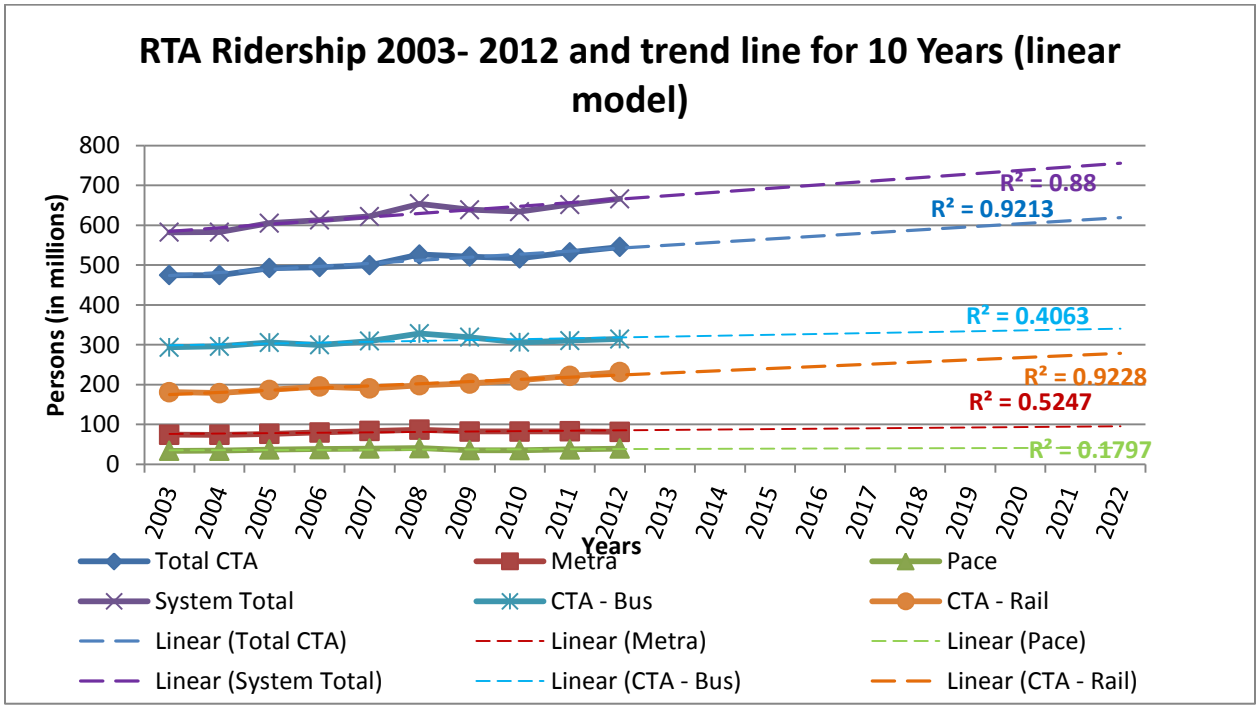
*All data exclude NICTD South Shore
Source: Regional Transportation Authority 2012

Metra provides commuter rail services connecting downtown Chicago with communities throughout Cook, DuPage, Kane, Lake, McHenry, and Will counties. In addition, Metra provides services through the purchase of service agreements with the Union Pacific Railroad, Burlington Northern Santa Fe, and Northern Indiana Commuter Transportation District. The CTA provides bus and rapid transit service within the city of Chicago and to 40 suburbs. Pace operates fixed-route bus services, paratransit, and vanpool services within Chicago's suburbs (RTA 2012). The six-county area served by the RTA system covers 3,700 square miles with a population of 8.3 million as of 2010 (RTA 2012).

The data sets examined herein are collected from the 2012 and 2013 CAFR of the RTA system.

Transit System Ridership Statistics from the Years 2003 to 2012

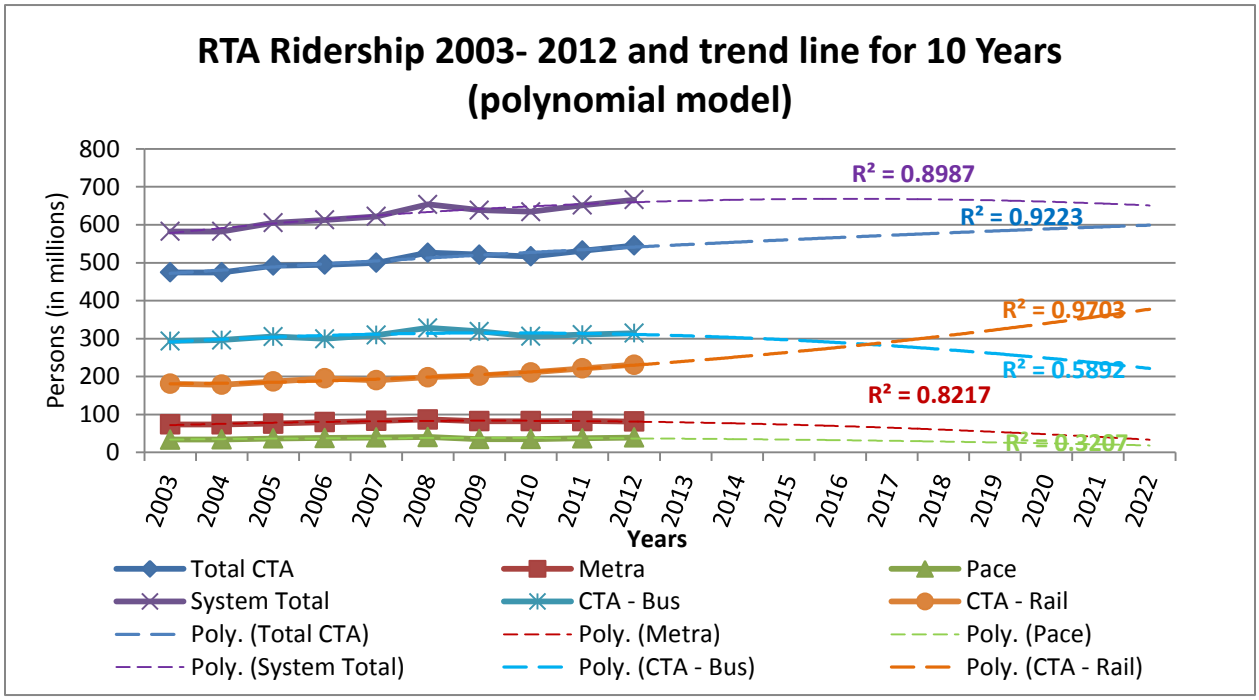
The first set of data analyzed is the transit system ridership statistics from the years 2003 to 2012. A data trend line has been estimated for each of the ridership modes (CTA, Metra, Pace, and system total), as well as a 10 year projection. The trend line for CTA rail and bus fit the data well: using a linear model, the R^2 is 0.92 and 0.41, respectively, which means that 92% of the variation of the dependent variable for CTA rail service is explained by time and 41% of the variation of the dependent variable for CTA bus service is explained by time. The R^2 trend line for total CTA ridership is 0.92 as well (Figure 12).



Source: Regional Transportation Authority 2012 (National Transit Database)

Figure 12. RTA ridership, 2003 to 2012 and trend line for 10 years (linear regression)

When attempting the regression with a polynomial model, the data fits better for both CTA rail and bus. The R^2 for CTA rail with a polynomial model is 0.97 (0.92 before) and the R^2 for CTA bus is 0.59 (0.41 before). The trend line for CTA bus with a linear model shows a steady increase in ridership in the future, whereas the polynomial model shows a steady decline in ridership (Figure 13).



Source: Regional Transportation Authority 2012 (National Transit Database)

Figure 13. RTA ridership, 2003 to 2012 and trend line for 10 years (polynomial regression)

The optimal model for this data set is the polynomial model. As for Metra and Pace, R^2 is 0.8 and 0.3, respectively, using a polynomial model, which means 80% of the variation in the ridership for Metra is explained by time and only 30% of the variation in the ridership for Pace is explained by time (Figures 12 and 13). Using the polynomial model, R^2 for the total system ridership is 0.89, meaning that 89% of the variation in the dependent variable can be explained by time. The CTA rail service has seen a steady increase in ridership for the period 2007–2012. The average growth rate for the period 2003–2012 is 2.78%.

On the other hand, much fluctuation can be seen for CTA bus ridership. The CTA bus ridership peaked at 328.2 million riders in 2008, but the average growth rate for the period 2003–2012 is only 0.81%. Nevertheless, bus ridership has seen a slow, steady growth since 2010. During 2003–2012, the average growth rates for Metra and Pace were 1.10% and 1.88%, respectively (Table 12).

Table 12. RTA system ridership statistics: system total and percentage change, 2003 to 2012

Service Consumed (in millions):	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
CTA - Bus	**293.6**	**296**	**305.5**	**299.6**	**309.3**	**328.2**	**318.7**	**306**	**310.4**	**314.4**
CTA - Rail	**181.1**	**178.7**	**186.8**	**195.2**	**190.3**	**198.1**	**202.6**	**210.8**	**221.6**	**231.1**
Total CTA*	474.7	474.7	492.3	494.8	499.6	526.3	521.3	516.8	532	545.5
Metra	**74**	**73.8**	**76.1**	**79.9**	**83.3**	**86.8**	**82.3**	**82.2**	**82.7**	**81.3**
Pace**	**33.7**	**34.1**	**36.9**	**38**	**39.2**	**40.5**	**35.1**	**35.1**	**37.1**	**39.2**
System Total	582.4	582.6	605.3	612.7	622.1	653.6	638.7	634.1	651.8	666
System total Percent Change	**-2.20%**	**0.03%**	**3.90%**	**1.22%**	**1.53%**	**5.06%**	**-2.28%**	**-0.72%**	**2.79%**	**2.18%**
										Average
Metra % Change	**-0.27%**	**3.12%**	**4.99%**	**4.26%**	**4.20%**	**-5.18%**	**-0.12%**	**0.61%**	**-1.69%**	1.10%
Pace % Change	**1.19%**	**8.21%**	**2.98%**	**3.16%**	**3.32%**	**-13.33%**	**0.00%**	**5.70%**	**5.66%**	1.88%

*CTA Stat amounts include rail-to-rail transfers
**PACE 2007 Stat amount includes ADA Paratransit rides

Source: Regional Transportation Authority 2012 (National Transit Database)

In 2009 and 2010, the total RTA ridership decreased drastically after years of increase in ridership. The percentage changes in ridership are -2.28% and 0.72% for 2009 and 2010, respectively. In recent years, the RTA ridership has been increasing at a good pace. In conclusion, the trend line for Pace, Metra, and total system ridership shows a pessimistic scenario of decline in ridership in future years. CTA rail is the only aspect of the RTA system that has a silver lining due to a steady increase in ridership at present and as forecasted by the trend line (Figure 13).

The ridership increase for the CTA rail could be attributed to resources committed to the capital projects. According to the 2012 CAFR, the proceeds from the bonds issued for these capital projects are allocated by the RTA as follows: 50% for capital projects of the CTA, 45% for capital projects of Metra, and 5% for capital projects of Pace.

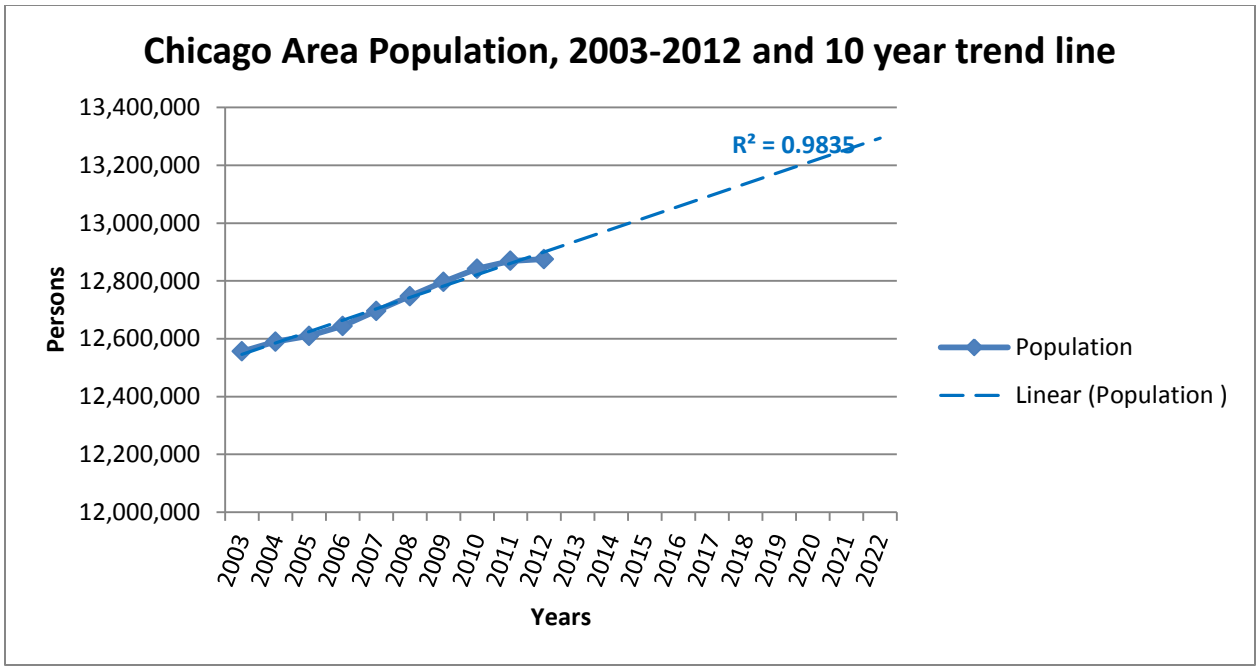
The population of Chicago in 2003 was just over 12.5 million. In 10 years, the population grew by 319,249, or 2.54%, with respect to 2003 (Table 13).

Table 13. Chicago area population and percentage change, 2003 to 2012

Fiscal Year	Population	% change with respect to 2003
2003	12,556,006	
2004	12,589,773	0.27%
2005	12,609,903	0.43%
2006	12,643,955	0.70%
2007	12,695,866	1.11%
2008	12,747,038	1.52%
2009	12,796,778	1.92%
2010	12,841,980	2.28%
2011	12,869,257	2.49%
2012	12,875,255	2.54%

Source: Regional Transportation Authority 2012 (Bureau of Economic Analysis, U.S. Department of Commerce and Bureau of Labor Statistics, U.S. Department of Labor)

The 10 year trend line for the Chicago area population has an R^2 of 0.98, meaning that 98% of the variation of the variable served population is explained by time. The trend line shows a steady growth in Chicago area population (Figure 14). Thus, some of the increase in ridership in recent years can be explained by the increase in population.



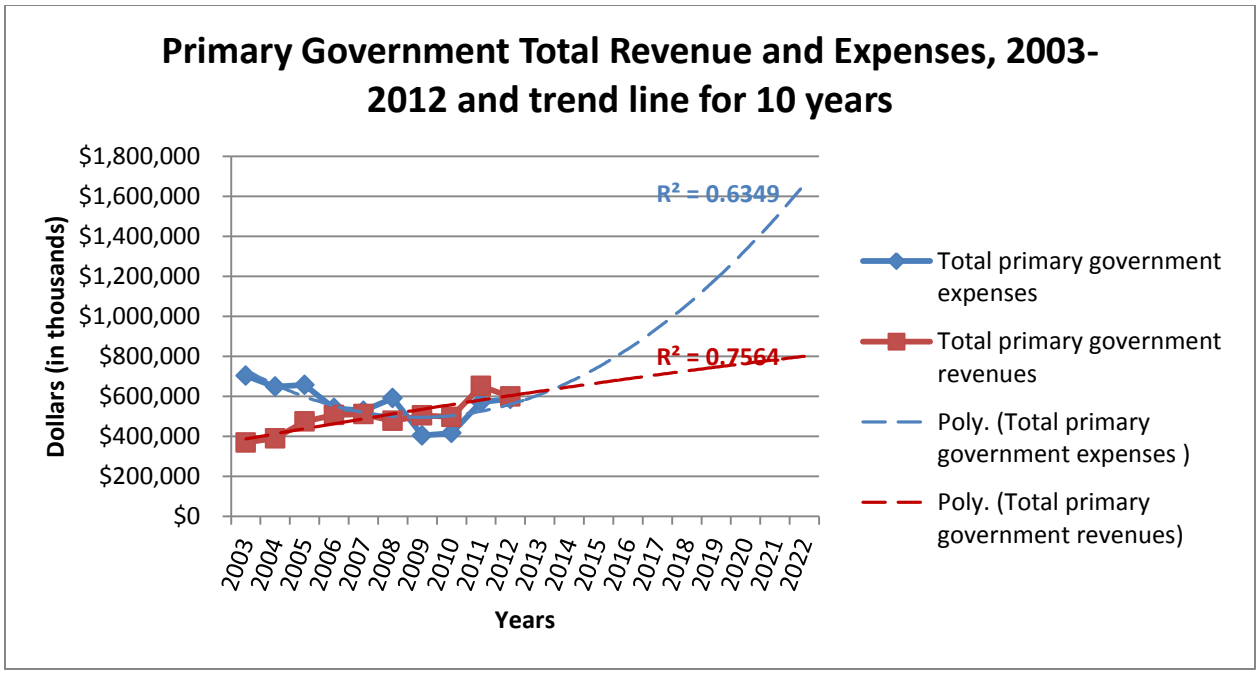
Source: Regional Transportation Authority 2012 (Bureau of Economic Analysis U.S. Department of Commerce and Bureau of Labor Statistics Data U.S. Department of Labor)

Figure 14. Chicago area population, 2003 to 2012 and trend line for 10 years

RTA Financial Data

The RTA Act (1983) appointed the RTA as a primary public body in the Chicago metropolitan region to secure funds for public transportation. The act authorizes the RTA to impose a series of taxes within the six-county metropolitan region by a vote of nine of its directors: a sales tax, a car rental tax, a motor fuel tax, an off-street parking tax, and a replacement vehicle tax (RTA 2012). Regional (occupational and use) sales tax and sales tax match from the State of Illinois are the primary sources of operating funding for the RTA (RTA 2013). Providing financial assistance to service boards (CTA, Metra, and Pace), interest expenses, and capital grants provided are the major expenses.

Figure 15 shows the total primary government expenses and revenue for the RTA.

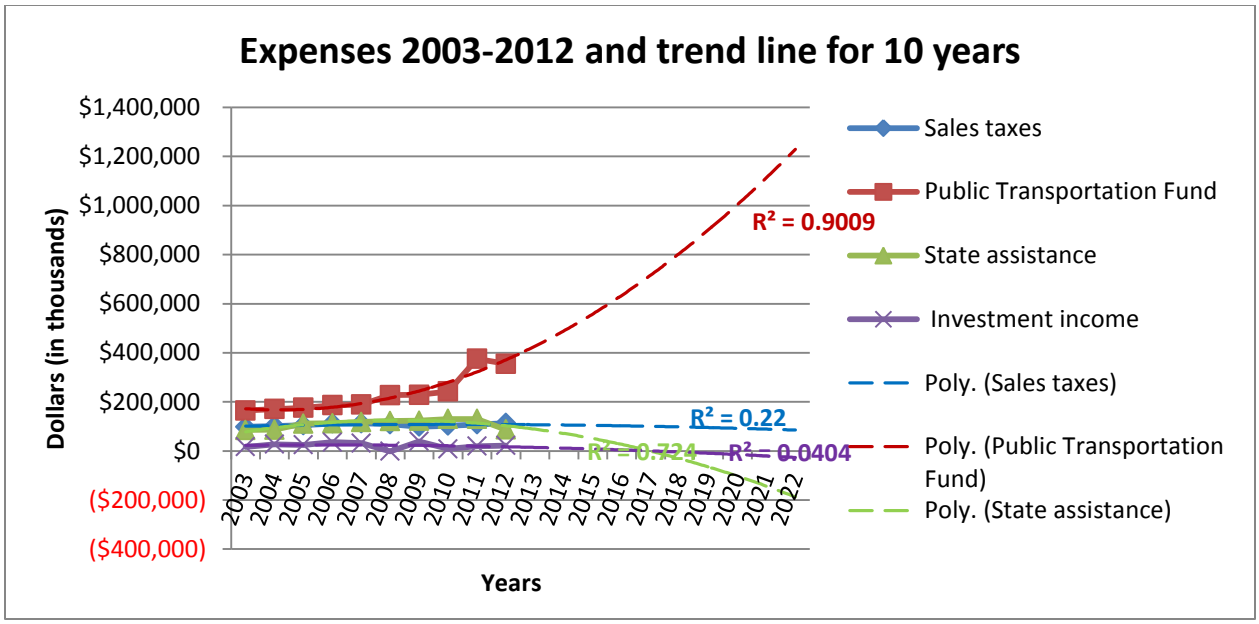


Source: Regional Transportation Authority 2012

Figure 15. Primary government revenue and expenses, 2003 to 2012 and trend line for 10 years

Prior to the year 2009, the RTA was running at a loss; for example, total primary government expenses were higher than total primary government revenues. However, for the years 2010, 2011, and 2012, the revenues were higher than the expenses, indicating a profitable transit system for the Chicago area, but only by counting tax and subsidies as revenue. However, the 10-year projections of the data using polynomial regression show a pessimistic scenario for the financial sustainability of the RTA in the future; for example, expenses will outgrow the current level of tax revenues in the next 10 years if steps are not taken by the RTA to resolve this issue in a timely manner. Using the polynomial model to fit the data, R^2 values of 0.63 and 0.76 are expressed for expenses and revenues, respectively; for example, 63% and 76% of the variation of the dependent variables are explained by the model.

The public transportation fund (PTF) consists of 30% of net revenues realized from sales taxes and real estate transfer tax (RETT) paid to the RTA only upon state appropriation (RTA 2013). As shown in Figure 16, the projections for the PTF indicate an increase in funds in the next 10 years. R^2 for the PTF trend line is 0.9, which means that 90% of the variation of the dependent variable is explained by the polynomial model used.

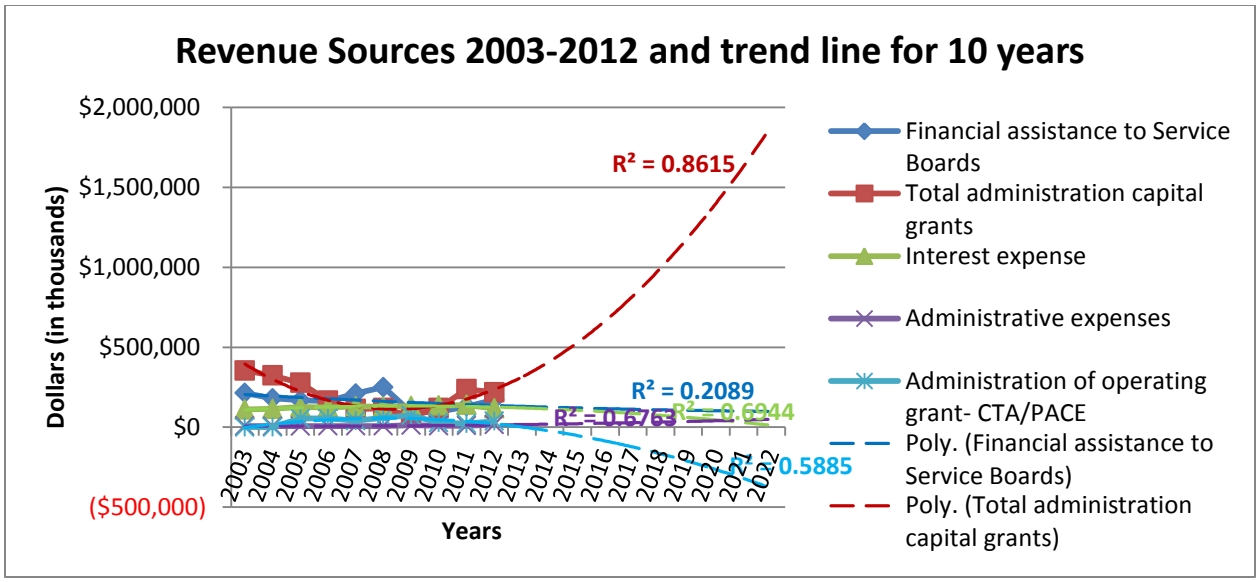


Source: Regional Transportation Authority 2012

Figure 16. Expenses, 2003 to 2012 and trend line for 10 years

Similarly, the R^2 for state assistance is 0.72, which means that 72% of the variation in the variable is explained by time. The 10 year trend line shows an imminent decline in the state assistance to be received by the RTA. Unfortunately, the polynomial model used fails to explain the variation of the dependent variable with respect to investment income and sales taxes because R^2 is 0.22 and 0.04 for sales tax and investment income, respectively.

The administrative expenses almost doubled from $8,918,000 in 2011 to $16,507,000 in 2012. The trend line for administrative expenses shows a steady increase for the next 10 years. The R^2 for administrative expenses is 0.68, which means that 68% of the variation in the variable is explained by time (Figure 17).



Source: Regional Transportation Authority 2012

Figure 17. Revenue sources, 2003 to 2012 and trend line for 10 years

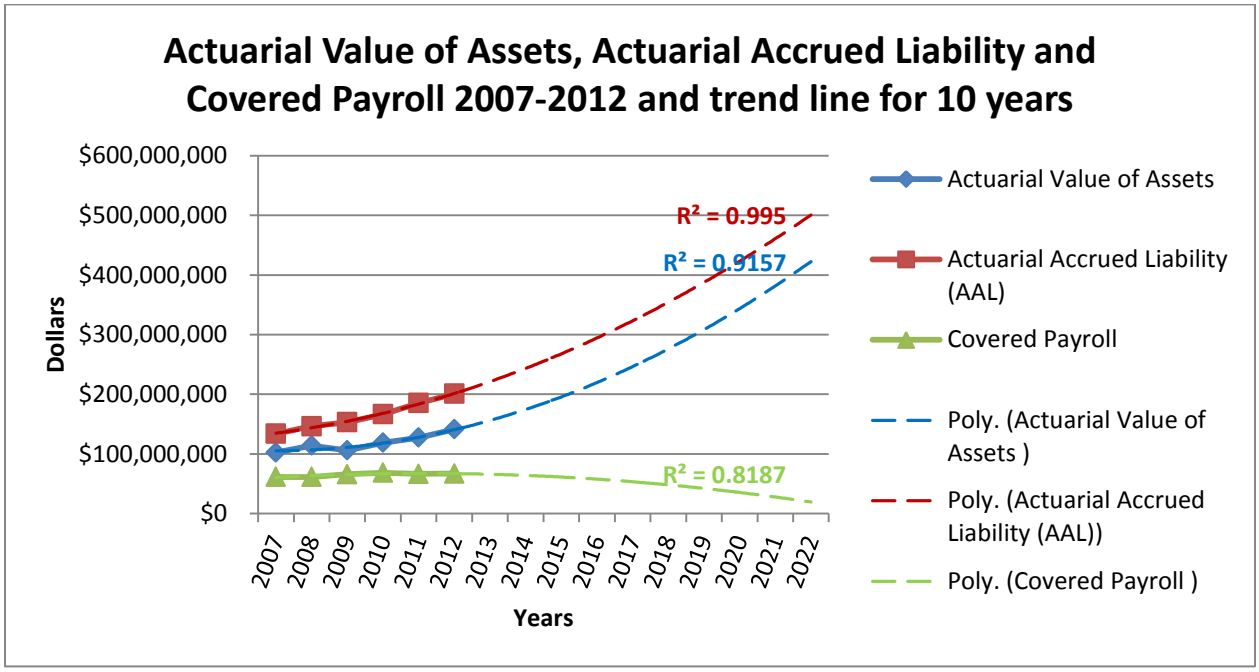
The financial assistance provided to the service boards are projected to increase rapidly over the next 10 years (Figure 17). The R^2 for the financial assistance provided to the service boards is 0.86, meaning that 86% of the variation in the variable is explained by time.

In summary, the increase in financial assistance provided to the service boards, the increase in administrative expenses, and the decrease in state assistance as well as the increase in the PTF projected by trend lines for the next 10 years all point towards the financial instability of the RTA system. Decreased revenue sources and increased public assistance will create a burden for taxpayers in upcoming years if steps are not taken to decrease expenses as well as increase revenue sources for the RTA system.

Pension Plans

As stated in the 2012 CAFR from RTA, the RTA, along with Metra and Pace, participates in a cost-sharing multi-employer noncontributory defined benefit pension plan known as the Regional Transportation Authority Pension Plan. This pension plan is funded solely by employer contributions and covers employees that are not covered by a union pension plan. Using the projected unit credit actuarial method, the RTA, Metra, and Pace are required to contribute amounts to fund the benefits of their respective employees. As of January 1, 2012, the pension plan was 70.4% funded (the underfunded actuarial accrued liability was $59.457 million). In addition to the pension plan, the RTA provides postemployment benefits of limited health care insurance coverage for its eligible retired employees. Metra and Pace do not participate in this postemployment benefit plan.

Figure 18 projects the actuarial value of assets and accrued liability to increase in the next 10 years and covered payroll (annual payroll of active employees covered by the pension plan) to decrease steadily during the same time period.

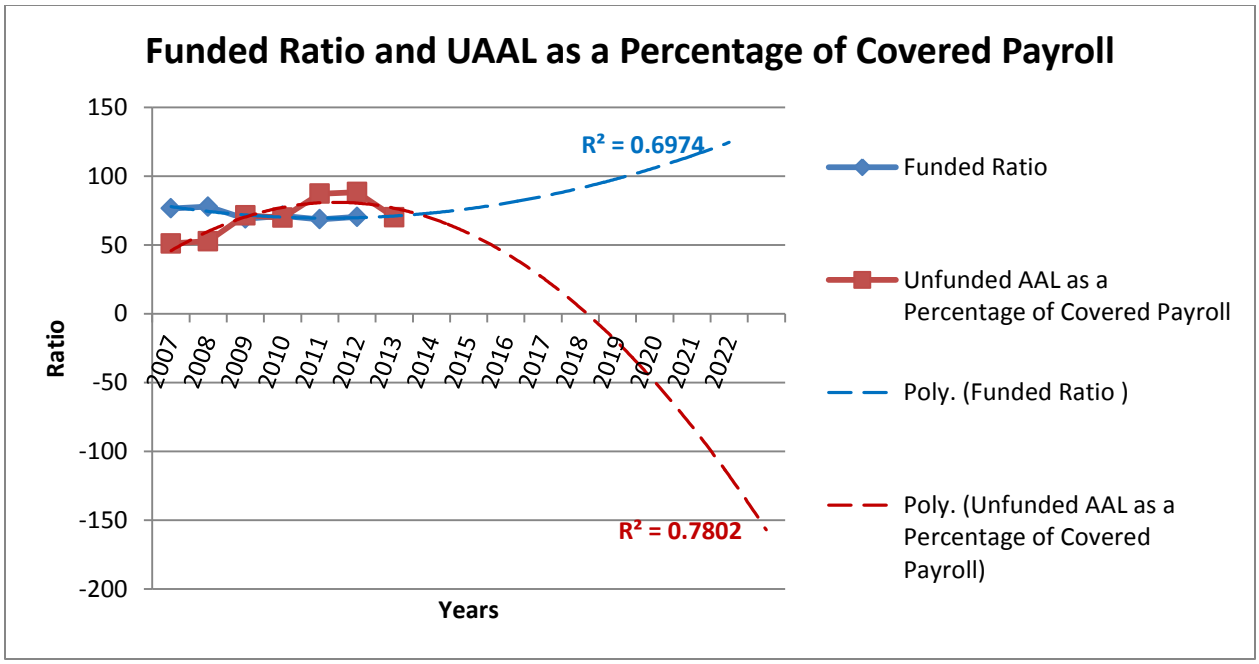


Source: Regional Transportation Authority 2012

Figure 18. Actuarial value of assets, actuarial accrued liability, and covered payroll, 2007 to 2012 and trend line for 10 years

The polynomial model was used to fit the data, and, as shown by the R^2, the model is a good fit for the data because the R^2 values are between 0.82 and 0.99. This means that a great proportion of the variation in dependent variables is explained by time. From 2007–2012, the AAL of the pension plan outweighed the actuarial value of the assets. The projection for the next 10 years suggests that the situation will remain the same. For the same period, the AAL increased by more than twice the actuarial value of assets (actuarial value of assets increased by $38,864,169 and actuarial accrued liability increased by $66,939,115 from 2007–2012). The rate of increase indicates a threatening picture for the financial sustainability of the pension plan.

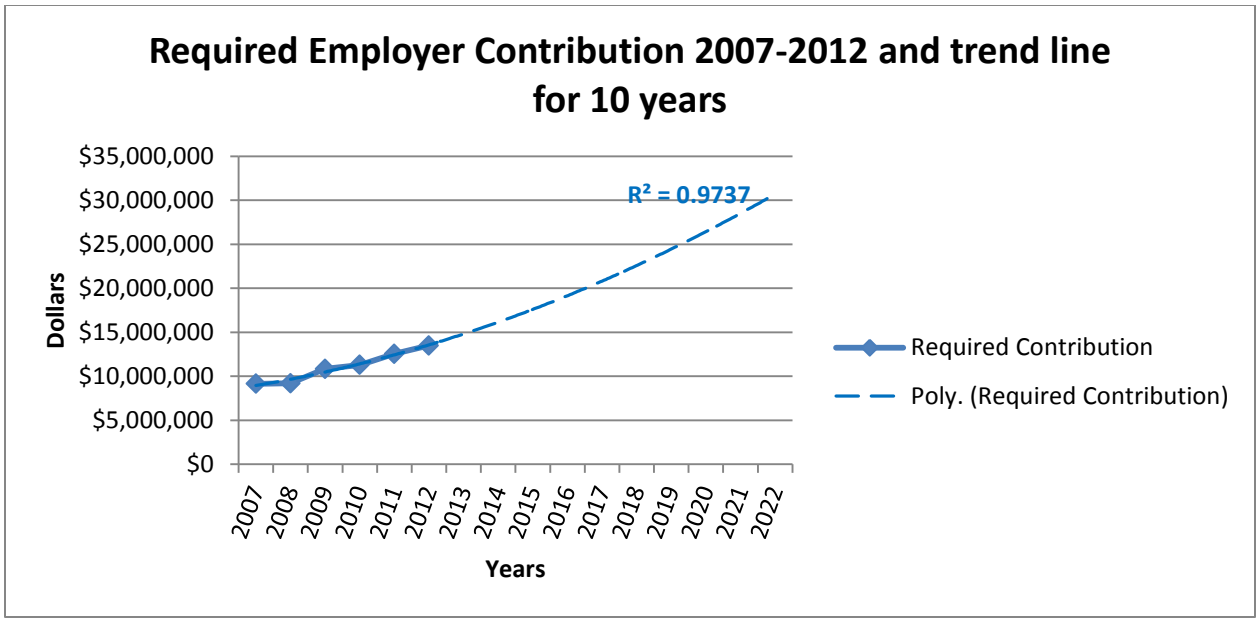
In addition, the funded ratio for the pension plan decreased from 76% in 2007 to 70% in 2012. UAAL as a percentage of covered payroll increased from 51.1% in 2003 to 88.5% in 2012 (Figure 19).



Source: Regional Transportation Authority 2012

Figure 19. Funded ratio and UAAL as a percentage of covered payroll, 2007–2012 and trend line for 10 years

The trend line shows that the funded ratio of the pension fund will continue to increase in the next 10 years, and UAAL as a percentage of the covered payroll will continue to decrease during the same time period. The projection has R^2 values of 0.67 and 0.78 for the funded ratio of the pension fund and for UAAL as a percentage of the covered payroll, respectively. Figure 20 shows that the employer contribution to the pension plan is increasing year after year.



Source: Regional Transportation Authority 2012

Figure 20. Required employer contribution, 2007–2012 and trend line for 10 years

An R^2 of 0.97 for the data set means that the variation in the variable is almost fully explained by time. In conclusion, the data and the projection of the data using polynomial regression indicates that the actuarial accrued liability will continue to increase in the future and that the pension fund will be underfunded and will therefore play a detrimental role in the financial sustainability of the RTA system.

The figures above for Bi-State and RTA help illustrate the severity of the financial calamity that mass transit systems are facing all across the United States. If the scope of this paper were to be expanded, other mass transit systems within the United States would exhibit a more or less identical picture. The gaps between operating revenues and operating expenses and between the actuarial value of assets and liabilities are widening annually. Furthermore, the subsidies provided by various levels of government are increasing yearly. These trends illustrate an alarming scenario that will be analyzed further below.

ANALYSIS OF CASE STUDIES

The availability and affordability of automobiles encourage people to move farther out from the city, creating suburban areas and reducing the need for mass transit services for these individuals. However, mass transit services are essential for the mobility of individuals who simply cannot afford the luxury of a personal vehicle. The benefits provided by the mass transit systems are concentrated on the consumers who use them, while the costs are widely dispersed amongst taxpayers. Core consumers of mass transit are those who habitually use the services provided by mass transit systems. Therefore, it is crucial to identify the core consumers of mass transit service and provide high-level services geared towards this consumer base.

In 2012, local taxpayers provided about 30% of the total funding for mass transit systems (Table 2). With such large public subsidies coming from local tax payers spread across all geographic sectors of the city, mass transit authorities feel obligated to offer services to all parts of the city, irrespective of the expected ridership demand and usage. This notion of expanding transit services across all geographic sectors of the city is not only idealistic but also cost inhibitive. In addition, expanding transit services to areas of low demand consequently leads to diluting services in areas of high demand. Instead, mass transit authorities need to recognize the importance of redirecting services from the suburbs to urban areas or cities where the core consumers of mass transit service reside.

As seen in the case studies of Bi-State and Chicago RTA, pension plans are underfunded and create an enormous liability to both transit agencies. There are two types of pension plans, namely defined contribution pension plans and defined benefit pension plans. Approximately three-fourths of the workers that are covered by pension plans are covered by defined benefit contribution plans, and the remainder are covered by defined benefit plans. Defined benefit plans are pension plans in which the employee's pension payments are calculated according to the years of service provided by the employee and the average of the last couple years of salary earned at the time of retirement. For defined contribution pension plans, the payments are not guaranteed at retirement, but the employer contributes funds on behalf of the employees throughout the employment period (Spiceland et al. 2013).

Most government agencies in the United States have defined benefit plans for their employees. About 90% of state and local governments provide defined benefit plans to their employees (CNN n.d.). According to an article by the Office of Retirement and Disability Policy, in 2006 about 33% of state and local government pension plans were less than 80% funded. This percentage increased to 46% when the stock market crashed in 2008. Despite the greater economics of defined contribution plans over defined pension plans, the public sector has seen very little shift from defined benefit plans to defined contribution plans. So far, only Michigan and Alaska have plans that require new employees to join a defined contribution plan (Butrica et al. 2009).

Regarding defined benefit plans, the agencies are responsible for making decisions about how much money to contribute to each individual's pension plan and how to invest it. These pension plans tend to be expensive for the agencies, and there is a higher probability of the plans being underfunded. At the time of retirement, transit employees have the opportunity to retire with full salary as pension payments (for example, "golden parachute"). For example, if an employee worked overtime hours during the last years of his/her employment, this amount would be included in the calculation of the pension amount, resulting in bigger pension payouts.

Changing the labor agreement related to pension plans will be a positive step towards future financial sustainability for mass transit systems. According to the information provided by Metro Transit – St. Louis, the Salaried Plan and IBEW Plan were closed to new entrants effective July 1, 2013 and January 1, 2014, respectively. After July 1, 2013, new salaried employees receive an annual agency contribution of 4% to their 401k account, whereas employees hired on or after

January 1, 2014 for the IBEW will participate in a defined contribution plan. There were no changes made to the 788 ATU O&M and the 788 ATU Clerical plans (Bryant 2014).

The existence of the enormous pension liabilities in the balance sheet of governmental agencies fueled by the defined benefit plans will ultimately lead these agencies into bankruptcy. For example, last year the City of Detroit filed for Chapter 9 bankruptcy, which was the largest municipal bankruptcy filing in U.S. history. The estimated debt for the City of Detroit at the time of bankruptcy was over 18 million dollars. One of the major reasons cited for this unfavorable outcome was the legacy costs—pensions and health care plans—owed by the city to its pensioners. In 2012, the legacy costs comprised 18% of the City of Detroit's total spending, up from 8% in 1960. In addition, the city's total funded retiree health care benefits rose 19% from 2007 to 2011. Over the years, the City of Detroit's leaders not only failed to take actions to reduce the legacy costs but also missed opportunities to overhaul the retirement benefit plans. For example, in 1997 the City of Detroit did not follow in the footsteps of the State of Michigan in switching from pension to 401(k) plans (Bomey and Gallanger 2013).

There are several lessons that mass transit authorities can learn from the experiences of the City of Detroit. First, mass transit authorities need to fully understand the future consequences (for example, liabilities) of having defined benefit plans for their employees. Second, these plans need to be phased out in favor of defined contribution plans. Last, the public transit authorities need to carefully assess the following question: "Do public transit systems have to go through bankruptcy before necessary changes are implemented?" If the answer is no, steps must be taken towards implementing changes mentioned herein.

Thirty-eight years ago, Mundy (1976) stated that the utilization of vehicles and labor during non-peak hours of operation is a major challenge faced by urban mass transit systems. This situation is still true today. Mass transit systems have not yet succeeded in operating at an efficient economic level. As per Mundy (1976), fixed costs could be reduced via utilization of owner-operated equipment. In addition, Mundy suggested that the provision to contract out services during peak periods will help reduce or eliminate the dependency of mass transit systems on operating subsidies (Mundy 1976). The mass transit systems have had 38 years to implement Mundy's (1970) suggestions, but have failed to do so, partially because of the artificial barriers set by the federal government. For example, the notion that only public transit systems can provide mass transit services hinders competition by making it difficult for private companies to enter into the industry. Additionally, the prevalence of Section 13(c) of the Federal Transit Law, which ensures the continuance of collective bargaining right (for example, unions) and protection of wages and benefits along with transit employees' other employment conditions should the transit systems be privatized, obstructs private parties from entering into the mass transit industry. Furthermore, Section 13(c) obstructs the use of federally funded vehicles by the private sector.

The union contract provided by the Bi-State Development Agency prohibits subcontracting work that is necessary for the operation or maintenance of revenue vehicles, except in cases of emergency or when the work cannot be performed by their employees, even though many drivers are only needed part time. These barriers prevent mass transit systems from experimenting with

the private sector to provide peak-time services or bidding out certain routes, as suggested by Mundy (1976). Considering the financial difficulties that the mass transit systems are facing today, it is time for the mass transit authorities to take a step towards experimenting with viable alternatives to make mass transit systems financially sustainable once and for all.

VIABLE ALTERNATIVES

As this paper has advocated, the future of mass transit systems, in regards to their ability to increase ridership and financial sustainability, is in peril. However, there are viable alternatives that could help mass transit systems take steps toward future sustainability. Among the various methods of revised and sustainable mass transit systems to be implemented, the most common appear to be privatized light rail; restructuring transit routes and peak times; and varying degrees of bus system improvements, including bus rapid transit (BRT), comprised of privately owned buses using private sector employees. Indeed, inviting the private sector to shoulder a portion of the financial burden could reward a currently failing and outdated system with new life. For example, maintaining core infrastructure and operating mass transit activities within the public sector can still allow for the private sector to fill gaps within transit peak times or even implement trials and beta tests of innovative transit changes. This collaboration is a win for both sides, in that the private sector is allowed to realize profit for service and innovation while the public sector benefits in relinquishing its dependence on government subsidies by instead outsourcing local support. It is time for mass transit to focus on its foundation—the need to deliver affordable and sustainable transit systems to the masses—rather than provide job support to a failing industry.

In establishing alternatives in mass transit systems, the majority of costs associated with implementing the project are capital; activities such as altering or creating transit right-of-way, building or updating stations and stops, purchasing vehicles, and environmental accommodations are expensive, but these should be considered one-time expenditures. Most cities that have adequate capital funds, or a means to raise them through local taxes, often opt for light rail systems. However, as exemplified in multiple countries such as Brazil and Columbia, with increasing economic strain on government funds and consumer tax contributions, many cities are foregoing light rail systems for BRT systems because they allow for not only optimal sustainable change at a lower cost, but also the flexibility to increase ridership over large geographic areas (Ashmore and Obregon 2011). Additionally, these transit systems that have little public funding often farm out services on which the private sector can bid, providing superb system support and increasing overall success.

In a study of 13 cities in various global locations over the last 50 years, the most frequently listed reasons cities indicated needing a new approach to their mass transit system were the following:

- Transit budget deficits
- High traffic congestion
- Slow commute times/unreliable service
- Disorganized and inefficient transit routes
- Disorganized and over-crowded service providers

- Need to service more low-income populations
- Combating poor air quality

However, perhaps one of the biggest failures attributed to revamped mass transit initiatives is the inability to consider consumer needs in order to increase ridership. Reasons for these failures include the following:

- Poorly focused target market initiatives
- Misaligned and unclear transit structure strategies
- Lack of consumer interest due to unperceived benefits

(Ashmore and Obregon 2011, Coleman et al. 2013, FHWA n.d., Global Mass Transit 2011, Goldwyn 2013, Hensher 1999, Leland 2009, Levinson et al. 2003, Lindau et al. 2007, Overdorf 2012, PPP Forum Limited 2014, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) 2011, Whitfield 2001, The William and Flora Hewlett Foundation 2011)

As outlined in Overdorf (2012), New Delhi has experienced all of these problems in the failure of its BRT project. First, the design of the transit system proved unable to alleviate mass traffic congestion and improve commute time due to the flawed placement of stations. The designers also targeted the wealthy, politically influential, and car-loving middle class as their target market instead of the lower and car-less classes, ensuring that neighborhoods where car parking was heaviest also had the highest traffic congestion. Finally, there was no incentive offered for those who chose commuting via BRT, as it proved to have longer commute times than car or bicycle, while the penalties associated with personal vehicles (for example, parking tickets, speeding) remained low and unwavering.

Therefore, the recommendations for successfully implementing viable and sustainable mass transit alternatives include:

- Prioritizing strategy alignment;
- Service differentiation;
- Offsetting financial risk by inviting local partner investment;
- Fostering consumer ownership to gain interest, awareness and support; and
- Utilizing public sector support to reduce government subsidies.

Utilization of Public-Private Partnerships

More financially conservative options include mass transit alternatives comprised of public-private partnerships (PPP) that greatly offset costs to taxpayers while simultaneously stimulating the local economy. The existence of private corporations, unlike government entities, is solely dependent on the competitive market forces of supply and demand. In order for private organizations to exist, let alone maintain competitive advantage, they must constantly reinvent themselves through product and price differentiation strategies. Corporations have the most

incentive to innovate and are known for their dynamism, which may be just what the dated and struggling mass transit industry needs. Government entities, due to their bureaucratic nature, are plagued by inefficiencies caused by lack of incentives and due to natural union pressure, compounding their inability to reduce costs. As shown, these inefficiencies have pushed many mass transit authorities towards financial instability and ever-increasing dependence on general taxpayer support.

A partnership between the efficient and dynamic private sector and the steadfast security of the government sector is a strong solution for the financial sustainability of mass transit systems going forward. Offsetting risk to private investors allows them to do what they do best: keep employee compensation relative and competitive, maintain efficient vendor partnerships, effectively measure and influence consumer behavior, and ultimately grow profit margins.

The United Kingdom has been a pioneer in using public-private partnerships to strengthen its infrastructure. Executed and refined throughout the 1990s, it was a strategy introduced in hopes of improving profound overspending and unsatisfactory public infrastructure projects while simultaneously promoting healthier public and private sector relationships (PPP Forum Linited 2014). The model used in the United Kingdom is known as private finance initiatives (PFI), in which design, construction, financing, operating, and maintenance of facilities are bundled into a long-term contract with a consortium of firms (Siemiatycki 2011). For example, the United Kingdom's prison system has successfully implemented the PFI model to provide adequate facilities and a healthy environment for prisoners by creating a competitive marketplace for service providers, keeping costs down and service quality high (Gabriel and Head 2006). Early transit infrastructure improvements include a rail link to the Channel Tunnel and a second Severn Bridge (Whitfield 2001). In recent years, countries across the globe have implemented similar PFI models extensively to build a diverse range of high-quality and competitively healthy infrastructures.

State and local governments, as well as transportation agencies, in the United States have already started using PPPs to finance government road infrastructure, citing the Chicago Skyway, San Diego's South Bay Expressway, and toll lanes in northern Virginia as examples found on the FHWA's website (FHWA n.d.). Authorities need to take advantage of the benefits provided by PPPs and utilize these partnerships as one method of reaching mass transit sustainability. For example, instead of contracting out various areas of mass transit infrastructure to different independent parties (construction, operations, maintenance), mass transit systems in the United States could bundle these areas together and foster a long-term partnership with a consortium of firms. This allows the private firms to take on the risk of securing competitive products and services in an efficient manner while meeting priorities set forth through the PPP agreement. As a result of the benefits of using PPPs, the minimum standards for the entire industry would be upgraded, maintained, and likely even surpassed.

Reducing Costs and Increasing Revenue

As simple as this solution may sound, it could be equally difficult to implement cost reduction and revenue increment measures. As established by the literature review, the unions usually have

a strong hold in the public sectors and are opposed to cost reductions via cutting salaries and benefits, which constitute a major operating cost for mass transit systems. Applying the fundamental concept of supply and demand (for example, as prices for goods increase, the demand for those goods decrease), an increase in fares would lead to a decrease in ridership. Therefore, increasing revenue via increased fares would be difficult to implement in practice without expecting a decline in ridership.

According to Buehler and Pucher (2011), regulated competition and private sector involvement has proved to be successful in Germany in operating mass transit systems. In addition, Germany implemented cost reduction and revenue enhancement measures to improve the financial performance of public transport. The cost reduction measures included cutting employee benefits by renegotiating labor contracts, increasing work hours, freezing salaries, implementing early retirement programs, organizational restructuring, outsourcing subsidiaries, cutting underutilized routes, and shifting resources to the most lucrative services, among others. The revenue enhancement measures included fare increases; regional coordination of timetables, fares and policies in metropolitan areas; region-wide monthly or annual tickets that provide discounts compared to single trip fares; full integration of public transport with walking and cycling; cost increases for automobile use; and clustering of new development around transit stops. The implementation of the cost reduction measures in Germany had some negative consequences, such as reduction in wages for new hires and reduction of the frequency of services provided, but improved transit sustainability with additional public funds (Buehler and Pucher 2011).

Historically, Germany has had stronger labor unions than the United States. If Germany was able to negotiate with its labor unions and come to an understanding in terms of making transit systems more cost effective, then why can't the United States? In applying the German experience to U.S. mass transit systems, transit authorities need to consider the resistance from the public transit unions. In the short run, resistance from the public unions is inevitable. Keeping this in mind, mass transit system authorities in the United States need to negotiate new contracts with the unions as they threaten the viability of mass transit sustainability. Increasing work hours is unrealistic, but using split shifts and part-time drivers, which would greatly reduce the variable operating costs of existing operations, is negotiable. Also, organizational restructuring and outsourcing service delivery to the private sector, as well as cutting underutilized routes, are practicable solutions to reduce costs for mass transit systems in the United States.

Although Germany and the United States are comparable economies, there are factors that are unique to the United States that need to be considered in applying the German experience to the United States:

- For the last 60 years, all levels of U.S. government policies—federal, local, and state—have been favorable for the automobile, unlike the governmental policies in Germany (Buehler et al. 2013).
- Unlike in Germany, where various levels of government interactively coordinate their land-use plans, in the United States land-use planning is fragmented and lacks coordination between different levels of government. In addition, land-use planning is not integrated with

planning for transportation in the United States (Buehler et al. 2013).
- Gas is twice as expensive in Germany as in the United States. Similarly, the price of automobiles is higher in Germany than in the United States.

Favorable government policies for automobiles combined with cheap gas and relatively inexpensive automobiles have enabled the public to purchase and maintain personal transport as opposed to opt for mass transit systems in the United States. The case is the exact opposite in Germany, where dense populations and social culture are built around public transit, and owning a personal automobile is not a common, prudent expenditure. Given these reasons, some would argue that there are some difficulties in adjusting the cost reduction and revenue increment measures applied in Germany to the United States, especially Germany's disincentive to automobile use.

We can begin to improve our own transportation system by building on the fact that the United States is not Germany, and transportation methods that work there just won't work in the United States. Despite the classic American mentality, we cannot have both a well-supported public transport system and well-funded, endless highway systems, all successfully supported by an efficient, proactive, and financially sound government. What we can do is learn by the successful examples of other countries and make those successes our own. Most United States mass transit systems have been in decline for a long time, so it's time to retire them and adopt better, more relevant, sustainable systems. The transit authorities in the United States may have no alternative but to work towards enhancing coordination among different public transportation modes, quality of service, and accessibility of all networks.

Contracting Out Transit Services to Private Parties

Much research has been conducted on whether or not contracting out transit services to private parties provides efficient asset utilization. Some results, such as those exhibited in Curitiba and Bogota, Colombia, claim success due to collaboration, whereas others claim that inviting privatization fails to yield effective change (Ashmore and Obregon 2011, Overdorf 2012). The reason cited against contracting out transit services is that it fails to create innovation in operations and service levels. However, claims of collaboration failure typically stem from the union representatives who are understandably more supportive of a unionized employee industry rather than a nonunionized employee industry. In fact, the use of the private sector creates a competitive work environment, allowing for optimal costs for service while eliminating outdated pension plans and other benefits that take advantage of flagrant government overspending. The result is lower cost, higher quality, and potential profit for the private sector. Such innovation is precisely what the mass transit authorities can utilize to ensure quality services are provided to transit riders at an affordable price.

Use of Competitive Tendering of Routes

Profitability of a route depends on the ridership. Routes with historically lower ridership drain financial resources and provide benefits to a limited number of people. Creating an efficient network of mass transit systems requires transit authorities to remove the routes that are

underutilized and focus resources on routes that have historically high ridership. This revised system offers two profitable solutions where there used to be none: eliminating the dependence on subsidies to maintain underutilized routes and capitalizing on routes with the highest demand to drive profit. Then, these routes that are potentially profitable can be made available for competitive tendering. The bidder who is capable of generating a profit along with maintaining quality of service should be allowed to run the route. According to Amaral et al. (2009), London has successfully implemented a competitive tendering of its urban transit systems that consists of 800 routes covering 629 square miles.

Innovation to Increase Ridership

The pundits supporting mass transit argue that transit agencies create jobs within the community and foster economic growth. In reality, the jobs created by mass transit systems are government-funded positions that drain taxpayer dollars if used inefficiently. In addition, one can argue that it is not the duty of public agencies to create jobs. However, public officials do have a duty to service the general public (taxpayers) in the most efficient and innovative way possible.

Over the years, mass transit sectors in the United States have seen little real innovation geared towards improving service and attracting ridership. For example, new buses and rail cars do nothing to change the speed and service characteristics of mass transit and therefore are not innovative changes. If public funds are to be utilized for mass transit, they should be used for innovative services that provide the one amenity consumers desire: time. For example, publicly provided mass transit systems in Japan have seen technological innovation over the years encompassing the needs as well as demands of the riding public. Most notable has been Japan's bullet train service, which drastically reduces travel time. Currently, Japan has one of the most efficient public mass transit systems, transporting over eight million passengers daily (Voyer 2011).

Over the years, the Japanese transit systems have set a high standard within the mass transit industry in terms of quality of service provided to the riders. It has been 50 years since Japan introduced the first bullet train, which travelled at the speed of 130 miles per hour. Over these 50 years, constant innovation has improved the speed of Japanese trains almost threefold to 320 miles per hour (McKean 2014). Unfortunately, none of these truly innovative systems and immense public moves above has made it overseas to the United States, despite the fact that the transit systems in the country have had 50 years to implement the changes.

Similarly, technology network companies (TNCs) like Uber and Lyft grew out of the public's poor perception of cab services on the west coast of the United States. The technology companies have taken the taxi riding public by storm, especially in the cities like San Francisco, San Diego, and New York. Despite all the controversies around these tech companies, we have to see the market innovation that fueled this newborn industry: the creation of a mutual platform that serves both drivers and riders, dispensed at the tip of the user's fingers with only a single click. TNCs have capitalized on both the accessibility of smart phones and the reliance of tech-savvy individuals on their phones. This entire industry is based on the convenience provided by sophisticated apps and the ability of those apps to capitalize on the preferences of the taxi riding

public. At the same time, TNCs attempt to avoid any safety regulations or insurance requirements that regulate the taxi cab industry. Can mass transit learn from these nascent companies? Probably, yes. The technologies used by TNCs can be customized to fit the needs of mass transit riders and improve their utilization of mass transit systems.

The future financial sustainability of mass transit depends on the ability of mass transit systems to shift their involvement from owning and operating public transportation services to supporting and encouraging the private sector to operate and create different services for different public needs for transportation. Only in this way can increased ridership levels be achieved. Doing the same thing year after year and expecting different results is obviously no solution, and time and money are getting short. The innovations mentioned above, and others, would help brand mass transit in an entirely new light. These changes would not only show that mass transit systems are financially reliable, but also that mass transit systems are incorporating the demands and needs of their riders.

Public Policy Implications

This review of the financial sustainability of U.S. mass transit systems would appear to be rather negative if it were not for the efforts of other nations to rethink their public transit policies and turn to the private sector for both creativity and innovation. Readers should note that the work does not call for a reduction in financial support for mass transit but rather a redirection of funds for greater efficiency and effectiveness. Public transit in the United States must relieve itself of the negative financial future it faces unless major policy decisions are made to significantly reduce the public service workforce and thus operational subsidies for mass transit. In the short run, this will necessarily include using mass transit assistance funds to keep the retirement promises it has made to current and past public employees, but, as this work has shown, there is little other choice. Intuitively, this is difficult for public policy decision makers who have lived in an era of larger and larger public entities as the solution to urban problems. However, as city budgets and community services crumble under their oppressive weight, decision makers will have little choice but to turn to the private sector for the provision of these services. The sooner this is realized, the sooner financial bleeding can be stopped and changes enacted that would return the provision of public transportation back to the private sector.

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