

Planes, Trains and Automobiles: Renewal of U.S. Transportation Infrastructure

Clive Lipshitz and Ingo Walter

Among President Biden's top policy priorities is his pledge to invest in America's infrastructure. In this, he is not very different from his predecessors. Besides the immediate employment and income gains that politicians like to focus on, well-conceived and well-executed infrastructure investments boost the growth of economic capacity, compounding year after year, potentially paying for themselves many times over.

During his campaign, President Biden put out a very detailed infrastructure plan.¹ His objectives are broad, and include job creation, applying "buy American" mandates, prioritizing safety across all modes of transportation, and utilizing existing federal government finance programs. His plan seeks to pave the way to sustainable funding, a low carbon future in road and rail transportation, and resilience to climate change for critical infrastructure. The plan gets more detailed – long-distance rails need to be electrified, highways must have a large network of charging stations, every mid-sized city should have zero-emission transit, and there should be state-of-the-art high-speed rail systems for both passengers and freight.

President Biden's plan nods to the possibility of an enhanced role for the private sector, perhaps including public-private partnerships (P3s). There is today plenty of private capital, know-how, risk-taking and entrepreneurship available and ready to engage under the right conditions. In this article we provide a transportation system overview in its key dimensions, explain the major pressure-points that will need to be addressed, and outline ways in which the private sector can be productively engaged to make the Biden plan a success.

Judging by the record of earlier presidents who were effective leaders in infrastructure, President Biden needs to combine national vision with executive leadership to get things done. His first objective will be to get past the Covid-19 pandemic. Infrastructure should follow soon thereafter. His most important ally in this effort will be Transportation Secretary, Pete Buttigieg.

TRANSPORTATION INFRASTRUCTURE

Transportation infrastructure is the logistical backbone of the economy. It is what historically enabled America to expand across its vast geographic footprint and allows cities and regional economies to function. It's how children get to school and how their parents get to work. It's what allows long-distance business travel and family vacations. It's how produce gets from farms in Iowa to tabletops in Manhattan and how manufactured goods get from Michigan or Ohio to the loading docks in Savannah.

There are four million miles of roads in the U.S. There are fifteen subway systems with 830 miles of track, 41 light rail systems with 1,000 miles of track and 33 commuter rail systems with 4,600 miles of track. Before the Covid-19 pandemic there were five billion rides on subways and

¹ <https://joebiden.com/clean-energy/>

commuter rail systems in 2019, 33 million intercity Amtrak travelers and 900 million passengers passing through America's airports.²

The history of American transportation infrastructure is marked by transformative projects that include the Erie and Panama Canals, the transcontinental railroad, the Interstate Highway System, and private and public development of commuter railroads and subway systems. There have been periodic booms and busts. Yet today, except for the 140,000 miles of freight rail lines there is almost no way for individuals or institutions to invest in any of this vast transportation infrastructure. The only significant access is through the municipal bond market.

Not surprisingly, what we have today leaves much to be desired – infrastructure that is deficient for the world's leading economy. It is common to refer to the widely cited report of the American Society of Civil Engineers (ASCE)³ which provides a report card on the country's infrastructure – the most recent of which was issued in 2017.

The ASCE report argues that failure to make the necessary investments in American transportation infrastructure will truncate GDP by as much as \$10.3 trillion by 2039, and result in three million fewer jobs than would otherwise have been the case.

To be fair, when the ASCE rates an infrastructure system as “structurally deficient” – which defines a failing grade – it means the system does not adhere to the ASCE's own standards. Much of America's civil engineering infrastructure – bridges, thruways, subway systems, and airports – was constructed prior to adoption of modern design and engineering specifications. For example, lane width on U.S. highways is twelve feet today, but older bridges were built to narrower standards. By comparison, European standards remain narrower than in the U.S., even today. A bridge with ten-foot-wide lanes may not really be deficient, but it is nevertheless reported as such. That said, the ASCE gives American transportation infrastructure a D+ rating. Not good.

Then Vice President Joe Biden in 2014 called New York's LaGuardia Airport “third world” – an embarrassment that helped trigger (with private capital) the redevelopment of the Airport's central terminal. As “Amtrak Joe,” President Biden knows well the importance of finding sustainable funding solutions for U.S. transportation infrastructure.

While much of the country's transportation infrastructure was originally developed with private capital, it is almost entirely owned today by state and local governments. This has allowed governments to further the policy of “transportation equity” – the idea that essential services should be available to as many as possible at an affordable price. This introduces cross-subsidies between modes of transportation and fiscal support for what might otherwise be nonviable airports or long-distance and commuter rail lines. These are all virtuous goals, but ones difficult for private capital to sustain.

Americans prefer highways to public transit and airplanes to trains. They have also become used to underpaying for transportation infrastructure, with fares, tolls, fees, and direct taxes below

² <https://www.apta.com/research-technical-resources/transit-statistics/ridership-report/>

³ https://www.infrastructurereportcard.org/wp-content/uploads/2021/01/FTA_Econ_Impacts_Status_Quo.pdf

comparable rates in many other countries. This model of funding deficiency has led to a reality in which general tax revenues – including a foreseeable burden on future taxpayers – are an accepted norm in infrastructure finance. And because government at all levels must balance infrastructure spending with other social needs, maintenance and modernization backlogs have compounded over time. The Covid-19 pandemic exacerbates this challenge with reduced direct revenues to support almost all modes of transportation.

The primary source of transportation infrastructure finance is the tax-exempt municipal bond market. There are also federal grant and loan programs, although these have been underutilized. As noted earlier, other than investments in municipal bonds private capital has been largely untapped as a financing source for U.S. transportation infrastructure. This despite large pools of funds that are now searching for investments in viable projects, including commitments by tax-exempt investors such as pension funds.

In short, under the right conditions for both the public sector and for private and institutional investors there is a lot of non-government capital that could now be tapped for transportation infrastructure. This goes for rebuilding existing transportation systems as well as for innovations such as Hyperloop, which may turn out to be game-changing. As we will illustrate, some infrastructure assets – such as large hub airports – lend themselves to private ownership (through P3s), others – such as commuter railroads and subways – are difficult to see in private hands. What is needed to bring private capital into play?

MODES OF TRANSPORTATION

We illustrate the challenges facing financing and funding of public infrastructure by focusing specifically on aviation, rails (freight rail, commuter rail, subways, and intercity passenger rail), and roads, bridges, and tunnels. The table below outlines the ownership, funding models, and opportunities for private capital in each of these transportation sectors.⁴

⁴ We restrict our focus to those modes of transportation generally owned by the public sector (aviation, rails, and roads). We exclude inland waterways and marine ports as well as other infrastructure sectors such as energy, telecommunications, and water.

Table 1 – Modes of transportation

	Ownership	Direct revenues	Subsidies	Maintenance backlog	Private capital opportunities
Freight rail	Generally private	Shipping fees	N/A	No	Extensive
Commuter rail	Public transit agencies	Fares	State and local taxes, toll subsidy	Yes	Private development or operation (limited)
Subways	Public transit agencies	Fares	Local taxes, toll subsidy	Yes	Value-capture (limited), select P3 projects
Intercity rail	Federal	Fares	Federal taxes	Yes	Private development (limited)
Hyperloop	Private	Fares	N/A	N/A	Entirely
Airports	State, local public transit agencies	Aeronautical, retail, usage fees	Federal grants	Yes	P3s (limited)
Roads, bridges tunnels	State, county, and local transit agencies	Tolls (limited), vehicle and gas tax	Federal, state, and local taxes	Yes	P3s (limited)

Airports

Although there are more than 5,000 public-use airports in the U.S., passenger volumes are highly concentrated. Of the largest 558 airports, fewer than 10 percent account for almost 90 percent of passengers – the 30 busiest account for 71 percent and the next 31 for a further 17 percent.⁵ Only the largest airports can hope to be self-funding. The rest rely extensively on federal grants. As a matter of policy, maintaining air service to rural and remote communities is viewed as a regional and national priority, particularly when – as in parts of Alaska – those communities are not connected to the national rail and highway systems.

Shortfalls in airport funding have long affected landside operations – terminals and parking facilities. These are the target for innovative solutions. Airside operations – runways, taxiways, and aprons – are generally well maintained.

There is very little private sector investment in airports. And with passenger volume down sharply due to the Covid-19 pandemic,⁶ projects such as the redevelopment of JFK’s Terminal One have encountered obstacles. But exceptions prove the rule – Toronto’s privately owned Billy Bishop Airport demonstrates a good template for an urban airport with first-rate last-mile service into the center of the city. As a matter of policy, airport privatization – through public-private partnerships – should be seriously considered, as we discuss below.

Freight railroads

In the freight rail sector, the largest players, a group of seven railroads – each with more than \$500 million in annual revenues – are categorized as Class I carriers. Four are publicly traded

⁵ https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/

⁶ <https://www.tsa.gov/coronavirus/passenger-throughput>

companies (Union Pacific, CSX, Norfolk Southern, and Kansas City Southern) and two are subsidiaries of Canadian publicly traded companies (Grand Trunk Corp, owned by Canadian National Railway and Soo Line, owned by Canadian Pacific Railway). The largest, BNSF, is owned by Berkshire Hathaway. Below the majors are 21 Class II regional railroads, each with more than \$40 million in revenues, and 603 Class III short-line railroads.⁷

Rail accounts for 33% of ton miles of U.S. freight (compared with 39% by trucks, 19% by pipelines, and 9% by water). This is why, when Berkshire Hathaway completed its 2009 buyout of BNSF (it had acquired 30% in 2006), Warren Buffet called the investment, an “all-in wager on the economic future of the United States.”

Because freight rail is the only component of U.S. transportation infrastructure easily accessible to private investors, it is not surprising that large infrastructure funds have focused on it. In 2019, the investment firm Brookfield and its equity partners acquired, for \$8.4 billion, Genesee & Wyoming, which operates 120 Class II and Class III railroads. In 2020, investment firms Blackstone and GIP made a \$20 billion bid for Kansas City Southern, the smallest of the Class I railroads. Similar transactions are likely in the future.

Intercity passenger rail

With limited exceptions, intercity rail in the U.S. is operated by Amtrak. Established fifty years ago by federal law, Amtrak assumed control of existing U.S. passenger railroads, mostly owned by freight railroads at the time. It continues to operate almost entirely on track leased from those railroads. It has never made a profit and its deficits are funded by appropriations through the Federal Railroad Administration. Even Amtrak’s heavily used Northeast Corridor (NEC) between Washington, DC and Boston – where it owns the tracks and along which it also operates the high-speed Acela service – makes money only on an operating profit basis. As Amtrak reports, the NEC has a \$45.2 billion “good repair” backlog.⁸ Most important is the critical Gateway Program to redevelop the tunnels beneath the Hudson River linking New Jersey and New York City. Ridership on Amtrak was down 48% in 2020 due to the Covid-19 pandemic.⁹

While intercity rail in the U.S. has long been displaced by the Interstate Highway System and commercial aviation, intercity trains – including high-speed trains – are very common throughout Europe. These are supported by government subsidy, at a degree that is much higher than is the case for Amtrak.¹⁰ High-speed intercity trains are also common in Asia. This includes Japan’s Shinkansen, an extensive high-speed rail network partly privatized in the 1980s. China’s more than fifteen thousand miles of high-speed passenger rail, developed in record time, had the advantage of starting from scratch¹¹ and an authoritarian government to clear the way.

⁷ https://www.aslrra.org/web/About/Short_Line_Definitions.aspx

⁸ <https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/corporate/financial/Amtrak-Management-Discussion-Analysis-Audited-Financial-Statements-FY19.pdf>

⁹ <https://media.amtrak.com/2020/11/amtrak-fiscal-year-2020-prioritized-customer-safety-advanced-infrastructure-and-fast-tracked-technology/>

¹⁰ <https://amtrakoig.gov/sites/default/files/reports/E-08-02-042208.PDF>

¹¹ <https://www.worldbank.org/en/news/press-release/2019/07/08/chinas-experience-with-high-speed-rail-offers-lessons-for-other-countries>

In the U.S., the California High-Speed Rail Authority anticipates running trains from San Diego to San Francisco and Sacramento. Due to budgetary concerns, the full network is in question, but the central portion between Bakersfield and Merced is already under development. Meanwhile, Texas Central, a private corporation, is planning a route from Dallas to Houston to compete with airlines and highways for the 100,000 people who travel weekly between the two cities – travel time between city centers would be 90 minutes instead of about three and a half hours by car or by air.

Brightline, which runs through southern Florida, is a rare privately-owned passenger railroad. It has exclusive rights to track owned by Florida East Coast Railway, a Class II freight railroad owned by Grupo Mexico and is developing its own track to extend service to Orlando and Tampa. Brightline has facilitated substantial real estate development along its route – a technique called value-capture to which we will return. Separately, it is planning a high-speed line between Los Angeles and Las Vegas.

Commuter rail

Commuter rail in the U.S. is generally owned and operated by municipal or state transit authorities. Most commuter rail was originally owned by freight railroads. Those in the northeast were part of Conrail, which assumed the operations of several bankrupt railroads. Conrail's freight business was sold to CSX and Norfolk Southern. Its commuter railroads formed the basis of New Jersey Transit, Philadelphia's SEPTA, Maryland's MARC, Chicago's Metra, New York's Metro-North, and Boston's MBTA. These transit authorities operate other modes of transit as well, such as light rail, subways, and buses.

The long-term outlook for commuter rail is tied to future employment and residential profiles. The Covid-19 pandemic may lead to a permanent change in the pattern of people commuting to dense urban districts. Commuter rail usage nationwide decreased by 80% in 2020.¹² Of those who had returned to work, 62% substituted cars for public transit.¹³

An area for innovation is “through-run rail,” which can facilitate a more even distribution of population in a megalopolis. For example, the Regional Plan Association has proposed merging the commuter railroads of NJ Transit, Metro-North and the Long Island Railroad into a unified system.¹⁴ NJ Transit and the LIRR run on interconnected tracks beneath Penn Station, so this is technically appealing. This type of development would open new sources of funding through mixed use developments above commuter transit nodes in the region.

¹² <https://www.apta.com/research-technical-resources/transit-statistics/ridership-report/>

¹³ <https://www.cars.com/articles/commuting-stalls-in-the-age-of-covid-19-cars-com-finds-62-of-americans-are-trading-in-public-transit-for-personal-vehicles-and-35-say-commuter-life-has-changed-forever-425939/>

¹⁴ <http://fourthplan.org/action/combined-commuter-network>

Subways

Subway systems are extremely expensive to operate and prohibitively expensive to expand.¹⁵ So it is unsurprising that they are heavily subsidized. For example, New York’s subway has a four-year capital budget (2020-2024) of \$40 billion¹⁶ and is subsidized by tolls from the MTA’s bridges and tunnels, by state taxes, and prospectively by a congestion pricing plan for midtown Manhattan street traffic. The Covid-19 pandemic severely wounded local transit systems – as of February 2021, New York City subway ridership was down 70-80%¹⁷ from the same time a year earlier.

Hyperloop

A novel transit concept is Hyperloop. Originally proposed in a white paper by Elon Musk,¹⁸ this is an ultra-high-speed point-to-point network comprising tubes through which transit capsules would travel at speeds up to 700 miles an hour. Several Hyperloop developers are undertaking feasibility studies and operating test tracks. Among these are The Boring Company, founded by Musk, which has developed a test track in California and is proposing a route beneath the Baltimore-Washington Parkway linking those two cities.

Transpod, a Canadian company, is designing an above-ground system, operates a test site in France, and has secured a partnership with the government of Alberta to connect Edmonton and Calgary. Another operator, Virgin Hyperloop One, has a test site in Las Vegas. If proven commercially viable, Hyperloop would be a game-changer in intercity passenger transportation, a catalyst in U.S. location economics, and a major disruptor in the passenger transportation industry.

Roads, bridges, and tunnels

The U.S. has 4.2 million miles of public roads of which the Interstate Highway System accounts for 47,000 miles.

Table 2 - Total road mileage by type (2017, thousand miles)

	Rural	Urban	Total
Interstate	29	18	47
Other state roads and highways	426	122	548
Local	2,281	875	3,156
Federal and other jurisdictions	197	199	396
Total	2,933	1,214	4,147

Source: Federal Highway Administration¹⁹

¹⁵ The New York Times reported that the Second Avenue subway cost \$2.5 billion per mile, while the No. 7 line extension to Hudson Yards cost \$1.5 billion per mile – the Times also reported that extension of the LIRR commuter railroad to Grand Central Station cost \$3.5 billion per mile.

¹⁶ <https://new.mta.info/document/10641>

¹⁷ <https://new.mta.info/coronavirus/ridership>

¹⁸ https://www.tesla.com/sites/default/files/blog_images/hyperloop-alpha.pdf

¹⁹ <https://www.fhwa.dot.gov/policyinformation/statistics/2017/hm12.cfm>

America has the highest rate of motor vehicle ownership per capita in the world²⁰ and Americans drive more miles than people almost everywhere else.²¹ Despite popular perception of deficiencies in road standards in the U.S., the World Economic Forum rates U.S. road connectivity as “best in the world,”²² and availability and quality of its overall road network as the world’s second best.²³

FINANCING INFRASTRUCTURE – SOURCES OF CAPITAL

With this brief overview of key dimensions of the U.S. transportation network, we turn now to the question of how infrastructure is financed (debt and equity) and how it is funded (direct and indirect revenues, which pay for that financing).

Municipal bonds

As far back as New York State’s issuance of bonds to finance the 1818-1825 construction of the Erie Canal, municipal debt has played a central role in providing capital to public transportation infrastructure. Even today, most U.S. infrastructure is funded in the \$3.8 trillion municipal bond market, either through direct-pay (revenue) bonds or general obligation bonds.

Exempt from both federal and state taxes, these bonds are a subsidized form of financing to states and municipalities and an indirect investment by the federal government in infrastructure. The tax exemption explains why longer-duration municipal bonds trade at yields below those of comparable Treasuries.²⁴ Certain activities are not eligible for tax-exemption, so some municipal bonds are taxable and carry higher rates of interest.

Private activity bonds

First introduced in 1968, Private Activity Bonds (PABs) extend the applicability of municipal finance to private-sector borrowers developing approved public projects. PAB projects combine private sector equity with tax-advantaged public debt.

Federal infrastructure finance programs

The federal government has a number of financing programs for transportation infrastructure. There is something of a “zero-sum game” in this financing. Funds granted or lent to one state, municipality or special district are essentially subsidized by taxpayers in the other 49 states. Senators and Representatives like to campaign on the basis of projects they have brought home with federal financing, so the politics involved are heavy.

²⁰ <https://ourworldindata.org/grapher/road-vehicles-per-1000-inhabitants-vs-gdp-per-capita>

²¹ <https://www.eia.gov/todayinenergy/detail.php?id=26192>

²² <http://reports.weforum.org/global-enabling-trade-report-2016/enabling-trade-rankings/#series=ROADQUALIDX>

²³ <http://reports.weforum.org/global-enabling-trade-report-2016/enabling-trade-rankings/#series=ETI.C.04.04>

²⁴ <https://www.bloomberg.com/markets/rates-bonds/government-bonds/us>

The Department of Transportation’s Build America Bureau oversees two programs which provide financing for infrastructure projects, particularly those which leverage private sector capital:

- Through the Transportation Infrastructure Finance and Innovation Act (TIFIA), it lends and provides loan guarantees to approved transportation projects, specifically those with “significant public benefits.” It had lent \$32 billion to 74 projects as of 2019²⁵ and has \$70 billion in total lending capacity.²⁶ TIFIA can lend up to half of a project’s cost.
- Through the Railroad Rehabilitation and Improvement Financing Act (RRIF), it provides financing specifically for railroads. It has \$35 billion in lending capacity and had lent \$6.3 billion as of 2020.²⁷ RRIF can cover the entire cost of a project.

While these programs allow borrowers to access the federal government’s credit rating, they do consider the creditworthiness of borrowers. So, states and municipalities with poor budgetary outlooks may not be eligible for financing.

To illustrate, these programs financed the entire cost of an upgrade to the Chicago Transit Authority’s rail fleet in 2016, provided \$526 million in assistance to the \$1.85 billion New York City Moynihan Train Hall project in 2017, and \$500 million of the \$1.56 billion cost of replacing the Gerald Desmond Bridge at the Port of Long Beach, California in 2020.

The INFRA program established under the 2016 Fixing America’s Surface Transportation (FAST) Act provides federal assistance to projects of national and strategic significance. The FAST Act has been reauthorized through 2021. Another Department of Transportation program, BUILD, provides grants for projects involving significant local or regional impact.

The Federal Aviation Administration (FAA) oversees the Airport Improvement Program (AIP) which provides grants for development of public-use airports. The Essential Air Service Program (EAS) provides subsidies to airports in communities that could not otherwise support scheduled air service, including 60 communities in Alaska and 115 in the lower 48 states.

Build America Bonds

As a reaction to the global financial crisis, the Obama administration, introduced Build America Bonds within the American Recovery and Reinvestment Act. Offered at a time when many borrowers did not have easy access to capital markets, these bonds provided a direct subsidy for issuers or a tax credit to investors on interest received. It is plausible that a similar program could be reintroduced as a complementary financing feature in the future.

²⁵ <https://fas.org/sgp/crs/misc/R45516.pdf>

²⁶ <https://transweb.sjsu.edu/press/Financing-America's-Infrastructure-Needs-Low-Cost-Federal-USDOT-Loans>

²⁷ <https://www.transportation.gov/buildamerica/financing/rrif/railroad-rehabilitation-improvement-financing-rrif>

Private loans

Private lenders play a role in financing complex infrastructure assets or borrowers with complex financing needs, where traditional municipal finance or federal loan programs are inappropriate. Bridge loans constitute an important category on the way to robust project capital structures and are booked on competitive commercial terms.

Institutional capital

The tax subsidy of municipal debt is not without distortive effects. For example, as tax-exempt investors, sponsors of the country's \$4.4 trillion public pension system as well as corporate pensions play a limited role in financing transportation infrastructure. This, despite the need for pensions to invest in just the type of cash flows typical of transportation infrastructure – long duration, inflation-protected, and relatively predictable (the impact of Covid-19 notwithstanding).

While large U.S. public pensions invest one to two percent of their portfolios in infrastructure, major Canadian pensions invest upwards of ten percent of their portfolios in infrastructure. Some of this is invested in domestic transportation infrastructure – partly because there is no tax-exempt provincial bond market in Canada. For example, pension plans are among the owners of Highway 407, the tolled ring road around Toronto. Quebec pension manager, CDPQ, is developing and financing Montreal's new light rail network (REM) on a greenfield basis.

One efficient way for pension plans to invest in transportation infrastructure would be for them to participate in consortia as long-term investors, either in partnership with asset managers or through pension-controlled investment specialists.²⁸

Infrastructure funds

With \$582 billion in assets under management, including \$220 billion of “dry powder” ready to be invested,²⁹ private infrastructure investment funds are among the largest owners of infrastructure in the world. Yet very little of this private capital is invested in U.S. transportation infrastructure. This is for reasons we have discussed – aversion to private capital in this sector of the economy and distortions due to the tax-exempt municipal bond market. Under the right conditions, this capital can play a truly transformative role in the financing of America's transportation infrastructure, using techniques we discuss below.

Listed infrastructure

Globally, infrastructure companies listed on financial exchanges – and therefore benefiting from improved liquidity – account for \$2.5 trillion in assets.³⁰ Nevertheless, this sector covers very few American securities. For example, one exchange-traded fund that markets itself as a way to “invest in companies that stand to benefit from a potential increase in infrastructure activity in

²⁸ https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3319497

²⁹ According to Preqin.

³⁰ <https://www.glio.org>

the United States” actually has limited exposure to infrastructure companies besides freight railroads. By way of contrast, in Europe and Asia there are numerous airports, toll road companies, and railroads that are listed on exchanges.

Infrastructure investment trusts

A structure that might facilitate development of a market for listed infrastructure is the Infrastructure Investment Trust. IITs are common in India, for example. They tend to take the form of tax-passthrough, yield-oriented securities similar to U.S. real estate investment trusts (REITs).

Infrastructure banks

Unlike other countries such as Canada – and a few U.S. states – the federal government does not have an infrastructure bank. Such a bank would use the government’s low cost of borrowing to seed its balance sheet, and then issue debt which could be lent to projects based on national priorities. These loans would eventually be repaid and recycled into new loans.

Over the years, various bills have been introduced in Congress to establish a national infrastructure bank. Among other things, an infrastructure bank would be a way of expanding the scope and scale of the aforementioned TIFIA and RRIF programs. There would be no Treasury guarantee covering its obligations, although the perceived “dotted line” to the taxpayer via the Treasury would nevertheless persist. This implicit subsidy characterized privately-owned Fannie Mae and Freddie Mac, which were bailed out in the global financial crisis and remain in government “conservatorship” today, thirteen years later, still serving as the fulcrum of the U.S. mortgage market. In fairness, Treasury reclaims all of their profits for the taxpayer.

INFRASTRUCTURE FUNDING

We turn now to how infrastructure is paid for. Most transportation infrastructure in the U.S. operates with substantial cross-subsidies. Inherent in this approach are political considerations related to tax policy, social welfare and equality, and other factors. Much of this is based on the idea that pricing certain services below their operating cost and true value, and subsidizing infrastructure operations from general tax revenues, is both progressive and equitable. But it has also created a reality in which infrastructure agencies have under-invested in necessary redevelopment and maintenance.

Usage fees

Direct usage fees – fares, tolls, and direct taxes are generally priced well below the cost of delivery. This is true for airports, public transit, and highways.

Airports are funded from a number of sources, including aeronautical revenues such as landing fees, and non-aeronautical revenues such as terminal concessions and parking fees. Another revenue source is the passenger facility charge (PFC) levied on each passenger. The PFC has been capped at \$4.50 since 2000. Smaller airports are heavily dependent on grants from the

federal government. The largest airports earn 82 percent of their revenues from direct sources and have substantial borrowing capacity to cover the rest of their expenses. Smaller airports do not generate enough traffic to fund themselves in this way, and so are necessarily dependent on subsidies. In particular, the federal Airport Improvement Program (AIP) funds 57% of the operations of these airports. Certain airports in certain rural areas rely on a separate program, the Essential Air Service Program, as previously mentioned.³¹

Table 3 – Funding sources for airports (2017)

	Aeronautical (landing fees)	Non-aeronautical	Passenger facility charge	AIP	Other
Urban airports	31%	27%	9%	5%	28%
Rural airports	16%	11%	2%	57%	14%

Source: RAND Corporation³²

In the case of public transit (which includes passenger rail and buses) – only 25 percent of the cost of operations and capital expenditure is covered by fares.

Table 4 – Funding sources for public transit by use of funds (2018)

	Federal	State	Local	Fares
Operating costs	8%	23%	33%	36%
Capital expenditure	36%	15%	49%	-
Total	17%	21%	37%	25%

Source: Congressional Research Service³³

Of the four million miles of roads in the U.S., only 5,000 miles are tolled³⁴ and tolls account for just six percent of highway funding. The federal government funds one-fifth of highway expenditures through the Highway Trust Fund, which itself is funded by motor vehicle and fuel taxes – the “gas tax.” In aggregate, states account for half of all revenue for highways – and about half of their share is funded by motor vehicle and gas taxes. Local governments fund 29% of revenues, largely from general taxation and property taxes.

Table 5 – Funding sources for highways (2014)

	Federal	State	Local	Total
Composition of total funding	21%	50%	29%	
o/w Fuel and motor vehicle taxes	60%	46%	5%	37%
o/w Tolls	-	10%	3%	6%
o/w Property taxes and assessments	1%	9%	30%	13%
o/w Investment income and receipts	2%	8%	12%	8%
o/w Bonds proceeds and general funds	37%	27%	50%	36%

Source: BATIC Institute³⁵

Average gasoline prices in the U.S., inclusive of taxes, are very low by international standards. More importantly, the gas tax was not indexed to inflation and has remained at 18.3 cents a gallon since 1993. It is also becoming obsolete with increasing fuel efficiency and the

³¹ <https://www.transportation.gov/policy/aviation-policy/small-community-rural-air-service/essential-air-service>

³² https://www.rand.org/pubs/research_reports/RR3175.html#download

³³ <https://fas.org/sgp/crs/misc/R42706.pdf>

³⁴ <https://www.statista.com/statistics/298864/toll-road-facilities-in-the-united-states-by-type/>

³⁵ http://www.financingtransportation.org/funding_financing/funding/

foreseeable shift to electric vehicles. This explains discussion of a mileage-based user fee, commonly referred to as a vehicle-miles-traveled (VMT) tax. VMTs have been piloted in several communities across the U.S.³⁶ Absent reform, the Highway Trust Fund will generate a cumulative deficit of \$188 billion by 2030.³⁷

Table 6 – Gasoline taxes per gallon (U.S. dollars, 2016)

	Gasoline	Diesel
Belgium	3.51	2.98
France	3.62	3.06
Germany	3.55	2.67
Italy	4.08	3.52
Japan	2.25	1.42
Netherlands	4.26	2.87
United Kingdom	4.16	4.20
United States	0.45	0.49

Source: Federal Highway Administration³⁸

Tolls are not used widely in the U.S. While existing portions of the Interstate are not tolled, newly constructed lanes may be tolled (either on the basis of fixed cost by time of day or as a means of proactively regulating traffic flow). To illustrate – portions of the Interstate through Maryland have time-based express toll lanes, while Virginia has high-occupancy toll (HOT) lanes.

Widespread adoption of tolling is not politically feasible, nor would it be effective as a revenue source for highways with insufficient traffic volume. And where tolling exists, it is often used to subsidize public transit systems. For example, the George Washington Bridge, with tolls of \$16, heavily subsidizes the PATH rail system linking New Jersey with New York. Similarly, the New York Metropolitan Transportation Authority’s bridge and tunnel tolls subsidize the New York City subway.

In summary – low gas taxes and infrequent use of tolling mean that U.S. roads and highways are heavily subsidized by taxpayers. When maintenance backlogs accrue – particularly due to the underfunded Highway Trust Fund – future taxpayers bear the cost for serving today’s drivers.

Earmarked sales taxes

Some regions have taken the lead in finding permanent sources of funding for infrastructure. Notable is the country’s most populous county, Los Angeles County, where a law enacted in 2016 (Measure M) imposes a permanent 50 basis point sales tax to support transportation infrastructure. Measure M is expected to generate \$120 billion in dedicated funding for infrastructure over a 40-year period.

³⁶ https://www.fhwa.dot.gov/ipd/tolling_and_pricing/defined/vmt.aspx

³⁷ <https://www.taxpolicycenter.org/briefing-book/what-highway-trust-fund-and-how-it-financed>

³⁸ <https://www.fhwa.dot.gov/policyinformation/statistics/2017/in1.cfm>

Value-capture and tax-increment financing

Infrastructure typically creates value for real estate that surrounds it. This is particularly true for transit systems, which constitute a highly efficient way of moving large numbers of people to and from particular locations. “Value-capture” creates a source of funding for infrastructure from neighboring real estate.

In an earlier era, Canadian National and Canadian Pacific, two large Canadian railroads, developed grand hotels strung like a string of pearls across Canada to serve passengers and create demand for travel. New York City’s subway system was originally developed by private investors to get people to real estate developments across the City. It was these real estate developments that made transit infrastructure financeable at the time.

MTR Corporation, which operates Hong Kong’s subway system, is a pioneer in use of real estate value-capture. It purchases development rights above its stations from the city government and partners with real estate developers to create value with new properties above the stations. Its share in profits from these developments is an additional source of revenue to supplement its transit revenues.

The extension of the No. 7 subway line in New York City was financed by securitizing and using as bond collateral the future tax revenues (tax increment financing) on real estate developed at Hudson Yards, which lies above the western end of the subway line.

BRIDGING PRIVATE CAPITAL INTO PUBLIC TRANSPORTATION INFRASTRUCTURE

If most transportation infrastructure is owned by the public sector and there is adequate and cheap public sector capital (whether through local, state, or federal sources), why does the American Society of Civil Engineers award U.S. transportation infrastructure a near-failing grade? Why does it estimate a twenty-year investment gap of \$1.5 trillion for highways and bridges and of \$535 billion for transit and intercity rail?³⁹ Moreover, why are there concerns with the adequacy of funds to pay for the annual capital expenditures of up to \$29 billion at America’s airports?⁴⁰

Governments are loath to cede control over prized infrastructure assets. And yet, governments have not adequately maintained the assets they own. This is due partly to artificial caps on user fees – as we have discussed – and partly to the inevitable incentive to divert capital away from discretionary maintenance to non-discretionary and social welfare needs. It is also due to a false calculus that looks exclusively at the upfront capital cost of a project. It is difficult to compete with the cost of tax-exempt municipal debt.

This is an important consideration as there is more than enough private capital interested in investing in transportation infrastructure and searching for opportunities. As we have noted, the

³⁹ https://www.infrastructurereportcard.org/wp-content/uploads/2020/09/FTA_SurfaceTransport_Study—FINAL.pdf (\$1.5 trillion for road transportation and \$500 billion for rails over the period 2020-2039)

⁴⁰ <https://airportscouncil.org/wp-content/uploads/2019/02/2019TerminallyChallenged-Web-Final.pdf> (\$128 billion for 2020-2023)

U.S. already has an extensive network of transportation infrastructure – so the need is tilted toward maintenance, redevelopment, and modernization, rather than new greenfield projects. Are there ways of sensibly matching that investable private capital with future transportation infrastructure needs?

Public-private partnerships

Public-private partnerships are widely considered a viable way to make that connection. In P3s the public infrastructure asset is not privatized. Rather, it remains under public-sector ownership. The public sector agency issues a concession of perhaps 25 or even 50 years to a private investor to design, build/rebuild, finance, operate, and maintain the asset (or any subset of these activities) at specified service levels. The public agency receives payment – generally up-front or potentially phased over time. The private investor receive payments – either from user fees or availability payments (discussed below) – over the term of the concession period. At the end of the concession period, the asset returns to public control.

P3s are uncommon in the U.S. We have mentioned the cost of capital conundrum. Private investors need to earn a return on their investment at a rate that is certainly above the yield on municipal bonds. As a counterargument, proponents of P3s point to the benefits to the public sector (and hence to the taxpayer) of risk-transfer to the private sector, and the need to focus on the full life-cycle cost, not just the upfront financing cost.

More fundamentally, there are structural challenges inherent to P3s that can make them unattractive to both investors and public sector agencies. P3s require enabling legislation, which today exists in only 36 states.⁴¹ These laws differ between the states. Each transaction involves customized concession contracts. Tenders for concessions can be terminated by politicians after investors have spent millions of dollars submitting bids, as happened with the Westchester County Airport in 2018 and with the St. Louis Airport in 2019. Each time that occurs, investors become more wary of participating in future P3 tenders.

Negotiating and managing concessions requires a lot of expertise, and few governments have an incentive to acquire this expertise, especially given the infrequency of such projects. For investors, the complexity of large civil engineering projects is another barrier to private investment – projects usually take much longer to complete at much higher cost than forecast. And some projects are just too small to interest large investors.

While airports might be considered good assets for public-private partnerships, there is political aversion to ceding full public control to private interests. With rare exceptions (San Juan, Puerto Rico being one), airport P3s are limited to terminals (such as LaGuardia Central Terminal and JFK Terminal One in New York) and other large on-airport assets such as car rental and parking facilities and sometimes people movers.

P3s are also unlikely in U.S. rail transit. The freight rail system is already almost entirely privately owned and – perhaps not coincidentally – operate efficiently. Passenger heavy rail

⁴¹ <https://www.ncsl.org/research/transportation/ncsl-p3-update.aspx>. Washington, DC and Puerto Rico also have P3 legislation.

(specifically commuter railroads and subways) requires large capital expenditures and there is pressure to maintain services on lines that may not be fully profitable.

Opportunities might exist in less capital-intensive light rail systems, especially if complemented with real estate value capture. For example, the Hudson-Bergen Light Rail (HBLR), connects 24 stations along three services lines on the New Jersey side of the Hudson River. It is owned by New Jersey Transit and was initiated as a P3 project in the 1990s with a private operator, 21st Century Rail, chosen for a design-build-operate-maintain (DBOM) contract covering its first 15 years of operation. Construction began in 1997 and was completed in phases by 2011. Further development has been proposed to extend the system to the north. The railroad is subsidized by state and federal sources and continues to be operated by 21st Century Rail, providing a good example of how light commuter rail can stitch together a burgeoning residential and commercial urban complex connecting seamlessly to other transit modes, including heavy commuter rail, the Port Authority Trans Hudson subway, and ferry services to Manhattan.

There are examples of public-private partnerships in the operation of commuter railroads. For example, Boston's MBTA commuter railroad and a smaller railroad in Virginia are both operated by Keolis, itself owned by the French national rail system SNCF and Canadian pension fund CDPQ. Herzog Transit Services operates Tri-Rail, a commuter line in South Florida.

Overall, private operation of commuter railroads might be more prevalent if contract terms were much longer – beyond the capital expenditure cycle of twenty years – and if the private operator were free to adjust services based on commercial criteria as opposed to public policy decisions. On the other hand, there are opportunities for private investors through P3s in components of commuter railroads and subways, for example in provision of WiFi services.

Turning to highways – there have been only a few P3s in the U.S. in this sector. Highway P3s are dependent on toll revenue, and tolls are levied on only a small portion of total U.S. highways, so this form of financing is of limited use as a national solution. That said, there have been reports arguing for the institution of tolls on the Interstate.⁴² Several highway P3s have had to declare bankruptcy due to overoptimistic traffic volume projections and resultant highly leveraged capital structures. These include the South Bay Expressway in San Diego, the Indiana Toll Road, and the Pocahontas Parkway near Richmond, Virginia.⁴³

An alternative form of funding highway P3s involves an “availability contract” wherein the highway remains un-tolled and the investor is paid a negotiated fee for maintaining the road to pre-agreed standards for the term of the concession. Given the low cost of capital of public financing sources, this structure can be viewed predominantly as a risk transfer mechanism involving maintenance outsourcing by the public sector to the private sector.

As a general rule, P3s might become more prevalent if the full benefit of risk transfer from the public to the private sector were transparent, if there were more uniformity in how these projects are structured, and if political toxicity were eased in the approval process.

⁴² <https://www.nap.edu/catalog/25334/renewing-the-national-commitment-to-the-interstate-highway-system-a-foundation-for-the-future>

⁴³ <https://www.everycrsreport.com/reports/R44910.html>

Asset recycling

A derivative of the P3 financing model is “asset recycling.” Recycling places existing infrastructure assets into concessions and reinvests the proceeds received from private investors into new public sector infrastructure. In this way, capital can be recycled between multiple projects over time. The Australian federal government has encouraged this structure using additional “top up” grants to make new projects more attractive. Recycling is particularly appealing as governments are much better at building new projects than at earmarking funding to maintaining existing projects over the decades of their operating life. Meanwhile, private investors prefer stabilized (brownfield) infrastructure over new development (greenfield) infrastructure which introduces the risk of budget overruns.

The Airport Investment Partnership Program (AIPP)⁴⁴ removed what had been a hurdle in incentivizing airport P3s. Previously, asset recycling in the case of this type of transaction was impeded by a requirement of Federal Aviation Administration grant agreements for airport revenues to be retained on-property. Under AIPP, a municipality may reinvest airport P3 concession proceeds to develop other infrastructure projects – a light rail system for example – elsewhere in a city.

A LOOK TO THE FUTURE

Having surveyed the U.S. public infrastructure scene in its various facets, its structural flaws and their consequences, the available tools to deal with them as well as focusing on the potentially useful role for the private sector, what is the bottom line?

First, if not now, when? Now is a particularly advantageous time to drive capital into infrastructure investment. Interest rates are very low, there is substantial focus on “impact” investments that generate societal benefits, the economy needs fiscal stimulus, infrastructure creates jobs, and it has been shown to provide economic leverage, particularly if American inputs are prioritized. Bipartisan action will be needed, and infrastructure is one of the few policy areas that appeals across the political spectrum.

Second, private capital has a role to play in financing transportation infrastructure. The pandemic will have long-lasting effects on the finances of the state and local governments that own and operate most transportation systems. Institutional investors and fund managers have hundreds of billions of dollars seeking to invest in just the type of cash-flows – long-duration, inflation-linked, and predictable – provided by the right infrastructure investments. Public-private partnerships should be explored as a national policy. Asset recycling provides a ready source of capital for financing greenfield development. A federal “top-up” can catalyze these projects. Allowing the private-sector partner to profit from any efficiencies it contributes is worthwhile if it can reduce the subsidy that would otherwise fall on taxpayers. But there are necessary antecedents to private investment in public infrastructure because nothing will happen absent political will. From the private sector perspective – if it wants to invest in transportation infrastructure it needs to evidence why it is a good partner. It cannot expect public agencies, legislators, and taxpayers to reach that conclusion themselves. And from the public sector

⁴⁴ https://www.faa.gov/airports/airport_compliance/privatization/

perspective – private capital must not be viewed as a malevolent force. Meanwhile, private sector entrepreneurship shows promise in intercity rail and emerging technologies such as Hyperloop. Third, the biggest challenge facing transportation infrastructure is one of funding. Absent sustainable revenue sources, the cost of maintenance and capital expenditures is borne by taxpayers. Inevitably, governments delay necessary investments, leading to physical deterioration and a burden on future taxpayers. The gas tax is becoming an anachronism. A vehicle-miles-traveled tax that overcomes the inevitable political pushback is necessary. Increased user fees in many modes of transportation can be achieved while maintaining the laudable objective of “transportation equity” – balancing accessibility and affordability. State and local governments should develop sustainable funding models. Solutions such as Los Angeles County’s Measure M – a permanent sales tax earmarked for infrastructure funding – should be considered nationwide. Likewise, value-capture – using infrastructure to stimulate real estate development and using real estate taxation or value creation to pay for the infrastructure – should be considered wherever possible.

Fourth, regional infrastructure centers should be part of the solution. Smaller states and cities do not necessarily have the resources or expertise to take advantage of federal financing programs. They would also have trouble designing, negotiating, and monitoring P3s. Partly supported by federal funds, a network of regional centers could coordinate this activity for states, counties, and cities. A special expertise program could – through secondment – bring the know-how of bankers, lawyers, and consultants to these centers. Renewing America’s infrastructure is a national goal.

Fifth, build for the future. Once beyond the pandemic, Americans will return to cities and towns. Suburban residents all over America need efficient commuter rail lines and well-maintained highways. Urban residents need working subways. In all these areas, city governments and the private sector can work together to develop efficient solutions to President Biden’s objective of accessible zero-emission public transit.

Sixth, federal support should be directed to areas that might otherwise be starved of infrastructure investments. There are numerous federal programs that direct capital to projects of national or regional importance. Sensibly structured, a national infrastructure bank could supplement direct federal financing. Some projects are important enough to be supported even with large subsidies from other states. The Gateway Program linking New Jersey and New York is one example.

The lessons from Lincoln, Roosevelt, and Eisenhower are that successful transportation infrastructure depends on vision and executive leadership. A coherent national commitment can provide the long-term framework for the country’s transportation infrastructure, with implementation devolved in large part to the states. Prioritizing the right initiatives, optimally leveraging public funds, and encouraging private sector participation will fortify America’s transportation infrastructure for the urgent climate, fiscal and competitive challenges facing this country over the course of the 21st century.

Clive Lipshitz is managing partner of Tradewind Interstate Advisors, Ingo Walter is Professor Emeritus of Finance at New York University, Stern School of Business.