

Options for financing and funding transportation infrastructure



In brief

- There is a growing interest in building urban transportation infrastructure across the developing world. Many policymakers are currently drafting ambitious transportation plans that implement new systems and build infrastructure.
- A key hurdle to the implementation of major transportation projects is funding which often costs billions of dollars and requires policymakers to decide how a piece of infrastructure is funded.
- This brief provides an overview of the three most important policy questions associated with transportation finance and project delivery: How is transportation infrastructure paid for? Do transportation projects make money? What are the financial implications of inaccurate cost and revenue forecasts?
- The author concludes that these questions require careful consideration in order to prevent infrastructure never being built or saddling governments with long-term debt that can result in future budget crises.

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Introduction

Around the world, there is great interest in building urban transportation infrastructure. In cities from Kampala to Lagos, policymakers are drafting ambitious transportation plans that call for the implementation of extensive bus rapid transit systems, light rail lines, and metros, as well as new highways, bridges, and tunnels. These plans are motivated by an urgent goal of reducing traffic congestion, driving economic productivity, improving air quality, and shrinking social exclusion.

However, a key hurdle to the implementation of major transportation projects is funding. The price tag for delivering transportation projects often cost billions of dollars, and policymakers must determine how best to pay for their proposals. Against this backdrop, the purpose of this policy brief is to provide an overview of the three most important principles associated with transportation finance and project delivery: first, how is transportation infrastructure paid for; second, do transportation projects make money; and third, what are the financial implications of chronically inaccurate cost and revenue forecasts. Understanding these core principles will enable policymakers to determine the viable options for funding their proposed infrastructure projects. The brief concludes by identifying key takeaways and lessons learned about transportation infrastructure finance for policymakers.

Transportation infrastructure finance 101

When determining how to pay for a major transportation infrastructure project, policymakers must consider two key factors. First is the financing and funding of the infrastructure. Project financing refers to the source of borrowing that the project sponsor (i.e., government department, agency, or ministry) will use to pay for the construction of the facility. Project funding, on the other hand, refers to the revenue streams or income sources that the project sponsor will draw on to pay back the initial project finance. Second, policymakers must determine how to fund both the capital cost of building the infrastructure, and the ongoing costs of operating and maintaining the facility. Each of these points will be examined in turn.

Project financing and funding

There are a variety of different types of investors and capital sources, available to finance large-scale public infrastructure. Each financing source and investor class comes with different risk/return expectations, time horizons, and level of involvement in the project, and investment terms and conditions. Public infrastructure projects can be financed either by borrowing through debt or bonds, or by selling equity positions in the project. Equity investments come at substantially higher return expectations than debt, and therefore come at a higher cost. For this

reason, projects are typically financed with a ratio of between 10-20% equity and 80-90% debt (See Appendix 1).

Major banks and financial institutions typically provide debt financing to infrastructure projects, while bonds are floated on international capital markets. The interest rates are determined by the creditworthiness and rating of the issuer. The term for bonds and loans are commonly between 5-15 years.

There are a wide variety of investors that take equity positions in infrastructure projects. Many large global construction contractors now have the financial capacity to take a 5-10% equity stake in the projects they build, which ensures that they have a financial stake in the performance of the contract. Private equity and hedge funds seek to buy equity in relatively high risk and high reward infrastructure projects, usually during the construction period of the project. The time horizon for these investors is usually quite short as they seek to maximise their return on investment quickly. Institutional investors such as pension funds, insurance companies, and sovereign wealth funds are considered patient capital who seek to make very large equity investments in infrastructure. They typically seek long-term, stable returns in infrastructure projects that are already built, and recoup their investment through user fee revenues.

In addition to private sources of capital, countries can also gain access to financing through international development banks such as the World Bank, the International Financing Corporation, the Asian or African Development Bank, and the European Investment Bank. These institutions invest in infrastructure by providing project sponsors with low cost loans, or by offering credit enhancements such as loan guarantees or subordinated debt that lower the total cost of borrowing from private investors. Strict conditions often accompany financial support from the international development banks, including extensive feasibility studies, transparent procurement, anti-corruption measures, and project monitoring. In recent years, Chinese state-owned construction firms have also become a major source of lending for infrastructure investments in developing countries, both for commercial reasons and to reinforce China's global strategic interests. These companies often make unsolicited bids to build projects, and typically put few conditions on their investments beyond the business terms.

For large projects, it is not unusual for project sponsors to draw on financing from a variety of different types and sources in order to match the risk and time horizon of the project while minimising the overall cost of capital. For example, a billion dollar toll highway project may include 80% loans from a syndicate of banks, 5% equity from the contractor building the project, and 15% equity from a private equity investor or pension fund.

Regardless of which financing sources are drawn on to pay for the up front construction of the transportation project, the project sponsor must have sufficient revenue sources to fund the project and repay the initial investment. As shown in Table 1, project sponsors can draw on a wide range of revenue tools to pay for infrastructure, including user fees and general taxes.

User fees can raise substantial amounts of money, and either be fixed or vary depending on factors such as time of day or location. Common user fees to fund transportation infrastructure are transit fares, road tolls, congestion charges, parking levies, and fuel taxes. A key benefit of user fees is that the price can be set to both raise revenue and manage demand on the facility to minimise congestion or encourage usage.

However, user fees are highly visible to the general public and often face strong opposition. While they are widely accepted on public transit, road tolls experience greater public hostility. User fees can also exacerbate inequality by making it too expensive for some lower income people to use the facility. It can thus be politically challenging or counterproductive to public policy on social equity grounds to implement new user fees on facilities that previously went uncharged, or to set user fees at rates to cover the full cost of funding the asset. As a result, user fees tend to be introduced on new rather than existing road infrastructure, and are also widely levied in the transit sector. In both transit and highways, there is a strong political motivation to set user fees below the cost of providing the asset, but this means that subsidies are required from other revenue sources.

Governments can raise revenues to fund infrastructure projects from a variety of taxes or levies, and then allocate the money to repay the financing on major infrastructure projects. In some cases, governments will dedicate a portion of revenue from a certain tax to fund specific infrastructure investments – for instance a special property tax levy or vehicle registration tax to fund infrastructure. An important consideration is the long-term stability and predictability of the revenues generated from a tax, as infrastructure projects require funding over many years. In general terms, income taxes, sales taxes, and property taxes can generate the largest and most predictable streams of revenue.

Another source of funding that has recently gained interest from policymakers is land value capture, in which the increase in land value resulting from an infrastructure investment is taxed. In one model, landowners within proximity of a new transit line are charged a one-time levy in recognition that their property will become more attractive and valuable when the infrastructure project is completed. In another model, governments devise formulas to tax the uplift in property values generated by the arrival of the new infrastructure. While potentially lucrative, land value capture mechanisms are no magic bullet solution for cash strapped governments to fund transportation projects. International experience suggests that land value capture mechanisms may generate revenues sufficient to fund between 10-20% of the capital costs of a major infrastructure project.

Finally, for developing countries, international development aid can in some instances provide a source of funding for major infrastructure projects, in cases where the donor provides a grant and does not expect to be repaid. Similarly, municipalities often receive significant funding grants from national and state/provincial governments to fund infrastructure in their jurisdiction.

Table 1: Common sources of funding for infrastructure

User fee	General revenue sources
<ul style="list-style-type: none"> • Transit fares • Road tolls • Congestion charge • Parking levies • Fuel taxes 	<ul style="list-style-type: none"> • Property tax • Sales tax • Personal income tax • Payroll tax • Hotel/recreation tax • Vehicle registration fee • Land transfer tax • Land value capture • Utility bill levy • Billboard tax • Advertisement revenue • International aid (non repayable) • Grants/financial support from government

Overall, the discussion of infrastructure finance and funding points to the most critical issue that policymakers must consider when evaluating the financial viability of a transportation project: is it affordable? It may be possible for a project sponsor to raise sufficient capital to finance the upfront cost of building a project. However the repayment costs are unaffordable if they are so large as to take up a significant share of the budget and crowd out money for other critical public services. The project is also unaffordable if it creates new long-term operating expenses that cannot be covered from either user fees or general tax revenues. This is similar to a prospective homeowner determining whether the size of a mortgage will result in monthly repayments that are so large as to leave the household cash poor and unable to afford their desired lifestyle. The key question with transportation infrastructure is thus whether the project is affordable given the revenues it is able to generate through user fees or the income sources that the sponsor has available to subsidise the project over the long-term.

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Transportation infrastructure cost recovery from revenue

With an understanding of the options for financing and funding transportation projects, it is now necessary to turn to the basic economics of transportation infrastructure: does the project make sufficient money from user fees to cover both the capital and operating costs of the project?

In a typical infrastructure project, the capital expenditure of building the project will account for anywhere from 20% to 50% of the total cost. Long-term operating expenditures over a project lifespan that can last for decades make up the remaining 50% to 80% of the project cost. The implication is that governments or private investors must not only account for hundreds of millions or billions of dollars that are necessary to build transportation infrastructure, but also the substantial money required to operate and maintain the facilities over the long-term lifespan of the facility.

This issue of cost recovery is important because it determines whether projects can be self-funding from user fees and other ancillary project revenues such as advertising, or whether subsidies are required from other government revenue sources to make the project financially viable. There is a strong distinction between public transit and road projects with respect to cost recovery from user fees and project revenues.

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International experience demonstrates that the revenues from fares on public transit mega-projects on their own are rarely sufficient to cover both the capital and operating costs of bus rapid transit, light rail, and metro projects. Transit is a capital and labour intensive business. Moreover, governments often see urban transit as an important social service with significant environmental benefits and therefore price the fares below market rates in order to encourage high ridership rather than maximise returns. Indeed, the operating cost recovery of transit infrastructure projects worldwide typically range from 30%-80%. This leaves a significant gap between the cost of providing the transit service and the fare revenues, a gap that must be funded through government subsidies regardless of whether the project receives private financing.

Thus regardless of the economic, social, and sustainability benefits of public transit, large bus rapid transit, light rail, and metros will invariably require significant public subsidies to fund project capital costs and to support a portion of the operating expenditures. This means that major transit infrastructure projects are not financially viable as a straight business transaction. Any private financing of transit projects through a public-private partnership arrangement is likely to require a substantial public subsidy that must be funded through general government revenues.

Toll road projects have a different return profile than public transit. Given the traffic volume and toll rates that can be charged on highways, bridges, and tunnels, some toll roads are able to recoup their capital and operating costs through user fees. This means that there is a business model where tolled road facilities can be implemented using private financing and funded entirely without government investment in the project. Despite the prospect of profitable toll roads operated as private business ventures, however, the experience with private toll roads has been mixed. While business on some toll roads such as Highway 407 in Greater Toronto and the network of toll roads in Santiago is booming, many other toll roads

have faced financial difficulty. In Madrid, Sydney, and Southern California, lower than expected traffic volumes on major toll road projects led to revenue shortfalls that ultimately resulted in project bankruptcies. And in Latin America, upwards of half of all toll road concessions have been renegotiated, often at the instigation of the private sector partner due to financial challenges caused by low traffic demand. In recent years, while toll roads may in theory be able to raise sufficient capital from user fees to cover capital and operating costs, in practice governments have been providing various forms of financial subsidies and guarantees to make toll road projects financially viable or to keep the toll levels below the full market rate.

Beware of over optimism

Finally, the financial viability of major urban transportation projects is threatened by the systemic inaccuracy of project cost and revenue forecasts. Evidence suggests that infrastructure costs are systemically underestimated, while traffic demand estimates are chronically overstated. Research by Professor Bent Flyvbjerg at University of Oxford shows that nine out of ten major transportation projects have a cost overrun, with final construction costs on average 28% above the initial estimate. Conversely, demand and revenues from transportation projects tend to be systemically overestimated. Transit mega-projects in particular are prone to ridership shortfalls. The number of riders on large transit infrastructure projects is on average less than half the amount that was predicted at the time that the project was approved. As one example, project planners estimated that daily ridership on the Rea Vaya bus rapid transit system in Johannesburg would be 162,000 passengers per day, while actual ridership on the system was 60,000 riders per day. Similar ridership shortfalls have been experienced with bus rapid transit systems in Accra and Cape Town.

This mega-project paradox puts an especially harsh strain on the financial viability of transportation mega-projects. Rising construction costs require additional funds from either government or private investors to complete the project. And ridership shortfalls mean that projects often generate far less revenue from user fees than initially expected, thus requiring greater subsidy from other funding sources to pay for capital and operating expenses.

Lessons learned

This brief addresses three key lessons learned for policymakers about the implications of infrastructure project finance and funding.

First, project financing and funding must be a central part of any assessment of infrastructure investment decisions. In particular, it is not sufficient to simply examine whether investors can be attracted to finance the up front capital costs of a project. Policymakers must carefully assess how any borrowing to finance a project will be paid back through the

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mix of user fee revenues and public subsidies. Evaluating whether the repayment of any borrowing through public subsidies will put an undue strain on the general public budget is critical to assessing affordability of the project.

Second, policymakers must identify the budgetary implications of funding both the capital and operating costs of major new infrastructure projects. The recent record with both transit and road projects demonstrate that public sector funding for subsidies is going to be a component of most urban transportation projects in both the transit and road sectors. In this context, government will continue to play a significant role as a funder of transportation infrastructure projects, even in circumstances where projects are privately financed through public-private partnerships.

Finally, construction cost and traffic volume forecasts should be viewed with deep skepticism. Projects that appear financially viable from the forecasts often face substantial financial pressure when construction costs rise or revenues from user fees fail to meet expectations. In order to avoid optimism biases, infrastructure project planners should subject their forecasts to scrutiny by independent peer reviewers. A technique called reference class forecasting can also be applied to benchmark the construction costs and demand forecasts of a project against similar initiatives in other jurisdictions. If the numbers seem out of line with comparable projects elsewhere, it is a sign that the forecasts are inaccurate and should be revisited to avoid significant financial risk.

In sum, transportation planners around the world are devising audacious and costly plans to remake the urban transportation network in many cities. But to turn transportation infrastructure dreams into reality will require a careful consideration of how to finance and fund these initiatives over the long-term. Otherwise, today's transportation plans risk never being built, or saddling governments with long-term debt and operating expenditure liabilities that are unaffordable and will result in future budget crises.

Appendix 1: Types and sources of capital for infrastructure projects

- *Debt:* debt refers to loans that are typically taken out from major banks and other financial institutions. The term on infrastructure project debt is usually between 5-10 years, and the borrowing rate varies depending on the creditworthiness of the borrower and whether the loan is secured against project revenues or a sovereign guarantee or other credit enhancement. For large infrastructure projects, the loan will typically be syndicated between a number of banks and financial institutions in order to spread risk between different parties. In order to protect their investment, lenders will typically maintain step in rights to scrutinise a project and force a default of the loan if key performance measures are not met.
- *Bonds:* bonds are a way of raising capital on international markets at competitive rates. Bonds can be floated to fund a specific project and backed by the revenues from the project. Or a government can undertake a general issue bond backed by general revenues, and then allocate the financing to pay for the cost of specific infrastructure projects. The time horizon for a bond to mature can be between 5-20 years. In order to undertake a bond issue, the project or government will require a credit rating from an international credit rating agency, and this score then signals to investors the level of risk in the investment and the commensurate borrowing rate.
- *Contractor finance:* many of the largest global contracting firms now have the financial capacity to make equity investments in large infrastructure projects, typically in the range of 5-10% of the total capital cost of the project. The inclusion of contractor capital is designed by the project sponsor as a pay for performance mechanism to incentivise the builder to deliver the project efficiently and meet their obligations. Contractors are often repaid some or all of their investment in the project through milestone payments from government, and they will usually look to sell their share in the project once their role in project delivery is complete.
- *Private equity and hedge funds:* tend to seek equity investments in medium to high-risk projects, and in return seek high returns. They thus favour investing in infrastructure projects during the construction phase of the project, when there is a high level of risk and potential reward. Once invested in a project, equity investors will actively manage the delivery of the scheme to mitigate risk. Private equity investors and hedge funds often have quite short time horizons, and they aim to realize their return and exit the investment within 3-5 years by reselling their position to other investors.
- *Institutional investors:* pension funds, insurance companies, and sovereign wealth funds are considered long-term, patient capital. They prefer to make very large equity investments (over \$400 million at a time) in projects that can generate returns from user fee revenues.

Institutional investors are relatively risk averse, and seek long-term, stable returns, typically in ‘brownfield’ projects that have already been built and are being resold on secondary markets with a track record of financial success. Once invested in a project, institutional investors are active project managers that typically take a role in the corporate governance of the organization as members of the board of directors.

- *International development banks:* International development banks such as the World Bank, International Finance Corporation (IFC), and the regional development banks in Africa, Asia, and Latin America are a significant source of capital for infrastructure projects in developing countries. They often provide loans on favourable terms compared to the private markets, and in particular may provide access to capital to governments with poor credit ratings. The development banks can also provide credit enhancements such as loan guarantees or subordinated debt that lower the total cost of borrowing. However, as a condition of accessing their capital support, development banks will be actively involved in project feasibility and planning assessments, and enforce conditions related to project selection, procurement rules, anti-corruption, and project monitoring.
- *Chinese state-owned enterprises:* In recent years, Chinese state-owned construction companies have become a major source of lending for infrastructure investments in developing countries. These state owned enterprises are able to provide competitive lending terms to foreign governments due to their ability to access capital from state-owned Chinese banks, while generating profits through expertise in the construction side of their business. Chinese state-owned enterprises will often make unsolicited infrastructure project proposals to governments in developing countries that they will then finance, build, and operate. Unlike the international development agencies, Chinese state-owned companies typically put far fewer conditions on their investments. Rather they are implemented more as a straight business transaction, and also as a state lever in global geopolitics to build China’s sphere of influence abroad.

Further reading

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