U.S. SURFACE TRANSPORTATION PUBLIC-PRIVATE PARTNERSHIPS: OBJECTIVES AND EVIDENCE

TRB Paper 18-04763

Lisardo Bolaños*
Center for Transportation Public Private Partnership Policy
George Mason University
3351 Fairfax Drive, MS 3B1, Arlington, VA 22201
Email: lbolano2@gmu.edu

Morghan Transue
Center for Transportation Public Private Partnership Policy
George Mason University
3351 Fairfax Drive, MS 3B1, Arlington, VA 22201
Email: mtransue@gmu.edu

Porter Wheeler
Center for Transportation Public Private Partnership Policy
George Mason University
3351 Fairfax Drive, MS 3B1, Arlington, VA 22201
Email: porterwheeler@gmail.com

Jonathan Gifford
Center for Transportation Public Private Partnership Policy
George Mason University
3351 Fairfax Drive, MS 3B1, Arlington, VA 22201
Phone: +1 (703) 993-2275; Fax: +1 (801) 749-9198
Email: jgifford@gmu.edu

Lauren McCarthy
Center for Transportation Public Private Partnership Policy
George Mason University
3351 Fairfax Drive, MS 3B1, Arlington, VA 22201
Email: lmccart5@gmu.edu

* Corresponding author

Revised Draft: November 10, 2017

Text: abstract 173 + text 5139+ references 1,938 = 7,250 words.
Tables (1 x 250 words each): 250 words.
Total Word count = 7,500

ACKNOWLEDGEMENTS
This study represents a compressed version of a report originally conducted with support from the Virginia Transportation Research Council (VTRC), (award no. 11120010). The researchers particularly appreciate Nossaman's Geoffrey Yarema for his guidance in developing the Center for Transportation Public-Private Policy's P3 Evidence Project. All errors are the responsibility of the authors.

ABSTRACT

Effective public-private partnership (P3) policy evaluations must acknowledge the multiple and varied reasons why public agencies pursue alternative procurement approaches. While economic efficiency and private sector funding typically rank high among evaluation criteria, they rarely represent a public agency's sole or primary P3 objectives. As a result, the research reported here conducted six U.S. surface transportation P3 case studies to identify the objectives pursued and the evidence available for effectiveness evaluations. The case findings demonstrate that the studied agencies pursued 1) private sector funding and financing; 2) private sector expertise and innovation; 3) accelerated project delivery; 4) cost, schedule, and quality certainty; 5) risk transfer and management; and 6) broader transit and development opportunities. The public agencies largely achieved these goals, although disagreements among public sector stakeholders and force majeure events affected performance. To further increase P3 benefits, public agencies should consider: 1) pursuing private-sector expertise and innovation earlier; 2) elevating risk transfer objectives; 3) incorporating broader transit, local development, and value capture opportunities; and 4) improving outcome measurement, analysis, and transparency practices.

INTRODUCTION

As the public sector struggles to keep pace with growing infrastructure maintenance, rehabilitation, and improvement requirements, public-private partnerships (P3s) can offer a potential solution, leveraging scarce public funding and delivering infrastructure improvements (and associated public benefits) through the innovation, efficiency, and capital resources available in the private sector (*1–3*). P3s allow private-sector partners to take on design, construction, financing, operations, and/or maintenance responsibilities through different contracts, including but not limited to design-build (DB), design-build-finance (DBF), design-build-finance-operate (DBFO), and design-build-finance-operate-maintain (DBFOM). Such partnerships typically contrast with traditional design-bid-build (DBB) procurement processes where the public-sector agency develops a more or less complete design, usually with support from consulting engineers, and then conducts a competitive solicitation to select a construction firm to build the facility.

The theoretical literature suggests that when compared to traditional procurement, P3 approaches can offer more efficient infrastructure provision for complex projects under clear service metrics and can improve risk management by transferring risk to the private sector (*4*, *5*). Empirical research on P3 efficiency and performance remains limited, however, with existing literature focusing largely on European projects (*6–9*). P3 procurement remains relatively new in the U.S. and as a result, very limited P3 performance evaluation literature exists to support policymakers and their decision-making. The few existing studies tend to focus on economic efficiency and/or financial metrics, depending on value for money (VfM) studies and benefit-cost analyses (*10–12*). Such evaluations often assume an idealized public policy formation process, envisioning public policymakers defining clear policy objectives, ranking alternative approaches, and selecting the best option (*13*, *14*). Nonetheless, the public administration literature recognizes that policymakers often bundle several objectives together to accommodate varied priorities and constraints (*15*). As a result, evaluators risk missing important outcomes if they impose efficiency as the sole criteria when studying projects.

P3 infrastructure projects present particular evaluation challenges since they typically involve large scopes, multiple objectives, and large variations between projects, partners, and environments. P3s, by definition, attempt to unite both public and private sector objectives amid broader societal concerns and institutional frameworks (*16*, *17*). This typically generates a complex and multi-dimensional objective set that complicates evaluation (*1*, *18–24*). Consequently, P3 evaluations focusing solely on financial and/or economic outcomes risk overlooking public agencies' primary objectives and underestimating true outcomes. Such evaluations could undermine P3 procurement approaches by missing key agency objectives. As a result, this study aims to 1) identify and analyze the broad range of public-sector objectives underlying surface transportation P3 projects in the U.S; 2) evaluate whether the projects achieve these objectives; 3) identify challenges; and 4) provide recommendations for policymakers and practitioners.

METHODS

This research narrows its focus using three criteria. First, the research focuses solely on U.S. surface transportation infrastructure projects, namely highway and transit projects. Second, the analysis restricts its focus to projects reaching financial close after 2003 to reflect the more mature P3 markets and institutions that followed first-stage discovery processes and legal framework developments in pioneering states like Virginia and Texas (*23*). This scope also isolates projects with more publicly available bibliographic information and more engaged public officials for participant interviews. Third, the study team limited the study scope to the construction contracts and long-term engagements that provide the greatest latitude for private engagement and innovation, namely DBFOM, DBFO, and DBOM contracts.

Based on these criteria, the research team identified twenty-one US surface transportation P3 projects for analysis. In order to provide detailed analyses and actionable policy recommendations, the research team selected six of these projects for exploratory study, weighing evaluation feasibility and costs when making the selections (*25*). These included Virginia's I-495 Express Lanes; Colorado's U.S. 36

Express Lanes; Virginia's I-95 Express Lanes; Florida's Port of Miami Tunnel; California's Presidio Parkway, Phase II; and Texas' LBJ TEXpress Lanes. The research team then applied a case study approach to evaluate the selected projects, following an approach used to measure European P3 outcomes (*26*).

Analytical data derived from two sources: bibliographic resources and participant interviews. Bibliographic sources included academic articles, news reports, and government records as available. Public-sector documents - including environmental impact statements, cost-benefit analyses, audits, and value-for-money studies - received particular attention when available. Unfortunately, the public record can be very limited and can vary greatly by project and jurisdiction. In addition, public records might not always reflect the nuanced and informal processes underlying public decision-making. As a result, the research team also conducted semi-structured interviews to solicit project objectives, results, and perceptions from key stakeholders, focusing primarily on sponsoring agencies and concessionaires.

The team identified senior public officials responsible for project oversight, public engagement, and financial (e.g., secretaries of transportation, chief financial officers, and project managers), conducting semi-structured interviews with as many as possible. While issues of memory, personal interest, and professional interest can introduce data limitations, such interviews can provide valuable perspective when considered carefully and in combination with other sources. When a project involved multiple public partners, the team endeavored to contact officials from all relevant agencies. Although the present research focused on public-sector objectives, high-level officials from pertinent private concessionaires were also contacted and interviewed when possible to provide a more exhaustive view. Time and budget limitations prevented the team from soliciting views from other stakeholder groups. To encourage forthright discussion, the research team did not record the interviews or attribute specific statements to particular interviewees.

STUDY CASES

Virginia's I-495 Capital Beltway HOT Lanes

Interstate 495 (I-495), also known as the Capital Beltway, is a 64-mile roadway ringing Washington, D.C. through Maryland and Virginia. Since the roadway opened in 1964, strong population growth has made the Washington Metropolitan Area among the top ten most congested cities in the U.S. (*27*, *28*). In 1997, the Virginia Department of Transportation (VDOT) conducted a Major Investment Study concluding that I-495 corridor improvements should promote high occupancy vehicle (HOV) travel and bus transit, and that the Beltway be widened from 8 lanes to 12 lanes. Public hearings held in May 2002, however, revealed strong public opposition to the project's $2.5 billion price tag and significant land acquisition requirements.

In response, the Fluor Corporation submitted an innovative unsolicited conceptual project development proposal in June 2002. Virginia statutes allow public agencies to accept unsolicited proposals from private-sector entities based on a provision in the Public-Private Transportation Act of 1995 (PPTA) (*29*). After the proposal completed the PPTA procurement process, financial close occurred in December 2007. The resulting comprehensive agreement included a DBFOM structure extending 75 years following construction. The private concessionaire would a) expand a 14-mile stretch of highway to 12 lanes from 8 lanes; b) reconstruct the 8 existing general purpose lanes; c) incorporate High-Occupancy Tolling (HOT) into 4 of the 12 lanes; d) replace 58 bridges and reconstruct 10 interchanges; and e) add pedestrian and bicycle facility improvements. Construction began in July 2008 and the express lanes opened early, in November 2012.

Project funding sources totaled $2.1 billion, divided into 16.8% private equity, 28.5% Private Activity Bonds (tax-exempt bonds issued by the private concessionaire), 28.5% Transportation Infrastructure Finance and Innovation Act (TIFIA) loan, 23.9% VDOT funds, and 2.3% interest income. The project relies on dynamically priced toll revenue for ongoing funding, varying with current traffic conditions, without an upper limit, to accommodate the 45 mile-per-hour minimum speed defined in the comprehensive agreement. The agreement also includes a revenue-sharing scheme between the public and private partners.

Colorado's U.S. 36 Express Lanes Phase II

The 18-mile section of U.S. Route 36 that connects northwestern Denver to Boulder in Colorado opened in 1951 (*30*) with demand increasing and congestion worsening as the local population grew over succeeding decades. By 2009, five improvements were deemed necessary to meet corridor capacity, congestion management, and safety requirements: 1) increased trip capacity; 2) expanded interchange capacity; 3) congestion reduction; 4) multi-modal transit and bikeway developments; and 5) highway facility updates (*31*, *32*). However, the Colorado Department of Transportation (CDOT) lacked sufficient resources to deliver the improvement project using DBB or DB approaches. Fuel tax revenues had stagnated and the state's 1992 Taxpayer Bill of Rights (TABOR) amendment implemented a strong constitutional limit on state and local revenue and expenditure growth (*33*).

In order to proceed, CDOT divided the project into two phases. Phase I construction commenced in July 2012 and involved a TIFIA loan application, raising the possibility for Phase II financing using a P3 structure. Colorado had enacted P3 legislation in March 2009 with the Funding Advancements for Surface Transportation and Economic Recovery Act (FASTER). This legislation launched the High Performance Transportation Enterprise (HPTE) under CDOT with authority to engage in P3 projects.

HPTE began Phase II P3 procurement in February 2012 and financial close occurred in June 2013 with a 50-year DBFOM agreement. For a 5.1 mile highway segment, the private partners would add a HOT lane in each direction, improve Bus Rapid Transit (BRT), and add a bikeway. The private partner would also take over operation and maintenance across both the HOT lanes and general-purpose lanes, while also taking responsibility for Phase I debt.

Phase II construction began in March 2015 and the facility opened gradually, with a modest delay, throughout early 2016. Phase II funding totaled $258.6 million including 8.0% private equity, 8.0% Private Activity Bonds, 23.2% TIFIA loans, 19.2% HPTE funds, 11.8% RTD sales tax revenue, 5.8% federal funds, 7.3% state funds, 4.2% local funds, and 12.6% other financing. Managed lane tolls provide revenue for debt service with rates varying by time of day. The toll rates remain subject to HPTE Board approval and the private concessionaire shares revenues with HPTE when its return on investment exceeds 13.68%.

Florida's Port of Miami Tunnel

Florida's City of Miami relocated its Port of Miami (POM) from mainland Miami to Dodge Island in 1964 and by 2008, the port handled more cruise passengers than any other U.S. port and its proximity to the Panama Canal made it the country's 12th largest container port. For decades, the Port Boulevard Bridge had provided primary access by way of downtown Miami, but as passenger and container traffic increased the surrounding community objected to the resulting congestion and accidents (*34*, *35*). As of 2003, Miami ranked 6th in the U.S. for travel delays, excess fuel consumption, and congestion costs (*36*).

Local agencies evaluated improvement alternatives during the 1980s and by 1990 both the Florida Department of Transportation (FDOT) and the Federal Highway Administration (FHWA) had selected a tunnel approach linking I-395 on Watson Island and POM on Dodge Island. After the planned blast-dredge construction approach raised environmental concerns, FDOT switched to a boring approach but lacked prior experience or specifications for major tunnel construction and maintenance (*37*). As a result, the agency pursued a P3 approach to shift construction and maintenance risks to an experienced private partner.

FDOT began its P3 procurement process in December 2005 and financial close occurred in October 2009 after delays caused by the 2007-2009 global financial crisis. The resulting DBFOM contract extended for 30 years and made the private partners responsible for constructing two bored tunnels and improving the existing bridge and roadway system. POM Tunnel construction began in May 2010, with the facility opening to traffic in May 2014. Project financing totaled $1,072.6 million, including 7.5% private equity, 31.8% senior bank debt, 31.8% TIFIA loans, and 28.9% FDOT funds. Facing concerns that tolls would harm the local cruise industry (*38*, *39*), FDOT compensated the private concessionaire using milestone payments and availability payments, rather than pursuing a toll-revenue funding approach.

Virginia's I-95 HOV/HOT Lanes

Following Interstate 95's (I-95's) mid-twentieth century construction, the sections running through Northern Virginia experienced increasing congestion despite high carpooling rates and bus ridership (*40–42*). Starting in 2002, viability studies considered HOV extensions and expansions (*43*), but these plans failed to gain traction, leading a private consortium to submit an original unsolicited P3 proposal in October 2003. After soliciting competing proposals under PPTA (*29*), VDOT signed an interim agreement in October 2006.

The resulting project included 56 miles of reversible HOT lanes, park-and-ride expansions, a BRT station, and $195 million for transit (*44*). However, the Arlington County Board filed a federal lawsuit against the project in August 2009, arguing that it: 1) disproportionally affected minority neighborhoods, 2) would increase congestion, and 3) failed to fulfill federal environmental standards (*45–48*). The Board withdrew its lawsuit in February 2011 after VDOT conducted an Environmental Assessment and modified the project to eliminate its Arlington County portions (*41*, *49*, *50*). VDOT's newly reduced project focused solely on HOV/HOT components; the agency did not include the concessionaire's originally proposed transit grants, park-and-ride expansions, and BRT station. The modified plan 1) widened the existing 14-mile, northern HOV lanes from 2 to 3 lanes, 2) improved another existing 6-mile HOV lane segment; and 3) built new HOV/HOT lanes 9 miles further southward (*51*). The partners reached financial close in July 2012 with a DBFOM comprehensive agreement extending 73 years following completion. Construction began that same month and the project opened to the public on time two years later in December 2014.

Project funding totaled $922.7 million, divided into 30.4% private equity, 27.4% Private Activity Bonds, 32.5% TIFIA loan, 8.9% VDOT funds, and 0.8% interest. The project relies on dynamically priced HOT revenue that varies with current traffic conditions. The agreement also included a revenue-sharing scheme where VDOT can claim 5% to 40% of gross revenues depending on the concessionaire's internal rate of the return. After the project opened, and with new leadership at the local and state levels, the partnership extended the HOT lanes into Arlington County once again– the original P3 agreement preserved this option in case conditions became favorable – and obtained a $15 million yearly transit commitment from the concessionaire. Construction for this northern extension should begin in the summer of 2017 with a 2019 opening date (*52*).

California's Presidio Parkway Phase II

The 1.5-mile, Presidio Parkway providing southern access to San Francisco, California's Golden Gate Bridge opened in 1940 (*53*) and faced sufficient congestion to merit roadway expansion and upgrade proposals in the 1960s. Political opposition blocked infrastructure development however, and the facility degraded progressively (*54–57*) until the California Department of Transportation (Caltrans), the San Francisco County Transportation Authority (SFCTA), and other affected agencies coordinated during the 1990s and early 2000s to consider facility improvement options. SFCTA and Caltrans ultimately elected to redesign the existing roadway, improve scenic views, and upgrade the facility in 2006 through eight DBB contracts, the first four of which (Phase I) commenced in December 2009.

The California state legislature then approved Senate Bill Second Extraordinary Session 4 (SBX2-4) in 2009, expanding allowable P3 projects beyond goods movement and eliminating legislative approval requirements. This allowed Caltrans to consider P3 approaches for the remaining Phase II contracts, scheduled to begin in Fall 2010. Caltrans and SFCTA began the Phase II P3 process in February 2010 and in November that year, the agencies publicized their Notice of Intent to Award the contract. Concurrently, the Professional Engineers in California Government (PECG) union sued the agencies, arguing that the project's reliance on fuel taxes rather than user fees did not comply with California´s P3 statutes (*58*, *59*). Although a judge dismissed the lawsuit in February 2011 and the California Supreme Court confirmed the finding that November (*60–62*), lenders would not sign agreements with the private concessionaire until the litigation was resolved. As a result, financial close, expected in June 2011 (*60*, *63*), was delayed to June 2012.

The resulting contract gave the private concessionaire DBFOM responsibilities for 30 years. Project financing totaled $364.7 million, including 12.5% private equity, 45.7% bank loans, and 41.8% TIFIA loans (*64*). Caltrans employed milestone payments and availability payments after the various responsible agencies could not reach consensus on a tolling approach (*65*). Presidio Phase II construction began in June 2012 and the facility opened to traffic in July 2015.

Texas' IH 635 LBJ Managed Lanes or LBJ TEXpress

The 37-mile U.S Interstate Highway 635 (IH 635), also known as the LBJ Freeway, rings the Texas City of Dallas on its northern and eastern sides. As strong regional economic activity and population growth developed between the 1960s and 1990s, traffic congestion also increased. Congestion improvement studies began in 1987 and by 1992 the Texas Department of Transportation (TxDOT) had concentrated on roadway expansion. The planned expansion's significant eminent domain requirements spurred strong and organized public opposition. To avoid a protracted conflict, TxDOT tabled the expansion plan and explored alternatives, ultimately settling on a tunnel approach in 1996, although it lacked sufficient resources to deliver the design.

Eventually, Texas' 2003 House Bill 3588 authorized TxDOT to conduct transportation P3s using Comprehensive Development Agreements (CDA). Recognizing the limited public resources available for traditional IH 635 project delivery, TxDOT moved forward with a P3 approach in April 2005. During the RFQ phase, one team proposed a trench-based design that presented attractive construction, operations, and maintenance savings compared to the tunnel plan. The 2007-2009 global financial crisis then affected the project's RFP and financial close phases; two teams withdrew and TxDOT was forced to delay the proposal submission deadline. The agency ultimately selected its concessionaire in February 2009 and reached financial close in June 2010.

The resulting DBFOM contract extended for 52 years, including both construction and operations. The final project design included managed lanes, a portion of which would be constructed below the general purpose lanes, and a range of facility improvements. Project funding totaled $2.6 billion, divided into 25.8% private equity, 22.9% Private Activity Bonds, 32.1% TIFIA loan, 18.5% public sector funds, and 0.6% toll revenues during construction. The project's financing relies on a three-component dynamic tolling process, adjusted by traffic volume, vehicle type, and roadway segment. The comprehensive development agreement also includes a revenue-sharing scheme between the public and private partners based on the resulting toll revenues. Construction began in January 2011 and the project opened four years later in September 2015.

RESULTS

Across the six cases, public-sector stakeholders focused primarily on addressing traffic congestion and the safety and service quality issues that stem from it, although seismic safety improvements also proved important in the Presidio Parkway case. Despite having recognized traffic congestion problems however, the case agencies encountered two complications that challenged traditional procurement. First, the public agencies involved in the I-495, U.S. 36, LBJ, Presidio, and to some degree I-95 cases encountered financial limitations (both short and long term), often exacerbated by debt limits (U.S. 36 in particular). For example, CDOT ran into TABOR limitations that undermined traditional funding sources for its U.S. 36 project. TxDOT, in turn, possessed only about one third of the resources required to build its LBJ Managed Lanes project. Similar funding limitations greatly limited VDOT's ability to deliver its I-95 and I-495 projects under existing capital plans. Second, project design and/or technical limitations often arose from environmental and legal challenges, eminent domain opposition (I-495), aesthetic opposition (LBJ, Presidio), tolling challenges (I-495), and/or the technical challenges related to tunnel construction (LBJ, POM). The public agencies then engaged with P3 procurement approaches to address these financial and technical challenges and achieve their original congestion management and user experience goals. Overall, the case agencies generally met these objectives (see Table 1).

Congestion Management and Improving User Experiences

The projects improved roadway congestion and user experience outcomes in accordance with the public agencies' original transportation development objectives. P3 procurement delivered congestion free HOT/HOV lanes in Virginia's I-495 and I-95 cases – and similarly successful managed lanes in the LBJ and U.S. 36 cases – that also reduced congestion across their corresponding general-purpose lanes. The POM Tunnel also successfully reduced passenger and truck traffic volume through downtown Miami in accordance with public-sector congestion reduction objectives. While many of these benefits would have developed regardless of procurement method, the P3 approach proved successful at addressing basic congestion objectives while also providing additional benefits.

Accessing Private-Sector Funding & Financing

P3 delivery approaches helped several case agencies overcome public funding and/or debt ceiling limitations by accessing alternative capital sources – private equity and debt – thereby diminishing the public sector's upfront financial commitments and associated risks. For example, privately acquired resources overcame Virginia's funding and debt capacity limitations to advance both the I-495 and I-95 projects. Private resources also enabled Texas's LBJ project and proved essential for addressing debt-ceiling limitations in Colorado's U.S. 36 case.

Accessing Private-Sector Expertise & Innovation

Since public sector agencies often lack sufficient capacity and/or expertise to develop and maintain complex and innovative technological solutions, P3 delivery approaches helped public agencies access crucial private-sector expertise and innovation in nearly all the study cases. For example, the private sector's unsolicited I-495 proposal introduced crucial design innovations that greatly diminished otherwise prohibitive and unpopular eminent domain requirements. Furthermore, \VDOT then recognized its limited tolling experience and employed P3 approaches to transfer technology deployment and toll enforcement to the experienced private concessionaire, a key aspect of the financial sustainability of both the I-495 and the I-95 projects. Similar private sector expertise contributed to alternative technical concepts in the U.S. 36 case (e.g. new road surfaces) and proved essential for lowering construction costs for the LBJ Managed Lanes project. Originally conceived with a tunnel design, the private sector's innovative trench-cantilever design proposal reduced costs by nearly $1 billion and enabled on budget delivery three months ahead of schedule. Finally, FDOT benefitted greatly from the POM Tunnel concessionaire's extensive experience with bored-tunnel technology when addressing construction, geotechnical, and hurricane concerns.

Accelerating Project Delivery

By employing P3 approaches to access private sector resources and expertise, several case agencies successfully accelerated their projects compared to the timelines expected under traditional procurement. For instance, P3-enabled private resources accelerated Virginia's I-495 and I-95 projects by at least six years compared to the delivery schedule expected with limited public funding and state debt restrictions (*66*). Second, the design innovations, cost reductions, and private-sector financing enabled by Texas' LBJ Managed Lanes P3 procurement accelerated that project by about 10 to 20 years compared to traditional DBB procurement (*67*, *68*). Lastly, Colorado's U.S. 36 P3 structure circumvented the state's TABOR restrictions to deliver the project 10 to 15 years faster than predicted under traditional procurement (*69*).

Project Certainty & Risk Management

The case study agencies aimed to improve cost and schedule risk management through two P3 mechanisms. First, the agencies implemented design-build contracts to bundle design and construction activities into single, fixed cost contracts (*70–72*) that consolidated responsibility for component delivery with one party for a fixed sum. This reduced the expensive contractor claims and change orders that often arise from discrepancies and uncertain events (*73*). Second, the agencies also conditioned P3 milestone payments, availability payments, and/or toll collection on facility delivery in accordance with predefined specifications (*19*, *71*). This approach incentivized greater engagement by private partners than would be expected under normal design-build contracts.

Combining both approaches, Texas delivered its LBJ Managed Lanes project on time and within budget. Virginia did the same with its I-495 and I-95 projects. The remaining projects also employed contract mechanisms to manage cost and schedule risks, although they encountered exogenous challenges. Colorado, for example, employed both mechanisms for its U.S. 36 project and achieved project delivery under budget and just two weeks late despite a major and unexpected flooding event. The POM concessionaire also delivered its project under budget using both mechanisms, but opened three months late following technical problems. Nevertheless, the contract's heavy monetary penalties – totaling almost $9 million (*74*) – helped minimize the delays and prevent potential years-long delays and multi-billion cost overruns exemplified by other large projects (*75*, *76*). While Presidio Parkway also achieved substantial on-time completion and opened to traffic after employing both mechanisms, landscaping remains incomplete due to disagreements between the project's public-sector stakeholders (*63*, *77*). Since the delay originated with the public sector, the concessionaire sued Caltrans and settled for partial payment (*63*). This increased the project's overall cost although the P3 alternative remains more attractive than the DBB option (*63*, *78*).

Broader Transportation Features and Missed Objectives

Finally, public agencies can employ P3 approaches to incorporate broader transit, local development, and risk-management objectives into infrastructure development opportunities. By incorporating transit, bike facilities, and associated improvements into a project originally designed to expand capacity for vehicular traffic, the U.S. 36 case in many ways exemplified this approach. The other case projects, in contrast, proceeded with narrower scopes and likely left potential transit, economic development, and related value capture opportunities underdeveloped. In addition, the study agencies appear to have missed important political risks relating to project designs, environmental impacts, and/or user fees (*79*) when formulating their risk-management objectives. While P3s can effectively manage such risks through careful consideration, communication, coordination, and public engagement, several case projects failed to adequately include such risk management in their primary objectives. As a result, U.S. 36 encountered strong public tax-increase opposition, the POM Tunnel faced tolling opposition, I-95 contended with a federal environmental and civil rights lawsuit, and Presidio Parkway encountered strong public and union opposition.

Discussion

This section discusses the study limitations and what are the implications of the findings to state DOTs. The study remains limited by the small number of cases analyzed. The six study cases present similar objective profiles, outcomes, and limitations, but other projects will likely offer a more diverse picture. Authors expect to continue pursuing this case study approach in further studies to provide a more complete view of transportation infrastructure P3s in the U.S.

On the methodology, the study projects often lacked readily available documentation elaborating on the P3 approach's marginal impact compared to traditional delivery. Not all study projects or objectives came with baseline outcomes, clear outcome measurement methods, or well-defined public communication approaches. For instance, some state departments of transportation either did not require or did not develop VfM analyses or equivalent studies, removing a valuable information source from consideration (*18*). In many cases, these limited evaluation efforts were exacerbated by transparency practices that varied widely by project and jurisdiction. Such limited and varied communication channels can erode citizens' trust and increase political risk, especially when combined with fragmented accountability.

Despite the data limitations, the study findings do suggest that state DOTs should consider P3s as a useful tool. For example, given the U.S.'s extensive roadway repair backlog (*80*), state DOTs should consider the maintenance and operations benefits achieved through P3s and their long-term delivery commitments. DOTs could also learn from the P3 approaches' cost and schedule benefits to improve design-build contracts and contractor management procedures. Public agencies could further reap P3 benefits by 1) pursuing private-sector expertise and innovation earlier in the procurement process; 2) placing stronger emphasis on risk transfer objectives; 3) incorporating broader transit and local development objectives; and 4) managing political risk through proactive community engagement.

Finally, considering the discussion, Federal and state transportation authorities should consider developing a P3 program evaluation approach to more convincingly assess their relative benefits and shortcomings. The challenge here is that the comparison group, traditionally procured projects, are usually less transparent than P3 projects. Agencies might also produce "citizens' guides" explaining P3 comprehensive agreements and implementing the P3 information disclosure best-practices observed on websites like California's Presidio Parkway site. Through such steps, agencies might improve communication and citizen engagement.

CONCLUSIONS

The six U.S. surface transportation P3 cases evaluated in this study presented five primary public-sector P3 objectives: 1) accessing private sector funding and financing; 2) accessing private-sector expertise and innovation; 3) accelerating project delivery; 4) improving cost, schedule, and facility or service quality certainty through improved risk assessment and management; and 5) expanding broader transit and development opportunities. Considering available information, the case P3s were generally successful in meeting, and occasionally exceeding, their original congestion management and user experience goals.

TABLE 1: P3 Objectives and Outcomes

P3 Objectives	Outcomes
Virginia's I-495 Express Lanes	
Congestion Management & Improve User Experiences	• Created "congestion-free" HOT/HOV lanes and added transit improvements • Improved congestion: 17-minute avg. time savings during peak hours; Up to two-hour single trip time savings compared to general purpose lanes; 8-15% increase in HOV usage; 33 minute avg. incident clearing time; 75% customer satisfaction
Accessing Private Sector Expertise for Toll Management	• Transferred technology deployment risks and toll enforcement risk to the private concessionaire, enabling the electronic toll system, managed lanes, and increased HOV travel
Project Acceleration	• Enabled an alternative unsolicited proposal design that required less property acquisition and reduced public opposition by minimizing shoulders and interchange improvements, requiring less right-of-way • Leveraged private sector funds and shifted revenue risk to the private sector • Protected VDOT from funding requirements and financial risk
Cost Certainty & Time to Completion	• Bundled design and construction activities into a single, fixed-cost contract • Reduced contractor claims and change orders • Met its estimated cost ($1.7 billion) and delivered the project 2 months sooner than the contract dictated • Transferred construction risk to the private sector, who absorbed additional costs
Colorado's U.S. 36 Express Lanes	
Overcoming Debt Ceilings, Project Acceleration	• Overcame TABOR debt limitations, accelerating project delivery by ten to twenty years • Shifted revenue risk and loan-repayment responsibility to the private sector
Trip Capacity, Congestion, Infrastructure Conditions	• Increased peak hour travel speeds by 20 to 29 % for commuters across all travel lanes • Introduced several alternative technical concepts to improve road quality,
Expanding Travel Options & Transit Efficiency	• Facilitated an alternative BRT approach using HOT lanes; expanded bikeways • Increased bus rides by 45% along the corridor; improved travel times
Cost Certainty & Time to Completion	• Consolidated responsibility for component delivery and delivered the project within budget • On-time delivery was complicated by public-sector partners, consequences under negotiation
Florida's Port of Miami Tunnel	
Cost & Schedule Certainty	• Provided cost assurance and incentivized on-time delivery through a DB fixed cost contract • Minimized project delivery delays through monetary penalties • Transferred community impact, hurricane, and geotechnical risks to the private sector • Limited risk sharing to losses not covered by insurance
Congestion Management, User Experience, Accessing Private Sector Expertise	• Reduced weekly average traffic volume through downtown Miami by 35 %; truck traffic by 77 % • Improved incident clearing, camera and fan functioning, user experience, etc., through contract conditions enforced via availability payments

P3 Objectives	Outcomes
Virginia's I-95 HOV/HOT Lanes	
Congestion Management & User Experience	• Met objectives for "congestion-free" HOT/HOV lanes • Improved driving-time certainty; 17.5 minute avg. timesaving for GP lanes; up to 3.5 hours single trip saving in HOV/HOT lanes; 75 % customer satisfaction ratings and accommodation of local carpooling community • Introduced several alternative technical concepts to improve road quality, including pavement designs, profiling, drainage, and bikeway improvements and extensions.
Accessing Private Sector Expertise	• Enabled technology that improved congestion management and trip-time certainties • Achieved economies of scale and improved prospects for a Northern Virginia HOV/Transit network
Debt Capacity & Project Acceleration	• Leveraged private sector resources to overcome debt restrictions • Shifted revenue risk to the private sector, protected the state from bondholder and concessionaire compensation obligations
Cost Certainty & Time to Completion	• Delivered the project on-time and on-budget • Procurement delayed by public-sector stakeholders, not the private-partners
California's Presidio Parkway Phase II	
Cost Certainty & Time to Completion	• Transferred risks to the private sector but faced problematic public-sector stakeholder coordination • Achieved substantial completion by July 2015 although some portions and components remain unfinished
Accessing Financial Resources & Project Acceleration	• Freed up several million dollars for Caltrans to use for other purposes • Accelerated access to federal stimulus resources • Project completion delayed after public agencies disagreed with each other regarding landscaping.
Texas' IH 635 LBJ Managed Lanes or LBJ TEXpress	
Project Acceleration, Accessing Financial Resources, & Cost Minimization	• Reduced costs and improved efficiencies through competitive private-sector proposals • Accelerated the project by 10 to 15 years compared to DBB • Shifted O&M cost increase risks to private sector
Cost Certainty & Time to Completion	• Experienced no change orders (other than TxDOT requests), opened on budget and 3 months ahead of schedule • Transferred construction risks to the private sector
Congestion Management	• Improved congestion: 77% overall congestion reductions; GP lane congestion reductions from 23% to 5% (April 2011-2015); improved drive-time certainty; increased 2015 rush hour speeds avg. to around 70 mph, consistently above 50 mph; 10% GP lane speed increases during rush hour; improved customer satisfaction from 46 % to 76 % (2013-2016)

1

REFERENCES

1. Department of the Treasury. *Expanding Our Nation's Infrastructure through Innovative Financing*. U.S. Department of the Treasury, Washington, D.C., 2014.
2. Weingart, J., R. Pieplow, R. Driskell, S. Gaj, M. J. Garvin, D. Holcombe, M. Saunders, J. Seiders, Jr., and A. Smith. *Public-Private Partnerships for Highway Infrastructure: Capitalizing on International Experience*. Publication FHWA-PL-09-010. Federal Highway Administration, Washington, D.C., 2009.
3. Boardman, A. E., and A. R. Vining. P3s in North America: Renting the Money (in Canada), Selling the Roads (in the USA). In *International Handbook on Public-Private Partnerships* (G. A. Hodge, C. Greve, and A. E. Boardman, eds.), Edward Elgar Publishing, Inc., Cheltenham ; Northampton, MA, pp. 499–509.
4. Hart, O. Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships. *Economic Journal*, Vol. 113, No. 486, 2003, pp. C69–C76.
5. Iossa, E., and D. Martimort. The Simple Microeconomics of Public-Privatepartnerships. *Journal of Public Economics*, Vol. 17, No. 1, 2015, pp. 4–48.
6. Dudkin, G., and T. Välilä. Transaction Costs in Public-Private Partnerships: A First Look at the Evidence. *Competition and Regulation in Network Industries*, Vol. 7, No. 2, 2006, pp. 307–331.
7. Blanc-Brude, F., H. Goldsmith, and T. Välilä. A Comparison of Construction Contract Prices for Traditionally Procured Roads and Public–Private Partnerships. *Review of Industrial Organization*, Vol. 35, No. 1, 2009, pp. 19–40..
8. Hampton, G., A. N. Baldwin, and G. Holt. Project Delays and Cost: Stakeholder Perceptions of Traditional v. PPP Procurement. *Journal of Financial Management of Property and Construction*, Vol. 17, No. 1, 2012, pp. 73–91.
9. OECD, and ITF. *Better Regulation of Public-Private Partnerships for Transport Infrastructure*. OECD Publishing, Paris, France, 2013.
10. DeCorla-Souza, P., D. Lee, D. Timothy, and J. Mayer. Comparing Public-Private Partnerships with Traditional Procurement: Incorporating Considerations from Benefit-Cost Analysis. *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2346, 2013, pp. 32–39.
11. Daito, N., and J. L. Gifford. U.S. Highway Public Private Partnerships: Are They More Expensive or Efficient than the Traditional Model? *Managerial Finance*, Vol. 40, No. 11, 2014, pp. 1131–1151.
12. Chen, Z., N. Daito, and J. L. Gifford. Data Review of Transportation Infrastructure Public–Private Partnership: A Meta-Analysis. *Transport Reviews*, Vol. 36, No. 2, 2016, pp. 228–250.
13. Bardach, Eugene. *A Practical Guide for Policy Analysis. The Eightfold Path to More Effective Problem Solving*. CQ Press & SAGE Publications Ltd, United States, 2012.
14. McLaughlin, J. A., and G. B. Jordan. Using Logic Models. In *Handbook of practical program evaluation* (J. S. Wholey, H. P. Hatry, and K. E. Newcomer, eds.), Jossey-Bass, San Francisco, pp. 7–32.
15. Wilson, J. Q. *Bureaucracy: What Government Agencies Do and Why They Do It*. Basic Books, New York, 1989.
16. OECD, Ed. *Public-Private Partnerships: In Pursuit of Risk Sharing and Value for Money*. OECD, Paris, 2008.
17. Verhoest, K., M. van den Hurk, N. Carbonara, V. Lember, O. H. Petersen, W. Sherrer, and M. Soecipto. Introducing the National Context for PPPs -Elements and Dimensions. In *Public private partnerships in transport: trends and theory* (A. Roumboutsos, ed.), Routledge, London, pp. 9–18.
18. FHWA. Value for Money Assessment for Public-Private Partnerships: A Primer. http://www.fhwa.dot.gov/ipd/pdfs/p3/p3_value_for_money_primer_122612.pdf.
19. U.S. DOT. *Risk Assessment for Public-Private Partnerships: A Primer*. U.S. Department of Transportation (USDOT), 2012.
20. Chasey, A., W. Maddex, and A. Bansal. Comparison of Public-Private Partnerships and Traditional Procurement Methods in North American Highway Construction. *Transportation Research Record:*

Journal of the Transportation Research Board, Vol. 2268, 2012, pp. 26–32. https://doi.org/10.3141/2268-04.
21. Lawther, W. C., and L. L. Martin, Eds. *Private Financing of Public Transportation Infrastructure: Utilizing Public-Private Partnerships*. Lexington Books, Lanham, 2015.
22. Gifford, J. Transportation Finance. In *The Oxford Handbook of State and Local Government Finance* (R. D. Ebel and J. E. Petersen, eds.), Oxford University Press, New York, pp. 594–623.
23. Oliveira, M., J. Costa, J. Ribeiro, and R. Macário. Finding an Institutional Evolutionary Maturity Concept. An Exploratory Analysis for European Experience in PPPs. In *Public private partnerships in transport: trends and theory* (A. Roumboutsos, ed.), Routledge, London, pp. 44–63.
24. Buckberg, E. Expanding the Market for Infrastructure Public-Private Partnerships. *U.S. Department of the Treasury*. https://www.treasury.gov/connect/blog/Pages/Expanding-the-Market-for-Infrastructure-Public-Private-Partnerships-.aspx. Accessed Jan. 3, 2017.
25. Wholey, J. S. Evaluability Assessment. In *Handbook of practical program evaluation* (J. S. Wholey, H. P. Hatry, and K. E. Newcomer, eds.), Jossey-Bass, San Francisco, pp. 33–62.
26. Liyanage, C., S. Njuangang, and F. Villalba-romero. Measuring Success in PPP Road Projects in Europe. A Performance Measurement System (PMS). In *Public private partnerships in transport: trends and theory* (A. Roumboutsos, ed.), Routledge, London, pp. 237–261.
27. Texas A&M Transportation Institute. *Annual Urban Mobility Scorecard. Congestion Data for Your City*. Texas A&M Transportation Institute, Texas, 2015.
28. VDOT, and FHWA. Capital Beltway Study. Final Environmental Impact Statement. Section 4(f) Evaluation. http://www.virginiadot.org/VDOT/Projects/Northern_Virginia/asset_upload_file77_72985.pdf.
29. Gifford, J. L., and M. Transue. The Evolution of Virginia's Public-Private Partnership Enabling Statutes. *Journal of Corporation Law*, No. 41, 2015, pp. 265–282.
30. Pettem, S. Toll Road to Denver Opened 60 Years Ago -. *Boulder Daily Camera*. http://www.dailycamera.com/ci_19691714?source=most_viewed. Accessed Mar. 15, 2017.
31. FHWA, and FTA. *Record of Decision for the US 36 Corridor*. Publication FHWA-CO-EIS-07-01-F. Federal Highway Administration And Federal Transit Administration, Colorado, 2009.
32. FHWA, FTA, CDOT, and RTD. *Final Environmental Impact Statement / Final Section 4(f) Evaluation. Volume I*. Publication NH 0361-070. Colorado, 2009, p. https://www.codot.gov/projects/us36eis/documents/us-36-final-eis-volume-i.
33. Watkins, K. *Memorandum on State Spending Limitations: TABOR and Referendum C*. Colorado Legislaslative Council Staff, Colorado, 2009.
34. Cambridge Systematics, Inc. Port of Miami Freight Access Study. http://miamidadempo.org/library/studies/port-of-miami-freight-access-final-2007-02.pdf.
35. Norton, F. Train Tunnel To Port Of Miami Seen As Way To Ease Congestion Promote Downtown Development. *Miami Today*. http://www.miamitodaynews.com/news/020613/story1.shtml. Accessed Mar. 23, 2017.
36. Schrank, D., and T. Lomax. *The 2005 Urban Mobility Report*. Texas Transportation Institute, Texas, 2005.
37. FDOT. *Value for Money Analysis. The Port of Miami Tunnel and Access Improvement Project*. Florida DOT, Florida, 2010.
38. Minnesota DOT. *Port of Miami Tunnel: Case Study on a DBFOM Contract with Availability Payments*. Minnesota Department of Transportation, Minnesota, USA, 2011.
39. Build America Bureau. Port of Miami Tunnel, Miami, FL. *U.S. Department of Transportation*. https://www.transportation.gov/policy-initiatives/build-america/port-miami-tunnel-miami-fl. Accessed Apr. 2, 2017.
40. Schrank, D., and T. Lomas. *The 2005 Urban Mobility Report*. Texas Transportation Institute, Texas, 2005.
41. Connaughton, S. Advancing New I-95 HOV/HOT Lanes Project, HOV/Transit Ramp at Mark Center. Feb 02, 2011.

42. VDOT. *I-95 HOT Lanes Interchange Justification Report, Phase I*. Virginia Department of Transportation (VDOT), Virginia, 2011.
43. USDOT, FHWA, and VDOT. *Environmental Assessment I-95 HOT Lanes Project*. U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA) Virginia Department of Transportation (VDOT), 2011.
44. I-95/I-395 Transit/TDM Technical Advisory Committee. *I-95/I-395 Transit/TDM Study. Final Report*. Virginia, USA, 2008.
45. Cullum, J. Arlington Stands Alone In HOT Lanes Lawsuit » AlexandriaNews. *AlexandriaNews*. https://alexandrianews.org/2009/top-stories/arlington-stands-along-in-hot-lanes-lawsuit/9379/. Accessed May 25, 2017.
46. Halsey III, A. Lawsuit Over Virginia HOT Lanes Spurs Mixed Reactions from Advocacy Groups. *The Washington Post*, Aug 21, 2009.
47. Zimmerman, C. *Letter to Speaker Howell and Senator Colgan Concerning the I-395/95 HOT Lanes Project and the Arlington Litigation*. Arlington County, Virginia, 2011.
48. U.S. District Court for the District of Columbia. *County Board of Arlington, VA v U.S.DOT, Honorable Raymond H. Lahood, FHWA, Victor Mendez, VDOT, Honorable Pierce R. Homer*. Publication 1:09-cv-01570. U.S. District Court for the District of Columbia, Washington, D.C, 2009.
49. ARLnow.com. Arlington Will Withdraw HOT Lanes Suit. ARLnow.com - Arlington, Va. Local News, Feb 08, 2011.
50. Helderman, R. Va. Cancels Plans for I-395 HOT Lanes. *POST Now*. http://voices.washingtonpost.com/local-breaking-news/virginia/va-cancels-plans-for-i-395-hot-lanes-inside-beltway.html?wprss=local-breaking-news. Accessed May 26, 2017.
51. Kilpatrick, C. I-I-95 Hov/Hot Lanes 95 Hov/Hot Lanes Project. Major Business Terms. Dec 07, 2011.
52. VDOT. I-395 Express Lanes Extension. *Virginia Department of Transportation (VDOT)*. http://www.virginiadot.org/projects/northernvirginia/395_express.asp. Accessed May 26, 2017.
53. Presidio Parkway. The Doyle Drive Historic Corridor. *Presidio Parkway*. http://www.presidioparkway.org/about/history/display_new_deal.aspx. Accessed Jun. 21, 2017.
54. SFCTA, FHWA, and Caltrans. *South Access to the Golden Gate Bridge - Doyle Drive FEIS/R*. Federal Highway Administration (FHWA) San Francisco County Transportation Authority (SFCTA) California Department of Transportation (Caltrans), 2008.
55. ARUP PB Joint Venture, CirclePoint, and MPA Design. *Doyle Drive Replacement Project. Summary of Sustainability Program: Phase I*. San Francisco County Transportation Authority (SFCTA), San Francisco, California, 2007.
56. FHWA, SFCTA, and Caltrans. *South Access to the Golden Gate Bridge - Doyle Drive Project. Project Management Plan*. Federal Highway Administration (FHWA) San Francisco County Transportation Authority (SFCTA) California Department of Transportation (Caltrans), 2009.
57. Superior Court of the State of California. *Professional Engineers in California Government et Al. v. Department of Transportation et Al.* Publication No. RG10-544672. Superior Court of the State of California, Alameda, 2011.
58. Aguilar, K. *Appellate Court Clears Way for Presidio Parkway Project to Move Forward as a Public-Private Partnership*. Hanson Bridgett Infrastructure Practice Group, 2011.
59. Carlsen, R. California Judge Dismisses Engineer Union's Lawsuit on P3 Project. *ENRCalifornia*. http://www.enr.com/articles/19396-california-judge-dismisses-engineer-union-s-lawsuit-on-p3-project. Accessed Jun. 19, 2017.
60. Ortega, N., and K. Ajise. *Memorandum to Chari and Commissioners. Update on Presidio Parkway Public-Private Partnership Project*. Publication 4.10. Information Item. California Department of Transportation (Caltrans), 2011.
61. Roberts, S. California Supreme Court Allows Presidio Parkway to Proceed as P3. *Infra Insight Blog*. http://www.infrainsightblog.com/2011/11/articles/p3s/california-supreme-court-allows-presidio-parkway-to-proceed-as-p3/. Accessed Jun. 21, 2017.

62. The Court of Appeal of the State of California. First Appellate District. *Professional Engineers in California Government et Al. v. Department of Transportation et Al.* Publication Alameda County Super. Ct. No. RG10544672. The Court of Appeal of the State of California. First Appellate District, 2011.
63. Reinhardt, W. G. Caltrans Settles Presidio Parkway Claims for $91 Million. Public Works Financing, 318, Sep, 2016, p. 1.
64. FHWA. Project Profiles. https://www.fhwa.dot.gov/ipd/project_profiles/index.htm. Accessed Mar. 3, 2014.
65. Moscovich, J. L. Presidio Parkway P3. The Case for Flexibility in Project Delivery and Finance. Berlin, Germany, Sep, 2011.
66. Debt Capacity Advisory Committee. *Report to the Governor and General Assembly*. Virginia, USA, several years.
67. TxDOT. *Self-Evaluation Report Submitted to the Sunset Advisory Commission*. Texas Department of Transportation (TxDOT), Texas, 2015.
68. Sunset Advisory Commission. Texas Department of Transportation. Sunset Staff Report with Commission Decisions. 2016–2017. https://www.sunset.texas.gov/public/uploads/files/reports/TxDOT%20Staff%20Report%20with%20Commission%20Decisions_1-27-17.pdf.
69. CDOT. *Achieving Value for Money. U.S. 36 Express Lanes Public-Private Partnership*. Colorado Department of Transportation, Colorado, 2014.
70. USDOT. *Challenges and Opportunities Series: Public Private Partnerships in Transportation Delivery*. U.S. Department of Transportation (USDOT), Washington D.C., 2012.
71. Lawther, W. C., and L. L. Martin. An Introduction to Private Sector Financing of Transportation Infrastructure. In *Private financing of public transportation infrastructure: utilizing public-private partnerships* (W. C. Lawther and L. L. Martin, eds.), Lexington Books, Lanham, pp. 1–18.
72. Lawther, W. C. Evaluation of Public-Private Partnerships for Transportation Infrastructure Financing: Process and Goal Achievement. In *Private financing of public transportation infrastructure: utilizing public-private partnerships* (W. C. Lawther and L. L. Martin, eds.), Lexington Books, Lanham, pp. 135–178.
73. Songer, A. D., and K. R. Molenaar. Selecting Design-Build: Public and Private Sector Owner Attitudes. *Journal of Management in Engineering*, Vol. 12, No. 6, 1996, pp. 47–53.
74. Bipartisan Policy Center. Case Study: Infrastructure Public-Private Partnerships. https://bipartisanpolicy.org/wp-content/uploads/2016/10/BPC-Infrastructure-Case-Studies.pdf.
75. Maza, E. Port of Miami Tunnel Project Could Be South Florida's Big Dig. *Miami New Times*. http://www.miaminewtimes.com/news/port-of-miami-tunnel-project-could-be-south-floridas-big-dig-6552797. Accessed Apr. 3, 2017.
76. Flint, A. 10 Years Later, Did the Big Dig Deliver? *The Boston Globe*. https://www.bostonglobe.com/magazine/2015/12/29/years-later-did-big-dig-deliver/tSb8PIMS4QJUETsMpA7SpI/story.html. Accessed Apr. 4, 2017.
77. The Presidio Trust. *Milestones. Presidio Trust 2012 Year-End Report to Congress and the Community*. Presidio Trust, 2012.
78. Arup, and Parsons Brinckerhoff. *Analysis of Delivery Options for the Presidio Parkway Project*. Caltrans, 2010.
79. Bolaños, L., L. McCarthy, J. Y. Kweun, and J. L. Gifford. Impact of Political Risk on the Efficiency of Public-Private Partnerships (17-05236). Presented at the Transportation Research Board 96th Annual Meeting, Washington, D.C, 2017.
80. ASCE. *2017 Infrastructure Report Card. Roads*. American Society of Civil Engineers (ASCE), 2017.