Competitive Government: Public Private Partnerships

Simon Hakim
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Handbook on Public Private Partnerships in Transportation, Vol II

Roads, Bridges, and Parking

Springer

Competitive Government: Public Private Partnerships

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A shift from monopolistic government to a competitive setting is expected to improve efficient production and stimulate innovation. That shift has typically been in the form of Public-Private Partnerships (PPP), where each partner contributes its share of comparatively advantaged resources towards the production and delivery of the services. The shift to PPP, the types of services, and the methods used in the shift are increasing and becoming ever more sophisticated. This book series intends to capture a state of the art of such PPPs and present a guide for the implementation of such ventures.

The book series will present, evaluate, and suggest policy implications based upon PPP experiences in fields like: police, prisons, courts, water and wastewater, telecommunications, air and water ports, rail, highways, schools, garbage collection, postal services, cyber security, foster care and child adoption, and homeland security management. The audience of this book series are advanced undergraduate/graduate students students in courses on privatization and public finance, consultants and researchers in both government and the private sector, and members of think tanks that promote the ideas of more-focused government, competitive government, and privatization.

The series welcomes proposals for monographs, edited volumes, and handbooks. Please contact the responsible editor for more information. All proposals submitted undergo single-blind evaluation by the series editors and/or external peer reviewers prior to acceptance and publication.

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Preface

As discussed in the first book in this series entitled *Handbook on Public Private Partnerships in Transportation, Vol I: Airports, Water Ports, Rail, Buses, Taxis, and Finance*, Public-Private Partnerships (P3s) are being used increasingly for investment in infrastructure. Given the deterioration of infrastructure around the world, especially in the United States, this mechanism creates an important opportunity for the private and public sector to work together to make these important investments.

It is projected that investment in transportation infrastructure will increase substantially throughout the world. Roads and highways will most likely remain the biggest area of growth because they play a major role in production and wealth generation. They are clearly a critical ingredient in economic development. For example, if a road network is undeveloped or underdeveloped it can have important economic consequence and result in a subpar quality of life for a nation. Governments are, therefore, constantly looking for ways to develop their road networks and other transport links to meet economic, political, and social needs.

This volume is the second of two volumes that presents worldwide case studies and related policy implications of P3. It contains a number of manuscripts written by a group of international experts that discuss various types of P3s in use for investment in roads, bridges, and parking. A wide range of applications of the P3 concept from the construction of highways in Spain, Colombia, Mexico, and the United States to the construction of bridges in Italy and parking structures and urban development in the United States are presented. Also discussed are some of the legal and policy issues associated with using P3s in the transportation field. It is clear that the P3 concept has strong potential for enhancing infrastructure construction and operation throughout the world.

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P3 in Transportation: Roads, Bridges, and Parking: An Overview

Simon Hakim, Erwin A. Blackstone, and Robert M. Clark

Acronyms

ASCE	American Society of Civil Engineers
BOOT	Build Own Operate Transfer
DBFO	Design Build Finance Operate
EU	European Union
FHWA	Federal Highway Administration
KPIs	Performance indicators
OECD	Office of Economic Cooperation and Development
PANE	Spanish National Motorway Plan
PMS	Performance Measurement Systems
P3s	Public–Private Partnerships
SRN	Strategic Road Network
SPC	Special purpose company
TIFA	Trade and Investment Agreements
USDOT	United States Department of Transportation
VfM	Value for Money

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Introduction

Transport infrastructure investment has been projected to increase at an average annual rate of about 5% worldwide over the period of 2014–2025 (PwC, 2015). However, growth will be unequal in various parts of the world. For example, it is estimated that Sub-Saharan Africa will have the fastest average annual growth rate with an increase of over 11% during this period. Roads and highways will most likely remain the biggest area of investment, especially for growth markets due partly to the rise in prosperity and car ownership in developing countries. In addition, a report by the International Transport Forum at the Office of Economic Cooperation and Development (OECD), an international organization with 54 member countries, states that transport infrastructure plays a major role as a capital input into production and wealth generation (OCED, 2013). Clearly, transport infrastructure is a critical ingredient in economic development.

In the United States, according to Altman et al. (2015), Americans are feeling the effects of a weakening transportation infrastructure. They cite poor road and bridge conditions, aging airports and seaports, weak passenger rail service, and inadequate public transportation. Virtually everyone agrees on the need to upgrade these systems and that there should be federal action on infrastructure; however, there are disagreements on which investments to make and how to pay for them. There is some hope because the American Society of Civil Engineers (ASCEs) 2021 Report Card for America's Infrastructure gives US infrastructure its highest overall grade since the Society began issuing its quadrennial assessments in the late 1990s (ASCE, 2021). Although much work remains to be done, this progress indicates the benefits that can result from increased funding, better asset management, and technological improvements.

One approach to achieving an appropriate investment level is the use of Public–Private Partnerships. According to the World Bank (2021), there is no one widely accepted definition of public–private partnerships (P3s). One possible definition is that a P3 is "a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance." It should be noted that service contracts or turnkey construction contracts or the privatization of utilities are not generally considered to be P3s. Under a purely contractual P3, there are different kinds of arrangements that depend on the characteristics of the contractual relationship and delegation of tasks to the private partner. Institutionalized P3 implies an establishment of an entity which would be held jointly by the public partner and the private partner. This joint entity has the responsibility of ensuring the delivery of a work or service for the benefit of the public.

This volume will present a number of manuscripts written by international experts. These authors discuss various types of P3s that could support investment in roads, bridges, and parking.

PPPs for Roads, Bridges, and Parking

As mentioned previously, an underdeveloped road network can have important economic consequence and result in a subpar quality of life for a nation (PPP World Bank, 2021). Therefore, governments are constantly looking for ways to develop their road networks and other transport links to meet economic, political, and social needs. In some cases, this may mean building brand new roads and bridges and related infrastructure. In others, it may mean focusing on improving existing facilities. For example, because new roads are expensive, governments are often unable to make the initial investment; therefore, Build Operate Transfer (BOT) projects are becoming more and more common.

A key issue for road and bridges using the P3s approach is how the Concessionaire is to be paid and who will bear the traffic and revenue risk. Traffic risk is the risk of how many vehicles will travel up and down a road, and the revenue risk is a function of both traffic volume/toll rates and collection enforcement risk. Availability-based payments generally do not transfer these risks to the private sector. “Shadow Toll” structures transfer traffic risk and revenue risk but do not discourage usage or annoy drivers. In that sense, with other factors equal, concessionaires may prefer shadow tolls. “Real-Tolled” payments clearly transfer both risks.

A series of case studies that illustrate the strengths and weaknesses of using P3 methodology is presented. A range of examples, from constructing parking garages in the United States to highways in Spain and the United States, to urban development in the UK is presented to illustrate the current and potential application of P3 methodology.

Spanish Toll Road PPPs in Financial Distress: Lessons Learned from the Strategic Behavior of the Stakeholders

Since 1967 the Central Government has awarded 32 stretches of highway with 14 awarded in the last two decades. During this time, Spain has developed a broad legal framework to regulate these contracts which facilitated the promotion of P3s for different infrastructure facilities. However, in 2013, nine out of the 14 toll highways awarded between 1999 and 2006 filed for bankruptcy after years of financial distress. Most of these projects had been operating for less than 8 years and were severely affected by traffic shortfalls caused by several factors. These factors included the economic recession after 2009, and overly optimistic estimates of traffic demand. Because of this problem, the government, the contractors, and the financial institutions started to position themselves strategically to safeguard their own interests. Their decision-making has been motivated by a legal provision—known as the State’s Financial Liability—that guaranteed compensation for the concessionaire in case of early termination of the contract. Vassallo et al. (this book) examine Spain’s extensive experience in promoting toll highways through P3s. The authors discuss the causes that motivated the bankruptcy of the projects and studied the behavior of the different stakeholders. A case study provides lessons about the correct way of designing termination clauses in P3 contracts. The goal is to safeguard service to the user while, at the same time, avoiding opportunistic behavior.

Risk Allocation and White Elephants in PPPs in Spain

In the 1960s, under the Franco regime, Spain was a pioneer in its use of road P3s. In 1961, the government approved a General Highway Plan, and later, in 1965, the Ministry of Public Works launched the Spanish National Motorway Plan (PANE). Budget constraints caused by the chronic weakness of the Spanish economy and the need for large-scale investment led to the adoption of P3s as opposed to more traditional public procurement models (Albalate 2014). Governmental policies therefore led to accelerated investments in a road network using the P3 approach. However, there is a danger under this type of pressure of making unwise investments.

Albalate and Bel-Piñana (this book) believe that risk allocation should lie at the heart of the theoretical framework for any P3. Together with task bundling, this should provide incentives to all parties, align their interests, and lead to actions that seek the benefit of all. P3 should offer a better screening of projects and prevent the construction of projects with negative social returns. The authors evaluate the key role played by risk allocation in P3s specifically designed for the financing and management of roads and highways, using Spain as an example. They review the phases of project implementation and, by examining their links to risk allocation, illustrate lessons that should help to avoid "white elephants" and other undesired effects of inappropriate risk transfer in P3s.

PPPs in the Mexican Road Sector

According to de Buen and Ortiz (this book), the road projects initiated in Mexico between 2003 and 2018 are examples of how common risks should be applied in P3 projects. They present examples that illustrate how the most common risks were handled in specific projects. In Mexico, public investment resources for large-scale road infrastructure projects are not sufficient to develop all of the road projects that are needed to improve, modernize, and extend the country's road network. During the first decade of the current century, new P3 models were designed and implemented to allow private resources to participate in the construction, operation, and maintenance of roads. These models have included concessions, availability-based payment models, privatization of existing roads, and long-term maintenance contracts and have allowed the development and completion of more than 30 projects during the last decade. The authors discuss future areas of opportunity and lessons learned throughout the various stages of the program and from the many different projects that were developed.

PPPs in Colombia: Policy Lessons

Latin American countries have introduced private participation in the transport sector to decrease the governmental resources needed in this important sector. This approach has resulted in the development of strategic corridors which have allowed trade, at the regional or international level. However, such an approach has resulted in new laws and policies.

Nieto-Garcia and Guzman (this book) discuss the general application of the P3 model applied in Latin America and the challenges faced by the use of P3s since the 1990s in Colombia. They describe how road projects have benefited both private and public stakeholders. In the specific case of Colombia, the P3 model has been the main vehicle for implementing infrastructure plans during the last decade. Since the early 1990s, the government has developed 30 important transportation corridors, which would not have been possible without the P3 model. However, there has been some negative reaction because of the implementation of tolls; therefore, in some cases, a toll subsidization has been applied. The most common approach has been the use of Build Own Operate Transfer (BOOT) and Design Built Finance Operate (DBFO).

PPPs in India: A Study of Two Urban Road Projects

According to Nallathiga (this book), India has a road network of 4.7 million km, which is the second most extensive road network in the world. It consists of National Highways, State Highways, and other roads. Other roads are further subdivided into major district roads, rural roads, and urban roads. Highways carry as much as 40% of passenger and freight transport (which is as much as 40% of the total). P3s have been deployed for road and highway development across the world. Following a global trend, India has deployed the P3 model in its highway development program including the development of urban arterial roads. However, whether such urban road development P3 projects are successful is largely an empirical question. The author examines whether such urban arterial road projects developed under P3s are successful not only in terms of "cost-time-quality" metrics but also in terms of other project features like strategic planning, detailing, and implementation. Nallathiga compares two urban arterial road projects located in two different metropolitan cities. Both used the P3 concept for ring road development but in a different manner. The study finds that strategic planning of urban ring road projects is essential for their success. Planning requires careful project planning (including financing) as well as process management (especially, land acquisition management) for these projects to become successful. There are higher risks associated with urban arterial road development projects under P3 that affect the timely execution of projects and may lead to cost overruns. P3 ring road projects are costlier and have more risks in execution but offer better project outcomes including superior built quality so they become a better "value for money." The study emphasizes the importance of institutional capacity and adequate finances and that choice of appropriate P3 model is also important for achieving project success.

Lessons from Indian National Highway Public–Private Partnerships

According to Gopalakrishniah (this book), India has been undergoing a significant transformation in the development of its road network. This transformation has been led primarily by highway development which came after the commencement of the National Highway Development Program (NHDP) in 2001. The NHDP encouraged private sector participation in road development through Public–Private Partnerships (PPPs). PPPs are widely utilized in highway development, but not utilized heavily in developing urban ring roads. Gopalakrishniah (this book) attempts to evaluate the experience of private sector participation in urban road development by examining two urban ring road projects. The author finds that urban infrastructure projects like ring roads need to be strategically planned and, when executed under a P3 program, require careful project planning as well as land acquisition management. Risks in the P3 road projects can affect the timely execution of projects while also leading to cost overruns. P3 projects although costlier offer the potential for superior quality but may not address underlying issues of funding which requires well-planned project financing. Also, the choice of the appropriate P3 model is important for achieving project success.

PPP Lessons from Italy's Morandi Bridge Collapse

Leccis (this book) discusses the Morandi bridge, located in Northern Italy, which collapsed on August 14, 2018. On that date, the Morandi bridge, a key component of the A10 highway, collapsed, causing 43 deaths and 566 evacuees. The collapse prompted a heated debate over the Value for Money (VfM) for P3s in delivering and managing transport infrastructure and caused a major political controversy. On the one hand, a widespread distrust in the private sector led to the request for the nationalization of the A10 highway. On the other hand, awareness of limited public funds encouraged an effort for a new transparent P3 agreement to be negotiated. The agreement was negotiated through a public tender procedure, entrusting the management either to a single contractor, which would operate the entire A10 highway or to a number of contractors, which would operate individual sections of the route. Leccis (this book) discusses the benefits and shortcomings of a new P3, using the Morandi bridge as a case study, and investigates new safety regulations introduced in Italy.

Applying a Performance Measurement System in European PPP Road Projects

Villalba-Romero and Liyanage (this book) offer a structured methodology to evaluate successes of, and to explore links between, different projects' performance levels and different P3 schemes and provisions. Their objective is to illustrate how project success could be evaluated in P3 projects using a number of road case studies across Europe. The analysis is based on a Performance Measurement System (PMS) using a step-by-step approach. They consider 29 performance measures (PMs) and nine key performance indicators (KPIs). Altogether 30 road projects developed in 16 European countries under the P3 model were selected for the analysis from a larger database that also contains projects developed under traditional contracting methods. The results are consistent enough to make recommendations for policymakers involved in P3 projects. Based on experiences in Europe, it could be used as a benchmarking tool to compare success both within and across projects. The authors conclude that the success of a project is most likely if the main source of income is based on payments from the granting public agency.

Highway Infrastructure Delivery Through Government Finance and PPPs

Williams (this book) discusses how new highway infrastructure is constructed in England and evaluates the use of P3s in delivering the Strategic Road Network (SRN). The SRN covers 13% of the highway network (4300 miles) and is formed of motorways and major A Roads. He also explores three case studies where a P3 urban development scheme delivered new non-strategic highway infrastructure. The research provides an analysis of the processes involved in constructing highway infrastructure in the UK and the challenges and benefits of this process to both public and private sectors. The Highways Agency used Design Build Finance Operate (DBFO) contracts through P3s to deliver infrastructure, with the private partners being paid in relation to performance. In 2015, the national government developed the Roads Investment Strategy (RIS), a $18.8bn fund for delivering infrastructure improvements, removing the need for private finance. The second RIS period (2020–2025), $33.9bn, confirms that government finance was the preferred method of funding for the SRN.

Funding for non-strategic network is more varied. P3s have been utilized by local governments to deliver new highways in England, with private companies building new infrastructure through Build Own Operate Transfer (BOOT) contracts. Local government adopts the highway once the development is complete. This remains the primary means of delivering new highways for non-strategic roads.

EU Financial Backing to Hybrid Transport PPPs

Carbonaro (this book) explains how a specific policy and operational framework for "hybrid" transport P3s has progressively taken shape within the European Union (EU). Over the past three decades, the parallel evolution of the EU policy environment and the P3 market has affected how EU budgetary support can be combined with other funds into "hybrid" or "blended" P3s in EU member states. Managing the process aimed at achieving a timely and cost-effective coordination across decisions taken by diverse stakeholders, at different time scales and governmental levels, has proved challenging. Since the early 2000s, the interaction between the EU policy framework and the P3 market has facilitated the consolidation of an increasingly articulated ecosystem. This ecosystem is populated by public sector agencies, project sponsors, infrastructure operators and financiers, active throughout the transport P3 project life cycle. The author discusses two recent hybrid P3 road operations to gain insight in this process and show the EU budgetary support for transport P3. This support has moved from an exclusive focus on cash subsidies in the construction phase to a far more articulated set of tools. These tools encompass a variety of financial instruments bolstering P3s in different phases of the project life cycle. This evolution may foster a more effective combination between EU budgetary resources and those coming from other private and public sources.

Highway Public–Private Partnership Projects in the United States

Public–Private Partnerships (P3) have been used as a project delivery method for complex highway projects in the US since the 1992–1993 timeframe. After that time period, P3 activity declined but then regained momentum in 2003 with the financial close of the South Bay Expressway in San Diego, California. To date, a total of 32 projects have been implemented via P3s or are under construction.

DeCorla-Souza and Sullivan (this book) assess the experience of highway P3s concession projects implemented in the USA since 1992. They present trends that have occurred for three groups of P3 projects—toll concessions, availability of payment concessions, and long-term leases—and analyze how financing strategies and procurement structures have evolved over time. DeCorla-Souza and Sullivan (this book) conclude that in general, public agencies have benefited from delivery of major highway projects through P3s. These benefits included expedited project delivery, allocation of risk to private partners, improved budget, and schedule certainty for the public agency, lower project lifecycle costs, performance levels meeting standards required by the P3 agreements, and conservation of public sector debt capacity.

Higher costs of financing under P3s can be mitigated through the use of Federal tax provisions such as accelerated depreciation, low-interest TIFIA loans that can provide flexible financing terms, and tax-exempt private activity bond (PABs). The United Sates DOT's (USDOT) Build America Bureau and the Federal Highway Administration (FHWA) have developed a suite of educational materials and programs to increase stakeholder understanding of the complexities of the P3 delivery approach and to support better informed decision-making. FHWA's National Highway Institute provides introductory and advanced P3 training courses available free of charge for public sector staff.

Case Studies of Financially Distressed Highway PPPs in the United States

The United States has experienced increased private involvement in infrastructure investment, development, and management, especially, in the transportation sector. This activity has rekindled an interest in public–private arrangements for infrastructure. These arrangements which were common in the nineteenth and early twentieth centuries but fell out of use in the 1990s are typically called public–private partnerships (P3). P3s typically involve:

- A contract, or concession agreement, between a governmental agency and a single private entity to design, build, finance, operate, and/or maintain a facility
- An arrangement in which a private entity is often a special purpose company (SPC) established exclusively for the intended functions and which includes a number of private firms which provide funds or services to the company
- Have contract durations of 30 years or more
- A financing package that the SPC puts together comprised of equity from the company's sponsors and debt provided by bonds or commercial loans
- Equity and debt secured solely by the revenue stream that the SPC receives from the facility/project

In such arrangements, the SPC receives payments in the form of user fees (tolls) or budgetary disbursements over time (or sometimes a combination of the two) from the government. These services are provided in return for the services and the financing associated with the facility/project. These payments are the primary or exclusive means for repaying upfront equity and debt investments. Consequently, the structure of these payments to the SPC dictates associated risks, and governments have various ways of structuring them. Three structures have become most prevalent in the United States and elsewhere.

Garvin (this book) discusses four P3 highway projects that have experienced financial distress or bankruptcy and explores the causes and outcomes. The evidence from case studies illustrated that the legal system and the market can handle bankrupt P3s, so the public sector is not significantly affected when these conditions occur. The transfer of the revenue risk to the private sector is generally sustained. Commercial lenders did experience sizeable losses.

State PPP Laws: Why Are They Needed?

Zerunyan (this book) examines the role of enabling P3 laws with a particular interest in transportation infrastructure. Typically, enabling laws allow state agencies to engage the private sector for greater participation in building infrastructure, which is often reserved for the public sector. Opportunities for public–private partnership (P3) are possible by enabling legislation to encourage collaboration between the sectors. P3s are legal arrangements allowing the private sector to undertake traditionally public functions, particularly in economic infrastructure projects. On the other hand, concerns for P3 projects include a potential lack of general control and flexibility while shifting profits from the public to the private sector. Much of the P3 enabling legislation addresses these concerns by leveling the playing field and inspiring the confidence of both public and private participants in P3 projects.

An Alternative Approach to Funding Parking Structures

Public agencies nationwide, including municipalities, transit agencies, and universities, are facing significant challenges and barriers to growth and development due to limited financial resources. The need to develop infrastructure to support growing populations, replace aging facilities, and keep up with modern advancements is a significant priority. One development type that continues to be a needed to support growing communities is parking. However, funds are often extremely limited as it is, with the money available often used for projects deemed a "higher and better use." As a result, many institutions have sought to identify more creative financing alternatives through the implementation of P3s. Martindill and Perry (this book) examine the various P3 structures, best practices, and lessons learned and review numerous successful P3 projects and the various elements that came together to make them work. In P3 projects, public institutions partner with private developers to finance and develop projects based on economic considerations and the alignment of strategic goals. P3 structures have been very successful in recent years for the development and implementation of parking and mixed-use facilities. Institutions throughout the United States have successfully navigated the P3 landscape, resulting in projects that have helped to revitalize or transform many communities and campuses and that would have otherwise been impossible without these creative financing structures.

PPPs in the Transportation Sector: Policy Implications

According to Hakim et al. (this book), transportation infrastructure investment is projected to increase substantially throughout the world with roads and highways likely remaining the biggest area of growth. Roads and highways play a major role in production and wealth generation and are a critical ingredient in economic development. Undeveloped or underdeveloped road network can have important economic consequence and result in a subpar quality of life for a nation. Therefore, governments are constantly looking for ways to develop their road networks and other transport links to meet economic, political, and social needs.

One approach to achieving an appropriate investment level for transportation is the use of Public–Private Partnerships (P3). In general, P3s in highways have been successful in the world. Problems with P3s have arisen when the private partner had low equity in the P3 ventures, the stake of the public partner was higher in risk taking, and when the partnership agreements were incomplete. All of these reasons have led to renegotiation. Other factors include the size of the project. The larger the project in scope and costs and the longer it takes to complete the project, the greater is the extent of risk and uncertainty and the lack of incentives for improvements in the last years of the concession period.

Summary and Conclusions

Transport infrastructure investment has been projected to increase at an average annual rate of about 5% worldwide over the period of 2014–2025 (PwC, 2015). It is estimated that Sub-Saharan Africa will have the fastest average annual growth rate with an increase of over 11% over this period. Roads and highways will most likely remain the biggest area of investment, especially for growth markets. Transport infrastructure plays a role as a capital input into production and wealth generation (OCED, 2013) and is clearly a critical ingredient in economic development.

An approach to achieving an appropriate investment level for transportation is the use of Public–Private Partnerships. This volume will present a number of manuscripts written by a group of international experts that discuss various types of P3s in use for investment in roads, bridges, and parking. A wide range of applications of the P3 concept from construction of highways in Spain, Colombia, Mexico, and the USA to the construction of bridges in Italy and parking structures and urban development in the USA, are presented. It is clear that the P3 concept has strong potential for enhancing infrastructure construction and operation throughout the world.

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Spanish Toll Road PPPs in Financial Distress: Lessons Learned from the Strategic Behavior of the Stakeholders

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The Toll Highway Concession System in Spain

Spain has extensive experience in promoting toll highways through public–private partnerships (PPPs). Under the regulation of the first Toll Road Construction Law, between 1967 and 1975, fifteen toll road contracts were awarded, totaling 2042 km. At that time, the Spanish vehicle fleet was rapidly growing, and the Spanish government was willing to improve the national road network so as to keep up with the European network development.

From 1976 to 1982, there was a period of stagnation in the toll road sector motivated, to a large extent, by the political instability due to the transition to democracy, along with the destabilizing effect of the petroleum crisis on the Spanish economy. In 1982, the newly elected socialist government, which was politically opposed to road charging, decided to prioritize the financing of transport infrastructure through the public budget. To that end, instead of keeping on building toll highways, the government opted for widening and upgrading the most important Spanish roads,

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turning them into double-track fast lanes free of charge[1] with worse alignment and design characteristics compared to toll highways.

The economic instability caused by the petroleum crises, as well as the inflation and the consequent increase in the cost of construction, negatively affected traffic on toll highways. For this reason, some of the first concessions awarded experienced economic and financial problems and had to be taken over by the government. In 1984, three toll roads were nationalized in a new state-owned company ENA (*Empresa Nacional de Autopistas*).

In 1996, the toll concession approach to build new roads was adopted again by the government as a mechanism to develop new roads and improve the existing ones. Between 1996 and 2006, 17 stretches were granted, reaching a total length of 3307 km. Ever since 2006, no more stretches have been awarded by the central government, especially due to the economic recession that started in 2008.

At the time of the writing of this case study, the toll highway network in Spain was made up of 44 toll road stretches 3307 km long—2759 km (30 stretches) owned by the central government, and the rest owned by regional governments. Toll highways meant approximately 18% of the high capacity road network. It is worth noting that most of the highway network in Spain is free of charge.

Past years have been marked by severe financial problems experienced by the most recently awarded toll roads. In 2012 and 2013, nine out of the 14 toll highways granted between 1999 and 2006 filed for bankruptcy after years of financial distress and negotiations among the government, the concessionaires and the lenders. The present chapter focuses on analyzing the effect of termination clauses on the strategical behavior of the different stakeholders involved in PPP contracts. In the first sections, the reader is given an overview of the reasons that motivated the bankruptcy of the contracts and the regulatory framework governing the early termination of PPP contracts in Spain. Then, the strategic behavior of the stakeholders involved is analyzed during the whole life cycle of the projects. Finally, the text presents a set of lessons to help decision-makers design termination clauses in PPP contracts with the aim of ensuring good service to the user and safeguarding the public interest.

Crisis of the Highway Concession Model

Toll highway PPPs in Spain have maintained most of their distinctive features over time (Ortega et al., 2016). The Spanish toll roads are usually greenfield projects which are awarded through competitive tendering based on the open procedure, and they have been characterized by the allocation of most of the risks to the private sector, but also by the provision of important contract termination guarantees by the government (Ortega et al., 2016).

[1] Called *autovías* in Spain.

In Spain, most of the market risks—such as construction, operation, traffic, and right of way acquisition—are allocated to the contractor (Baeza & Vassallo, 2010). Most concession projects have been financed through the project finance approach. Therefore, the lenders' recourse is limited primarily or entirely to the project's assets, including completion and performance guarantees and bonds, in case the project company defaults.

The experience of Spanish companies in the construction, maintenance, and operation of highways in this country has made them pioneers in the field of infrastructure concessions worldwide (Carpintero, 2011). However, the Spanish model has been clouded by the bankruptcy of nine (see Fig. 1) out of the fourteen highways that were awarded by the central government between 1999 and 2006. All those highways went bankrupt between 2012 and 2013 (see Table 1).

Most of the aforementioned toll highways (see Table 1) were intended to offer greenfield alternatives to alleviate the increasing congestion in sections of the existing toll-free highway network, especially those giving access to the city of Madrid. The sponsors to which the concessions were awarded were mostly composed of national construction companies (FCC, OHL, Sacyr, ACS, etc.), financial entities (national saving banks), and other highway concessionaires (ENA, AUMAR, EUROPISTAS, IBERPISTAS, etc.).

Currently, it can be claimed that the results have not been as expected. There are mainly three reasons for this situation: the economic crisis, traffic underestimation, and cost overruns during the expropriation and/or construction phases. These reasons will be further analyzed below.

Impact of the Economic Crisis

The impact of the economic crisis in Spain has been one of the greatest among the European countries. The country was in recession for seven quarters, which was reflected in negative GDP growths in both 2009 and 2010, then briefly stabilized to fall back into recession for 11 quarters between 2011 and 2013. This provoked an accelerated increase in the unemployment rate, which in 2013 surpassed 26% of the working population, the highest among the countries of the European Union.

There is a marked relationship between vehicle travel and economic activity (Mcmullen & Eckstein, 2012). Road demand on toll highways is highly correlated with the evolution of the country's macroeconomic variables such as Gross Domestic Product (GDP) per capita or industry GDP (Gomez et al., 2015; Gomez & Vassallo, 2016). Another worth noting characteristic of toll highways in Spain is that they always have a rival route, a free alternative with worse characteristics that serves the same corridor in the form of either a conventional single road or a free highway. As already mentioned, most of the toll highways implemented in this period were intended to absorb part of the traffic that was congesting their free parallel alternative.

Table 2 shows traffic shares in the corridor and annual traffic growths in the toll highway concessions analyzed in three different periods: since their commissioning

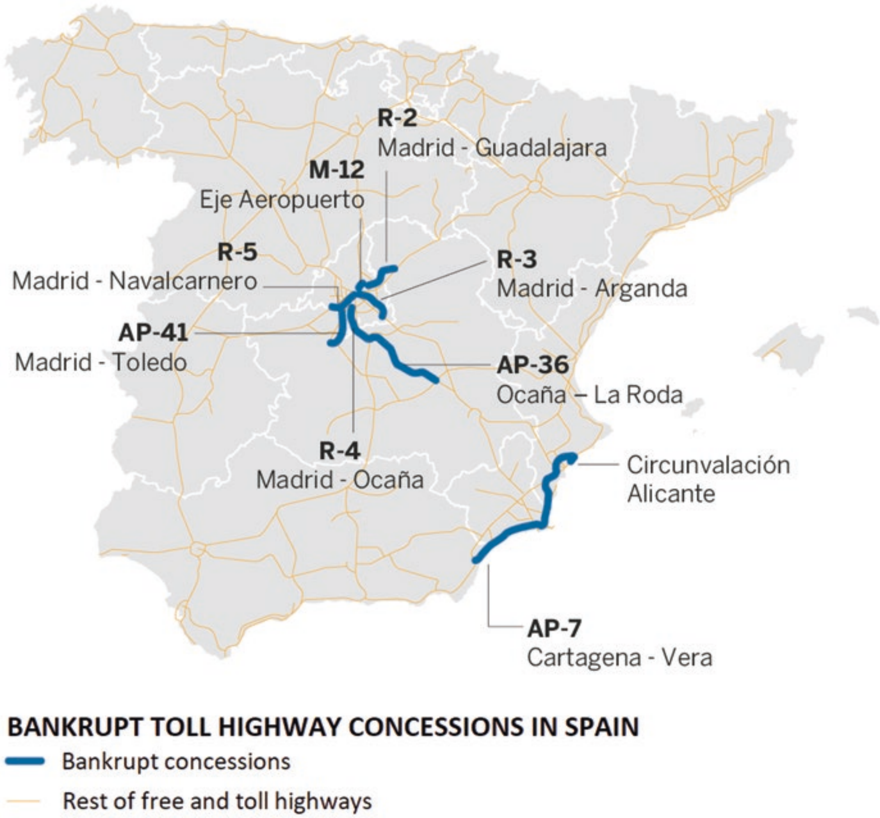

Fig. 1 Spanish toll highway concessions awarded by the central government that went bankrupt between 2012 and 2013

to 2007; from 2007 to 2008, when the crisis started; and from 2008 to 2009, when the crisis was at its peak. For instance, for the *Madrid–Ocaña* Highway, it is notable how even though from 2008 to 2009 the traffic fell by 4.78% in the corridor, the fall of the traffic in the toll highway was much greater, going down by 15.2%. As a consequence of that, the share of the toll highway in the corridor went down from 16.6% to 14.7%. In the table, the concessions are classified into three different groups according to their characteristics (Vassallo et al., 2012): (1) group 1 comprises the toll concessions competing with conventional single roads in interurban corridors with a low density of population; (2) group 2, the toll concessions competing with free highways experiencing peak-hour or seasonal congestion located in urban or suburban areas; and (3) group 3, the toll concessions competing with single roads and/or free highways in interurban corridors with high population density located in tourist destinations. The *Málaga-Alto de las Pedrizas* concession was not included in the table since it entered into operation in 2011.

Table 1 Toll highway concessions awarded by the central government from 1999 onwards

Political party	Highway	Length (km)	Concessionaire	Type of road	Competition in the main corridor	Other competition	Year of award/ commissioning	Year of bankruptcy
People's party	Santiago–Alto de Santo Domingo	56.6	ACEGA	Interurban	Single road		1999/2003	–
	Ávila–Villacastín	23.1	CASTELLANA	Interurban	Single road		1999/2002	–
	Segovia–El Espinar	27.7	CASTELLANA	Interurban	Single road		1999/2003	–
	León–Astorga	38	AULESA	Interurban	Single road		2000/2003	–
	R-3 Madrid–Arganda	33.1	ACCESOS DE MADRID	Suburban access to Madrid	Free highway	Public transport	1999/2004	2013
	R-5 Madrid–Navalcarnero	29	ACCESOS DE MADRID	Suburban access to Madrid	Free highway	Public transport	1999/2004	2013
People's party	R-2 Madrid–Guadalajara	64.1	HENARSA	Suburban access to Madrid	Free highway	Public transport	2000/2003	2013
	R-4 Madrid–Ocaña	53	MADRID SUR	Suburban access to Madrid	Free highway	Public transport	2000/2004	2013
	M-12 Eje Aeropuerto	8.8	EJE AEROPUERTO	Urban access to the airport	Free highway	Public transport	2002/2005	2013
	AP-41 Madrid–Toledo	60	MADRID TOLEDO	Suburban access to Madrid	Free highway	Public transport	2004/2006	2012
	AP-36 Ocaña–La Roda	148	MADRID LEVANTE	Interurban	Single road	Free highway	2004/2006	2013
	AP-7 Cartagena–Vera	114	AUCOSTA	Interurban	Single road	Free highway	2004/2007	2013
	AP-7 Circunvalación de Alicante	28.5	CIRALSA	Urban bypass	Free highway		2004/2007	2013
Socialist party	Málaga–Alto de las Pedrizas	24.5	GUADALCESA	Interurban	Free highway		2006/2011	–

From the above table, it can be observed that, before the crisis, concessions were performing reasonably well, with traffic growths higher than that of the Spanish GDP, which went from 2.8% in 2002 to 3.6% in 2007. However, to a lesser or greater extent, the recession negatively impacted traffic demand in almost all the corridors (Vassallo et al., 2012). This had a double pernicious effect on toll highways. Not only was their traffic diminished, but also parallel routes serving the same corridor were decongested, thus decreasing the users' willingness to choose the tolled option instead of the free alternative. This is the reason why urban toll highways competing with free highways (group 2), and also with public transport, have been the most affected by the crisis in terms of traffic shortfalls. They have also seen their traffic share in the corridor being diminished in favor of the free alternatives to a greater extent than those highways only competing with single roads in interurban areas. As Table 2 shows, all toll highways included in group 2 ended up filing for bankruptcy.

Traffic Overestimation

Revenues generated by the highways depended exclusively on tolls and traffic. Tolls were regulated by the contracts through price caps, so the focus should be put on traffic forecasts. In this respect, traffic estimates included in the economic-financial plans of the toll highway concessions were, in all cases, very optimistic. As a consequence of that, ever since highways came into operation, real traffic has been much lower than that originally forecasted (Baeza & Vassallo, 2012). Figure 2 summarizes traffic deviations in the highways analyzed since their commissioning to the present. These deviations are measured as the percentage of real traffic over the one forecasted by the concessionaires and included in their offers. Thus, values under 100% show traffic overestimations. The figure also differentiates those highways that in the end went bankrupt (represented by dots) from those that managed to stay afloat (represented by triangles). Finally, the green line shows the average trend of traffic deviations for all the highways included in the sample.

The figure helps distinguish three different periods determined by two turning points, reached in 2007 and 2014, respectively:

- First, the ramp-up period during the first few years of operation of the toll highways, where estimates tend to improve over time as the users get familiarized with the new infrastructure and the benefits it provides.
- Second, the drastic change in the traffic trend during the economic crisis that started in 2008 and lasted till 2014. In this period, traffic estimates proved to be far less accurate than those of previous years. The *Madrid-Toledo* concession became the greatest exponent of traffic deviations by reaching only 4% of the expected demand in 2014.

Table 2 Traffic growths before and during the economic crisis in the toll highway concessions awarded by the Central Government of Spain after the year 2000

Toll highway		First-year of op. (FYO)	Share in the main corridor		Traffic growth in toll highways			Traffic growth in the corridor		
			2008	2009	FYO to 2007	2007–2008	2008–2009	FYO to 2007	2007–2008	2008–2009
Average annual growth of real GDP in Spain			0.9%	−3.7%		0.9%	−3.7%		0.9%	−3.7%
Group 1	Ávila–Villacastín	2002	67.3%	67.8%	6.5%	−1.0%	17.3%	−0.65%	−5.5%	16.2%
	Santiago–Sto. Dom.	2003	51.8%	51.8%	13.5%	3.7%	3.1%	7.40%	−2.9%	3.2%
	Segovia–El Espinar	2003	55.6%	52.9%	5.9%	−3.2%	5.6%	9.70%	−23.0%	11.0%
	León–Astorga	2003	33.4%	33.0%	2.6%	4.4%	−4.4%	1.30%	1.4%	−3.4%
	Ocaña–La Roda	*2006*	*50.3%*	*50.4%*	*8.2%*	*2.5%*	*−3.3%*	*−1.80%*	*−5.4%*	*−3.5%*
Group 2	*R-2*	*2003*	*11.2%*	*10.3%*	*8.8%*	*−3.7%*	*−11.8%*	*2.90%*	*−3.7%*	*−4.0%*
	R-3	*2004*	*13.5%*	*12.8%*	*15.0%*	*−4.2%*	*−4.5%*	*4.60%*	*2.4%*	*0.9%*
	R-5	*2004*	*12.2%*	*11.6%*	*3.7%*	*−4.5%*	*−5.9%*	*6.20%*	*−5.5%*	*−0.8%*
	R-4	*2004*	*16.6%*	*14.7%*	*22.0%*	*−8.8%*	*−15.2%*	*7.80%*	*−13.8%*	*−4.8%*
	Eje Aerop.	*2005*	*53.8%*	*52.3%*	*N.A.*	*0.7%*	*−2.6%*	*N.A.*	*11.4%*	*0.2%*
	Madrid–Toledo	*2006*	*4.1%*	*3.44%*	*−0.1%*	*−13.2%*	*−21.6%*	*6.90%*	*9.2%*	*−5.6%*
	Circ. Alicante	*2007*	*10.6%*	*9.1%*	–	*7.2%*	*−21.3%*	*N.A.*	*−4.3%*	*−8.4%*
Group 3	*Cartag.–Vera*	*2007*	*50.5%*	*N.A.*	–	*2.9%*	*−13.6%*	–	*−1.9%*	*N.A.*

Source: Vassallo et al. (2012)

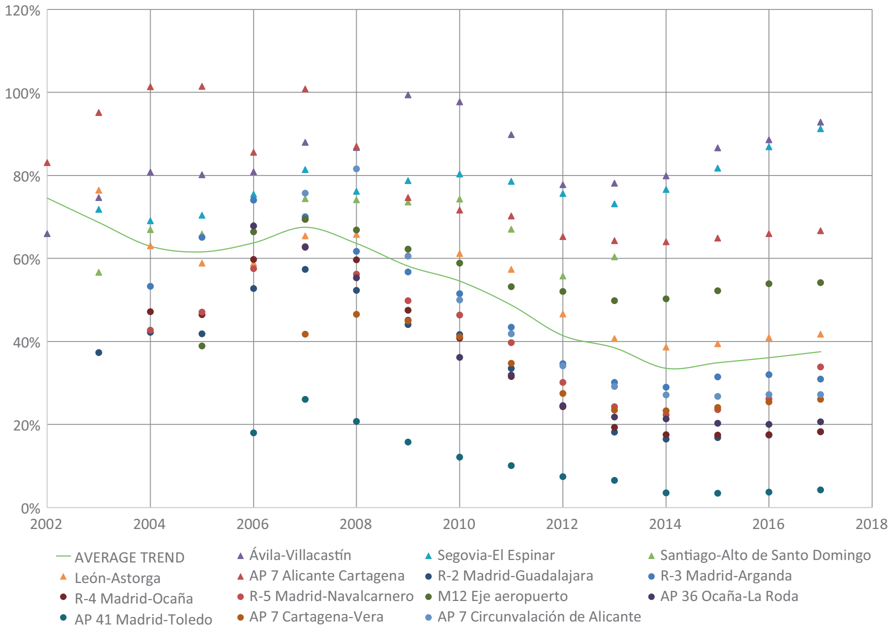

Fig. 2 Yearly traffic deviations (real/expected in %) of the Spanish toll highway concessions since their commissioning. Source: Compiled from Baeza and Vassallo (2012) and updated. Data not available for Santiago–Alto de Santo Domingo from 2014 to 2018

- Third, a change in the accuracy of the traffic forecasts can be perceived in the last period thanks to the slow but steady increase in traffic demand in the highways that went hand in hand with the economic recovery in the country.

Cost Overruns

The higher extra costs experienced by the highways, especially those located in the metropolitan area of Madrid, were mostly due to expropriations. The risk of acquisition and cost of the right of way was fully allocated to the private sector. As a result of a ruling by the Supreme Court stated in 2018 on how to quantify the price of land, the price that concessionaires had to pay to acquire the right of way ultimately became much higher than expected. The Supreme Court understood that the highways are general road systems destined to create a city due to the existence of evident urbanistic expectations, so it should be valued as developable land instead of rural land (Baeza & Vassallo, 2011). As a consequence of that, the Supreme Court stated that the concessionaires had to pay a much higher amount to the landowners, approximately ten times the original value that had originally been estimated by the government (Ortega et al., 2011).

Moreover, the underestimation of construction costs conducted by the concessionaires in their offers was also far from negligible even though the construction risk was transferred to the private sector (Vassallo et al., 2013). For example, the year in which the R-3 and R-5 highways came into operation, the cost overruns were 33.70%, and those of the *Eje Aeropuerto* exceeded 25%. There were also delays in the date of commissioning of the highways, with the subsequent revenue forgone. For example, the R-4 highway entered into operation 2 years later than expected due to the discovery of an archaeological site.

Termination of Concession Contracts in Spain: The State's Financial Liability

One of the most distinctive features of concession contracts is their incompleteness, as it is very complicated to establish contractual clauses ex-ante that take into account all the circumstances that may occur over the life of the contract (Vassallo & Izquierdo, 2010). The Spanish legislation sets up certain principles to rebalance the economics of the contracts if unforeseeable circumstances occur, and to compensate the concessionaire in case of early termination of the contract. These principles are summarized in this section.

Causes to Restore the Economic Balance of Concession Contracts in Spain

As concession contracts in Spain allocate most market risks to the private sector, the concessionaire has the right to benefit from the income of the activity and the obligation to bear the damages derived from the management of the contract. However, the Spanish legal framework provides certain circumstances where the government should restore the economic balance of the contract.

According to the Law, the economics of the contract will have to be restored to the benefit of the aggrieved party in the following cases: (a) when the government changes the terms of the original contract for reasons of public interest; (b) when the government undertakes actions not foreseen at the time the contract's signature that substantially alters the economics of the contract; (c) when causes of force majeure lead to substantial disruption of the financial terms of the contract; (d) when specific assumptions set up in the contract entitling its revision ultimately occur.

Termination of Concession Contracts

According to Spanish law, concession contracts are terminated by either the finalization of the agreed term or resolution. That is, a contract expires either because it has reached its end or because one of the causes that may give rise to its resolution, according to the Law, takes place. Causes prompting the resolution of the contracts include mutual agreement, reasons of public interest, etc. It is worth noting that unlike other countries, bankruptcy is one of the causes that prompt the early resolution of concession contracts in Spain.

A brief summary of the procedure to be followed by the parties involved (concessionaires, creditors, and the government) is presented. The Spanish Bankruptcy Law establishes three different stages within insolvency proceedings: (1) the common phase, (2) the negotiation phase, and (3) the liquidation phase.

The common phase begins with the declaration of insolvency upon request of either the concessionaire or the creditors. Once the judge declares bankruptcy, a bankruptcy trustee, appointed by the judge, will be in charge of administering and disposing of the concessionaire's assets and resources. The bankruptcy trustee will determine the assets and the liabilities of the concessionaire, detailing the list of creditors, the size of their claims, and their classification in order of priority. The concessionaire may propose and negotiate an anticipated agreement within this first phase that, if approved, will finish the insolvency procedure.

In the negotiation phase, all parties involved try to negotiate the restructuring of the debt through a bankruptcy agreement. This is a solution agreed between the concessionaire and the creditors that may include debt releases, payment deferrals, or changes of debt to other financial instruments such as participation loans or shares, among others, that will allow the continuity of the contract and the end of the bankruptcy proceedings. Both the concessionaire and the creditors are allowed to present bankruptcy agreement proposals that will be discussed and voted on the meeting of creditors. If no agreement is reached, the ex-officio opening of the liquidation phase takes place. However, this phase can also start upon request of the concessionaire at any time during the process or by the creditors provided that the concessionaire breaches the agreement.

The liquidation procedure comprises the dissolution of the special purpose vehicle running the concession contract, the termination of the concession contract, and the subsequent transfer of the assets to the contracting authority within a certain period of time established by the judge. During this period, the concessionaire must continue to meet its contractual obligations while the government establishes the amount of the final compensation, whose meaning will be explained in greater detail below, and decides whether to take over the assets or retender the contracts.

State's Financial Liability (RPA)

One of the most controversial issues regarding concession contracts in Spain is the State's Financial Liability (*Responsabilidad Patrimonial de la Administración* or *RPA*), a guarantee established in the Public Procurement Law that is activated in case of early termination of the contract. This clause commits the government to pay to the concessionaire the amount of the capital costs (expropriation and construction costs) not yet depreciated, according to the accounting norms, at the time of the resolution of the contract.

This guarantee was established to prevent the unjust enrichment of the government in case the concession contract is terminated. In other words, it was intended to avoid the government canceling the contract and take over the assets for the use of the infrastructure free of charge (Bel et al., 2017). The fact that this guarantee also applies when contract termination is not caused by the government (i.e., if the project files for bankruptcy) may create moral hazard for private sector players (Garcia Moraleja et al., 2018).

The RPA poses important problems for the government since, although in theory financial risks are borne by the concessionaire, in practice the government will assume at least part of the financial risks if bankruptcy ultimately occurs (Albalate et al., 2015). This situation may produce inefficient incentives for both public and private parties. As a consequence of this guarantee, should a concessionaire go bankrupt, the government will have to pay a significant amount to the contractor that will directly account for public deficit. This situation may encourage the government not to let concessions go bankrupt and, consequently, renegotiate the contract terms when projects do not perform as expected (Baeza & Vassallo, 2011). These renegotiations may end up involving toll increases, contract extensions or the awarding of public subsidies, which are ultimately borne by future users and taxpayers (Baeza & Vassallo, 2012).

Regarding the private sector, the aforementioned government approach to this guarantee encouraged an aggressive bidding behavior. The analysis carried out by Baeza and Vassallo (2008) shows that, in general, Spanish bidders tend to overestimate traffic forecasts in their offers as a strategic decision to win the tender at all costs, relying on the fact that government's propensity to renegotiate contracts will make the contract profitable in the end.

In the absence of step-in clauses, financial institutions have traditionally taken a favorable view of this guarantee, since it is usually pledged in the financial contracts as a means of reducing the repayment of third-party debt in case of early termination of the contract (Baeza and Vassallo 2014). However, this guarantee also reduced the private companies' incentives to assess and control the risks arising from the projects. Thus, just as private firms were less reluctant to get involved in projects whose cost-effectiveness may be somewhat uncertain given the existence of the RPA, financial institutions were more prone to provide financing for those projects for the very same reason (Bel et al., 2017).

Strategic Behavior of the Stakeholders

The strategic behavior followed by the main stakeholders involved in the process is studied in this section. The process is classified according to the stages defined in Table 3. The stakeholders considered are sorted into three different groups: first, the government; second, concessionaires and construction companies; and third, lenders.

Table 3 Toll road milestones and strategic behavior of the stakeholders

Stage	Government	Concessionaires and construction companies	Lenders
Awarding of the toll roads	Between 1999 and 2016, 14 toll roads are awarded	Aggressive tendering	Aggressive financial structures of the bidders
Economic turndown and land costs overruns	Economic turndown in 2008 The supreme court changed the compensation value of the right of way acquired Important construction cost overruns		
State aid and rebalance of the contracts	Subordinated public participation loans (SPPLs) and clearing accounts are granted	Most of the concessionaires apply for these aids	The refinance of mini-perms (short-duration loans relying on being refinanced) come to standstill until the awarding of the SPPLs
Filing for bankruptcy	The central government stops providing SPPLs and cancels clearing accounts	8 concessionaires file for bankruptcy	Lenders only accept the restructuration of *Ausur*
Negotiation phase and the State's proposal	State's proposal: 30-years bond	Most concessionaires offer restructuration proposals	The lenders and the courts do not accept the State's proposal
	RDL 1/2014: Reduce the RPA in case of liquidation	RDL 1/2014: Reduce the possibility of shareholders to recover their equity	
Liquidation opening	The government claims unsuccessfully in the courts	The courts open the liquidation of 4 concessions	The opening of the liquidations paves the way to the RPA's payment
	Hedge funds reduce the possibility of avoiding the RPA's payment	Hedge funds force the concessionaires to open the liquidation	Lenders sale debt to hedge funds with large cuts
SEITTSA solution	The government decides to take over all bankrupted toll roads and pay the RPA	The control of the toll roads is transferred to SEITTSA	Hedge funds claim the full payment of the RPA
Final outcome and the foreseeable future	The government estimates the RPA's calculation	The concessionaires' equity is wiped out	Financial entities should reach an agreement with the government about the calculation of the RPA

Concessionaires and construction companies are merged into the same group because the main shareholders of the concession companies were actually big Spanish construction companies that in their turn built the works.

For the right understanding of the case, it is key to know the seniority in case of bankruptcy and liquidation. If the special purpose vehicle (SPV) running the contract is ultimately liquidated with no agreement among the creditors, the shareholders of the concession will lose control over the company, and the government will have to pay the State's Financial Liability (RPA). As financial contracts usually pledge the RPA, this guarantee will first cover the senior debt.[2] If there is still an amount remaining, it will cover other credits subordinated to the senior debt such as loans subsequently provided by the State as a result of overruns. If some resources still remain after that, they will go to the shareholders.

During the process, the government has been mostly concerned about reducing the impact of the State's Financial Liability (RPA) on government accounting. The RPA's total amount that the government has to pay in case of bankruptcy would affect the country's deficit, thereby constraining the public budget in the years following the payment (Baeza and Vassallo 2014). The RPA has encouraged the government to prevent and delay the insolvency of the toll roads. The RPA value decreases over time because of the depreciation of the assets. For this reason, time is on the government's side, thus delaying the bankruptcy declaration as much as possible provides greater value to the government, even if contractors' insolvency is ultimately unavoidable.

Despite the fact that, due to the high levels of leverage, the probability of recovering some of the initial investment through the RPA would be almost null, the strategy of concessionaires and construction companies has been to minimize the losses and maintain the bargaining power over the toll roads in the hope that the trend may reverse. To that end, they have used all available mechanisms at their disposal: request for public aid, claims to the courts, debt restructuring, etc.

In their turn, the strategy of the lenders was aimed at recovering the maximum amount of the loans provided. The RPA was a key factor for the lenders, who looked at this government liability in a very positive way. For them, the quantification of the RPA's amount is of paramount importance.

The following subsections provide a more detailed analysis of the behavior of the three stakeholders in each one of the stages previously mentioned.

Awarding of the Toll Roads

Between 1996 and 2006, the Spanish economy was booming, being one of the countries of the European Union with the highest GDP growth. There was much liquidity in the financial markets with low-interest rates. Banks offered very

[2] Debt tranche with the greatest priority to be paid back in case of early termination of the contract.

favorable conditions to project finance loans such as long tenures and low debt service coverage ratios, which enabled highly leveraged project finance deals. For example, the interest rates of the loans borrowed by the Cartagena–Vera toll highway were Euribor[3] 6 months +1.3% and Euribor 6 months +2.5%, being the debt to equity ratio higher than 4.

Government

The overall optimism in the country at that time led the government to conduct very optimistic feasibility studies assuming very high traffic growths and urban development expansions. Some of the toll roads procured, most of them around Madrid, directly competed with high capacity free alternatives. Others, like *AP-7 Cartagena-Vera*, were conceived pending on the development of urban settlements on the south-east coast.

Concessionaires and Construction Companies

The new toll road package was a good opportunity for the Spanish concessionaires, which had expanded their business abroad, to enter again in the national market. If these toll roads were successful, it could be the beginning of a large number of projects. Winning the tender was crucial for the future national strategy of the companies. Because of the high competitiveness of the Spanish market, bidders offered aggressive economic conditions (prices, etc.), which were justified on feasibility studies that usually overestimated incomes and underestimated costs.

Lenders

The estimates conducted by the shareholders based on the feasibility studies produced by the government, along with the RPA and the seniority of their debt, were enough for the lenders to join the project. The optimism in the financial markets prompted risky financial structures characterized by syndicated loans arranged by the most influential Spanish banks with minority participation of foreign banks.

As the tender rewarded the provision of own resources by the bidders, some of the firms developed complicated financial structures to reduce, at least in appearance, the amount of debt in the balance sheet of the SPVs. To that end, some concessionaires created subsidiary companies that issued debt in the markets and provided equity to the SPVs in charge of managing the contracts. These financial frameworks

[3] Euribor: Euro Interbank Offered Rate based on the averaged interest rates at which Eurozone banks offer to lend unsecured funds to other banks in the euro money market.

gave high bargaining power to the lenders, who were able to heavily influence the development of the process.

In most cases, the financial close was reached before the construction of the highway was finalized. The most common financial structure was a mini-perm, short-term loan that relies on being refinanced after few years of operation of the concession.

Economic Turndown and Land Costs Overruns

The economic downturn beginning in 2008 damaged the economic performance of all projects as a consequence of the severe traffic shortfalls. In addition, toll roads were also subjected to other important problems. On July 21, 2008, the Supreme Court ruled that the compensation to pay to the landowners for the right of way already acquired was around ten times higher than originally envisaged by both the government and the concessionaires. This court ruling prompted dramatic increases in the expropriation costs, especially for the toll roads close to Madrid.

Because of the traffic shortfalls and high-cost overruns, concessionaires were not able to refinance their short-term loans (mini-perms) so the loans came to standstill awaiting future government's aid. The financial system also suffered greatly from the economic crisis. Actually, some Spanish banks required state aid because of the impact of the crisis on the mortgage market.

State Aids and Rebalancing of the Contracts

Between 2010 and 2012, the government approved a set of measures aimed at rebalancing the economics of the contracts to keep the concessions afloat. The rebalancing was justified based on the need for building additional works for the public interest and providing liquidity to address the land cost overruns. Taking advantage of them, the government provided financial support to the concessionaires in the form of subordinated public participation loans (SPPLs) and clearing accounts that will be explained in greater detail below.

Government

The central government, ruled by the socialist party from 2004 to 2011, began to get seriously concerned with the situation of many toll roads in Spain. It realized that, if no action was taken, the concessionaires' insolvency would be imminent, and subsequently the government should have to pay the RPA with negative consequences for Spain's public deficit. For that reason, in 2009 the government implemented a set of measures to reverse the trend. It awarded SPPLs to help concessionaires with the expropriation cost overruns and provided a temporary liquidity facility (clearing accounts) to cushion the impact of traffic shortfalls caused by the economic crisis.

SPPLs are loans provided by the State with lower seniority compared to the senior debt. These loans have to be paid back at the end of the concession contract, and their interest rates are usually variable depending on the economic performance of the project. This way, the government intends to share potential gains and losses with the concessionaire. For national accounting purposes, SPPLs are considered financial investments of the State with no impact on public deficit levels. This is the reason why this instrument is so well regarded by the government to provide aid to the concessionaire.

SPPLs were provided, along with a set of measures such as the extension of the duration of the contracts or toll rises, to rebalance the economics of the contract to compensate for additional works imposed by the government, and also to help concessionaires deal with the expropriation cost overruns caused by the aforementioned Court's ruling. The loans covered the expropriation costs exceeding 175% of the costs initially estimated by the PPP sponsors, not being eligible those projects experiencing cost overruns below this figure. The interest rates payable by the concessionaires over the life of the contracts would depend on the future revenues of the toll roads according to the following function, with a minimum rate of 1.75%:

$$Int = \frac{\left(0.75\ TNI - \frac{TI}{N}\right)}{TI} \tag{1}$$

where Int is the annual interest rate; TI, the total investment including land costs overruns; TNI, the yearly net income from tolls; and *N*, the contract period, including extensions.[4]

Equation (1) shows that if traffic gets higher, the interest rate—that measures the price the concessionaire has to pay for the government's loan—becomes higher. The idea behind setting this variable interest rate is to oblige the concessionaire to share a greater amount of revenue in case that the economic performance of the concessionaire becomes better. However, as the revenue did not recover, the interest rate remained stable at the minimum value of 1.75%.

These were not the only measures adopted by the central government. The following year, Law 43/2010 created a liquidity facility to mitigate the impact of traffic shortfalls, which was called clearing accounts. The purpose of these accounts was to provide liquidity to the concessionaires whose traffics and revenues were far too low, alleviating operating cash flow problems for the adversely affected concessionaires, thus helping maintain the short-term economic stability of the firms.

[4] For instance, if for a concession TNI is €50 million in a certain year, TI is €500 million, and *N* is 40 years, the value of the interest rate will be $5\% = \frac{\left(0.75 \times 50 - \frac{500}{40}\right)}{500}$.

Through the clearing accounts, the concessionaires would receive from the government the difference between 80% of the toll revenues originally expected and the actual revenue during a period of 3 years. The yearly compensation provided should never be higher than the actual income coming from tolls. The maximum amount to be given by the government was also subjected to a limit depending on budget availability. For instance, the limit set in the general State budgets for 2011 was €80.1 million. The clearing accounts were designed to work in a symmetrical way such that, if in any year of the concession revenues were higher than expected, the concessionaire shall pay 50% of the extra revenues to the account. In contrast to SPPLs, the clearing accounts were not awarded as part of the package to reestablish the economics of the contract.

Despite the need for this aid to avoid the bankruptcy of the motorways and the payment of the RPA, these measures were questionable practices that challenged the key principle of risk-sharing in concession contracts.

Concessionaires and Construction Companies

Most of the toll roads awarded between 1998 and 2006 were eligible to apply for SPPLs to rebalance the economics of their contracts. Between 2010 and 2011, the granted loans represented a total of €532 million as Table 4 shows (Baeza and Vassallo 2014). However, not all applications were successful. For example, the SPPL for the *Eje Aeropuerto* highway was rejected. The concessionaire in charge of that contract claimed before the courts without success.

The SPPLs were accompanied by other measures aimed at rebalancing the economics of the contracts to compensate for both additional works and expropriation cost overruns above 175%. The rebalancing included in some cases the extension of the concession terms and/or an increase in toll rates. Table 5 shows the details of the rebalancing of the contracts.

Concerning the clearing accounts, all concessionaires, except for five firms, were allowed to apply for them in 2011 and 2012, see details of the amounts requested in Table 6.

Those measures alleviated the financial problems of the concessionaires for some years. However, this aid will be useless in the long-term unless traffic levels

Table 4 Public Participation Loans granted, in million € (31-12-2012)

SPV	Amount of the SPPLs provided
Ausur	25.20
Henarsa	275.32
Accesos de Madrid	168.45
Madrid Levante	8.57
Ciralsa	55.44
Total	532.98

Table 5 Terms of the rebalancing of the contracts

SPV	Toll rate increases	Contract term extension	Additional construction costs required by the government (M€)[a]
Ausur	1% annual	–	–
Henarsa	1.95% annual (2024–2039)	15 years (2024–2039)	70.48
Accesos de Madrid	18% (2011)[b] + 1.95% annual (2011–2045)	–	228.36
Autopistas Madrid Sur	1.95% annual	–	110.73
Acega	0.5% annual	–	0.64

[a]Including accrued interest (2003–2010, 6.5% annual) and excluding VAT
[b]Off-peak fee

Table 6 Compensation account granted, in million € (31-12-2012)

SPV	Clearing accounts amount
Madrid Toledo	3.57
Henarsa	16.18
Accesos de Madrid	17.84
Autopistas Madrid Sur	14.00
Eje Aeropuerto	4.80
Aucosta	8.28
Ciralsa	6.84
Total	71.52

substantially recover. The SPPLs and the clearing accounts only were a patch-up, but the real problem was not solved.

Lenders

Regarding the financial structure, lenders decided not to take any action to refinance the mini-perm loans until the SPPLs and the clearing accounts were working properly, so the bank loans came to a standstill. Lenders awaited the next steps of the central government concerning the stability in the provision of state aid.

Filing for Bankruptcy

In 2012, a new conservative government led by Mariano Rajoy took office in Spain. One of its priorities was to recover the economic stability of the country. To that end, it adopted strong measures to reduce the national public deficit. Public expenditure was severely cut.

This new approach radically changed the policy of the previous socialist government to support the toll roads under distress. As a result, the granting of additional SPPLs to the concessionaire was canceled, and the clearing accounts were no longer working. Those decisions made the concession business unviable for the private sector. In response, between 2012 and 2013, nine toll roads managed by eight different SPVs filed for bankruptcy (see Table 1).

The strategic behavior of each one of the stakeholders during this stage is displayed below.

Government

The right-wing People's Party who took office in 2012 adopted a different policy regarding the toll highways under distress. Even though the state's general budget for 2013 originally incorporated the extension of the eligible period for the clearing accounts until 2018, and three more concessionaires—*Ausur*, *Acega,* and *Aulesa*—were included, the government decided to stop supporting the affected highways. Since then, no additional state aid has been granted.

At that time, the highways' bankruptcy was considered unavoidable, so following the previous strategy would have implied higher costs for the public budget in the short-term under the unlikely possibility that the State's financial aid would ultimately be recovered in the future (Garcia Moraleja et al., 2018). Moreover, the economic situation of Spain at that time was at its worst, so the government could no longer afford any kind of state aid. Besides, public opinion began to be critical of the situation due to growing media coverage, which put the government in the spotlight.

As a result, between 2012 and 2013, nine toll roads managed by eight different SPVs were filed for bankruptcy. This put the government in a complex situation. At that point, the maximum RPA corresponding to the concessions in trouble amounted to more than €3.56 billion (Baeza and Vassallo 2014), in a context where Spain was in the midst of a severe economic recession.

Concessionaires and Construction Companies

The state aid along with contract rebalances were not sufficient to reverse the situation of most private concessionaires. A first action conducted by private companies was to sue the government in court for withdrawing already committed state aid. The initiative, however, was not successful. The law only constituted the aid mechanisms but did not set any government commitment to provide them.

Some concessionaires negotiated with the lenders to achieve restructuring of their debt to avoid insolvency. However, this option was eventually viable for only one concession. Unsuccessful debt restructuring negotiations triggered the beginning of a series of bankruptcies. On May 11, 2012, the concessionaire of the AP-41 toll road stretch (*Madrid–Toledo*) was voluntarily filed for bankruptcy. This had a knock-on effect on the rest of the concessionaires in financial distress. Between 2012 and 2013, eight toll roads managed by seven SPVs followed the same path. The reasons for synchronized bankruptcies are unclear. The concessionaires might have thought that this situation could help them reach a better agreement in the negotiation phase; the payment of the RPA liabilities by the government would significantly affect the public deficit of the country, so it should be avoided by the government at all costs.

Lenders

Thanks to the state aid granted between 2010 and 2012, the concessionaires were able to comply with their commitments to repay the senior debt. The most common financial structure at that time was that of mini-perm loans to be eventually refinanced a few years after the beginning of the road operation phase. Before the bankruptcies, the concessionaires tried to negotiate with the banks, but the latter decided not to do so until the government made the decision to continue providing additional state aid.

After the withdrawal of state aid, the banks were no longer willing to wait for unexpected solutions. Given the situation, many concessionaires decided to voluntarily file for bankruptcy. In this situation, financial institutions in Spain are required by law to make provisions for the total amount of credit granted to the bankrupt company. This measure has a major impact on the balance sheets and profit and loss accounts of the banks.

Only the lenders of one concessionaire, *Ausur*, ultimately accepted the proposed new financial structure. This firm refinanced an initial mini-perm, restructuring €240 million of debt. The traffic shortfall in this concession was not as high as other cases, and it did not experience large expropriation cost overruns.

Agreement Proposal Promoted by the Government in the Negotiation Phase

The insolvency process in Spain starts with a common phase in which the courts appoint an insolvency administrator in charge of quantifying the assets and liabilities and classifying the credits according to their seniority. Once the common phase is finished, a negotiation phase begins intended to find a negotiated solution between creditors and debtors. The strategic behavior of each of the key stakeholders is shown below.

Government

The government still wanted to avoid bankruptcy at all costs. For this reason, it became actively involved in the negotiation phase in order to promote an agreement between concessionaires and lenders—mainly national banks—and avoid the liquidation phase.

The government proposed that an existing state-owned company named SEITTSA[5] absorbed the already bankrupt toll roads without paying any compensation to the concessionaires. In exchange, the creditors had to renounce approximately half of the senior debt outstanding at that time, which was around €2 billion. The remaining liabilities—around another €2 billion—would be acquired in their entirety by the main national banks in exchange for a 30-year treasury-backed bond. This bond would be issued by SEITTSA with a nominal value equal to the remaining liabilities, and a 4% guaranteed interest rate equivalent to the Treasury 30-year bond rate at that time. The banks entitled to acquire the bond were those that provided financing to most of the projects through syndicated loans. These banks (Banco Santander, BBVA, Caixa, Bankia, Sabadell, Popular) would buy the liabilities of other banks with minor participation, most of them being foreign banks.

It is worth mentioning that the government did not negotiate a single solution for each one of the bankrupted concessions and, therefore, for the banks that were financing specific projects. However, it preferred to outline a single solution on the grounds that the largest Spanish banks participated through syndicated loans in almost all the concessions, so that their gains and losses were compensated through different projects. This turned out to be a problem as other banks, mainly foreign ones, that financed a few specific projects, felt negatively affected by a solution based on the average behavior of the portfolio.

Despite this, the Ministry of Finance did not accept the proposal. It stated that the government could only guarantee a 1% interest rate. The final proposal was a step-up bond with an interest rate linked to the evolution of traffic levels with a guaranteed minimum interest rate of 1%. The interest rate would rise over the 30-year tenure of the bond as revenues grew in the future.

The main advantage of this solution for the government was that it avoided the payment of the RPA and its immediate consequences on the public deficit. Even though a national toll road company may have been a reasonable solution for everyone, the strict requirements set by the Ministry of Finance were not acceptable to most banks. The negotiation was hence unsuccessful, thereby making it difficult for the Government to avoid paying the RPA.

Due to the impossibility of reaching an agreement, the government changed its strategy. The new objective was to reduce the amount of the RPA to be paid by postponing the execution of this guarantee as much as possible. At this point, it is worth reminding that the amount of the RPA to be ultimately paid by the government decreases over time as the depreciation of the assets increases.

[5] State-owned land transport infrastructure company.

At this point, it should be recalled that the Supreme Court, after the bankruptcies began, ruled that the government was liable to pay any unpaid land expropriation costs to landowners. In order to avoid paying twice, the government passed Royal Decree-Law 1/2014 amending the Public Procurement Law concerning the valuation of state aid for land expropriation. According to this provision, the government was allowed to reduce the RPA compensation to each concessionaire by the amount of money corresponding to the expropriation costs directly paid by the government when the SPV failed to meet its payment obligations.

The implementation of the aforementioned law implied a significant reduction in the value of the RPA for the concessionaires and lenders. This law was not well received by the lenders who, on the grounds that it was unconstitutional, appealed to the Supreme Court without success.

Concessionaires and Construction Companies

The government's proposal to absorb the assets within a state-owned company and negotiate debt cuts with the lenders to avoid paying the RPA implied that shareholders would lose all their equity. This outcome was not convenient for the concessionaires since, in addition to losing their equity, they would have given up managing the highways. The lenders' rejection of the government's proposal was thus not bad news for the concessionaires.

The Spanish Bankruptcy Law also allows concessionaires to present proposals in the negotiation phase. Most of the firms submitted negotiation proposals that were not ultimately accepted by the creditors. Some others, such as *Autopista Madrid–Levante* and *Autopista–Eje Aeropuerto,* decided not to do so.

Law 1/2014, which reduced the amount of the RPA in case that the State became liable for the claims of expropriated landowners, further limited the possibility for shareholders to recover at least part of their equity.

Lenders

The government's proposal in the negotiation phase did not comply with the Bankruptcy Law and had significant drawbacks for the lenders. First of all, not all the lenders were in the same situation regarding the possibility of recovering their loans. The leverage, revenues, and guarantees set up in the financial contracts between the lenders and the concessionaires were different in each case. A global negotiation harmed some financial institutions, most of them international, whose loans financed projects that performed much better than the average. To solve this problem, it would have been much better to propose a specific solution for each specific concession. Another major problem for the lenders was the low bond interest rates guaranteed by the government, which substantially affected its value and the willingness of the banks to accept the proposal.

While the national banks, which were going to acquire all the remaining liabilities, still tried to negotiate the interest rate and terms of the proposal, the foreign banks refused any negotiation and focused on the liquidation and payment of the RPA.

Royal Decree-Law 1/2014 was a major setback for the lenders. Prior to its enactment, the senior debt of financial institutions was supposed to take preference over expropriation costs not paid by the concessionaire. However, after the law, the government became subsidiary liable for the expropriation debt of the concessionaires. As a result, in the event of liquidation, the amount payable to landowners would be deducted from the RPA. This law implied a significant reduction of the RPA and, consequently, of the part of the loan potentially recovered by the lenders who, through this Law, were assigned a secondary seniority position behind the landowners.

Though the lenders were considering appealing the Royal Decree-Law to the courts as unconstitutional, they ultimately decided not to do so. This would have meant additional litigation costs, making the final outcome and payment even more uncertain for future lenders (Garcia Moraleja et al., 2018).

Opening of the Liquidation Phase

In 2015, the Commercial Court of Madrid initiated the liquidation procedure corresponding to the *Autopista Madrid Levante* and *Eje Aeropuerto* firms, following the rejection of the government's proposal and the non-presentation of alternative proposals by these concessionaires. A year later, the liquidation process also began for two other concessions (*Accesos de Madrid* and *Ciralsa*). The courts did not accept the restructuring proposals outlined by the concessionaires. For the rest of the concessionaires, their liquidation processes were delayed.

The strategy followed by the main stakeholders is described below.

Government

The insolvency procedure was voluntarily delayed by the government because time was on the government's interest to reduce the RPA. However, the opening of the liquidation phase by the courts was a problem for the government because, once this phase was effective, the depreciation count for the final calculation of the RPA was stopped.

For that reason, the government strove to avoid the beginning of the liquidation phase. The Central government appealed to the Supreme Court to put an end to the liquidation of *Accesos de Madrid* (R-3 and R-5) and *Ciralsa* (Circunvalacion de Alicante) firms under the premise that the termination of an administrative contract in Spain, such as the concession contract, was not within the competence of the commercial courts. The claim was not successful.

In this situation, the government started to get ready to take over the assets. In order to prepare for the reception of the highways, it requested an extension of the liquidation term. This request was successful, so the liquidation phase was delayed by about a year.

Concessionaires and Construction Companies

To avoid liquidation, some of the concessionaires, such as *Ciralsa* and *Accesos de Madrid*, appealed to the provincial courts alleging that their agreement proposals had been unfoundedly rejected by the commercial courts, which led to the opening of the liquidation phase. The claims were successful, so for these two companies, the process returned to the negotiation phase in early 2017.

Even though only two of the nine SPVs were at that time in liquidation (*Autopista Madrid Levante* and *Eje Aeropuerto*), the slight possibility of reaching an agreement faded since a large part of the outstanding debt had already been sold to hedge funds.

Lenders

The opening of the liquidation phase for some of the concessions halted the depreciation of the RPA. This was good news for the lenders. However, some concessionaires were successful in their appeal to the courts to return to the negotiation phase, thus activating again the depreciation of the assets and reducing the value of the RPA. For this reason, between 2016 and 2017, the lenders began selling their senior debt to hedge funds to recover at least part of their losses as soon as possible. Cuts in these transactions ranged between 60% and 70% of the outstanding value of the loans. This clearly shows the little hope of the lenders to achieve a good outcome in the short term.

Hedge funds bought a large share of the senior loans of the bankrupt concessions. Their strategy was to liquidate the firms as soon as possible to obtain the maximum value of the RPA. Of course, they were no longer open to any kind of negotiation. Moreover, they pushed the concessionaires not to continue delaying the liquidation. The hedge funds initiated an aggressive policy aimed at communicating to the board members of each concession that if they continued adopting unreasonable actions to delay the liquidation process, they would be responsible for the losses caused thereof.

SEITTSA Solution

Given the fact that the hedge funds had removed any possibility of restructuring the outstanding debt, the central government decided that the nationalization of the toll roads was the only solution to end the conflict. The strategic position of the key stakeholders at this stage is shown below.

Government

The government ultimately gave in. On July 26, 2017, it was decided that the state-owned company SEITTSA would take over both the toll roads already in the liquidation phase and those that would be liquidated in the future. This implied that the government agreed to pay the RPA. At this point, it is worth noting that in 2017 the Spanish economy was doing much better than years before, so the concern about the impact of the RPA on the public deficit was not as distressing as a few years earlier. In 2018, the liquidation plans for eight concessionaires were approved and the toll roads were gradually absorbed by SEITTSA, with the R-4 stretch being the first.

Concessionaires and Construction Companies

With the state-owned solution, the shareholders' hope of recovering part of the original equity investment disappeared. This decision, along with the pressure from hedge funds, prompted concessionaires to accelerate the liquidation phase in 2017. The following year, the liquidation plans of many concessionaires were approved, and all assets were absorbed by the state-owned company SEITTSA in a gradual procedure.

Lenders

The opposition of hedge funds to any negotiation prevented the possibility of any restructuring. This was one of the main reasons why the central government decided to take over the toll roads in trouble.

The Outcome as of 2020 and the Foreseeable Future

The initial strategy of the right-wing conservative party that was in office when the assets of the concessionaries started to be nationalized was to re-tender the assets as new toll concessions in exchange for an upfront payment from the private sector. This upfront payment would help reduce the impact of the RPA on the public deficit.

However, political plans for the toll highways changed when in May 2018, the Spanish Parliament, following an article of the Constitution, unexpectedly appointed a new government led by the socialist party. This government decided to stop the plans of the People's Party to re-tender the toll highways, so for the time being the assets continue being managed by SEITTSA. Actually, one of the first measures adopted by the new government was to reduce tolls by 30% on average in 2019, with the expectation that this measure would trigger greater use of the roads.

Table 7 shows the monthly evolution of AADT on the toll highways taken over by the government in 3 months (February, April, and June 2019) after tolls were lowered in January 2019. Besides the monthly traffic, the table also shows its variation compared to the same month of the previous year. A general increase in traffic both over time and in comparison with the same month of the previous year may be observed. Given that the revenues from these highways depend entirely on traffic, for the government's measure to have been effective—that is, for revenues to be

Table 7 Annual average daily traffic (AADT) evolution since tariff reductions and traffic growth compared to the same month of the previous year

Name of highway	Company	February 2019		April 2019		June 2019	
		AADT	Growth compared to previous year (%)	AADT	Growth compared to previous year (%)	AADT	Growth compared to previous year (%)
R-3 Madrid–Arganda	ACCESOS DE MADRID	27,137	-4.83%	29,002	1.39%	29,934	-11.07%
R-5 Madrid–Navalcarnero							
R-2 Madrid–Guadalajara	HENARSA	16,838	10.46%	16,482	3.54%	17,204	3.99%
R-4 Madrid–Ocaña	MADRID SUR	20,794	7.06%	24,283	6.79%	23,920	6.04%
M-12 Eje Aeropuerto	EJE AEROPUERTO	23,059	4.49%	23,195	2.18%	23,818	-1.59%
AP-36 Ocaña–La Roda	MADRID LEVANTE	3338	17.08%	5833	17.61%	5235	17.02%
AP-41 Madrid–Toledo	MADRID TOLEDO	1357	32.22%	1456	19.03%	1645	38.21%
AP-7 Cartagena–Vera	AUCOSTA	3381	9.64%	3834	10.12%	4317	12.45%
AP-7 Circunvalación de Alicante	CIRALSA	5489	14.34%	6852	14.62%	7675	13.24%

higher than the previous year's with the new tariff—traffic should have risen by at least 30% over the previous year. However, traffic increases were lower than 30% for almost all the concessions, thereby meaning that the revenue collected was lower than it was before the toll rebate. Given the inelastic demand, raising tolls would have been a more effective measure to collect greater revenues. This measure, however, was not feasible to implement given its lack of acceptability by the general public.

In early 2019, the government approved the RPA interpretation agreement, challenged by lenders and concessioners, after conducting a due diligence intended to estimate the final amount of the RPA liabilities to be paid, as well as the value of the new assets managed by SEITTSA. This document establishes how certain issues of the highway concession contracts that affect the calculation of the RPA payable should be interpreted. Among other aspects, it highlights the fact that the infrastructure was not delivered in perfect condition and, thus, it considers that the cost to upgrade the assets should be deducted from the amount of the RPA. The agreement also establishes the method to depreciate the assets, which will be linear, and the deadline for the depreciation, which will be the day that SEITTSA began to operate the highways.

Finally, the agreement also sets the maximum limit of the RPA for each concession contract (see Table 8).

At the time of writing this chapter, the government has already quantified the final amount of the RPA for the Eje Aeropuerto highway, which has been set at zero euros. The government still has to quantify the RPA for the rest of the concessions in the process of liquidation, but everything suggests that the final amount will be determined in the Supreme Court since the concessionaires and lenders quantify it at 4.5 billion euros.

Table 8 Ceiling of the RPA established in the Government's agreement, in EUR million

Name of highway	Company	Expropriations RPA limit	Works RPA limit	RPA limit
R-3 Madrid–Arganda R-5 Madrid–Navalcarnero	ACCESOS DE MADRID	39.04	598.93	637.97
R-2 Madrid–Guadalajara	HENARSA	40.72	0	40.72
R-4 Madrid–Ocaña	MADRID SUR	72.82	486.83	559.66
M-12 Eje Aeropuerto	EJE AEROPUERTO	36.97	268.50	305.47
AP-36 Ocaña–La Roda	MADRID LEVANTE	24.54	462.70	487.24
AP-41 Madrid–Toledo	MADRID TOLEDO	54.16	294.73	348.89
AP-7 Cartagena–Vera	AUCOSTA	30.82	496.00	526.82
AP-7 Circunvalación de Alicante	CIRALSA	88.84	309.83	398.67
Total		387.91	2917.52	3305.43

Lessons Learned

The story of the bankruptcy of toll highway concessions in Spain has had very negative consequences from different points of view. The credibility of the PPP model was seriously undermined. Public officials from the Ministry of Public Works and the Ministry of the Treasury became reluctant to apply this model any longer. The media, which were very critical towards the process, heated up the sentiment of many Spaniards, making them very distrustful of this kind of relationship between the government and private companies. Financial institutions, especially foreign ones, showed their doubts about the effectiveness of the Spanish legal system to rationally terminate concession contracts. Concessionaires lost all the equity invested in these projects. Banks incurred significant losses on their balance sheets because of the loan provisions required by the accounting regulations.

Despite the poor global opinion about the whole process, it is fair to acknowledge that its consequences were likely worse for the private sector (concessionaires and financial institutions) than for Spanish taxpayers. Although eventually the public budget—and therefore the taxpayers—will have to pay the RPA to take over the assets, this will happen 15 years after the assets were built, and at a price of about half of the original construction costs since a large part of the original value of the assets was already depreciated.

Some lessons can be drawn from the analysis conducted that may be potentially applicable to other experiences. The first lesson is that the success of demand-based concession requires projects that are sufficiently resilient to economic cycles. One of the main reasons explaining the problems of the highway concessions described in this paper was the high sensitivity of traffic flows to economic development. If traffic flows are very sensitive to the evolution of the economy, it is advisable to apply other models such as availability-payment schemes, regardless of whether the government decides to charge tolls to the users or not.

The second lesson is that guaranteeing a termination payment from the government in the event of bankruptcy does not provide the right incentive to the stakeholders. On the one hand, this approach encourages the government to do as much as possible to avoid the termination of the contract, which may extend the litigation process without solving the problem. On the other hand, concessionaires use this guarantee to raise cheap financing from lenders, who have little incentive to pay much attention to the actual feasibility of the project.

Actually, the Spanish government became aware of this problem, and in 2015 promoted the amendment of the Public Procurement Law regarding the early termination of concession contracts. For projects procured since then, the RPA is only applicable if early termination circumstances are prompted by the government. If termination occurs because of poor economic performance of the concessionaire, lenders can only claim the market value of the project. This value will be determined as the price of re-tendering the concession through an upward auction, the only award criterion being the price. This change will likely diminish the unaligned incentives already commented, although it will also increase the financial costs of PPP contractors and, consequently, the cost of the PPP for the public sector.

The third lesson is that applying a common agreement to a set of contracts filed for bankruptcy is not an effective way to find a good solution for everyone. Contracts are so different from each other, and the stakeholders involved have such different interests that a global negotiation is never a good solution for all.

The fourth lesson is that both legislation and contracts should be much better prepared to properly regulate the potential early termination of a concession. At the time the contract is drafted, hardly anybody thinks of the full array of interests that may ultimately arise in the event of termination. One of the main reasons for the uncertainties during the bankruptcy and liquidation processes was the lack of definition of the legislation and the contracts on how to proceed in this case, and what was the real seniority. Legal loopholes have been the main cause explaining the lengthy litigation processes and the difficulty in reaching a final solution.

Finally, it is worth mentioning that one of the worst consequences of the process was the reputational impact that the negative experience had on the concession model, the government, and the legal system. This reputational aspect was particularly sensitive to the general public, and to the foreign institutions involved in the process. Many years have to pass, and many legislative reforms will have to be enacted to reverse this trend.

Glossary of Terms

AADT Annual average daily traffic

ACS *Actividades de Construcción y Servicios.* Spanish company dedicated to the construction and management of infrastructures and services

ENA *Empresa Nacional de Autopistas*. National Toll Highways Corporation

Euribor Euro Interbank Offered Rate based on the averaged interest rates at which Eurozone banks offer to lend unsecured funds to other banks in the euro money market

FCC *Fomento de Construcciones y Contratas*. Spanish company dedicated to the construction and management of infrastructures and services

FYO First year of operation

GDP Gross Domestic Product

OHL *Obracón Huarte Lain*. Spanish company dedicated to the construction and management of infrastructures and services

PPP Public–Private Partnership

RDL Royal Decree-Law

RPA *Responsabilidad Patrimonial de la Aminsitración.* State’s financial liability

SEITTSA *Sociedad estatal de Infrasetrcuturas de Transporte Terrestre*. State-owned Land Transport Infrastructure company of the Governmnet of Spain

SPPLs Subordinated public participation loans

SPV Special purpose vehicle

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Risk Allocation and White Elephants in PPPs in Spain

Daniel Albalate and Paula Bel-Piñana

Acronyms

AADT	Average Annual Daily Traffic
BOOT	Build Own Operate Transfer
BOT	Build Operate Transfer
DBFOM	Design Build Finance Operate Maintain
EPEC	European PPP Expertise Center
MOP	Ministerio Obras Públicas
PANE	Programa Autopistas Nacionales España
PPP	Public–Private Partnership
R-2	Radial 2 Madrid–Guadalajara
R-3	Radial 3 Madrid–Arganda
R-4	Radial 4 Madrid–Ocaña
R-5	Radial 5 Madrid–Navalcarnero
ROT	Rehabilitate Operate Transfer
US	United States
USD	United States dollars

Introduction

The growing presence of public–private partnerships (PPPs) in the management and financing of transport infrastructure has given rise to the need for further research into the design of these contractual relationships and their outcomes. One of the

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areas in which PPPs have been used most frequently is that of transport infrastructure. Indeed, the experience gained in this area offers the opportunity to review, analyze, and extract both theoretical and empirical lessons from the design and implementation of PPPs.

According to the World Bank PPP Database, 1792 PPP projects have been implemented in the transportation sector across the globe since the 1990s and until 2018. Among them, roads represent the largest share (59%) and about half of the total investment.

The most prevalent type of road PPP and the one with the largest investment in the road sector is the 'greenfield' project. These usually involve private sector participation throughout the life cycle of the project, that is, from the design and construction of a new infrastructure to its operation and maintenance. Projects of this type are typically governed by long-term concessions or different forms of build-operate-transfer (BOT) agreements (see Albalate, 2014; Delmon, 2009; World Bank, 2012). These contracts are characterized by competitive bidding or bilateral negotiation for the award of the project to a special purpose vehicle with private sector participation that will be responsible for the construction, exploitation, and operation of the road for a period of time that should be sufficient to recover the sunk costs. The private partner might be remunerated via user tolls or budgetary obligations (e.g., shadow tolls, availability payments) charged to taxpayers (see Albalate, 2014; Iossa et al., 2007) for the length of the contract, at which point the infrastructure is transferred to the State. Thus, the project is exposed to various risks during both the pre-inauguration (design, financing, and construction) and post-inauguration (operation, exploitation, and maintenance) phases, as well as to other risks that might emerge at any juncture in the project (political and regulatory risk, force majeure, etc.).

The design of PPPs is expected to provide the parties involved with appropriate incentives, align interests in this principal–agent relationship, lead to actions that seek the benefit of all, and achieve efficiency gains. In this regard, Albalate (2014) argues that the presence of PPPs has increased in road infrastructure investment projects because of their theoretical attractiveness for governments in a number of key areas: (1) *relief from budget constraints*; (2) *efficiency gains from management*; (3) *efficiency gains from tasks bundling*; (4) *efficiency from risk transfer*; (5) *public sector reform*; (6) *better screening of projects provided by the market (private partner).*

In spite of these theoretical advantages, the outcomes of PPPs in the road sector have been mixed. All too often PPPs have been characterized by the proliferation of renegotiations, bankruptcies, and bailouts (Guasch, 2004; Engel et al., 2009), leading to opportunistic and strategic behavior on the part of the partners. Indeed, it has been claimed that the rigidity of PPP contracts and their poor contractual design fuel incentives to behave opportunistically.

PPP contracts are incomplete to the extent that it is not possible to anticipate all future scenarios for any given contractual arrangement (Hart, 1995; Kerf, 1998). Thus, a view widely shared is that under such uncertainty, inefficient risk allocation is an important source of PPP failure (Abdel-Aziz, 2007; World Bank, 2012). This is especially true when rigid, fixed-term contracts have been used to accommodate PPPs (Engel et al., 1997, 2001).

The incorrect allocation of risk can result in the bankruptcy of the private partner, which can lead to frequent renegotiations (Kerf, 1998; Spiller, 2008), undermining the benefits of competitive tendering (Athias & Saussier, 2010; Baeza & Vassallo, 2010) and reducing the attractiveness of future investment programs. Moreover, renegotiations may significantly harm the welfare of road users—exposed to probably higher tolls and longer contracts—and of tax payers—being made to provide bailouts and subsidies (see Albalate, 2014; Albalate & Bel-Piñana, 2016).

In this chapter, we argue that one of the key reasons for the failure of road PPPs is the purposely inefficient risk allocation provided by policymakers with the complicity of the private sector. Before considering this, we should first address how the literature on PPPs defines the allocation of risks.

Risk Allocation in Road PPPs

The most influential approach is that derived from Grimsey and Lewis (2005), who state that PPP risks should be allocated to the party best able to manage them. In line with this, Loosemore et al. (2006) outline several criteria for the effective distribution of risk, to the effect that a party should be fully aware of the risk faced, have the capacity to manage this risk effectively and efficiently, dispose of the resources to cope with the risk eventuating, and the ability to charge the corresponding risk premium.

Roumboutsos and Pantelias (2015) argue that efficient risk allocation in PPPs requires optimality, i.e., that risks should be allocated to the party that can manage them at the lowest cost for the overall transaction. Thus, revenue risk, they claim, should be allocated to the private sector, and the overall remuneration model should tend toward user charges, the more the scope of the private sector's involvement tends toward business development (alluding to a better control of demand for services), and the more the assets exhibit strong exclusivity and "monopolistic" attributes.

Several studies offer a solid guide for the correct assignment of risks (Yescombe, 2007; Delmon, 2009; Phillips, 2008); however, the latter stands out as the one that focuses specifically on road projects. A review of studies and guides to risk allocation seems to suggest that incentives should be attached to the risks potentially controlled by the private sector and that protection be provided in the case of the remaining risks (see Albalate, 2014). Given that private companies are assumed to have perfect knowledge of their businesses, the risks directly linked to exploitation should be transferred to the private sector.[1] This was the basic distinction drawn in

[1] Exploitation risks include maintenance costs like resurfacing, signalizing, and cleaning tasks among others.

early studies (e.g., Grimsey & Lewis, 2002; Lilley & DeGiorgio, 2004) when classifying risks as either global or elementary, where the former referred to legal, environmental, force majeure, regulatory, and political risks and the latter to operational, financial, and revenue-generation risks.

Private companies are expected to have more instruments available to manage some tasks and their underlying uncertainty. Among them, project planning, site conditions and preparation, cost overruns, operation interruptions, quality performance and safety (accidents), technological, financial risks, etc. (see Albalate, 2014 for an extended description). Note that other major risks that could appear in phases of (1) design and planning (design project presented in call tender, permits, and expropriations), (2) construction (change of output requirements by the state), (3) operation and maintenance (supervision of performance standards), and (4) commercial (state investment in a parallel road) are better allocated to the State.

Private companies maximize benefits and, as such, have greater incentives to anticipate any risks they may have to bear in the areas transferred. In combination with task bundling, the transfer of risks during the project's life cycle generates incentives to make efficient decisions. However, some risks are difficult for the private sector to control because it lacks sufficient instruments to manage the variables that underlie the uncertainty. Even among the elementary risks, there are specific sources of risk that are not easily controlled. Therefore, the government needs to offer protection or instruments to mitigate such risk. If risks that are easily controlled by the private sector are transferred to the company submitting the winning tender and the state offers protection in all other areas, the efficiency is assured at a lower capital cost in the face of unexpected risks.

Commercial risk remains the main challenge for the design of road PPPs. The variable determining the success or failure of the project is that of expected demand and, in most PPPs, volume of traffic is exogenous (Engel et al., 2014). On the one hand, the evolution of demand depends on economic growth and urban development, which the private manger can do little to affect, while, on the other, it also depends on the conditions of competition and the operation of alternative routes and modes of transport, which might emerge from the free dynamics of the mobility market or by public intervention. This results in the private sector enjoying limited control of demand risk, especially in the case of Greenfield projects. As such, the complete transfer of demand risk to the private sector threatens to be a likely cause of contract renegotiation. Some degree of public sector coverage of risk is desirable, although offering a full guarantee may encourage the construction of public projects with negative social returns.

Indeed, some PPPs have highlighted the fact that the lack of risk transfer can constitute a major source of failure in attempts to achieve value for money. Full risk protection diminishes the schemes of incentives and, as a result, PPPs would just become a mere financing tool to obtain (cheaper) private capital for infrastructure projects. Without risk transfer, the price of capital is cheaper, but the expected benefits of bundling and risk transfers are lost.

The Trade-Off Between Risk Transfer and White Elephants

In this section, we challenge the assumption that PPPs are better able to provide screening of projects, thanks to their market filter, and thereby avoid potential white elephants, which are investment projects with negative social surplus (Robinson & Torvik, 2005). It is our theory that limiting risk transfer to attract cheaper private capital actually increases the likelihood of investment in white elephants, while transferring risk increases the cost of capital or limits the potential interest of the private sector in the project.

Governments are likely to be interested in attracting private capital for large-scale infrastructure projects. Fiscal constraints and financial motivations are usually the main rationale, given that cost minimization or productive efficiency gains are lower in standardized capital-intensive industries such as road infrastructure. One of the main features of private financing is that it is usually more expensive than budgetary alternatives (e.g., taxes, debt, or public corporation bonds). The premium required by investors is based on the potential estimated risk of the project, which may lead to adverse scenarios in the revenue-generating process or may even result in the bankruptcy of the special purpose vehicle. In contrast, the public sector has a wider portfolio of projects so that specific project risks are diluted among a larger pool of publicly driven projects. It is also very unlikely that the State would go bankrupt over a specific project, and it has more instruments and powers to prevent or shape competition between infrastructure and services. Thus, the State is usually considered "nearly" risk-neutral in public economics (Arrow & Lind, 1970), while the private sector seems better described as having risk-averse preferences.

Indeed, the risk premium is directly related to the agreed risk transfer. If governments are interested in attracting private capital at a cheaper cost—for users or for taxpayers—they will have incentives to limit the risk transferred. Roumboutsos and Pantelias (2015) recognize the direct impact of risk mitigation measures and associated risk premiums and argue that a principal objective of risk allocation is the minimization of risk premiums and contract transaction costs.

However, by protecting the private sector from adverse scenarios, governments might be eroding the incentive scheme that would lead to optimization in the exploitation of synergies from the bundling of tasks and the efforts for revenue maximization and cost minimization. Thus, there is a trade-off between the cost of private capital and incentive schemes to promote PPP efficiency.

Note that when the main interest lies in attracting private capital, risk allocation plays a significant role in facilitating this transaction. For instance, the EPEC (2014) claimed that "standard risk allocation" was not sufficient to satisfy a private sector suffering the effects of a financial crisis and proposed the use of state guarantees in support of PPP bankability and attractiveness to financial investors. If the interest of the government lies in attracting private capital for specific projects that do not pass the market filter, this last fact can be disguised by limiting effective risk transfers. The theoretical advantage of the market screening is jeopardized by a politically purposeful risk allocation that lowers the capital costs for such a risky project that may lead to a white elephant. Thus, PPPs can be used precisely to select and make possible socially unprofitable projects with private capital.

Although PPPs have long been seen as a filter for white elephants, warnings about the strict conditions that must be adhered to for this filter to work are increasingly being voiced. For example, Engel et al. (Engel et al., 2011, p. 16) warn that PPPs will not filter out such projects if they are financed with subsidies or if there is an implicit guarantee that the government will bail out a troubled concessionaire (see also Iossa & Martimort, 2013, 2016).

Indeed, a flexible but usually opaque institutional framework is one in which renegotiations and bailouts are frequent when the private partner is faced with adverse scenarios, yet non-existent in favorable scenarios. Renegotiations and/or bailout of PPPs may be perceived by the market as a signal that the government would support PPP projects should they run into difficulties, even if, formally, it appears that the risks are fully transferred. However, renegotiations may also be in the public interest, if all the stakeholders involved are better off. In reality, renegotiations rarely lead to this Pareto improvement but give rise to winners and losers (see Albalate & Bel-Piñana, 2016). Indeed, international evidence points to the fact that renegotiations mostly benefit the concessionaires (Guasch, 2004). This asymmetry appears to rely on the fact that governments rarely force renegotiations in those favorable scenarios in which private partners obtain large returns on their investment.

In sum, PPPs do not necessarily offer an advantage in terms of project filtering, given that the effective allocation of risks may undermine this characteristic to the extent that they can be used precisely to promote white elephants with the apparent support of the market (private partners). Attracting private capital for politically motivated projects is possible by managing risk transfers, or even by agreeing to frequent and asymmetric renegotiations and bailouts. Although these projects are implemented at a lower cost for both taxpayers and users (risk premium), many PPPs, in limiting the effective risk to the private partner, make white elephants possible. Nonetheless, this is an illusory advantage, given that public financing could facilitate these socially unprofitable projects at a cheaper cost. In the section that follows, we illustrate this framework with a case study.

Case Study: Road PPPs in Spain

Spain is considered a pioneer in its use of road PPPs. Under the Franco dictatorship, an initial network of highways was first planned in the 1960s, reflecting the economic dynamism produced by the 1959 Stabilization Plan and the need to modernize the country's infrastructure. In 1961, the government approved the General Highway Plan, and later, in 1965, the Ministry of Public Works launched the Spanish National Motorway Plan (PANE), the first project of its kind, comprising a full PPP program of toll motorway concessions that envisaged the building of 3160 km of greenfield motorways.

The budget constraints caused by the chronic weakness of the Spanish treasury (attributable to the low level of taxation) and the need for large-scale investment led to the adoption of PPPs as opposed to more traditional public procurement models (Albalate, 2014). The economy was crying out for new infrastructure to facilitate growth, but the possibilities of levying additional taxes on the transportation sector were severely limited given the heavy burden it already faced in the shape of vehicle and gasoline taxes (Puncel, 1996). Thus, attracting private capital, above all international capital, was a necessity.

The new investment program generated considerable expectations throughout Spain's regions, resulting in substantial political and institutional pressure to attract investment. Sansalvadó claims that some projects, such as the construction of the Sevilla-Cadiz motorway, were the result of political pressure, and Bel (1999, p.130) explains that "toll motorways became the object of desire for all regions and the plan satisfied virtually all demands."

Although the World Bank recommended that efforts be focused on the rehabilitation and conservation of the existing road network, arguing that the only motorway that needed to be built was in the Mediterranean Corridor (linking Murcia to the French Border), various toll motorway concessions were granted under the PANE program. Most of the PPP projects were long transversal motorways serving corridors with high demand expectations. Indeed, PANE was designed to provide full scale network coverage and not to target specific bottlenecks.[2] Success in attracting private capital, in conjunction with the need to satisfy regional demands, led to an update of PANE and the expansion of the network with a further 2042 km of projected tolled motorway.

Given the interest of the dictatorship in improving the State's balance of payments, the government placed a ceiling on the use of domestic capital. To attract international capital PPPs included singularly favorable conditions, guarantees, and risk mitigation mechanisms, such as tax rebates and exemptions, the state endorsement and insurance of debt, exchange rate insurance, reduced bail and special borrowing rules, and minimum capital and loan stocks (Albalate, 2014). It is highly illustrative that the only attempt to award a PPP without these favorable conditions—the case of the Tarragona–Valencia motorway—resulted in a complete lack of interest from the private sector, and the Ministry was eventually obliged to offer the same protection to attract candidates. Similarly, a 1953 enactment failed to attract private capital for road PPPs as it did not include public subsidies and limited the length of contracts to 75 years, a duration that would be extended in the 1960s to 99 years.

Furthermore, the concessionaires were granted an additional guarantee: namely the State's Financial Liability. This guarantee, included in the 1965 Public Sector Contract Act, as well as in the PANE program of the same year, recognized the right of the concessionaire to be fully compensated for investments made, in the case of

[2] The projects awarded between 1967 and 1972 were Barcelona-La Jonquera and Montgat-Mataró, Bilbao-Behobia, Villalba-Villacastín and Villacastín-Adanero, Barcelona-Tarragona, Sevilla-Cadiz, Tarragona-Valencia and Valencia-Alicante.

bankruptcy. This guarantee, together with minimum capital regulations, offered greater incentives to debt (as opposed to capital) and provided risk protection in the case that financial distress led to the bankruptcy of the special purpose vehicle (for the concessionaire), via a taxpayer bailout. Thanks to the State's Financial Liability, lenders were protected, and concessionaires took advantage of this to obtain the necessary funds from banks to initiate investments while making only limited contributions from their own capital.

In the early 1970s, a new policy was adopted to accelerate the construction of new motorways with the approval of a new legislative framework that offered concessionaires even more favorable conditions. Although this new law limited the period of concession to 50 years, it added non-refundable grants and refundable advances. The State could now provide non-refundable subsidies in cases where, for reasons of "urgent national interest," the promotion of a motorway was deemed advisable without any guarantees of a minimum profitability threshold being reached. It could also grant the private sector refundable advances during the first few years of operation in cases where the revenues were insufficient to meet the financial commitments accrued. Moreover, the State's financial liability was consolidated by law. Under this regulatory framework, six new toll motorway concessions were awarded between 1973 and 1976.[3]

Renegotiations and Bailouts

The economic crisis of the mid-1970s was to have a major impact on this industry. By the middle of the decade, the PANE program had completed just a third of the 3000 km of its planned network length. Rising energy costs and interest rates at a time of the appreciation of the US dollar, combined with low traffic demand, paralyzed the industry, while canceled road investments left it highly indebted. The energy crisis was to affect the profitability of the industry in the ramp-up period, with losses still being reported up until 1987.

The Ministry of Public Works warned of the potential dangers of low traffic volumes on the first toll motorways and also warned of the high financial and construction costs (MOP, 1974) due to the increase of the international price of materials and energy. This heralded a period of frequent renegotiations and bailouts. Various projects were canceled, new auctions were declared void, while a number of concessions that had been awarded had to be rescinded. Difficulties in obtaining foreign funding and the limited capability of Spain's financial system were additional obstacles (Galdón, 1977).

The private concessions in operation were heavily indebted and insufficiently capitalized: the law had established a minimum level of capitalization of between

[3] Zaragoza–Mediterranean highway, El Ferrol–Portuguese border, Bilbao–Zaragoza, Montmeló–El Papiol, Burgos–Armiñon, and León–Campomanes.

10% and 20% while other public works required 50% (Bel, 1999), while the State's Financial Liability offered limited incentives to invest above these figures. All this generated considerable financial distress.

Gaviria (1973), Gómez-Ferrer (1972), and Puncel (1996) argued that the real business of toll motorway concessionaires was not primarily the operation of the motorways but rather the management of capital imports (at very low interest rates) during the construction stage, and their introduction into Spain's financial system (see Albalate, 2014). The need for the constructor and concessionaire to have separate legal identities (as provided for by the decrees enacted prior to the new Law of Motorways) was not respected and had to be further consolidated with the new law.[4] This behavior and incentive scheme defeated the advantages of bundling, given that construction companies owned purposefully the special vehicles. They just pretended to be benefited enough during the construction phase (as builders of the road) so that these profits were higher than the equity losses of their failed special purpose vehicle.

As a result of the crisis, all concessions awarded since 1967 to 1975 underwent various rounds of renegotiation. Here, the Government facilitated mergers—the profitable concessionaires acquired failed projects in exchange for longer concessions on more profitable roads—while other concessionaires had to be bailed out and nationalized in 1984 under a new publicly owned corporation (ENA—National Motorway Enterprise).

Baeza and Vassallo (2010) examined the drivers of these renegotiations, concluding that investment underestimations and traffic overestimations were the main determinants. In 50% of cases, a change of the toll charge was made, while in 24% the concession was extended. In those conducted during the 1970s and 1980s, additional guarantees were given in return for additional external debt. The main changes implied a decrease of the charge between 30% and 40%. Moreover, some also involved investment in safety improvements, new links, or the extension of the concession duration (10–15 years).

Between 1983 and 1995, no new concessions were granted. From the mid-1980s to the mid-1990s, the high-capacity road network continued to expand; however, it was completely financed out of public expenditure.

[4] The separated identity is a legal provision that banned concession companies owned by construction companies to award construction contracts to the companies of the same group, and therefore, these cannot use these special purpose vehicles to the benefit of the construction company at the expense of the PPP operating business.

A New Wave of Toll Motorway PPPs

As of 1997, the financing of high-capacity roads by means of PPP contracts regained momentum. The new Conservative government, ruling since 1996, was more favorable to private participation.[5] Part of the incentive to use PPPs was that, in accordance with the European System of Accounts, such contracts did not have to be included in the national accounts of budget deficits and debt, and this at a time when the Government found itself having to satisfy the convergence criteria to join the European Monetary Union (Albalate et al., 2015a).

The government's first action was to renegotiate all the concessions awarded during the initial wave. Second, the government opted to privatize ENA, the enterprise set up following the nationalization of three bankrupt concessionaires in 1984. Third, it awarded a new portfolio of 13 PPP concession contracts. In its first term in office, between 1998 and 1999, the government awarded eight new toll road PPPs. Later, during its second mandate, a further seven toll motorway concessions were awarded. And plans were initiated for the Alto de las Pedrizas–Málaga project, which was finally awarded in 2006 by the next government (Socialist Party).

Note that six of these PPPs (five radial highways which are R-2, R-3, R-4, R-5, and Madrid–Toledo and a motorway access route to Madrid–Barajas Airport) were greenfield projects to provide motorway access to the capital city, Madrid, which was already served by six free motorways running parallel to the newly planned corridors. These radial highways were deemed urgent, of "exceptional public interest," due to the growth of Madrid's urban periphery and the congestion suffered by the city's motorways at peak times.

The rest of projects awarded during this second wave were allocated to corridors for which no accurate forecasts of future traffic volumes had been made. In 1997, the government undertook profitability studies of various toll motorway projects, concluding that six motorways would require significant subsidies, amounting to between 40% and 65% of total investments (Izquierdo, 1997).[6] Despite this, all these motorways were awarded as toll motorway concessions between 1998 and 2006.

The last wave of concessions granted in Spain was the reform of previously free of charge motorways that were transformed into shadow toll concessions. This reform was designed to improve and rehabilitate the first generation of free motorways constructed during the 1980s. To this end, the 2005 Transport Infrastructure Strategic Plan, for the period 2005–2020, considered PPPs in the form of DBFOM contracts, without toll charges, but to include a series of payments based on the volume of traffic received. This wave of PPPs was awarded in 2007 and affected more than 900 km of free motorways.

[5] The only toll motorway concession previously awarded by central government had been the Malaga–Estepona motorway in 1996, coinciding with the Socialist Party's last year in office.

[6] Madrid–Guadalajara, León–Astorga, Avila–Villacastín, Segovia–San Rafael, Estepona–Guadiaro, and Santiago–Alto de Santo Domingo.

All these policies were initiated on approval, in December 1996, of a new law of fiscal measures and social order that promoted the construction of new highways through PPPs. The law granted the state the power to make subordinated, or other, loans to concessionaires to guarantee the economic and financial viability of infrastructure projects.

Concessions were formed by special purpose vehicles, made up primarily of construction companies (majority stakeholders), banks and savings banks, and infrastructure management companies. Own capital participation was extremely limited, to the extent that in some projects, such as the Henarsa concession, debt accounted for 88%, with the partners contributing just 12% of the total capital.

Interestingly, in 15 of the 16 adjudication decrees formulated between 1998 and 2006, awarding the last road PPPs in Spain, the amount the Government had to pay the concessionaire for construction, and expropriation in case of bankruptcy was quantified. This was included to protect the interests of the administration and to define precisely the extent of the State's Financial Liability.

A New Collapse of Toll Motorway PPPs

The outbreak of the 2008 economic crisis led to the bankruptcy of more than half the highway concessions awarded between 1998 and 2006.[7] Two more, the León–Astorga and Alicante–Cartagena highways, were brought to the brink of bankruptcy, while the Alto de les Pedrizas–Malaga highway had to be renegotiated so that the company could re-establish the economic and financial balance between partners.

Most of the PPPs faced bankruptcy almost immediately after inauguration and were in direct need of government aid. Indeed, by May 2013, six concessionaires were declared bankrupt, and many more were receiving government financing. As in the late 1970s, the industry was characterized by massive indebtedness—accumulated debt was estimated at almost 4000 million euros in 2013—and a shortfall in its revenues. Concessionaires were not even able to meet their loan interest payments. Because of the limited participation of own capital from the partners and their large recourse to debt, the Spanish financial system was left highly exposed to risk. Moreover, the partners were denied new capital contributions from shareholders (Albalate, 2014).

The reasons underpinning this collapse can be summarized as follows. The first reason was the deviation from projected expropriation and construction costs. The real price paid for expropriating the land for the radial highways in some cases was more than 600% higher than that initially envisaged. Construction cost overruns were not as severe but ranged between 15%, in the case of the R-3 Madrid–Arganda, and 31%, in that of the R-2 Madrid–Guadalajara (Vassallo et al., 2012). On the one

[7] The R-2 Madrid–Guadalajara, R-3 Madrid–Arganda, R-5 Madrid–Navalcarnero, R-4 Madrid–Ocaña, the Airport Axis, Madrid–Toledo, Ocaña–La Roda, Cartagena–Vera, and the Alicante ring road.

hand, the expropriation differences were due to court decisions on the controversies in the valuation price of the land.

The second, and more significant, reason for the collapse was the deviation between expected traffic predictions and actual traffic volumes. Errors in the prediction were made not only by the administration, but the concessionaires were also guilty of serious miscalculations, even greater than those of the state (Baeza & Vassallo, 2010). Deviations ranged between 23% (Alicante–Cartagena) and 82% (Madrid–Toledo), in the first year of operation (Baeza & Vassallo, 2010; Vassallo & Baeza, 2011). Only one of these concessions overcame this early deviation, thanks to the ramp-up period (Málaga–Estepona–Guadiaro). In 2012, twelve toll motorways were used by a daily average of less than 10,000 vehicles (Albalate, 2014). Vassallo and Baeza (2011) report a significant bias toward overestimating traffic on Spanish toll motorways and claim that this was strategic as it provided greater scope for renegotiation.

Finally, the explosion of the housing market bubble also played an important role. The profitability expectations of many of the highways awarded in this last stage, such as the Cartagena–Vera highway, were based on the projection of great urban development that the tourism industry would create on the Spanish coast. Others, as in the case of the Madrid radial highways, were based on the expected increase in traffic derived from the urbanization of the periphery of large cities (see Albalate et al., 2015a for a more detailed description of the crisis in this sector).

Thus, Spain is a good example of how PPPs can easily lead to the construction of white elephants and to failed projects if the State is willing to provide excess guarantees. Here, the favorable stance taken by the government toward PPPs, on both political and financial grounds, has resulted in a limitation being placed on the risks transferred to industry in both tolled and non-tolled (shadow tolled) PPPs. The most significant of these guarantees can be identified as follows.

1. The government, in accordance with the prevailing regulatory framework, has to compensate the concessionaire, by extending the term of the concession, by providing participating (subordinated) loans (i.e., granting a loan at preferential interest rates to the concessionaire so it can assume its debts), or by financially compensating the concessionaire directly through the setting up of a provident fund.
2. The European Court of Auditors (2018) highlights that in the case of shadow tolled PPPs, even in instances where traffic was much lower than expected, the quality of maintenance (facilitated by low traffic levels) gave rise to contractual bonuses that offset all the private partner's losses originating from the demand risk. Here, the public partner was contractually obliged to pay considerably higher amounts to reward outstanding maintenance of under-used motorways.
3. Most importantly, in the case of tolled motorways that declared bankruptcy, in application of the State's Financial Liability, the government was obliged to bail out the industry in 2018. Motorways were nationalized, as had happened in the early 1980s, starting with the acquisition of the radial R-4 Madrid–Ocaña motorway, which had an average daily traffic of just 5258 vehicles in 2017 (63% less

traffic than traffic projected on the R-4 Madrid–Ocaña decree of concession). The government's plan included the nationalization of 570 km of highways, compensating the private partners in accordance with the amount of their debt, estimated at 3200 million euros. Following on from the R-4, the Ministry of Transport assumed ownership of the rest of the radial motorways. It is also worth noting that although the new 2003 law provided for the possibility of introducing risk mitigating mechanisms based on the limitation of profitability by the setting of cap and floor thresholds, none of the PPPs adopted this risk mechanism.

In sum, through the late 1960s and early 1970s, Spain needed to provide more favorable conditions and better financial guarantees to facilitate private participation in PPPs, given the greater political, financial, and institutional risks faced (Albalate et al., 2015b). These risks became less important after Spain joined the European Union, and as a result, the degree of taxpayer-borne risk fell due to this enhanced stability. However, a political project aimed at boosting motorway investment, centered above all on Madrid, once more had to be accompanied by guarantees of full investment recovery to facilitate both intensive and extensive private participation. This case provides, therefore, a good example of how a purposeful excess of state guarantees can lead to the construction of white elephants using PPPs, resulting in the massive failure of the program.

In order to illustrate the failure of the recent PPP road program and the role played by low levels of traffic demand, we first compare the actual traffic demand for toll motorways awarded since 1996 to traffic projected by the concessionaires in the first year of operation (Fig. 1). Projected demand in all toll motorways awarded since 1996 were overestimated. The only exceptions were Ávila–Villacastin and Segovia–San Rafael. More relevant, all toll motorways that were bailed out by the State were those that showed highest levels of overestimated demand (deviations between 46% and 90%).

Second, we show mean traffic demand differences in 2013 and 2017 for toll motorways awarded between 1967 and 2006 and toll motorways awarded since 1996 (Fig. 2). The average of all concessions awarded since 1996 show 70%–67% (2013 and 2017, respectively) less traffic than toll motorways awarded between 1967 and 1975. In fact, the majority of toll motorways that were bailed out by the State did not surpassed 5700 vehicles per day, either in 2013 or in 2017. Note that technically, it is difficult to justify the construction of a dual carriageway motorway or the enlargement of a conventional road, for traffics lower than 10,000 average daily vehicles. Despite the economic crisis recovery since 2013, few of the motorways awarded since 1996 received more than 9000 vehicles per day. Therefore, the data presented suggest that PPP road projects with traffic demand below 9000 vehicles per day are probably socially unprofitable. Nonetheless, specific cost–benefit analysis should be needed to confirm this claim.

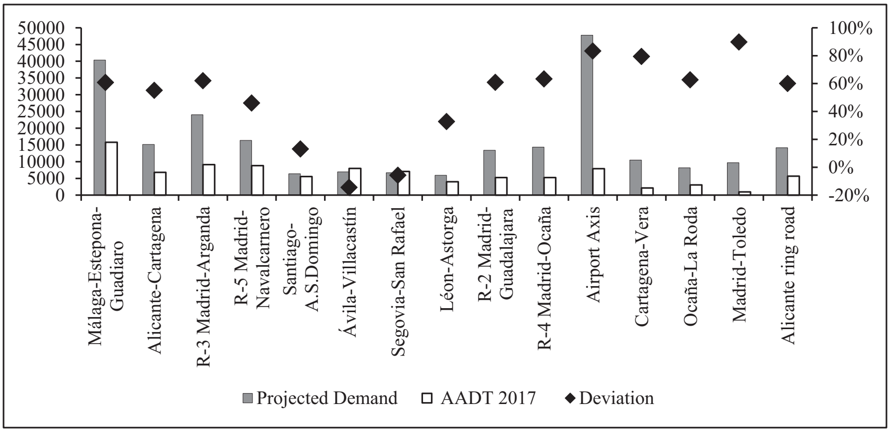

Fig. 1 Traffic demand deviation in motorways awarded since 2006

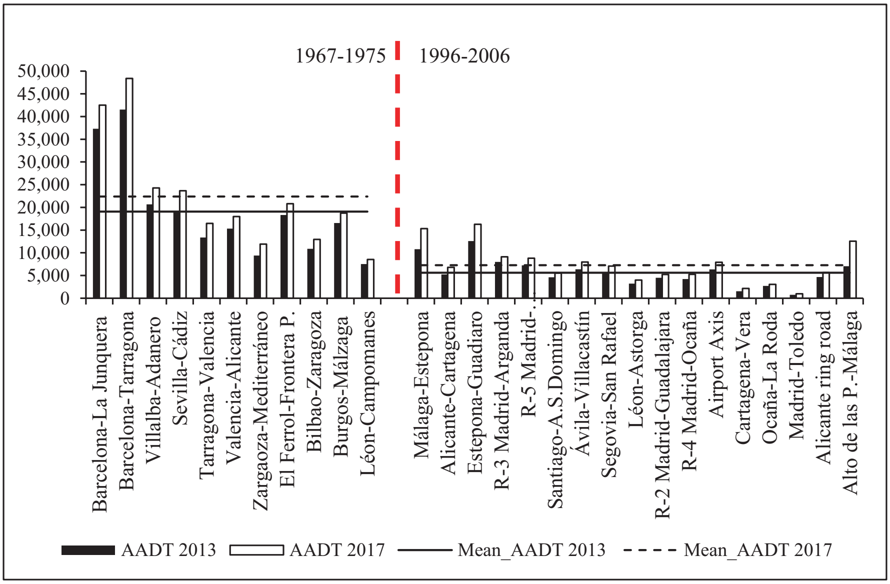

Fig. 2 Traffic demand in 2013 and 2017 comparison between toll motorway awarded in 1967–1975 and toll motorways awarded in 1996–2006

Summary and Conclusions

PPPs constitute attractive contractual alternatives to traditional methods of procurement, offering a series of potential benefits that need to be given careful consideration by any public authority when planning their road infrastructure policy. PPPs can offer substantial efficiency gains and other advantages based on the private sector's ability to raise funds in times of budget constraints, manage assets and production factors efficiently, and exploit the synergies between bundled tasks. However, PPPs should be carefully designed in order to accomplish those benefits. Indeed, PPPs do not deliver advantages in all circumstances. We believe PPPs can contribute in many manners to provide better (more efficient) service and infrastructure delivery. To be desirable, they should address correctly the two main requirements of a PPP: (1) bundling tasks with potential in exploiting synergies and (2) a correct allocation of risks.

One of the advantages of PPPs is the ability of private initiative to better evaluate the viability of a project, thereby offering a market filter to investments. PPPs should help avoid the construction of white elephants and prevent economic resources being misused in promoting projects detrimental to social welfare.

In this chapter, we have shown that these benefits depend on how successful risk allocation is in establishing trade-offs or dilemmas. The latter may lead a government to design risk allocation to obtain cheaper funding for its projects or to attract private capital to its riskier projects. We illustrated the strong relationship that exists between risk allocation and PPP participation in infrastructure projects. We have also shown how a government's financial and political interests might lead to purposeful risk allocations that facilitate private participation even for the construction of white elephants.

Note we are not establishing a direct association between the bankruptcy of PPPs and their translation into white elephants. Not financially viable projects may deserve government subsidies if social benefits surpass social costs in a welfare analysis. These subsidies should be carefully calculated to cover the private partner losses under a most likely renegotiated PPP agreement to keep the operation and maintenance tasks of this socially enhancing project. Even some white elephants—with negative socioeconomic surplus—may deserve being operated and funded with subsidies if, by doing so, the socioeconomic loss diminishes thanks to the operation of the infrastructure even if it can never compensate for the huge construction cost. By operating the infrastructure, it is unlikely that positive externalities and welfare gains do compensate the costs of construction and the derived negative externalities of a white elephant. However, these socioeconomic benefits may offset the maintenance and operating costs, as well as those negative externalities linked to the operation of the infrastructure. Thus, the gap between the construction costs and the accumulated socioeconomic benefits over time are minimized if the infrastructure keeps running. Because many infrastructure projects are characterized by large sunk investments but moderate maintenance and operating costs, public sector subsidies may be an efficient alternative. They should be established as the amount that satisfies financial breakeven of the special purpose vehicle. This is because it is taken for granted that the government preserves the private operation of the utility. When considered from the efficiency perspective, the government, interested in welfare maximization, should consider and compare different policy alternatives. While keeping the financial breakeven of the PPP, welfare could be maximized if the renegotiation between the government and the private partner—as a result of the bankruptcy—modifies specific aspects of the management and service delivered that increase social benefits and limit social costs. These aspects should be explored instead of just covering the financial losses (for instance with toll increases or contract extensions). Thus, the determination of the actions to be taken should consider the optimization of social welfare (Net Present Social Value).

Therefore, it is derived from the previous argument that keeping the private operation of the infrastructure with the necessary subsidies to cover private losses might not be optimal. The government should compare and evaluate whether taking over the infrastructure, getting full control of management, and service delivered may maximize welfare outcomes and choose the appropriate intervention without being trapped in a PPP setting that has failed.

There are at least two lessons we can learn from the foregoing discussion. First, PPPs do not necessarily provide a better screening of projects, their market filter capacity being dependent on how risks are allocated in the first place. Thus, a PPP may be a necessary, but not always successful, condition for ensuring that a privately funded project is welfare enhancing. Second, by focusing on PPP contracts we might experience an illusory perception of risk allocation that could be somewhat misleading. Frequent, opaque renegotiations, bailouts, and legal frameworks designed to protect partners from risk transfers might be other ways of shaping risk allocations outside contractual agreements. The Spanish experience has shown how a PPP model that was supposed to transfer most risks to the private partners was, in reality, protecting investments and as a result leading to the construction of white elephants. In short, both lessons provide a warning of how a PPP might result in the construction of a white elephant. Fortunately, these are not inherent weaknesses of PPPs. Awareness of these mechanics and effects may help in improving their outcomes.

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PPPs in the Mexican Road Sector

Oscar de Buen and Bernardo Ortiz

Acronyms

AADT	Annual Average Daily Traffic
BANOBRAS	Banco Nacional de Obras y Servicios Públicos
CAPUFE	Caminos y Puentes Federales de Ingresos y Servicios Conexos
CPI	Consumer Price Index
ETC	Electronic Toll Collection
ESG	Environmental, Social and Governance
FARAC	Fondo de Apoyo al Rescate Carretero
FINFRA	Fondo de Inversión de Infraestructura
FONADIN	Fondo Nacional de Infraestructura
ITS	Intelligent Transportation Systems
KPI	Key Performance Indicators
MRO	Maintain Rehabilitate and Operate
O&M	Operation and Maintenance
OPEX	Operating Expenses
PPP	Public–Private Partnerships
PPS	Long-Term Service Contracts
RCO	Red de Carreteras de Occidente
SCT	Secretaría de Comunicaciones y Transportes
USD	United States Dollars

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The Mexican Toll Road Sector

Mexico's road network comprises almost 380,000 km of roads. The road network serves the whole territory and provides access and mobility to most of the country's 125 million inhabitants. Therefore, road transportation accounts for the largest share of domestic transportation, for both passengers and freight, as it captures respectively 97% and 56% of all domestic movement. The federal road network of about 50,000 km is the responsibility of the Secretaría de Comunicaciones y Transportes (SCT). There are 117 toll roads and 49 toll bridges which have a total length of 8755 km.

Toll roads have a long history in Mexico. The first one opened in 1952; since then, the toll road system gradually expanded according to traffic needs and to the Federal Government's financial capabilities. By the end of the 1980s, it consisted of about 1000 km of toll roads, most of them around Mexico City. Between 1989 and 1994, the Federal Government granted 52 concessions to state governments and the private sector. Through these concessions, about 4500 km of new or improved toll roads was built and put into operation with a total investment of about 12 billion USD. This program, which heavily engaged the private sector, had design flaws that eventually affected the construction and financial sectors and triggered a profound crisis in the toll road sector.

In 1997, the Federal Government took control over 23 private road concessions in exchange for assuming their bank debts of about 7.7 billion USD. The Government created *Fondo de Apoyo al Rescate Carretero, FARAC* (Road Bailout Support Fund), a trust in the *Banco Nacional de Obras y Servicios Públicos, BANOBRAS* (National Public Works and Services Bank), to receive a "master" concession to operate, maintain, and exploit the 2793.7 km of the toll roads belonging to the 23 concessions that came under government control. In exchange, it was made responsible of serving the debt transferred to the government. The Government also created the *Fondo de Inversión en Infraestructura, FINFRA* (Infrastructure Investment Fund), another trust in BANOBRAS, to promote private participation in infrastructure projects and develop opportunities for that purpose.

During the first decade of the present century, as the economy and the toll road sector resumed growth, the chronic insufficiency of investment resources for road infrastructure led the federal government to seek ways to develop partnerships with the private sector to increase investments for roads. For this purpose, a new concession model that incorporated lessons from the past was developed and implemented to allow the private sector to return to the road sector to invest and develop suitably selected and prepared road projects.

During the 2001–2012 period, 35 road projects with a combined length of 1985 km were opened throughout the nation. These projects received an investment of about 5.7 billion USD through PPPs, which accounted for 21.3% of total road investments during the period. After 2012, PPPs have continued to be applied to develop and maintain the federal road network. However, as the number of projects previously identified and prepared by the SCT for development through competitive bids diminished and Unsolicited Proposals proved difficult to implement in the short term, only a few concessions were granted to build, operate, and maintain new toll roads.

Public–Private Partnership Models

The public–private partnership models that were developed by the *Secretaría de Comunicaciones y Transportes*, SCT (Ministry of Communications and Transport) to attract private investment to highway projects are the following:

- Concessions
- Long-term service contracts (*Proyectos de Prestación de Servicios*, PPS, according to its Spanish acronym)
- Asset utilization
- Road Maintenance and Operation under Key Performance Indicators (KPIs)

These models allowed SCT to increase highway investments and helped it to achieve a rapid, efficient development of strategic projects that are put into operation in comparatively short periods of time. They have also aided in maintaining and operating some toll roads under long-term operations and maintenance contracts based on KPIs to improve quality of service. These models have also opened up new opportunities for the private sector and for contractors, investors, financial institutions, consultants, suppliers, and insurers. Investment facilitation through these models contributed significantly to economic activity and job generation in many regions of the country.

The most relevant features of each one of these models are discussed in the following paragraphs:

The concession model is mostly applied to highway projects with their own revenue source, generally toll highways. Concessions are awarded for up to 30 years through public bidding processes open to participants with proven capacity and experience to carry out these projects. Bids are organized and managed by SCT, which provides project designs and rights of way to the bidders and sets the maximum average tolls and the rule for inflation-based adjustments over time. In some projects, SCT provides a grant through *Fondo Nacional de Infraestructura, FONADIN* (National Infrastructure Fund) to guarantee project feasibility. This grant is provided at the request of the winning bidder as a result of the bid. The winner is the participant who complies with all technical, legal, and financial requirements and at the same time requests the lowest amount of government funds or offers to pay the largest sum in exchange for the concession.

An example of a road project developed through a concession is the Morelia–Salamanca Tollway. This project consisted of building a new, two-lane toll road with asphalt pavement between the Copándaro interchange on the México–Guadalajara toll road and the Cerro Gordo interchange on the Querétaro–Irapuato toll road in the states of Michoacán and Guanajuato. Construction of the 83 km road took place between 2005 and 2007 and included a 15-km rock embankment across the Laguna de Cuitzeo, seven interchanges, and two toll plazas. Investment costs were about 235 million USD and construction was completed in 28 months.

The PPS model is focused mainly on projects to improve existing toll-free highways which, once modernized, must continue operating as toll-free roads. Under this model, SCT organizes a public bid to award a concession that grants the winner the right to sign a long term (15–30 years) service contract to design, finance, build, improve, maintain, and operate a highway. The company provides those services in exchange for quarterly payments based on the quality of the infrastructure made available to the user, measured according to quality indicators (availability payment). The source of funds for these payments is the federal highway budget, which includes an amount for these payments each year.

An example of the use of this model was the improvement of two existing federal toll-free roads, one is 75-km section between Irapuato and La Piedad (AADT of about 18,000 vehicles), and another is 93-km road between Querétaro and Irapuato (AADT of about 25,000 vehicles), in the states of Guanajuato and Querétaro. In the first case, work consisted of widening the two-lane sections of the road (about 31 km) to accommodate four lanes, improving existing interchanges and rehabilitating the total length of the highway, with a contract amount of 82 million USD. In the second, the project included widening to four lanes about 35 km of the road, improving two bypasses and rehabilitating the full length of the road. Total project costs were about 164 million USD. Actual physical work in both roads was completed in 45 months.

The asset utilization model consists of packaging existing highway assets, generally belonging to the FONADIN network, with new toll roads to be built. Through a public bid organized by SCT, a concession is awarded to a private party who will operate, maintain and exploit the existing asset and build the new toll roads in the package, and also operate and maintain them later on. This model facilitates the development of new infrastructure while also allowing obtaining additional funds to capitalize FONADIN and enable it to participate in new projects, even in other sectors, as well as to improve the quality of services offered to highway users.

An example involving this model was the so-called FARAC I project, which consisted of a concession to the private sector four existing toll roads included in theFARAC concession, all of them with more than 10 years of proven operations, for a period of 30 years. The four roads have a combined length of 556 km and are located in west-central Mexico, in the states of Guanajuato, Jalisco, Michoacán, and Aguascalientes, and serve major population and economic centers such as Guadalajara, León, Aguascalientes, and Morelia. Contractual obligations included the construction or improvement of about 76 km of road sections that improved network connectivity to other urban centers in the region. This bidding process culminated in October 2007 with the adjudication of the concession to an international consortium in exchange for the payment of 4 billion USD to the Mexican government. Given the success of this model, it was also applied to consolidate the development of toll road infrastructure along the western coast of Mexico, from Guadalajara to Culiacan.

As described above, multiannual road maintenance and operations contracts under KPIS are being applied with positive results both in toll and toll-free roads by FONADIN and SCT, respectively. In general, both the models seek to attract private capital to maintain and operate federal roads; to improve road conditions and reduce vehicle operating costs, provide public services at lower costs and increase quality of service, road safety, and user comfort. Both the models require an initial investment to improve the physical condition of the road during the first years of the contract and then maintain it throughout the term of the contract, with variations on a case-by-case basis. At the end of the contract, the infrastructure will be transferred to their owner with a remaining useful life of 3 years. Payments are scheduled on a monthly basis according to the defined KPIs. They are composed of two parts: one to recover initial capital investments and the other to cover maintenance costs. This latter part is subject to deductions if the established KPIs are not met.

Project Risks, Mitigation, and Cases

Under the concession model developed by SCT for projects undertaken after 2003, the main project risks were distributed as shown in the following table:

Risk	Party responsible for the risk	Mitigation
Right of way acquisition	Government	Construction starts when all rights of way are available
Design	Government	Concessionaire accepts project design developed by government
Private equity contribution	Concessionaire	Concessionaire provides letter of credit as guarantee
Construction costs	Concessionaire	Concessionaire builds road according to accepted design at resulting costs
Cost increases due to additional quantities of work	Government	Governments pays for work quantities not included in initial project design
Construction delays	Concessionaire	Concessionaire absorbs additional costs
O&M costs	Concessionaire	Concessionaire absorbs additional costs
Traffic demand	Concessionaire	Concessionaire performs own traffic study or accepts the one provided by government and accepts demand risk
Toll increases	Government	Tolls are increased when Consume Price index (CPI) exceeds 5% from date of last increase
Financial costs	Concessionaire	Concessionaire absorbs additional costs
Acts of god	Concessionaire	Concessionaire has to insure the road
Force majeure	Government	Government is obliged to pay costs of interruption or inability to collect tolls
Competing toll roads	Government	Concessionaire needs to demonstrate loss of revenue and government must compensate

The concession model's general risk allocation worked reasonably well during the first stages of the program. However, in the large Mexican road concession program, it was inevitable to have cases in which some of these risks materialized in actual projects. Therefore, solutions had to be implemented to allow the projects to meet the objectives for which they were developed.

In the next sections, a number of cases are presented to illustrate the specific way in which some of the risks shown in the table materialized in some projects and also to show the way in which they were dealt with during the concession contract management phase. In the final section of this chapter, lessons learnt from these experiences are summarized and presented to help the reader draw his/her own conclusions.

Right of Way-Related Risks

During Construction

One of the most significant risks in greenfield projects in Mexico consists of making sure that the rights of way for the construction of a new road are available according to project needs. Throughout Mexico's history, land ownership has been a major source of conflicts and disputes. Even today, there are numerous issues to be resolved in order to acquire and transfer land ownership in many regions of the country. In this context, the legal framework for declaring that it is in the public interest to dispose of certain lands is not particularly strong. Therefore, linear infrastructure projects (pipelines, electric transmission lines, roads and rail lines, among others) frequently encounter problems to acquire the rights of way needed to build and operate them.

In the Mexican road concession model, risks dealing with right of way acquisition were retained by the government. According to its provisions, the government would make sure that the extensions of land needed for the road were acquired and made available to the concessionaire. Various options were available to conduct the process, as payments to owners were sometimes made with public funds and in other cases with resources provided by the concession. In all instances, government teams that negotiated with the owners and prepared all the paperwork to ensure that ownership was transferred according to the law performed an active and leading role.

In practice, completing road of way acquisition has proven difficult, especially in projects developed at the later stages of the program. Difficulties have increased because local communities are growingly aware of the opportunity to obtain economic gains by complicating the negotiations to sell their land. At the same time, the specialized areas of the government have lost expertise in these matters and the net effect has been that negotiations have often stagnated. An example of this problem is provided by the Atizapán–Atlacomulco toll road, an 80-km four-lane highway to the northwest of the Mexico City Metropolitan Area. In this case, in which negotiations have made little progress after 6 years, with construction making slow progress. The Barranca Larga–Ventanilla toll road in the state of Oaxaca has had similar problems, where problems with communities have made it impossible to acquire all necessary rights of way 10 years after the concession was granted.

Needless to say, these problems typically require negotiations between the government, the concessionaire, and its creditors. These problems usually lead to the suspension of construction and to the implementation of alternative strategies to try to acquire the pending rights of way and thus finish construction.

During Operations

Another right of way-related problem occurs after the toll road is constructed. In many cases, the road crosses regions that are not well communicated and in others its operations generate an economic opportunity for people living in the surrounding areas that they would otherwise not have. As a consequence, illegal connections to the toll road are frequently opened. In many cases, these accesses are suitable sites for people who offer food, produce, or other goods to establish themselves at the side of the toll road.

If the road concessionaire is not careful and does not make sure that these illegal accesses are closed and potential sellers retired from the road, it can happen that these accesses become permanent. Then removal of persons trading their goods on the right of way of the road becomes impossible. The longer the concessionaire takes to react, the greater the danger of these illegal fixtures becoming permanent and more accidents and security-related incidents happen along the road.

In Mexico, experience has shown that private operators are better at handling these risks than the publicly owned road operator *Caminos y Puentes Federales de Ingresos y Servicios Conexos*, *CAPUFE* (Federal Toll Road and Bridges Revenue Corporation). For example, *Red de Carreteras de Occidente,* RCO (Western Road Network), a private operator that has been managing a 600-km toll road network in western Mexico during the past 13 years, has implemented permanent surveillance programs to ensure that no new accesses are built on its highways. RCO has also created a specialized team which, in coordination with government authorities, conducts negotiations to close down illegal accesses to the roads and retire persons conducting trading activities along the right of way.

In addition to these programs, RCO has also created a series of formal, well-established rest areas that provide service to the users, including food and lodging facilities. As part of its Opex program, it also has undertaken major improvements to the Guadalajara–Zapotlanejo section of its network, where service roads, interchanges, and new toll plazas were built in order to ensure an orderly operation of the highway and its adjoining areas.

Equity Contribution Risk

The Amozoc–Perote toll road is a 103-km, two-lane highway in east-central Mexico that provides an efficient pathway for freight and passenger flows between central Mexico and the port of Veracruz. The road was built under a concession with an investment of 182.1 million dollars. It started operations at the end of 2008 with a daily traffic of about 5000 vehicles per day.

Under the new concession model, at the bidding stage, participants were asked to prove that their technical and financial capabilities met the requirements established by the government to secure proper project implementation. One of the most important requirements was that they provide a letter of credit that proved that they were able to provide the equity needed to complete the financial structure of the project.

In the case of the Amozoc–Perote toll road, the concessionaire that was awarded the concession had difficulties meeting the requirements that were established. As a consequence, periods of compliance had to be extended to allow the company to provide the expected guaranties. As they were unable to do so within the extended periods of the time, in the end this company was forced to negotiate with another firm that was in a position to provide the necessary guarantees. Thus, the original concessionaire had to surrender control of the concession in order not to lose it because of non-compliance of the established requirements.

Construction Risk

The Mexico–Tuxpan road is a 36.6-km four-lane road section through a very difficult terrain along the Mexico City to Tuxpan road corridor. The project included the adaptation of the "Nuevo Necaxa" interchange and the construction of six tunnels, the San Marcos special bridge, other nine bridges, two viaducts, and 14 vehicle underpasses. It was constructed under a private service contract and required an investment of 339.0 million dollars. Its expected traffic was 10,500 vehicles per day.

Because of the technical complexity of this project, it was developed as a combination of a concession and an availability-based payment model. Under contractual conditions, the concessionaire had to prepare final designs for the project, which had to be built in a very difficult terrain, in an area with heavy rainfall where considerable geotechnical risks were identified. Under these conditions, the bidding documents of the project required the concessionaire to prepare all the "standard" geotechnical studies and assume any cost increase or impact risks.

In order to help the concessionaire deal with the geotechnical risks of the project, he was granted the right to modify project alignment inside a 2-km band along the axis of the original line. The concessionaire took advantage of this provision and changed some sections of the alignment, including the San Marcos Bridge, in order to reduce the perceived risks of the project.

The project was completed in 2016 and started operations during that same year. Notwithstanding the provisions that were undertaken, the concessionaire still has open claims related to geotechnical risks that materialized because some onsite geological faults could not be detected with "standard" studies. An arbitration procedure implemented according to the concession contract is under way to decide how to consider these risks and who should pay for them.

Traffic Demand Risk

According to the concession model developed in the first decade of this century, demand risk was transferred from the government to the private concessionaire. At the bidding stage, as part of the bidding documents, the government provided a demand study as a reference to all bidders. These bidders who were then free to use this study as a basis for their own demand projections or to conduct their own studies to estimate future traffic demand and the associated revenues. Under both the circumstances, the bidder had to assume the resulting demand risk. The government did not extend any kind of guarantee if the demand levels assumed by the winning bidder did not materialize in practice.

In most projects, traffic demand behaved in line with expectations, but there were two cases in which this clearly did not happen. The first was the Irapuato Bypass, a 29.2-km two-lane road to the northwest of the city of Irapuato, in central Mexico. This road was built as a concession with an investment of 48.0 million dollars. According to the concessionaire's traffic estimates, expected demand was 3000 vehicles per day, but when it entered into operations only about 1000 vehicles per day used the road.

Because of this substantial traffic shortfall, revenues were too low to service the debt contracted to build the bypass. Since demand risk was transferred to the concessionaire, the government did not participate in a debt-restructuring effort that was undertaken between the concessionaire and its bank. Eventually, a private agreement was reached that allowed the bypass to keep providing service under prevailing conditions.

The Reynosa–Anzaldúas International Bridge linking Mexico and the United States at Reynosa, which came into operation in 2009, was a similar case. The project included the construction of a 2.5-km bridge, 10 km of access roads and border port facilities on the Mexican side of the border, with an investment of 68.8 million dollars. Expected traffic was 7000 vehicles per day, but once it entered into operations, only about 2000 vehicles per day showed up.

In this case, demand did not materialize as expected because of wider ranging events that affected the use of the bridge, such as the world financial crisis of 2008 and the ensuing recession in the USA, the security crisis that hit the region from 2009 on and the drastic reduction in maquiladora investments during those years. As in the previous case, traffic volumes on the bridge were insufficient to pay the project debt, and thus, the parties negotiated to scale down the financial commitments of the project to allow it to service its debt. The government, once again, did not have to provide financial support to the project as it had transferred demand risk to the concessionaire.

Toll-Related Risks

Toll Levels

The Mexico–Toluca toll road was concessioned in 1989, under the provisions of the first concession model used in Mexican roads. Because the initial time of concession was short, tolls were set at levels that the market found difficult to pay, thus generating a situation in which revenues were below expectations. Since the peso-generated revenues of the Mexico–Toluca road had been securitized to issue dollar-denominated bonds in the US market, an obligation to maintain tolls constant in real terms was in place and had to be observed.

According to the concession contract, tolls had to be raised every time that inflation exceeded 5% from the date of the previous toll increase. This rule, together with the already high toll levels of the road and the need to meet the conditions agreed with the bondholders during an economically volatile period with high inflation, generated a politically explosive situation that had to be managed over a period of several years, as toll increases generated protests from the public and unrest but not increasing them put pressure on Mexican financial authorities with foreign creditors.

In the end, the problem was solved by negotiating with the concessionaire a solution that consisted of paying in advance the outstanding balance of the bonds while at the same time extending the time of concession in exchange for a substantial toll reduction that provided a direct benefit to the users. Project debt was refinanced according to the new terms of the concession and thus an acceptable equilibrium was reached.

Toll Increases and Debt-Related Obligations

In August 1994, the Mexican Government issued dollar-denominated bonds in the US market. These bonds were backed by the revenues collected at four CAPUFE-operated toll roads around the south of the Mexico City Metropolitan Area (México–Cuernavaca, La Pera–Cuautla, Puente de Ixtla–Iguala, and Zacapalco–Rancho Viejo). Since no foreign exchange guarantee was provided to the bonds, a provision was included to ensure that tolls would be raised every time that inflation, as measured by the CPI, exceeded 5% from the time of the previous toll rate adjustment.

By December 1994 and early 1995, the so-called Tequila crisis affected the Mexican economy, provoking a massive devaluation of the local currency and an inflation surge that brought annual levels to about 50%. According to the contract provision, tolls on the above-mentioned roads had to be increased to keep them constant in real terms, amidst growing protests and objections from users, political groups, and representatives from the directly affected regions.

Since the contractual obligations eventually proved impossible to comply with because of the political situation, and despite the implementation of a tolling policy that sought to honor the obligations of the Mexican government, negotiations were undertaken to modify the contractual terms and allow the bond to be repaid without having to increase tolls frequently. Eventually, before the maturing term of the bonds, the Mexican government decided to pay the outstanding balance of the bonds to thus recover the flexibility and capability to manage tolls on these roads according to local priorities and possibilities.

Acts of God and Force Majeure-Related Risks

Acts of God

The Monterrey–Saltillo toll road, a 50-km four-lane road that crosses the Sierra Madre Oriental and links two major cities and industrial centers in the northeast of Mexico, was developed as a concession and opened to traffic during the year 2009. The project costed 183.2 million dollars and improved road user safety. A year after it started operations, in July 2010, hurricane Alex swept through the region and produced torrential water flows that affected the toll road with mudslides along a 10-km section that totally interrupted traffic during several days. Although the road suffered only minor damages in its drainage systems, it was closed to traffic for a period of about 2 weeks during which no revenues could be generated.

The operational risk of the toll road had been transferred from the government to the private concessionaire, who had to put in place a series of maintenance guarantees and insurance to prevent cases such as this. By using these provisions, the concessionaire was able to ensure that the road was cleaned and repaired in a short period of time, thus reestablishing normal service without needing financial assistance from the government.

Force Majeure

During recent years, many Mexican toll roads have been affected by groups that take control of the toll plazas, usually during a few hours, and either let users pass through without payment or demand a monetary contribution from them, which they keep for their private use. Although such practices are clearly illegal and merit prosecution, they are tolerated and left to occur without suitable punishment for the perpetrators.

Risk related to these events is normally taken by the government, who requires that the concessionaire maintain a record of these events, their time of duration and the estimated loss of revenues produced. These records are reviewed from time to time to sustain negotiations in which the corresponding losses are compensated through an extension of the time of concession, an additional increase in toll levels or both. In some cases, such as the Tuxtla Gutiérrez–San Cristóbal toll road in the state of Chiapas, which is often subject to these kinds of events, the government has agreed to create a reserve from which funds are periodically drawn to compensate the concessionaire for lost revenues because of blockades or theft.

Risk Compensation

In general, the main principle of the PPP models applied in Mexico since 2003 is to allocate each project risk to the party that is best suited to address it. Therefore, no risk compensations are foreseen in the PPP models. As described in previous sections, the concession contracts include some arbitration or mediation mechanisms to deal with potential controversies, but no direct compensations are explicitly considered in the PPP models.

In the Mexican experience, given the nature, scope, and life cycle of projects developed under PPP models, the most effective way to handle project risks consists of ensuring that a thorough preparation of each project is made before it is actually undertaken, including detailed studies and comprehensive consultation processes to make sure, in so far as possible, that these projects are mature and can be successfully developed through a PPP.

Areas of Opportunity

PPP projects will be needed in the Mexican road sector now and in the future to ensure that the highway network keeps pace with the needs and challenges posed by an increasingly mobile and road transport-dependent society. This is especially true during times when public budgets are expected to be notoriously insufficient to meet those needs. However, given the complexity of PPP projects and their unsuitability to solve all possible problems, sustained efforts need to be given to constantly reviewing and updating them.

In this context, some areas of opportunity for the future improvement of PPP models in the Mexican road sector are the following:

- Apply the 2012 PPP law (Ley de Asociaciones Público-Privadas) in a way that facilitates the presentation, assessment, and implementation of unsolicited proposals. To ensure that these proposals are presented thoroughly and that they are treated equitably, the new law provides clear rules for presenting and processing them. It also states the advantages that proponents will receive if their proposal is accepted by the government and used for a public bid. However, a clearer, less cumbersome process could be useful to make the most out of this feature of the law.

- Introduce options to achieve economic and financial re-equilibrium of highway PPP projects in cases when events outside of private control affect project performance and substantially alter their financial results. In particular, introduce flexibility to existing contracts to facilitate investments in new technologies and capabilities that improve services to the users.
- Improve and strengthen institutional capabilities to manage PPP programs in the road sector. Managing a successful PPP program requires specialized expertise that is frequently unavailable in the public sector. External legal, financial, and technical advisors are needed both to structure and manage PPP project bids as well as to monitor and evaluate performance during their operational stages.
- Provide a complete framework for right of way acquisition and management for PPP projects in the highway sector. This should include valuation procedures, rules for negotiating with land owners and modern legal procedures to declare public utility of the project.
- Create a specialized professional group that is permanently assessing project risks, reviewing alternatives to allocate them and developing the proper legal mechanisms to introduce them to the prevailing models.

In Mexico, as in other countries, PPPs will remain necessary for the expansion, modernization, and maintenance of road infrastructure networks. To continue the development and maintenance of road programs, and given the relevance of road transportation for social opportunities and well-being, a number of state-of-the-art topics must be considered and incorporated to future PPP models to ensure that they generate the greatest possible value.

- *PPPs must be user-centered*: More than building and maintaining infrastructure, PPPs must place the user at the center of planning, design, construction, operation, and maintenance-related processes. Although current project owners might claim that they are promoting user-centered infrastructure, this is not the case in most projects. Thus, in Mexico, a change in the mindset and culture of organizations is needed to bring issues such as road safety to the forefront of PPP-related obligations. In Mexico, road safety is a significant health-related concern, since every year around 16,000 persons die in road accidents. If safety-related requirements were incorporated into PPP contracts, this figure could be lowered.

- Another aspect to be considered in PPPs is that infrastructure is not just concrete or asphalt, bridges or steel. Today, it should also include a series of services to provide better quality of service to the user, such as rest areas, incident management, providing real-time information or permanent two-way communications. The incorporation of technology in services to the user should be also considered by PPPs, encouraging innovation and a permanent drive to increase quality of services.
- *PPPs should be system-oriented*: Transportation networks are complex, large, integrated, open systems (Sussman, 2000). As such, each component should be

integrated to the system as a whole. In the case of highways, each project should fit into broader, comprehensive strategies and initiatives to increase value-added provided. A clear example of the benefits of integration is interoperable operations in Electronic Toll Collection (ETC). Until 2014, Mexican road users were forced to use different tags to use different highway sections. In that year, the Mexican Secretariat of Communications and Transport invited ETC operators to implement interoperable tolling systems to allow the user to travel around the road network with just one tag. Interoperability has been a clear success, and as a consequence, electronic payment of tolls has grown rapidly, especially in the Mexico City Metropolitan Area, where an extensive network of toll roads is in operation.

- A similar improvement in quality of service to the users can be achieved when providing access to road information. Instead of requiring them to consult or call each concessionaire's website, an effort directed to coordinating concessionaire companies and providing a unique point of contact with the user could add significant value across the network. The cultural change needed by focusing on the user and improving their travel experience could also be systematically explored and promoted through suitable changes to PPP contracts.
- *PPPs must take greater advantage of technology*: Technology has reached virtually every aspect of our lives, including infrastructure. An ongoing technological revolution is sweeping through most components of road infrastructure, including planning and design, use of new, self-sustainable materials, new tolling systems, two-way communications with users and automated vehicle operations, to name but a few. In addition, climate change, infrastructure aging, and asset management needs present ever growing challenges that must be successfully met if roads are to keep providing the services they are expected to. In this context, given the long-term duration of most PPP contracts, it is essential that they remain flexible and accommodating enough to incorporate technological innovations to the assets that they regulate. In particular, contract structures should include provisions to allow innovation-related investments to be made during the life of the contract.
- *PPPs must increasingly rely on Key Performance Indicators (KPIs)*: Based on the premise that what cannot be measured cannot be improved, KPIs should be used throughout the lifecycle of projects developed through PPPs, both to evaluate infrastructure and operator performance in critical activities, especially related to quality of service and safety. However, PPP contracts need to develop KPIs that are realistic and easy to measure to avoid devoting more time to KPI measurement than to the activities that are subject to these measurements.
- *PPPs must explicitly take environmental, social, and governance (ESG) aspects into account*: During the past decade, as public–private partnerships became increasingly used to develop infrastructure projects in all sectors and many regions of the world, it has become increasingly necessary to incorporate a wide, systematic, and thorough consideration of ESG factors critical for the success of any project.

- As projects become more complex and costly, the range and depth of their impacts also grow in quality and quantity. As a consequence, social groups, special interest parties, project stakeholders, and others demand that proper consideration is taken of the project's multidimensional impacts as part of their preparation, implementation and operation. As these factors grow in number and importance, they are increasingly becoming key determinants of project success or failure, and thus cannot be left out of consideration in PPP programs and projects.

Since PPPs are likely to remain of interest in the future to accelerate the development of infrastructure programs. PPP models will need to be constantly reviewed and improved to ensure that they meet market expectations, especially during or after critical times due to economic crises or after problems with individual projects or events. Since each project has its own characteristics, each one of them offers an opportunity to learn and improve. In the long-term, much of the success of future PPP programs will depend on the capacity to continuously review and improve them.

Lessons Learned

The results of PPPs in the Mexican highway sector have produced value for social welfare and economic development around the country. However, these models and the way in which they are applied to specific projects need to be constantly reviewed and updated to ensure that they meet market requirements and remain attractive to interested parties under constantly changing economic and financial conditions.

The lessons that follow have been extracted from the development of the Mexican PPP program in the road sector, both from the program as a whole as well as from some of its individual projects. While they are taken from the Mexican experience, an effort has been made to state them in general terms to ensure that they can be useful in other national contexts.

- Not all projects are suitable for development through public–private partnerships. For example, the 232-km Durango–Mazatlán toll road, a two billion USD highway in northwestern Mexico crosses the *Sierra Madre Occidental.* It could not be built with private participation because the amount of private funds that could be recovered through toll revenues was so small that large public grants were needed anyway and thus made private participation superfluous. As a consequence, thorough planning and screening processes are needed to select those projects that are most likely to be successfully developed as PPPs.
- Development of road projects through PPPs is very different from doing it according to the traditional public works model. Since institutions and their staff are used to undertaking road projects as public works, efforts are needed to implement proper working procedures and train the workforce that will be involved in PPPs. In the Mexican program, most of these efforts focused on field personnel working at the Ministry's offices in the states. These professionals had

key roles to perform in supervising work progress but did not become much involved in the preparation of the projects.

- PPP projects are complex and involve identifying, assessing and transferring risks from the public to the private sector. As a consequence, they need to be exhaustively prepared to ensure that a fair and efficient risk transfer is made. A key element of the design process used to develop the PPP models in Mexico was the systematic consultation of key project stakeholders, whose views were decisive to identify well balanced approaches to risk transfer and allocation between the public and the private sector.
- In highway projects to be developed through PPPs, estimating the demand of the new or improved road, and thus its revenue-generating potential, is the most relevant risk associated with the project. As a consequence, it is sound practice to provide good, thorough, quality traffic demand studies to the participants in bidding processes. Even if most of them have their own traffic studies performed, quality information on this subject usually leads to better proposals from the private sector and more value for money for the sponsoring agency.
- In the Mexican experience, another key risk of PPP projects in the highway sector, especially greenfields, consists of ensuring that rights of way will be available in time to construct the new road. This risk is normally associated with social and environmental issues that can compromise the feasibility of a project. For example, in the Irapuato–La Piedad and Querétaro–Irapuato projects presented in section "Public–Private Partnership Models", some adjustments to the scope of the project had to be negotiated with the private concessionaire. This occurred because rights of way needed to construct improvements to elevated passes could not be purchased because of local opposition.
- The public sector is generally subject to restrictions and constraints and normally lacks the institutional capacity to manage PPPs. Therefore, a well though-out outsourcing model is needed to ensure that the necessary technical, legal, and financial skills will be available to structure projects in a way that reflects market conditions. This will be needed to ensure that quality participants will be attracted to them. However, care must be taken to ensure that a proper balance is struck between in-house and outsourced capabilities. No matter how large and qualified the outsourced portion of the preparation of the project, it will always need to be complemented with public officials capable of understanding the project, providing leadership and timely decision-making.
- PPP projects are not for any kind of participant. Given their complexity and requirements, private firms participating in these programs need to show that their capabilities and skills are in line with project requirements. In Mexico, political pressures were felt to let smaller, regional firms participate in the projects. Strict filters were implemented (experience, size, balance sheet, available personnel) to avoid having weak firms participating in the bidding processes and eventually jeopardizing the goals of the project. These kinds of problems have been experienced in concessions granted by states, where preferences for local firms have led to adjudicate concessions to firms who later prove to be incapable of undertaking the project.

- PPP projects have long lifecycles, and both public and private participants need to recognize that they are long-term partners that will be involved in the project for many years. Thus, they need to establish relationships based on mutual trust, respect to contract conditions, and permanent dialogue. Their contractual framework must consider some flexibility to allow the stakeholders to review and adjust their relationships to each other according to evolving conditions over time.
- In order for bidding processes to lead to competitive, efficient, and quality propositions, they need to provide participants with timely and comprehensive information on the project, as well as sufficient time to prepare them. This should include opportunities to engage in structured dialogue with the sponsoring agency. The bidding process that was designed for the FARAC I road package mentioned in section "Public–Private Partnership Models" put emphasis in providing bidders with quality information and sufficient time to prepare their bids. This was instrumental in achieving the highly successful results reported. Although pressures to shorten bidding times and start implementation as soon as possible are commonly felt, they must be resisted in order not to compromise the success of the project.
- Typically, a private participant must spend between half a million to a million USD to prepare a bid for a PPP project in the road sector. Therefore, it is essential that the program and the agency responsible for it are credible, so that bidders perceive that they have a fair chance of winning a contract and that quality participants remain attracted to the program. A key condition to achieve this credibility is that the evaluation of proposals is performed strictly according to the bidding conditions, that it is transparent and that it accepts scrutiny from third parties.
- Finally, given permanently changing market conditions, PPP programs and projects need to be constantly reviewed to ensure that they remain responsive to perceptions and requirements from the various kinds of participants. In Mexico, the onset of the world financial crisis of 2008 forced the sponsoring agency and FONADIN, its financial agent, to explore new financial models and guarantees to ensure that private parties remained interested and willing to participate in concession and long-term contract bids.

Conclusions

In Mexico, federal and state road administrations must satisfy the population's growing highway-related needs in the face of budgetary limitations that will continue to affect public investment levels in infrastructure and transportation. As a consequence, PPPs will continue to play an essential role in mobilizing public and private resources to undertake road projects that would otherwise take much longer to implement.

Mexico's already long experience with PPPs in the highway sector provides multiple cases and lessons of what works and what does not. Since projects developed through PPPs are complex and present many challenges to road administrations, one major conclusion is that they should be carefully selected and prepared as thoroughly as possible and that public contingencies linked to these projects should be identified and narrowed before actually implementing them.

Although the main motivation in Mexico for applying PPPs in roads, and more generally in infrastructure, has been related to the need to increase investment levels by engaging private resources in specific projects, it is likely that over time PPPs will also offer alternative procurement options to achieve other goals, such as improving the availability and quality of public services, resulting in better use of existing infrastructure or ensuring that public assets are managed efficiently and transparently.

Because of such reasons, but also because market conditions are permanently changing and presenting new challenges to PPP programs, it is essential that PPP models and tools are permanently held under review. They must be adjusted to remain competitive and attractive to stakeholders interested in PPPs. In this same context, the federal and state governments must develop institutional capabilities and working procedures that ensure their proper involvement in these programs and its projects. As their name implies, PPPs involve partnerships between the private and public sectors, and both parties need to be able to properly play the role that is expected of each one of them.

During the present federal administration (2018–2024), PPPs are again considered to play a major role in extending and improving the federal road network. As discussed in previous sections, specific efforts will be needed to develop a project portfolio to be implemented through PPPs, to strengthen the institutional capabilities of agencies involved in PPP projects, to train larger numbers of PPP specialists from multiple disciplines, and to keep updating PPPs models to ensure that projects are attractive under prevailing market conditions. Developing PPP projects correctly can help them to achieve a greater contribution to economic development, social welfare, and, ultimately, quality of life.

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PPPs in Colombia: Policy Lessons

Jose Ignacio Nieto-Garcia and Andres Felipe Guzman

Acronyms

4G	Fourth generation
ANI	National Infrastructure Agency of Colombia
BOOT	Build Own Operate Transfer
CAF	Andean Development Corporation, now, Latin America Development Bank
COP	Colombian Pesos
DBFO	Design Built Finance Operate
DBOM	Design Built Operate and Maintain
INVIAS	National Roads Institution of Colombia
km	Kilometer
mi	Miles
MUSD	Millions of US dollars
PPP	Public–Private Partnership
USD	US dollars

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The Public–Private Partnership Contracts for Road Projects in Latin America

During the last decades, Latin American countries have applied the PPP model in road infrastructure construction, operation, and maintenance as a development strategy on a very variable investment context. This evolution has been the result of the government's need to increase state presence and establish commerce and trade routes from a regional to an international market, mainly to the United States and Europe.

That process change has involved significant adjustments along a learning curve in each road infrastructure plan where some countries have adopted a PPP model. Those PPP variations in each country have included the evolution of laws, investment from private companies or the government, risks and management allocation, and external financing characteristics looking for the stability of road projects. Nowadays, Latin America is one of the regions with a significant number of PPP infrastructure projects around the world (Vasallo, 2015).

To reach those infrastructure achievements, Latin American countries have constantly improved their PPP policy and institutional framework. For instance, in the development of laws, Brazil and Chile have led to the creation of specific concessions and contract laws since 1995 and 1996, respectively. More specifically, concerning PPP governmental strategies, the following countries do not have a special unit or committee for planning and managing PPP projects in general: Argentina, Colombia, México, Nicaragua, Panamá, and Dominican Republic. As a result, these needs are covered by some particular functions of agencies and areas related to transportation ministries or their equivalent depending on the country (Berrone et al., 2018).

Regarding the economic scenario, financing and monetary availability strategies in Latin America and the Caribbean have been the result of a combination of the financial backing from multilateral banks, private companies, engineering and construction companies, national and commercial banks, among others. In that backing combination, commercial banks have a participation of 51%, followed by national banks and engineering companies with 14% and 9% approximately (Vassallo, 2018).

Those strategies and financial backing solutions are the results of the challenge of achieving the development of an entire infrastructure plan in a context of difficult conditions, namely monetary savings, high levels of external debts, and investment priorities (Vassallo & Izquierdo, 2010). This scenario and obstacles are the standard conditions in Latin American countries based on the nature of the developing regions, economic growth, and lack of opportunities.

Finally, it is relevant to consider an essential influence in Latin American countries of the PPP model from Spain. Most of the countries have adopted some characteristics and made changes according to their context in the areas of separation between the public and private sectors, competition in the process of contract award, open offering system, and risk transfer related to traffic conditions (Vassallo & Izquierdo, 2010).

The Public–Private Partnership Contract for Road Projects in Colombia

The private participation in the transport sector in Colombia, as in many other countries, has been generally associated with the inability to use their limited resources to carry out projects needed in this sector for the country's development because of demands from other main sectors, that is, healthcare, education, and defense. For this reason, the greater involvement of the private sector through financing transport projects is a turning point in countries such as Colombia to build its transport infrastructure to achieve the best possible results from this type of contract.

In Colombia, this private involvement first started within the railway sector in the nineteenth and twentieth century until the 1960s, and more recently, for the road sector in the 1990s due to the then recently proclaimed economic aperture policy (Nieto-Garcia & Guzman, 2019). Colombia, as well as many other countries in the world, has come a long way applying concession contracts, mainly to deliver road infrastructure for interurban corridors. The experience has been valuable since 1993 because the government has introduced various measures and actions designed to improve the contract through the four different programs developed since then. Most of the measures proposed have been related to changes in risk allocation.

It is important to note that road projects before this economic policy were developed exclusively under public contracts. The economic aperture promoted a potential for international markets to fill in such needs; this boosted the implementation of private participation in this sector. Unfortunately, as mentioned by Sharp (2005), the railway sector at that time was set aside with devastating results (tonnage volume declined from about 1.9 million tons in 1980 to 295,000 tons in 1992). Besides, the public-owned railway company was shut down in 1991 because of the severe financial problems it was facing. As a result, these two situations became the main drivers behind the participation of the private sector.

Then, as mentioned above, most of the monetary resources turned into road programs named generations. Each generation has a timeline directly related with each presidential period and its development plans in terms of connectivity and regional progress. Currently, the Colombian national government is developing the Fourth Public Private Partnership Road Program (4G) with a total investment of COP$53B (around USD14.5 Million) in 2019 and an average total length of 7601 km (4723 miles).

In the process of generations planning and to have a stronger institutional, technical, and legal framework, it was necessary to launch two technical institutions: The Instituto Nacional de Vías (National Roads Institution [INVIAS]) in 1994 and The Agencia Nacional de Infraestructura (National Infrastructure Agency [ANI]) in 2011.

Also, three main laws were proclaimed, they are all related with PPP private investment, scopes, and standards of public contracting: transportation law in 1993, public contracting statute in the same year, and the law of indebtedness in 1995 which allows the government to participate in internal and external indebtedness, among other dispositions. In addition, two more laws, 80 and 105 of 1993, established the conditions to do public contracting, in a more specific manner, the strategies related with investment recovery, and also the guarantees offered to the private sector in terms of investment like the use of tolls as an income mechanism and the minimum income as a protection measure (Vassallo & Izquierdo, 2010).

Five years later, in 1998, a liabilities fund was created as a special account where the contracting part saves resources to cover any risk or eventuality related with the PPP development.

In terms of risk management, a total shift occurred, from a protective government in the first generation around the mid-1990s, where the public party assumed most of the risks on a first attempt of PPP relationship in 1994 (Consejo Nacional de Política Económica y Social, 2013), to a more equitable risk allocation between public and private parties in the third and fourth generation since 2001. In the current model, the public party is responsible of force majeure risks and the private sector is responsible on a high percentage of construction and networks, land expropriation, and revenue based on users' demand.

The next section explains in greater detail each one of the PPP generations in Colombia in terms of number, location, scope, achievements, and failures, among other characteristics regarding the public and private relationship and its learning curve throughout the last three decades.

The First Generation of the PPP Contract for Road Projects in Colombia

The first generation of PPP projects started in 1994 with 11 projects and included the rehabilitation and expansion of 1220 km (758 mi), the construction of 306 km (190 mi) of roads with a total investment of USD830M (Benavides & Fainboim, 2002) and a concession time of approximately 20 years.

This group of concessions was the first that established a PPP model for road development in Colombia, looking for new social and economic benefits supported by a relationship between public and private parties.

In terms of contract processes, the private participant was selected by competitive bidding based on points. Despite government efforts, some projects were declared unsuccessful, and, in those cases, it was necessary to directly select the company or engineering group who would oversee the execution of the project.

The list below contains some of the main issues, situations, and lessons from this first PPP program, which certainly were the foundation for the next generations in terms of financing, licensing, guarantees, contract adjustments, among others (Vassallo & Izquierdo, 2010).

- The government did not have enough experience at the beginning of the first PPP generation and did not do a strong campaign focused on attracting international investors. Additionally, some contracts were launched with the licensing process incomplete, for example, environmental licenses and land purchasing negotiation procedures. This context generated significant cost overruns in most of the projects of this first group of concessions. Overall, user demand was 40% less and construction costs 40% more than expected.

- Some first-generation projects had delays at the beginning of the construction process due to economic difficulties. That situation happened because INVIAS did not evaluate the economic solvency of the concessionaries that won the bids and more time than expected was needed to obtain appropriate financing.
- The first generation was characterized because of the great number of renegotiations, construction delays, cost overruns in land purchasing and construction and numerous guarantee payments. Between 1996 and 2000 INVIAS had to pay a total of USD 44.7 millions in guarantees, in terms of minimum income and cost overruns in construction processes.

Finally, and despite all the issues in some important areas related to the contract process, execution of construction, and others, the first-generation PPP was the main vehicle to reach social and economic development in Colombia. It also represented the starting point to launch the next concession programs in the next presidential governments. That contribution and new knowledge in the PPP model made up in part for the negative monetary effect of the first group of road concession projects in Colombia.

Bogotá-Villavicencio Corridor, First PPP Model

The Bogotá–Villavicencio corridor is in the south east of Colombia and is one of the main routes to connect Colombia with Venezuela, the eastern region of Latin America. The project has a total length of 85.6 km (53.2 mi) crossing some critical geological zones that has forced to build a long sequence of tunnels and viaducts. According to INVIAS, the Bogotá–Villavicencio corridor is the project in Colombia with the highest investment in 30 years, around 2260 M USD (8.5 billion of Colombian Pesos).

The location of the project and its actual context are shown on the map below (Fig. 1).

In terms of contract evolution, the first PPP contract was established in 1994 (concession contract number 444) and then a new contract was created by private initiative in 2015 as a part of the fourth PPP generation.

In the first roadway development, a single origin–destination carriageway with a Design Built Operate and Maintain (DBOM) contract was built in a total term of 192 months. The new contract, also with a DBOM scope, has a total execution time of 30 years.

Table 1 shows the initial risk allocation model applied in contract 444 and first-generation projects. It is a basic risk allocation with a protective background from public to private party. This scenario has been highly criticized, but it was a unique government strategy to create an “attractive” scenario for private investors.

Fig. 1 Location of Bogotá–Villavicencio corridor

Table 1 General risk allocation in first generation of PPP projects

Risk	Party responsible	General description
Construction	Public and private	Private is responsible of more quantities of work needed
Traffic volume	Public and private	Private assures a minimum and maximum vehicle flow
Revenue	Public and user	Private assures a minimum income because of toll rates or evasion
Land expropriation and purchase	Public	Overrun related with land purchase
Environmental and social	Public	Cost overruns and delays in the acquisition of permits
Taxation	Private	Includes taxation abnormal changes
Foreign exchange	Private	Foreign exchange abnormal changes
Force majeure	Public and private	Cost overruns and timeline delays not included in insured events
Financing	Private	Not obtaining the financial closure and changes in market variables related with financing dynamic

Source: Ramírez Muriel (2015) and Galvez (2013)

As a result of this first PPP Project execution, the public party assumed most of the cost overruns with INVIAS. The financial compensation in this case was 27.36% (Ramírez Muriel, 2015).

The Second Generation of the PPP Contract for Road Projects in Colombia

Years later, between 1997 and 1999, the second generation of PPP road projects was launched. This group of corridors had a total length of 389 km (241.7 mi) and a total investment of USD 295 million (CAF & Fedesarrollo, 2015). In this new PPP model, significant changes in terms of risk allocation were made from a protective government to a more equitable designation based on public and private experience, knowledge, and strengths.

The most relevant changes in contrast with the first generation were a better knowledge of traffic and demand, engineering needs, and geological conditions. That group of studies was part of the information needed before the contract process. Also, INVIAS had the environmental license process done before offering the projects to potential investors (Vasallo & Izquierdo, 2010). Those strategies decreased risk perception and the lack of knowledge related with the corridors' investment plan.

As for risk management, the government limited the minimum income guarantee and the construction guarantee established in the first generation was eliminated. In its stead, the term "support" was created as a kind of guarantee figure applied in the areas of income, monetary exchange, and geological risk (Vasallo & Izquierdo, 2010). Income support was the financial backing in the first years of operation and maintenance of the infrastructure. Monetary exchange support was designed to cover the possible impact related with currency devaluation, and geological support was thought in the cases of construction conditions under special geological contexts. It is important to know that a high percentage of the corridors in Colombia are in mountainous topography.

Besides the support strategy planned by the government, private parties had to create a surplus account in the case of force majeure events, with the additional income in cases when users demand was above expected.

Finally, the bidding process did not show significant changes in comparison with the first generation, but two aspects had an important effect in final decision in this new model: expected income and complementary works. Expected income refers to the income coming from toll payment during the operation time of the project, and complementary works describe not only civil constructions but also any additional element or acquisition not included in the contract conditions (Agencia Nacional de Infraestructura, 2020).

The Third Generation of the PPP Contract for Road Projects in Colombia

The third generation of PPP road projects in Colombia was launched between 2001 and 2004. In this group of corridors, The Americas Highway was one of the most important projects to contribute to the connectivity situation of Colombia, Panamá, and Venezuela. In this opportunity, the third generation included a total of 1772 km of roadways and an investment around USD933 million (CAF & Fedesarrollo, 2015).

As for the bidding process, the model applied in the second generation is simplified by just considering the expected income as a variable.

In general terms, the third generation includes changes in risk management, the level of study of the projects, and terms and conditions for land expropriation (Vasallo & Izquierdo, 2010). The next generation of PPP projects will be based on the more equitable model of risk management and allocation of the third generation, considering the faculties and experience of public and private parties in the contract.

The Fourth Generation of the PPP Contract for Road Projects in Colombia

The last concession program or fourth generation (4G) has an execution plan of 30 years and is divided into four phases or corridors subgroups. The first, second, and third group of projects include corridors of public initiatives and the last are private initiatives. Additionally, there are projects in response to the effects of climate events occurred in 2010 and 2011 aiming to mitigate its impact and prevent future similar situations.

The fourth PPP generation corridors are the most ambitious generation in Colombian transportation history with a total investment of COP$53B (around USD14.5 million) in 2019 and an average total length of 7601 km (4723 miles) with 1200 km (745.7 mi) of dual carriageway and a new design conception in the use of tunnels and viaducts.

One of the most relevant reforms in terms of institutional framework was the creation of the National Infrastructure Agency (ANI) in 2011. This Agency not only deals with road PPP projects but also other public private associations in public infrastructure and special projects as requested by the government. In general, ANI leads the phases of planning, coordination, structuring, contracting, execution, management, and assessment of concession projects and other PPP associations (Ministerio de Transporte de Colombia, 2011).

Since this institutional change, INVIAS started to provide technical support to the national paved and unpaved road network which is not under a concession contract with approximately 10,901 km (6773.6 mi) of total length (Subdirección de estudios e innovación INVIAS, 2019).

Mulaló–Loboguerrero Corridor, a New PPP and Risk Management Characteristics

This corridor is in the central western zone of Colombia and was made by a Design Built Finance Operate (DBFO) model. It is part of the fourth-generation projects launched by government and is the unique DBFO road created to improve the connectivity between the center of the country and the Pacific Ocean.

The average total cost of the project is 830 M USD with a total length of 31.8 km of dual carriageway with a design speed of 80 km/h (50 mph) approximately. Nowadays, there are two options to go from Mulaló to Loboguerrero both with an average speed of 50 km/h and lengths of 99 and 61 km (61.5 and 37.9 miles) and a 76% percentage of heavy truck vehicles.

The location of the project and its actual context is presented on the map below (Fig. 2).

Table 2 shows the timeline of the contract process in the design, built, operate, maintain, investment recovery, and project reverse phases.

In most of the cases and through the fourth generations of PPP road projects (since the 90s), road operation and maintenance have been around 20–30 years. At the end of this time, it is usually common for the government to launch a new contract to continue with the PPP contract model in the new corridor phase.

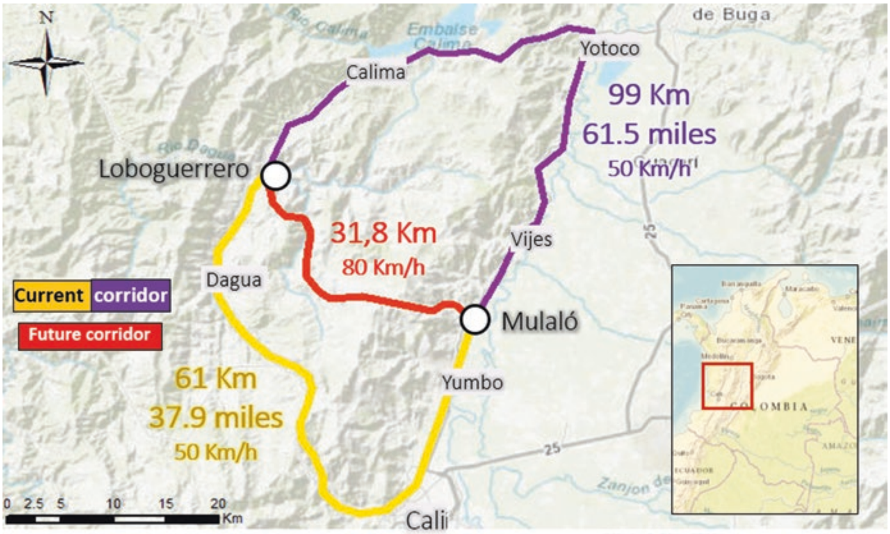

Fig. 2 Location of Mulaló–Loboguerrero corridor

Table 2 Timeline of contracting process, Mulaló–Loboguerrero corridor

Contracting phase	Expected time
Design and preliminaries	18 months
Building process	60 months
Operation and maintenance Investment recovery—Toll system	18–22 years
Project reverse process	180 days

Risk Assignment

Table 3 shows a summary of the risk assignment model applied in fourth generation corridors by the Colombian National Government through the National Infrastructure Agency (ANI). This risk assignment model is the result of the development of

Table 3 Characteristics of renegotiations in Colombia, Chile, and Peru 1993–2010

Risk	General description	Party responsible	Probability and percentage	Impact (activity value/project value)
Land expropriation and purchase	– Land purchase delays – Overruns related with land purchase	Public and private	Medium-high More than 30%	Medium Between 15% and 30%
Environmental and social	– Delays in the acquisition of permits – Overruns in compensations of environmental damage – Additional works after permit acquisition	Public and private	Medium From 15% to 30%	Medium From 15% to 30%
Design	– Overruns in studies development – Overruns because of adjustments in environmental permits – Overruns because of changes or decisions of technical institutions related with the investment plan	Public and private	Medium From 15% to 30%	Low From 0% to 5%
Construction and networks	Networks damage Higher workload needed Prices variation in materials	Public and private	Medium-high Around 30%	Medium From 15% to 30%
Operation and maintenance	More quantities and prices variation in materials needed in operation and maintenance plans	Private	Medium From 15% to 30%	Medium-low From 5% to 15%
Revenue	Low income because of toll rates and evasion	Public and private	Medium-low From 5% to 15%	Medium From 15% to 30%
Financing	Not obtaining the financial closure Changes in market variables related with financing dynamic	Public and private	Medium-low From 5% to 15%	Medium From 15% to 30%
Foreign exchange	Foreign exchange abnormal changes	Private	Medium-high From 15% to 30%	Medium-low From 5% to 15%
Regulatory	Changes in regulatory conditions or government type	Public and private	Medium-high Around 30%	Medium-low From 5% to 15%

(continued)

Table 3 (continued)

Risk	General description	Party responsible	Probability and percentage	Impact (activity value/project value)
Force majeure	Land purchase acquisition Networks damage Risk related with project socialization with communities Delays in the acquisition of permits Insured and not insured events	Public	Medium-high From 15% to 30%	Medium From 15% to 30%

approximately 28 projects in all national corridors development since the first generation until now.

Finally, it is important to notice that the current risk allocation model used in fourth PPP road program assigns risks in terms of capabilities and experience in the different phases, especially in design, construction, maintenance, and operation. This is the one of the most important lessons and evolution from a protective to a more equitable model where the government used to assume most risks, overlooking private responsibilities in each situation, trying to create a more engaging investment context.

Renegotiation Context of PPP Contracts in Colombia

During the first three PPP generations, there has been a constant renegotiation situation and a very significant number of contracting changes. It has been very common to have contract additions, scope changes, and contracting adjustments in terms of time and budget. Those changes have been the result of the analysis to identify new needs in the corridors and the possibility to cover them with the concessionary group in charge of the road project. Nevertheless, it has been also an evidence of a poor project preparation and management, including studies that did not allow the access to the real dimension of the infrastructure projects (Guasch et al., 2014).

In the case of the current PPP generation (4G), the scope of the projects is, at a first glance, appropriate enough to cover all the current and future needs from 20 to 30 years. In fact, an opposite scenario has existed in some cases where the project's scope has been questioned because of the dimension of its objectives in terms of number of lanes, design speed, technical characteristics, and others.

Specifically, between 1993 and 2010, Colombia did seven times the number of renegotiations done in countries like Chile or Peru. This context supposes an important fiscal impact and a reduction of the value for money of the PPP project estimated on the basis of the original contract characteristics (Guasch et al., 2014).

Table 4 shows a summary of the renegotiation situation of Colombia on a comparative scenario with Chile and Peru in the years between 1993 and 2010 (Table 5).

Finally, it is important to notice that in Latin America, there is a very common renegotiation context in PPP road infrastructure management. Nevertheless, there are significant differences in the fiscal cost and number of renegotiations in the case of Colombia, when compared with Chile and Peru, which is the most critical variable. On the other hand, the three cases present similar renegotiations conditions in terms of the way it is done (unilateral or bilateral), the time when it is made (during construction), and the strategy to cover the payment by increasing concession terms, among others.

Table 4 Renegotiation in Colombia, Chile, and Peru 1993–2010

Aspect	Country		
	Chile	Colombia	Peru
Renegotiated road concessions	18	21	11
Total number of renegotiations	60	403	44
Mean number of renegotiations per concession	3.3	19.2	4.6
Mean fiscal cost of renegotiations (constant USD Dec 2009, million)	54.8	262.5	28.9
Mean added term (years)	0.9	6.30	0.8
Mean added length (km)	0	54.6	0

Table 5 Characteristics of renegotiations in Colombia, Chile, and Peru 1993–2010

Aspect	Percentage by country		
	Chile	Colombia	Peru
Renegotiations made by bilateral agreement	83	98	100
Arbitration needed	17	2	0
Renegotiation made during construction	53	51	62
Renegotiation made after construction	47	49	38
Changes because of complementary works	69	39	17
Changes because of new contract conditions	22	55	83
Paid by present fiscal transfer	66	42	14
Paid by deferred fiscal funds	55	6	0
Paid by other costs realized later	36	28	39
Payment by fiscal transfer	66	48	20
Payment increasing concession term	12	12	14
Payment increasing toll fee	24	1	0
Payment by other types	16	0	0
Payment without direct costs	15	45	77

Source: Guasch, J. L., Benitez, D., Portables, I., & Flor, L. (2014). The renegotiation of PPP contracts: An overview of its recent evolution in Latin America. International Transport Forum, 28

Summary and Conclusions: Policy Lessons

PPP Contributions in Developing Countries

In the specific case of Colombia, the PPP contract model has been the main vehicle to reach development goals and infrastructure plans during the last decades. Since the early 1990s, the government has developed around 30 high-importance corridors, in the economic and social context, which would not have been possible without a PPP model. Nonetheless, it has not been enough, and the last corridors generation was launched to reach even more goals and development plans.

Without a doubt, PPP contracting model is the correct way to reach infrastructure plans in developing countries. In most of the cases, developing countries realities are difficult in terms of financial capacity and the association with private sector starts a relationship of mutualism. Those benefits are so significant, that in most of cases, when the project reverse phase starts, the government decides to extend the contract and change the contract scope to guarantee the corridors' operation and maintenance.

Finally, it is important to consider that users' perception is not always positive because of toll costs. Therefore, the government performs a complete socialization process to change this point of view in terms of accessibility and transportation costs benefits. Despite that, users expect that the public party could offer a toll subsidy with a direct effect on the reduction of toll fees. In the case of Colombia, this is not available, and users must pay the entire toll fee.

Best Practices in Road Infrastructure Planning: Accessibility and Territorial Cohesion Benefits

In some Latin-American countries, it is common to find some technical institutions decisions influenced by governmental interests and this relationship does not always leads to develop projects in a correct way.

In this situation, it is important to understand how engineering and economic issues could help the government to better understand the impact of corridors investment and planning. Based on experience, accessibility and territorial cohesion are two of the main concepts to reach a well-done comparison between the current and future scenario of an investment plan. Those two concepts integrate users' benefits and regional impacts of infrastructure with a direct relationship with the social and economic scenario. Then, accessibility and territorial cohesion should be the main goal in infrastructure investment plans in Latin American countries.

If it is necessary to quantify in more detail the investment impact, we recommend analyzing and quantifying the spillover effects of the corridor or group of corridors planned.

Experiences in PPP Type and Project Scope

In a developing country where the infrastructure context is based on building new corridors and transportation facilities, the most common PPP modalities are Build Own Operate Transfer (BOOT) and Design Built Finance Operate (DBFO). Then, at the end of the concession time, it is common to move onto operate and maintenance contract. Those modalities are in fact government strategies to ensure that the infrastructure lasts over the course of the years.

In the case of Colombia, those two modalities have been implemented in the current PPP road programs, and the government has reached the expected results in terms of infrastructure and regions development.

Learning Process in Risk Distribution

In the specific case of Colombia, risk assignment has shifted from a protective to a balanced risk distribution. In the early 1990s, the public party assumed most of the risks on a paternalistic model at the beginning of PPP contract plans in corridors development. This paternalistic model was launched to show foreign investors an attractive investment context. As years passed, the government had to address the consequences in terms of cost overruns in most of the project phases, timeline delays, change of contract terms, among others.

Then, based on experiences from first and second PPP generation, third program roads established a new model based on a more equitable risk distribution. The latter was done to allocate the risk to the direct responsible of the specific aspect, for example, in the case of land purchase, the government assumes most of the risk, and in the case of design, materials, and others, the private party is in charge of this specific aspect in the project development. In each one of the risk types, each party is directly related with the practices or aspects of its expertise. This model is nowadays the basis of PPP road planning not only in road corridors but also in other infrastructure projects like airports, railways, and fluvial and sea ports.

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Public–Private Partnerships in Roads Sector: A Study of Two Urban Road Projects in India

Ramakrishna Nallathiga

Acronyms

AMC	Ahmedabad Municipal Corporation
AUDA	Ahmedabad Urban Development Authority
BOOT	Build, Own, Operate, and Toll/Transfer
BOT	Build, Own and Toll/Transfer
BRTS	Bus Rapid Transit System
DP	Development Plan
DPR	Detailed Project Report
EPC	Engineering, Procurement, and Construction
FDI	Foreign Direct Investment
GHMC	Greater Hyderabad Municipal Corporation
GoAP	Government of Andhra Pradesh
GoI	Government of India
HGCL	Hyderabad Growth Corridor Limited
HMA	Hyderabad Metropolitan Area
HMDA	Hyderabad Metropolitan Development Authority
JICA	Japan International Cooperation Agency
JV	Joint Venture
LAA	Land Acquisition Act
MCA	Model Concession Agreement
MRTS	Mass Rapid Transit System
NH	National Highway

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NHAI	National Highways Authority of India
NHDP	National Highways Development Programme
NORR	Nehru Outer Ring Road
PDF	Project Development Fund
PPP	Public–Private Partnership
QA	Quality Assurance
QC	Quality Control
R&R	Rehabilitation & Resettlement
RoW	Right of Way
SEZ	Special Economic Zone
SH	State Highway
SLNC	State Level Nodal Committee
SPPR	Sardar Patel Ring Road
SPRRIL	Sardar Patel Ring Road Infrastructure Limited
SPV	Special Purpose Vehicle
TOT	Toll, Operate, and Transfer
TPS	Town Planning Scheme
VFM	Value For Money
VGF	Viability Gap Fund
WPI	Wholesale Price Index

Currency Unit

$ 1 (US dollar) ₹ 65 (Indian Rupee)

Introduction

India has a road network of 4.7 million km, which is the second most extensive road network in the world (Sahni, 2015). It comprises three broad segments—National Highways, State Highways, and other roads (which are further categorized into Major District Roads, Rural Roads, and Urban Roads). Highways are an important segment of the road sector because of their greater share of passenger and freight transport (which is as much as 40% of the total). For a long time, India's highway network was growing steadily; it picked up the momentum in the early 2000s after (1) the establishment of the National Highways Authority of India (NHAI) in 1997, and (2) the commencement of the National Highway Development Programme (NHDP) in 2001. The NHAI was established as a nodal agency through the NHAI Act, 1988 to oversee the development as well as maintenance of all national highways—existing as well as newly planned—through the NHDP. The NHDP aimed at expanding the country's road network systematically in different time phases. While the Phases I and II were completed many years ago, the Phases III to VII are under different implementation stages. The development of urban ring roads and by-passes near urban areas was included in Phase VII.

Roads (including highways) were built for many years with the public money (both Central and State funds); public departments and agencies (of both Central and State governments) used the conventional method of executing construction work through either lump sum or item rate or similar contracts while following tendering and bidding processes. However, besides being subject to political interference, collusion, and corruption, this arrangement gave limited results in terms of the output (the quality and quantity of road network) and outcomes (without time delays and cost escalations) due to the inefficiencies and susceptibilities of the public sector; it was also fraught with several operational and budgetary issues. The opening up of roadway development, operation, and maintenance to the private sector began under the NHDP. While the NHDP Phases I and II were publicly financed through fuel cess[1] and federal grants, and were executed using traditional Engineering, Procurement and Construction (EPC) contracting for highway development, the subsequent phases were proposed to be undertaken with the private sector participation in the form of Public–Private Partnership (PPP). Box 1 shows the incentives provided to private developers by the Government of India (GoI) in order to make road development attractive to them, thereby augment the funds flow into the sector.

Box 1: Incentives to Private Sector

- Declaration of road as an industry and allowing 100% Foreign Direct Investment (FDI).
- Government of India (GoI) to carry out all preparatory work including land acquisition and utility removal; Right of Way (RoW) to be made available to concessionaires free from all encumbrances.
- NHAI / GoI to provide capital grant up to 40% of project cost to enhance project viability on a case by case basis.
- 100% tax exemption to contracting firms for 5 years and 30% relief for next 5 years, which may be availed as a block in 20 years.
- Longer concession period allowed up to 30 years.
- Dispute settlement under the Arbitration and Conciliation Act 1996, which is based on the UN Commission on International Trade Law (UNCITRAL) arbitration rules.
- Duty free import of specified modern high capacity equipment for highway construction.

[1] Fuel cess is mobilized through the levy of a fixed charge on every unit of fuel consumption (petrol and diesel) in the country that is raised at the time of fuel sale at the outlets.

Besides giving incentives, the GoI adopted various implementation models based on the PPP to accelerate the private sector participation in roads/highway development. In fact, PPPs became an important means of investment inflows and project execution across all major economic sectors after the GoI formulated a National PPP Policy in 2001. Further, a slew of measures were also taken to attract the private sector players to participate in roads/highway development, viz. (Nallathiga & Shah, 2014):

Viability Gap Funding (VGF) for Highway development projects.

Model Concession Agreement (MCA) for Small and Large Road Projects.

Project Development Fund (PDF) for meeting the expenses of Detailed Project Report (DPR) preparation.

PPP Advisory Committee for the Project Scrutiny and Clearance.

Subsidies and Grants for Special Projects/Purposes.

Public–Private Partnership (PPP)

The technical definition of the PPP is as follows (World Bank, 2004):

> Public Private Partnership (PPP) is an arrangement through a legally binding contract or some other mechanism to develop, implement, operate and maintain infrastructure services/assets with the involvement of private sector in the provision of services/functions, which were hitherto provided by a public agency.

This collaboration or partnership is built upon the appropriate allocation of—Resources, Risks, Responsibilities, and Rewards (ESCAP, 2009). PPP is expected to be developed/built upon the respective strengths of both public and private sectors (Mishra et al., 2013). Therefore, under PPP, the responsibilities for design, finance, build, operation, and maintenance are transferred to private sector, which is either paid a unitary payment for creating infrastructure facilities or assigned the concession to collect charges from the users (Yescombe, 2007). Some other advantages of the PPPs include better project structure and design, better project screening, better technology choice, competitive procurement, better service delivery, and better project closure. The PPPs are also seen as "Value For Money (VFM)" proposition, i.e., they result in the creation of better infrastructure asset (in terms of technical quality and service durability), rather than mere "Cost-cutting Mechanism" (3i Network, 2004). In fact, the VFM analysis is now built into project identification and feasibility analysis in a good number of PPP projects.

PPP has become an instrument for leveraging the private sector advantages with that of the public sector, so that the infrastructure development takes place at a faster pace than the conventional methods of project execution through construction work contracting. A variety of partnership arrangements are possible between the public and private partners, ranging from modified conventional contracts to concessions. Accordingly, a spectrum of the PPP models has emerged, which vary in terms of: (a) the Ownership of Capital Assets, (b) the Responsibility of Investment, (c) the

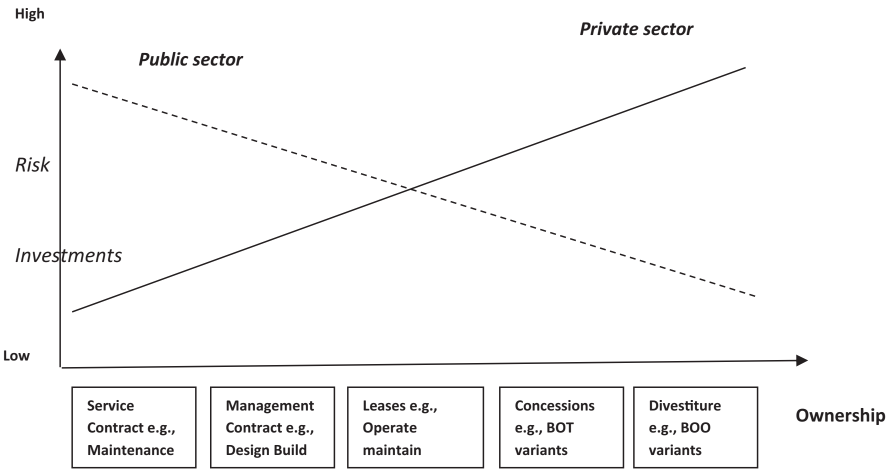

Fig. 1 Spectrum of PPP arrangements. Source: Based on World Bank (2004)

Assumption of Risks, and (d) the Duration of Contract. Figure 1 shows the spectrum of PPPs and their variance in terms of the degree of risk as well as investment inflows. At the lower end of the spectrum is the service contracts, which involve very limited role played by the private partner to execute a development or maintenance project with the given design, specifications, and details in a very short time period. The management contracts will have in-built incentives to private sector players to execute a development or maintenance project in terms of either rewards for better performance or punitive measures for poor performance, e.g., performance bonus/deduction for achieving project closure before/after the set time frame. Management contracts are of short duration with the project assets owned by the public partner. Leases are medium-term arrangement that gives partial ownership rights of the project assets with some degree of flexibility to the private sector in the infrastructure asset development and maintenance. Concessions provide complete ownership rights to the private sector partner during concession period and offer full flexibility of execution in the design and development of infrastructure assets. They are also of relatively long duration contractual arrangements and involve making other institutional arrangements, e.g., monitoring and regulation, for ensuring the delivery of desired infrastructure assets and services. Divestiture involves the full private ownership of infrastructure assets and services and a limited role played by the public sector in the form of service regulation or ensuring compliance with the operational standards.

Table 1 PPP models in road development sector

PPP type	PPP model	Ownership	Investments	Risk	Duration (years)
Modified Service Contracts	Works/Maintenance Contracts (including EPC/ Turnkey)	Public	Public	Public	1–2
	Management Contracts	Public	Public	Public	3–5
Leases/ Affermages	Operate and Maintain Contracts	Private	Public	Public/ private	8–15
	Affermage	Private	Public	Public/ private	8–15
Concessions	Build Operate and Transfer (BOT) (Toll/ Annuity)	Private	Private/ public	Private	20–30
	Design, Build, Operate, Maintain, and Transfer (DBOT)	Private	Private	Private	20–30
	Hybrid Models (Combination of Toll, Annuity, Loan, and Grant)	Private	Private/ public	Private	20–30

Source: Adapted based on Mishra et al. (2013)

PPPs in Roads/Highway Development

Table 1 shows the major PPP models that have been used for road/highway development in India. These PPP models that fall under the broader set of PPP arrangements (or types) described above are distinguished in the table in terms of their features on some of the major parameters, viz. ownership of infrastructure project assets, investment responsibility, risk undertaken, and the duration of project contract.

Although a PPP framework was prepared as early as in 1997, the impetus to its adoption came in after the National PPP Policy, 2001. The inherent contractual advantage of the concessions has prompted the Government to adopt the policy to develop roads/highways exclusively on the Build, Operate, and Transfer (BOT) basis.[2] Essentially, the earlier model based on the upfront development financing was sought to be replaced by a revenue model based on the toll fee collections/annuity payments to finance road development, operation, and maintenance under the BOT model. Much of the private sector participation in road development has been coming forth in India under the BOT model with the variants of: (1) BOT—Toll model, (2) BOT—Annuity model, (3) BOT—Hybrid model (Nallathiga & Shah, 2014).

While the BOT—Toll model involves no payments made to the concessionaire but only the award of toll rights, the BOT—Annuity model involves annual

[2] There is a revival of Engineering, Procurement, and Construction (EPC) model, a modified contracts type of PPP, in the recent times with the loss of attraction and appetite for BOT models.

payments to be made by the public agency to the concessionaire while reserving the toll rights with it. BOT—Hybrid model was initially started to have both toll and annuity built-in, so that the annuity payment works as a means of compensating the operating revenue shortfall (due to the difference between projected/forecast traffic and actual/realized traffic). However, the BOT hybrid model has taken different dimensions in practice—such as:

- BOT (toll/annuity and grant) in order to meet upfront construction costs
- BOT (toll/annuity and loan) in order to provide access to low cost borrowing
- BOT (toll/annuity and periodic payment) in order to meet with periodic capital costs

These models were developed so as to reduce the overall costs of PPP projects and to aid the concessionaire to focus on infrastructure project execution, i.e., highway/roadway asset development and/or its maintenance.

Experience of PPP Projects

The application of PPPs in developing countries like India began in the mid-1990s, in line with the Liberalization, Privatization, and Globalization (LPG) movement, but it gained importance after the 2000s,when the policy framework for the PPPs was laid down and supporting legal and institutional arrangements were made (Nair & Kumar, 2006). PPPs are utilized across a wide range of infrastructure projects in several countries and the experience of them also varies widely. It has been found that some of the major bottlenecks to PPP projects at the State and local level are at institutional, organizational, and project levels in India (Mahalingam, 2013). Further, private sector response/responsiveness to the projects also matters.

It is now widely held that the PPP is way forward for developing infrastructure services, including for highway/roadway development, given that the public funds are not readily available in proportion/matching to their investment requirements in India (Nallathiga & Shah, 2014; Nair & Kumar, 2006). Although the PPPs leverage private sector strengths so as to execute the infrastructure projects efficiently and effectively, it is also argued that the PPPs may on-load private sector engagement costs (procurement, monitoring, and contract enforcement costs) as well as finance costs (due to borrowing from debt market) to the development projects, thereby jeopardizing their adoption (Harris & Tadimalla, 2008). Conflicts could also arise in the PPP projects due to the differences in the orientation and focus of public and private sectors (Datta, 2009). Moreover, general risks associated with project completion/closure extend to PPP projects as well.[3]

[3] There are several risks associated with the PPP projects, which are categorized into (a) internal or contractual risks, (b) external or non-contractual risks. It is this larger set of risks that makes the PPP projects vulnerable to cancelations or stalling or failure (Kalidindi & Thomas, 2002).

The success of PPP projects depends upon a variety of factors related to the host government (political/ governance systems) to economic conditions to legal and financial framework to the occurrence of natural disaster events (Mahalingam, 2010). Devkar and Laishram (2015) find that institutional capacity and governance issues can also hinder the progress of highway/ road projects in India. It is reported that the road infrastructure projects are complex and feature both time and cost overruns (Agale et al., 2015). It is also held by some that the PPP projects are good at keeping tabs on time but not costs (Rajan et al., 2014). In India, several road sector projects suffer from the delays in project completion and cost escalation, to which urban road projects may not be an exception (Nallathiga & Shah, 2014).

Project success/failure has been a matter of concern when it comes to PPP projects in the road development sector in India, e.g., Mahalingam (2010), but it has not been examined in the context of urban roads. The recent research suggests that the PPP road projects, when compared to the traditional road development projects executed by the Government, tend to have relatively shorter time delays and higher cost overruns but the quality of assets developed tends to be superior (Ram Singh, 2018). The project success/failure is traditionally viewed from the dimensions of cost, time, and quality (which form the three nodes of "iron triangle" of project success/failure), and they continue to be important means of measuring project success/ failure.

Risks tend to be higher in PPP projects, due to the presence of (1) contractual risks (risks related to project completion), (2) non-contractual risks (risks related to project external environment) (Kalidindi and Thomas, 2002), the project success/ failure can not only be studied in terms of cost, time and quality, but it is also important to view it in terms of whether the PPP projects have delivered/ achieved their targets in terms of infrastructure asset development and rendered concomitant services. It is also important to note that for any PPP project to become success, it has to be well thought of (or strategically positioned), planned (or phased and detailed), and implemented (or contracted and coordinated). Therefore, the PPP project success can be assessed in terms of strategic positioning, planning, financing, implementation, and delivery besides cost-time-quality metrics. This chapter is an attempt in that direction that uses the "time-cost metrics framework" but extends it to some other dimensions mentioned above, with reference to select urban road projects in India. We have chosen urban ring roads, as they did not receive much attention; much of the literature is concerned with national and state highway PPP projects.

PPPs in Urban Road Development

Background

As India has become increasingly urbanized in the last few decades, large cities began to receive disproportionately more population than small and medium cities (Kundu, 2006). The urban population share of large cities is rising and so also is the rise in demand for infrastructure in these cities to support population and to give a boost to their economic development. The availability of good and efficient transportation infrastructure is essential for the movement of people and economic goods in a city, which requires the creation, operation and maintenance of urban road infrastructure (MGI, 2010). Good city-wide transportation infrastructure also fosters trade and other linkages of the city with its hinterland/region, thereby promotes its development as well.

An important phenomenon associated with urbanization in large Indian cities is that much of it is happening in the sub-urban and peripheral areas, which are growing more rapidly than the central cities (Sivaramakrishnan & Kundu, 2007). It is because the central city (or urban core) is already very dense in terms of population and vehicular traffic, therefore not able to accommodate the incoming population. The peripheral areas (or fringe areas) are a natural choice for the incoming population as they are closer to their home town/village in the region. Further, the various socio-economic and trade ties between urban core and peripheral areas lead to the demand for transportation between them as well as across/along the peripheral areas. Under such circumstances, urban ring roads provide physical connectivity and support the development and operation of various transportation services on them.

In India, urban roads are developed and maintained by the urban local governments as well as the para-statal agencies i.e., municipal bodies and urban development authorities, but not enough concerted efforts are made to perform this function. There are several reasons for it (Nallathiga, 2007): they may lack a strategic vision and action plan of city development; they award projects with a short-term approach to meet the annual budget spending levels; there is interference (political and other) in all aspects of urban road development—from awarding contracts to fund releases/disbursements. The development of some road segments, e.g., arterial roads, highway bypasses, expressways, and ring roads, will give a major facelift to some of the large Indian cities like Mumbai, Delhi, Chennai, Bangalore, Kolkata, Pune, Ahmedabad, and Hyderabad.

Peripheral/Ring Roads

A ring road (or, orbital motorway, beltway, peripheral highway, or loop highway) is a road that encircles a city so as to streamline the inner-city traffic flow through better circulation and connectivity between various nodes (Road Traffic Technology, 2013). Ring roads are an important means of achieving transport connectivity and higher traffic movement (with better vehicle speeds), which, thereby, reduce the environmental impacts such as traffic congestion, air, and noise pollution. They also offer hinterland connectivity and divert the highway traffic that passes through the city. Given the multiple benefits of such ring road projects, it is imperative for Indian cities to develop them rather than wait for addressing chaotic transport and traffic conditions after land development and traffic growth. Chinese cities are known for developing several such annular/peripheral ring roads (or belt roads) in order to meet with the development and environment challenges. Indian cities also began to undertake the development of ring roads—some cities have begun early while others are catching up.

However, in order to be effective, the ring road projects have to be planned well ahead of time/requirement, and they should be completed in accordance with plans/schedules, so that the project costs are minimized and project benefits are achieved early. Most of the Indian cities have authorities for urban development and management, which develop ring roads according to their master plans and timelines therein. The development of ring road as a project, however, requires many skills/capacities apart from administering/supervising development works. This includes abilities to conceptualizing project and its activities, raising capital for development, deploying technology, scheduling project activities, coordinating with other public authorities, supervising project implementation, adhering to timelines and costs, achieving quality and specifications, and so on. Undertaking such a variety of tasks may exert pressure on the planning/development authorities and may give rise to the risk of project not becoming successful. Therefore, partnering with the private sector may lead to better chances of project success than otherwise. Whether this can be achieved in practice is left to empirics.

Current Study of Urban Road Projects

Given the above background, this chapter attempts to examine whether PPPs are successful in the case of infrastructure projects such as urban ring roads. The development of urban ring roads is a recent phenomenon in India, and there are few initiatives taken toward them. Most of the literature on PPPs in roads in the Indian context is concerned with highways and large road development projects and scant attention is paid to urban road projects; further, there have not been any studies that make a comparative analysis[4] of road projects. An attempt is made in this chapter to perform a case-comparative analysis of two major urban ring road projects in the cities of Ahmedabad and Hyderabad, which are located in different parts of the country—Western and Southern India, respectively.

Ahmedabad is a major city of the Gujarat State; the administrative capital of the State—Gandhi Nagar—is located very proximate to it. It is well connected by road, rail, and air transport to the various parts of country; it is also connected to the Kandla sea port located on the west coast. Ahmedabad city had a population of 5,577,940 according to the Census (2011); its metropolitan area was even more populous at 6,361,084 according to the same source. The annual population growth of the city was 3.46% during 2001–2011, which is much higher than the country's urban population growth rate of 2.76% per annum during the above period. Much of the population growth happened in the sub-urban and fringe areas, like that in several other Indian cities. Gujarat is one of the lead States of the country in terms of economic growth, which is primarily driven by the industrial manufacturing and trade sectors. It sought to improve the infrastructure of Ahmedabad to attract investments from domestic and foreign investors in order to give a further boost to the State's economic growth.

Hyderabad is the capital city of newly formed Telangana State in 2014; prior to that, it had been the capital city of Andhra Pradesh State. It is also well connected to different parts of the country by road, rail, and air transport. Hyderabad is the largest city in the State with a population of 6,371,790 according to the Census (2011); its metropolitan area is much bigger with a population of 7,674,689 according to the same source. The annual population growth of Hyderabad city was 2.95% during 2001–2011, which is also higher than the country's urban population growth but less than that of Ahmedabad city. Much of the population growth happened in the sub-urban and fringe areas, like that in several other Indian cities. Telangana State, though recently formed, has been showing promise in terms of the economic growth with a strong political push for it. It has been promoting Hyderabad city as the hub of service sector (led by Information Technology and Entertainment) while also giving a thrust to pharma and bio-tech industries. The State is also keen to promote Hyderabad as an attractor to the investors and, therefore, strengthening the infrastructure of the city.

The next two sections provide, sequentially, a narrative description of the case study ring road projects, based on the secondary information available from multiple sources, which is followed by a comparative analysis, before drawing conclusions from the case projects.

[4] A comparative analysis involves comparing similar subjects, i.e., projects, areas, and economies. Comparative analysis is attempted recently in infrastructure sector as well, e.g., Shaikh and Narain (2011).

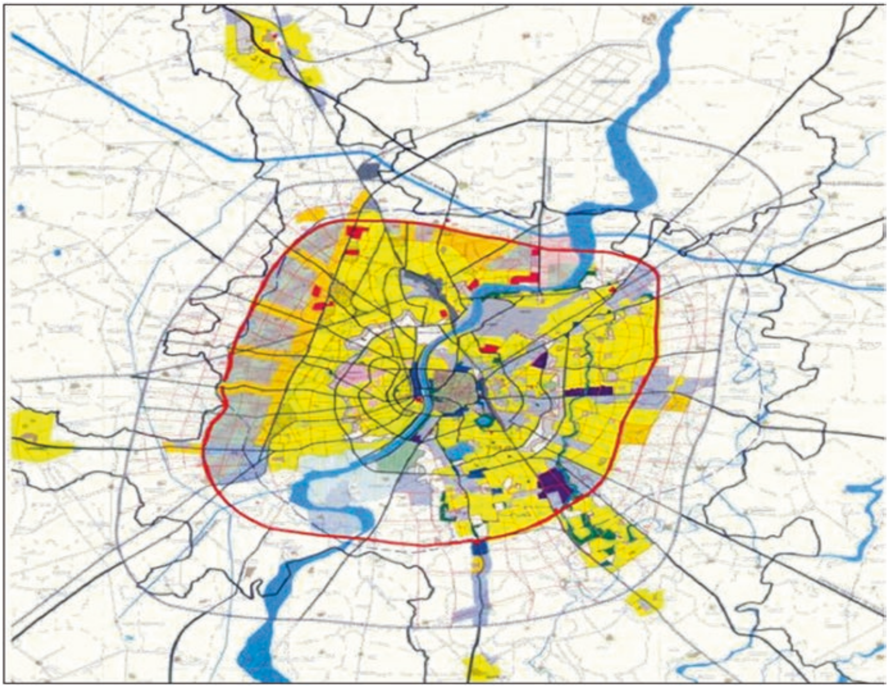

Fig. 2 Location and alignment of SP Ring Road, Ahmedabad. Source: AUDA

Case Project 1: Sardar Patel Ring Road, Ahmedabad

Introduction

The Sardar Patel Ring Road (SPRR) was conceptualized in the revised Development Plan (DP), 2011, prepared by the Ahmedabad Urban Development Authority (AUDA). It was planned with a long-term vision, while considering the current road network and the spatial structure of Ahmedabad city. However, the AUDA took up implementing the ring road project even before the sanction of DP (UMC, 2007). Accordingly, the SPRR was planned to be built around the developing areas of Ahmedabad to strengthen the existing road network with better traffic circulation. It encircles the boundary of Ahmedabad Municipal Corporation (AMC)[5] while containing its jurisdiction and an additional 64 sq. km of urbanizable land as proposed under the revised DP (UMC, 2007). The proposed ring road would provide good road infrastructure support to the growing sub-urban areas of Ahmedabad. Figure 2

[5] Whereas AMC is the local government responsible for urban services within the city, the AUDA is an urban authority whose jurisdiction falls outside AMC limits and extends into the larger region. The jurisdiction of AMC is spread over 409.39 sq. km and that of the AUDA covers 1866.53 sq. km area outside AMC limits.

Table 2 Links and road stretches of the SPRR

Link	Description of SPRR Stretch	Length (km)
1	Rajkot Highway Junction (NH-8A) to Vadodara Highway Junction (NH-8)	14.106
2	Vadodara Highway Junction (NH-8) to Himatnagar Highway junction (NH-8)	25.518
3	Gandhinagar Highway Junction (NH-8C) to Rajkot Highway Junction (NH-8A)	22.862
4	Himatnagar Highway junction (NH-8) to Gandhinagar Highway Junction (NH-8C)	13.827

Source: Ballaney and Patel (2009)

shows the location as well as the alignment of SPRR on city region map, which is indicated in thick red color with contained area in it. There is also another regional ring road shown on the map in the form of gray color alignment, which is proposed to be undertaken in future. Further, there are 19 major roads radiating from the city of various categories either connecting or crossing the ring road.

The ring road alignment was made so as to contain the proposed development and expansion of Ahmedabad city over a larger area. The SPRR is an arterial road, facilitating traffic movement within the city through dispersal and providing easy access to and from the city outskirts. It would also facilitate through traffic moving to the city from north and south, thereby reducing congestion on western and eastern bypass roads. The 60 m wide SPRR project was conceptualized with the objectives of: (1) reducing traffic congestion on peripheral roads; (2) segregating regional and urban traffic; (3) increasing the connectivity of city with the region; (4) guiding the development and expansion of city in a larger region (UMC, 2007). The SPPR encompasses an area of about 400 sq. km which includes most of the developed as well as developing areas. It measures about 76.313 km in length, and the entire length of the ring road is divided into four major links as shown in Table 2.

Strategic Importance of the SPRR

The SPRR has a strategic importance, as it integrates land use planning with the road network and other infrastructure facilities. It is considered to be an important project for improving the functional efficiency and for achieving a steady growth of urban as well as metropolitan areas of Ahmedabad. It acts as an effective mechanism for reducing the economic and environmental costs of traffic congestion in the city. It also acts as a catalyst for the economic development of AUDA area and surrounding villages. An important advantage of the ring road is that it helps to divert regional traffic, which earlier passed through the city. The ring road connects the NH 8, 8A and 8C, State highways, and other important roads connecting Ahmedabad. The SPRR was also planned as a four-lane divided road with facilities like an exclusive bus lane for the Bus Rapid Transit System (BRTS), service road, footpath, utilities, and plantations on either sides (UMC, 2007). The proposed radial roads will further help in traffic and population dispersal to the peripheral areas close to the ring road, thereby reducing the congestion in central/core city.

Project Development Phasing

The SPRR project implementation is planned in two major phases and an extended phase.

- *Phase I* includes the development of a two-lane road on the entire length of ring road and four-lane road on some stretches. It also included earthwork for four lane configuration. This phase of was planned to be completed within 2 years.
- *Phase II* envisaged the development of a four-lane road by widening the existing two lane road. This phase was to be completed in a year and half from the date of award.
- *Phase III* is an extended phase that includes providing facilities like access control, service roads, exclusive bus lane for Bus Rapid Transit System (BRTS), bicycle-way and walkways, and junction infrastructure (flyovers and underpasses) at major junctions crossing national highway, state highway, major district roads, and important roads.

Project Implementation Structure

The Phase I of the SPRR was proposed to be developed by the AUDA with its own funds. Conventional construction work contracts were awarded to the contractors for the roadway construction under the Engineering, Procurement, and Construction (EPC) model. The EPC contractors were selected through the tendering and bidding process, and the project work progress was supervised by the AUDA itself. The construction work of two-lane ring road started in 2001, and many parts of it became operational after 2003; the entire ring road development was completed in 2006.

The Phase II of the SPRR was conceived as a PPP project to be implemented on BOT–Toll model. It was awarded to the private partner M/s Sadbhav Engineering Ltd., who was selected through national competitive bidding, which involved two-stage selection based on the technical and financial scores of the participant firms. The AUDA (concessioning authority) entered into a 20-year concession contract with the above private partner (concessionaire) for developing the four-lane ring road under the design, procure, construct, operate, and maintain type of arrangement of the BOT model; the concessionaire was given the toll rights of roadway and also the advertisement charges levy rights that compensate it for the project costs. This project phase was to be completed by February 2008, but it was completed by March 2009. Figure 3 shows the implementation structure of this project phase.

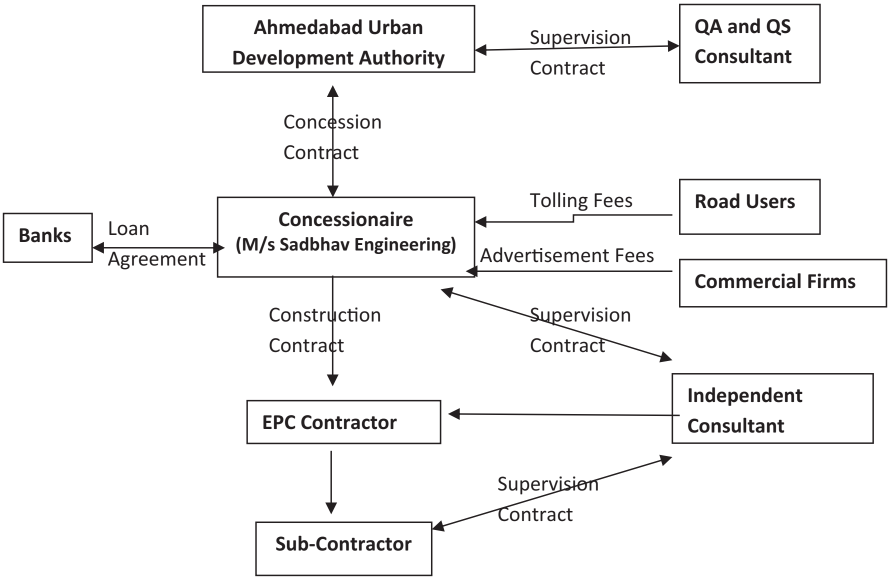

Fig. 3 BOT structure of Phase II of SPRR project. Source: UMC (2007)

The Sardar Patel Ring Road Infrastructure Limited (SPRRIL) was established as a Special Purpose Vehicle (SPV) to implement the project phase II. This project SPV led by the concessionaire would undertake road development. The project also envisaged private sector participation during various stages of project cycle—pre-feasibility studies, feasibility, planning, design, construction, and monitoring. The development of ring road was divided into small packages of about 3–10 km road length and was awarded to different construction contractors on EPC basis who implemented it simultaneously. It is claimed that the ring road project was completed in 3 years, though the envisaged time period was a year and half. The delay was primarily due to the time taken for acquiring land and handing over for construction.

Project Cost and Financing

Phase I was estimated to cost Rs 2.3 billion ($35.38 mn), which equals to Rs 15.07 million ($231,850) per km lane of roadway. The AUDA contributed Rs 1.3 billion ($20 mn) from its own funds and obtained Rs 1 billion ($15.38 mn) loan from a consortium of six banks. This loan amount was to be repaid by using the toll fees collected on ring road, which was estimated at Rs 120 million ($1.85 mn) per annum (UMC, 2007).

Phase II was estimated to cost Rs 4.59 billion ($70.615 mn), which equals to Rs 31.3 million ($481,602) per km lane of roadway; it was 20% more than the initial estimate of Rs 3.78 billion ($58.15 mn) (UMC, 2007). As the project could not obtain grant support from the Viability Gap Fund (VGF) of the GoI (2006), the AUDA agreed to pay a grant of Rs 360 million ($5.54 mn) to the concessionaire over a 2-year period. However, the AUDA would receive compensation of Rs 2.3 billion ($35.38 mn) from the concessionaire for surrendering toll rights on existing two-lane road asset, which was developed under the Phase I (UMC, 2007). The concessionaire was awarded toll rights, and advertisement charges levy rights for 20 years. The toll fees/charges were laid down as under the NHAI Act 1997.[6]

Land Acquisition for the Project

Given the size of the SPRR project, timely land acquisition posed a big challenge. The AUDA resorted to land acquisition primarily through the Town Planning Schemes (TPS), together with a limited amount of it in conventional mode, for ensuring speedy project execution. While the conventional land acquisition involves cash compensation payment to losing land owners, the TPS mechanism does not involve any such payment to land owners. TPS involves declaring the area adjoining ring road as planned project area, into which the plots of land owners are amalgamated and the area for ring road and other infrastructure is allocated, and remaining land is allocated to land owners by preparing an area development plan (Nallathiga, 2009). The land owners get developed land (with infrastructure services) as near as possible to their original location and in proportion to the surrendered land (in value terms)[7] (Ballaney & Patel, 2009). It is a participatory process involving citizen consultation in the scheme preparation and takes time. The TPS mechanism has been crucial in acquiring land for the ring road project, and it has been successfully built into land development and project financing mechanism (UMC, 2007).

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[6] The National Highways Fee (Determination of Rates and Collection) Rules, 2008, later replaced the NHAI Act, which specify the base rate of fee in terms of Rs per km length of road way for different categories of vehicles—light vehicles (car, jeep, van), light commercial vehicle, bus or truck, heavy vehicles or multi-axle load vehicles, and over-sized vehicles. It also gives a formula for revising the rate or fee to current level by using the WPI.

[7] For example, suppose a 60-acre TPS that covers a stretch of ring road and adjoining areas has 10 land owners with an equal holding area, i.e., 6 acres. Let the value of each land holding before TPS is Rs 2 mn per acre or Rs 12 million per each holding. If the ring road stretches over 5 acres of land, then the remaining area of holdings reduces to 5.5 acres per holding. But, with the land price rising by 9% after construction of roadway, the value of the holdings will rise to Rs 2.18 mn per acre and total value remains unchanged at Rs 12 million even after a reduction in the total land holding by each land owner. Loss of land is compensated by gain in land value due to the creation of an infrastructure asset like road way.

Case Project 2: Nehru Outer Ring Road, Hyderabad

Introduction

The Nehru Outer Ring Road (NORR) was proposed by the State government in a bid to improve the infrastructure in the capital city of Hyderabad. It was planned by the Hyderabad Metropolitan Development Authority (HMDA), which is a State government para-statal formed for the development of Hyderabad Metropolitan Area (HMA),[8] so as to decongest the traffic flow on the existing major arterial roads. It is also viewed as a 'Growth Corridor' with an aim of achieving the spatial growth/development of the metropolitan region through demographic concentration and the expansion of economic activities (industries, services, and logistical hubs) by making use of improved transport connectivity and traffic circulation. Some of the salient features of the NORR project include (HMDA, 2012):

- The road corridor was designed as fully access controlled eight-lane expressway with two-lane service roads on both sides (the link road connecting NORR is of six lanes).
- The Right of Way (RoW) of 150 m (however, it is 125 m in Phase-I) with the main expressway covering about 66 m and the balance for ramps at interchanges, service roads wherever necessary, utility ducts, rail corridor, etc.
- No at-grade intersections and the provision of suitable interchanges like cloverleaf, diamond type for National and State Highways, and other important urban roads.

The NORR is a road-cum-area development project aiming at the development of well-planned and well-connected urban settlements in the HMA. It connects the peripheral areas with central city and also connects the State and National Highways so that the highway traffic bypasses the central city. Further, 33 radial roads were proposed to be developed to augment traffic circulation by connecting the city to the NORR (Road Traffic Technology, 2013). Figure 4 shows the location and alignment of NORR on metropolitan region map shown in pink color.

Strategic Importance

The NORR is a strategically important urban infrastructure project. Therefore, its experience will serve as a guide for the successful completion of other upcoming urban infrastructure projects. The NORR brings in the following advantages to the HMA (HMDA, 2012):

[8] While HMA is the metropolitan area governed by the HMDA, the central city of Hyderabad is governed by the Greater Hyderabad Municipal Corporation (GHMC).

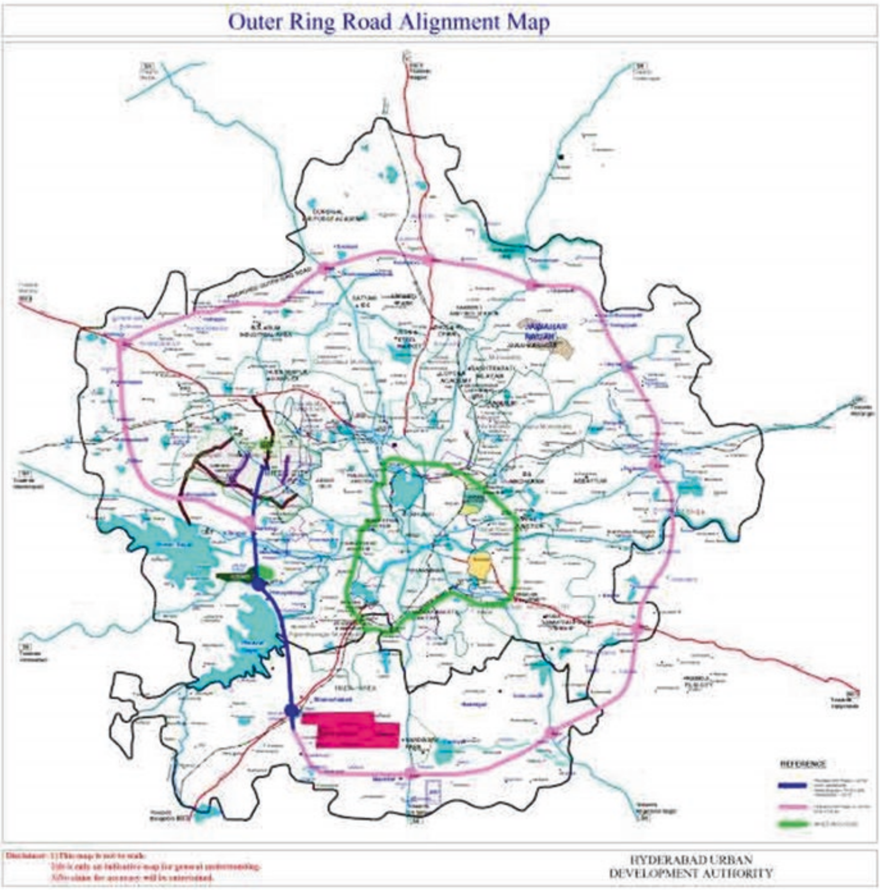

Fig. 4 Location and alignment of NORR. Source: HMDA (2012)

- De-congests metropolitan area and inner ring road traffic
- Provides infrastructure to meet future traffic demand
- Provides orbital linkage to radial arterial roads
- Leads to the development of satellite townships
- Provides linkage to the proposed Mass Rapid Transit System (MRTS)
- Provides faster access to the International Airport
- Connects urban nodes like Hi-tech city, Games village, Indian Institute of Information Technology, Indian School of Business, Hardware Park, Singapore Township, and Financial district
- Develops linkages with Special Economic Zones (SEZs), industrial and service hubs

Table 3 NORR Project costs and finance

Development phase	Road length (km)	Road stretch	Mode of development
Phase I			
Component 1	11.00	Gachibowli–APPA junction	Construction/EPC contract
Component 2	13.38	APPA junction–Shamshabad	Construction/EPC contract
Phase II			
Phase II A	67.3	Narsingi–Patancheru and Shamshabad–Pedda Amberpet	BOT-annuity
Phase II B	71.3	Patancheru–Pedda Amberpet	EPC contracts

Source: GoAP (2012)

Project Development Phasing

The NORR Project was proposed to be developed in two major Phases (Road Traffic Technology, 2013):

- *Phase I* covers 24 km road stretch between Gachibowli Junction and Shamshabad NH-7 Junction. It was to be developed within 2 years from project award date—March 2006.
- *Phase II* covers the remaining 137 km in peripheral areas of Hyderabad. It was further sub-divided into Phase II-A and II-B, given the long length of roadway to be built. The Phase II A and B were planned to be completed in 2010 and 2012, respectively.

Table 3 shows the road stretches, lengths, and development model in the development phases.[9]

Project Implementation Structure

The HMDA established the Hyderabad Growth Corridor Limited (HGCL) as a Special Purpose Vehicle (SPV) for implementing the NORR project. The construction of Phase I of the NORR project was split into two packages and two different contractors were awarded turnkey/ EPC contracts, after their selection through international competitive bidding. Such competitive procurement has ensured that the NORR construction work would have world class construction quality. The four lanes of Phase I were developed and opened for traffic in November 2008 and the remaining four lanes were also completed and opened for traffic in July 2010. The

[9] The NORR project also envisaged the development of 33 Radial Ring roads in 4/6/8 lanes (including the widening of some existing roads) during both the phases.

Table 4 NORR Project implementation model and contract award

Project phase	Implementation model	Contract amount	Road length (km)	EPC contractors
Phase I	Construction/EPC contracts	Rs 5.61 billion ($86.31 mn)	24.38	M/s Corporation Transstroy OJSC, Russia M/s Continental Engineering Corporation, Taiwan
Phase II-A	Concession contracts (BOT-annuity)	Rs 24.39 billion ($375.23 mn)	62.3	M/s HRRPL (M/s Induni Era JV) M/s CEL (M/s Maytas Infra) M/ EHE Ltd. (M/s KMC Constructions) M/s HEL (M/s Gayatri Projects Ltd) M/s REHRRL (M./s Ramky&Eslamex JV)
Phase II-B	Joint venture (EPC)	Rs 35.58 billion ($547.38 mn)	75.3	M/s Somdatt Builders—Ramky JV M/s Gayatri Projects Ltd. M/s KNR-GVR JV M/s United Gulf Construction Co. M/s Nagarjuna Construction Ltd.

Source: GoAP (2012)

development of PVNR Expressway, which connects Hyderabad city to the international airport, was also completed in this phase as a radial road project and opened for traffic in October 2009.

The Phase II of the NORR was proposed to be developed under PPP. As the road length and associated construction costs were large, the contracts were awarded in multiple packages to different firms while keeping in mind their work appetite and also to promote competition. Table 4 shows the project implementation details during both development phases. Table 5 shows the details of contract packages of road construction works.

- Phase II-A was developed under the BOT—Annuity model while reserving toll rights with the HMDA. The private partners were selected through national competitive bidding. They were awarded 15-year concession contract, which includes an estimated construction period of 30 months. More than one firm was allowed to participate as Joint Venture (JV). Under the BOT Annuity model, the concessionaires would receive semi-annual payments from HMDA as compensation for road construction. The construction work on five different ring road stretches was divided into contract packages and awarded to five different concessionaires, who in turn used the EPC contractors to get the development work executed.
- Phase II-B was to be developed through EPC model while forming Joint Venture (JV) with private partners, who were selected through national competitive

Table 5 Details of contract packages under the NORR development phases

Contract package	Road stretch	Road length (km)	Amount/cost
Phase I (contracts were signed in March 2006)			
Package-1	Gachibowli–APPA junction	11	Rs 2.22 billion ($34.15 mn)
Package-2	APPA junction–Shamshabad	13.38	Rs 3.39 billion ($52.15 mn)
Phase II-A (contracts were signed in December 2007)			
AP-1	Narsingi–Kollur	12	Rs 3.00 billion ($46.15 mn)
AP-2	Kollur–Patancheru	11.7	Rs 4.03 billion ($62 mn)
AP-3	Pedda Amberpet–Bonguluru	12	Rs 3.88 billion ($59.7 mn)
AP-4	Bonguluru–Tukkuguda	12	Rs 3.60 billion ($55.38 mn)
AP-5	Tukkuguda–Shamirpet	12.63	Rs 3.325 billion ($51.15 mn)
Phase II-B (contracts awarded in June 2009 for Part I and May 2010 for Part II)			
JP-I/CP-1	Patancheru–Mallampur	11.3	Rs 3.24 billion ($49.85 mn)
JP-I/CP-2	Mallampur–Dindigul	11	Rs 3.24 billion ($49.85 mn)
JP-I/CP-3	Dindigul–Shamirpet	15.7	Rs 5.764 billion ($88.7 mn)
JP-II/CP-1	Shamirpet–Keesara	10.3	Rs 1.95 billion ($30 mn)
JP-II/CP-2	Keesara–Ghatkesar	11	Rs 3.48 billion ($53.5 mn)
JP-II/CP-3	Ghatkesar–Pedda Amberpet	12	Rs 3.00 billion ($46.15 mn)

Source: Based on GoAP (2012)

bidding. More than one firm was allowed to participate by forming a JV. The road construction work under Phase II-B was also divided into six contract packages and awarded to five different private partners as EPC contracts of 30 months duration.

NB: Firms in brackets are the EPC contracts and outside the brackets are concessionaires.

It can be seen that the construction cost of the Phase I was Rs 28.763 million (or $442,513) per km lane of roadway. The construction costs of a km lane roadway under Phase II A and II B are Rs 48.936 million (or $752,871) and Rs 59.064 million (or $908,673), respectively. The completion of Phase II took longer time due to problems encountered in land acquisition and utility shifting as well as obtaining clearances from concerning authorities. Some road stretches were opened for traffic from 2012 onwards, but the complete construction was achieved only by 2016. Figure 5 shows the BOT structure of Phase II development.

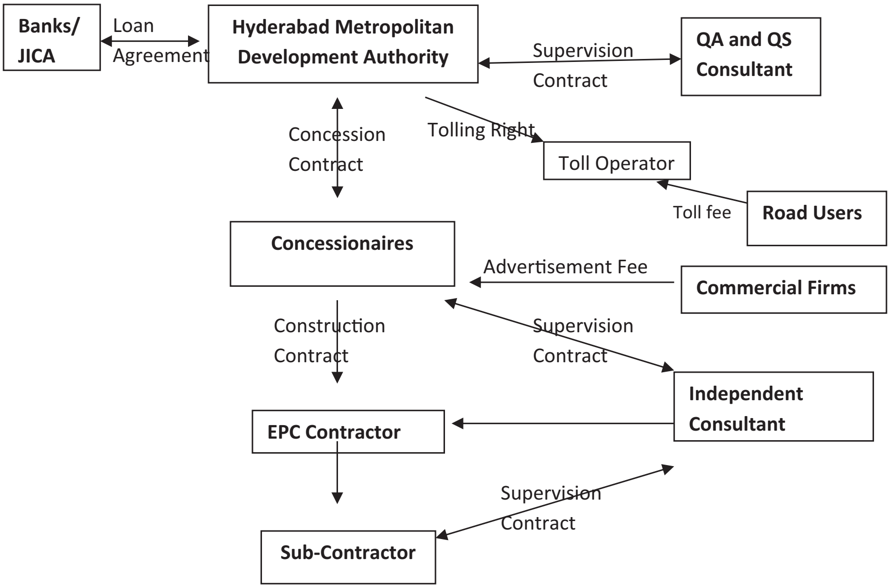

Fig. 5 BOT structure of Phase II of NORR project. Source: Author

Table 6 NORR Project costs and finance

Development phase	Estimated cost	Mode of finance	Remarks
Phase I (including PVNR expressway)	Rs 5 billion[a] ($76.92 mn)	Long Term Loan from the Consortium of Five National Banks	Land bank of HMDA was mortgaged to the Consortium to raise loan
Phase II (including 3 radial roads)	Rs 25 billion ($384. 61 mn)	Development Assistance from Japan International Cooperation Agency (JICA)	Development Credit agreement signed between GoAP and JICA
33 Radial roads development (including 3 roads of phase II)	Rs 7.5 billion ($115.34 mn)	Own funds of HMDA	Proposed to be taken up with own funds and other scheme funds

Source: Road Traffic Technology (2013)
[a]Excluding the cost of PVNR express, which was estimated at Rs 6 billion

Project Costs and Finance

The initial cost estimates of the NORR project Phases I and II were pegged at Rs 5 billion ($76.92 mn) and Rs 25 billion ($384.61 mn), respectively, but they were subsequently revised to Rs 5.61 billion ($86.31 mn) and Rs 45 billion ($692.31 mn) in 2010. The cost estimates were further revised for Phase II at Rs 60 billion

($923.1 mn).[10] The NORR project met funds crunch during the Phase I that led to the deferral of radial ring roads component; it got a lifeline in the form of development assistance/credit from the Japan International Cooperation Agency (JICA) in 2008. JICA funds were utilized for completing the remaining works under the Phase II. Seven radial roads were developed during the Phase II using JICA loan; but, due to the paucity of funds with the HMDA, most of them await development under other infrastructure development schemes. Table 6 shows the NORR project costs and financing model.

The financing of Phase I development was done through loan obtained from a consortium of five banks with the land bank of HMDA as security/collateral. As the Phase II development was envisaged under BOT-Annuity (hybrid model), the HMDA made grant payment to during construction period (paid in four installments); subsequently, annuity payments (of 25 installments) were also made to the concessionaires (GoAP, 2012). The HMDA retained toll rights as the means of cost recovery. It proposed the levy and collection of toll tax/fee on the NORR as well as the PVNR expressway (radial road built under Phase II), but it was not approved by the State Government. The realization of inevitable levy of toll tax/fee came much later, when there was no money left with the HMDA for making loan repayments to the Banks and the JICA. The levy and collection of toll tax/fee on PVNR expressway was cleared by the State Government in 2010 (ToI, 2010). It also finally allowed the HMDA to levy and collect toll tax on the NORR (Indian Express, 2015). Recently, the toll rights were awarded to a private toll operator on Toll, Operate, and Transfer (TOT) model. The toll operator, who was procured through competitive bidding, collects toll tax/fee from the road users and makes annual payments to the HMDA as a part of the revenue sharing agreement.

Land Acquisition and Compensation

An important aspect of the NORR project is the land acquisition for road development and a gigantic project like the NORR faced a great challenge on this front. A total amount of 5142 acres of land covering 83 villages was required for the NORR. Out of this, 912 acres of Government land could be to be transferred to the HMDA for road development, leaving behind the acquisition of 5142 acres from private land owners. Conventional land acquisition involving monetary compensation payment to land owners was envisaged in the project. The normal provisions of the Land Acquisition Act, 1894, were being observed for determining the compensation amounts. Compensation was to be paid to land owners with a clear title. For

[10] The final cost estimates were pegged at Rs 6.99 billion ($107.54 mn) and Rs 67 billion ($1030.77 mn) for Phase I and Phase II, respectively (GoAP, 2012).

Table 7 Comparison of the urban ring road projects

Project parameter	SPRR project, Ahmedabad	NORR project, Hyderabad
Conceptualization	This project was conceptualized ahead of the time when it would be required. The opportunity of Master plan revision was well utilized to conceive the project. However, the project may not fulfill future traffic requirements due to the capacity constraint of ring road, as it is a two-lane road converted into four-lane road	This project was conceptualized at a time when the city growth was set to take-off. The ring road project was conceived of as an opportunity for providing connectivity between various nodes and to boost economic growth. The road project has built a huge traffic capacity, but the utilization of it is low
Strategic positioning	This ring road project is seen as a solution to traffic problems and also aids the development of mass urban transportation systems. The linking of project with the BRTS augurs well for both roadway capacity and transport system. Regional linkages of the city are also expected to strengthen with it	This ring road project is seen as a growth driver for various sectors. Its linkages with SEZs, manufacturing and service hubs, and airport are to be seen from this perspective. A master plan is planned for the growth corridor to propel the development of various industries, service enterprises, and townships
Development components	This project was developed in two phases; both these phases covered the entire road length but of different road width. A third phase was proposed to develop the mass transportation system (BRTS) on it and to provide connectivity to the ring road through radial roads along other road facilities, e.g., service roads, pavement shoulders	This project was also developed in two phases with each of them covering different road length but of uniform road width. A third phase was proposed to develop the radial roads that provide connectivity and improve traffic circulation. An Intelligent Transport System was proposed to be developed for better traffic surveillance and control
Land acquisition	Much of the land was acquired through innovative TPS mechanism along with conventional land acquisition for a smaller part of the road stretch. The land acquisition for this project was speedier (though some delays in consultation) and led to huge cost savings	Much of the land acquisition was done in conventional mode but with a better compensation payment and R&R. land acquisition for the project had hit a lot of bumpy rides that led to project delays and cost overruns. Legal disputes on land also hampered project progress
Partnering with private sector	This project envisaged private sector participation in Phase II through the BOT Toll model of PPP. It was able to develop the project largely within some time and cost overruns. Private sector funds with toll rights relieved public investments. Private sector expertise was well tapped, and partnering with citizens was also achieved in this project	This project also envisaged private sector partnership in Phase II by adopting BOT—Annuity and EPC models. It was, however, neither able to achieve timely completion nor adhere to the costs. But, as it received interest from international construction firms, the project led to the development of world-class expressway

(continued)

Table 7 (continued)

Project parameter	SPRR project, Ahmedabad	NORR project, Hyderabad
Role of the authority	The AUDA played an active role of project conceiver, interested partner, and overseer of ring road development. In particular, it worked on land acquisition in consultation with the project affected people in TPS-based land acquisition. Therefore, the project did not lead to any financial or other troubles to the AUDA	The HMDA played the role of project conceiver, developer, and administrator. It was able to create a database system for managing land acquisition and R&R. However, it has not dealt with land acquisition and legal disputes effectively. Also, a lot of political interference and limited own financial resources affected the outcomes
Project completion time	The completion of phase I of the project (under conventional contracts) was delayed by 3 years, while phase II took 3 years for it as against envisaged time period of 1.5 years. Time delays were lower during the phase II which involved the PPP	The completion of phase I of the project (under conventional contracts) was delayed by over 1 year while phase II A & B were completed in 4 and 6 years as against envisaged time period of 1.5 years. Time delays were higher during phase II which involved the PPP
Project completion costs$	The cost of Phase I road construction through EPC contracts was Rs 25.848 million per km lane, whereas the Phase II road construction using BOT cost rose to Rs 44.194 million per km lane. Roadway construction using PPP was expensive	The cost of Phase I road construction through EPC contracts was Rs 37.069 million per km lane, whereas it rose to Rs 63.072 million per km lane in Phase II A (BOT) and Rs 76.125 million per km lane in Phase II B (EPC). Roadway construction using PPP was again expensive
Project cost controls	The project has achieved fair cost controls through concession contracts (under BOT Toll model) and by limiting land acquisition using TPS. The AUDA has actually benefited from the re-payment of Phase I expenses by the project concessionaire	The project could not keep tab on project costs. Cost overruns are due to delays from land disputes, litigation, political interference, and protests against land acquisition. The HMDA ran out of money and had to approach an international donor (JICA) for mobilizing funds

$N.B.: The construction costs are revised to 2016 price levels after adjusting for inflation using data of Wholesale Price Index (WPI)

those who lost houses, the rehabilitation measures were worked out based on the Resettlement & Rehabilitation (R&R) Policy, 2005[11] (GoAP, 2005).

The land acquisition, however, did not follow a smooth path. Initially, some influential land owners were even able to force the HMDA to make changes to road alignment such that their land would not be lost to acquisition. Land owners also protested initially against the acquisition of their land and subsequently against compensation award. The matter was raised to the State Government, which formed

[11] In fact, the Land acquisition and Rehabilitation & Resettlement Bill, 2013, came much later, but it is comprehensive in coverage in terms of the assessment of compensation and R&R.

a State Level Nodal Committee (SLNC) for fixing the award of compensation. The SLNC raised the compensation to land owners across all stretches of land ranging from 40% to 100%. The HMDA formed a separate cell (or unit) for land acquisition and developed a data base of land parcels to be acquired for better record keeping and raised the compensation to be paid. Land acquisition picked up much thereafter, but the acquisition costs have gone up substantially.

Comparison of Ring Road Projects

Having discussed the features of the two major urban ring road projects in India, we now make a comparison of them in Table 7 on project performance under several parameters.

Conclusions

This chapter began with an exposition that the PPPs are becoming a way forward for infrastructure development (particularly, roads/highway infrastructure), and it was proposed to examine it through a case-comparison of two urban ring road projects in India. Both the ring road projects of Ahmedabad and Hyderabad cities have a common feature—their strategic role in terms of traffic dispersal, improving connectivity and promoting regional development. Both of them were conceptualized well ahead of time/requirement by the respective public authorities of the States. Both the projects were also planned to be implemented in development phases. Based on the implementation experience, the AUDA appears to have exhibited a better execution skill/competence when compared to the HMDA, which mattered in the success of SPRR.

The Phase I of both ring road projects was somewhat similar—they were small (in terms of road way length) and executed using conventional works contracts through EPC under traditional procurement method. The roadway construction costs per km lane under Phase I of both the projects are lower, but both of them suffered from delays in completion and also experienced some cost overruns. The Phase II of the ring road projects was implemented under PPP but using different BOT models; they met with different experience. Both the projects had a higher amount of road construction costs per km lane under Phase II (involving BOT) than that of the Phase I (involving EPC contracts). So, cost overruns and time delays are more in the case of PPP projects than the conventional projects, as they involve several risks; it also confirms similar results obtained by Ram Singh (2018) using cross-sectional data. Though delayed, the SRRP Phase II was a reasonable success due to its adoption of BOT (Toll) model, which shifted the financing risk to private partner, and well administered land acquisition further helped. On the contrary, the NORR project Phase II was packaged complexly with the BOT (Annuity) and EPC models, which was not suitable given the multiple annuity/ capital payments to be made to the concessionaires/contractors without any secure revenue from the road asset in the form of toll tax/fees; land acquisition process met with difficulties that resulted in delays and cost overruns.

The comparative study of both the PPP ring road projects implies that the PPP is appropriate model for executing large infrastructure projects, but the choice of appropriate PPP model is important when it comes to successful execution. For successful completion of PPP projects, the public authorities (apart from private partners) also require skills/capacity and resources, which confirms Devkar and Laishram (2015). Road infrastructure development may be more expensive under PPP projects rather than conventional projects; but the quality of road infrastructure asset that gets built under them tends to be superior (due to competitive procurement), thereby justifying such PPP projects on "Value For Money (VFM)" grounds. Therefore, the VFM analysis has to be done carefully for such road development projects. Further, the time delays and cost overruns in the PPP projects also indicate that there are larger risks that operate in such projects and the public authorities as well as the private players have to be wary of them in the future. The public policy makers need to consider some of these experiences while planning and implementing such projects.

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Lessons from Indian National Highway Public–Private Partnerships

Nagesha Gopalakrishniah

Acronyms

BOT	Build operate transfer
CAG	Comptroller and Auditor General of India
DBFOT	Design build finance operate transfer
EPC	Engineering and procurement contract
GOI	Government of India
Hybrid PPPs	Blend of PPP with annuity
NHAI	National Highway Authority of India
NHs	National highways
PPP	Public–private partnerships
SHs	State highways
TOT	Toll operate transfer
VFM	Value for money
VGF	Viability gap funding

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Introduction

India has four types of road networks of which the national highways (NHs) act as a vital link in connecting the country's people. The ministry of transportation and National Highway Authority of India are responsible for the construction of NHs. Here, it is important to note that the increasing supply–demand gap existing across various infrastructure services, including roads, has become a major problem the world over. This huge infrastructure demand–supply mismatch could be attributed to the limited financial and other resources available with the respective governments. Further, the mismatch between supply and demand is rapidly expanding due to an escalating demand for such services. As a way of addressing this issue, the entire world, including India, has started raising funds from the private sector through the adoption of the Public–Private Partnership (PPP) model. The private sector alone cannot fund infrastructure development, including roads, directly due to several factors such as financial requirements, the public good nature of the road sector, long delays involved in receiving revenue, and the socially viable and economically unviable nature of some projects. Therefore, India has adopted PPPs as an effective way of addressing this infrastructure gap in the needs of the National Highway Program. Prior to the economic reforms in the 1990s, infrastructure services, including NHs, were funded through government finances. The present paper attempts to trace the empirical path of India's NH growth including PPPs along with the factors behind the success of NH PPPs in India. The performance of NH PPPs and non-PPPs is also analysed as well as issues to be addressed for further development of NHs and the latest developments in NH PPPs in India.

History of NH PPPs in India

To address the unmet needs of road infrastructure, The Government of India, in the nineth Five-Year Plan (1997–2002), for the first time in the history of India, gave its highest priority to infrastructure development. Road infrastructure has been funded by the World Bank coupled with local funds through the central road fund, which is executed through additional fees (cess) on petroleum fuels. For the first time in India, roads are receiving additional funds through users' tolls. Programs such as golden quadrilaterals, North-South and East-West corridors and a phased manner of developing roads are being planned to connect the length and breadth of India through various models of PPPs, primarily, Service Contract Management, Build Operate Transfer (BOT) (Annuity[1]), BOT (Toll), Build Own Operate Transfer (BOOT), Design Build Finance Operate Transfer (DBFOT), Hybrid PPPs (a blend of toll with capital grant), Toll Operate Transfer (TOT).

[1] Annuity is a assured annual or bi-annual fixed payment to the private developers by NHAI or GOI.

In the initial stages (late 1990s and early 2000s) of NH PPPs, 'service contract management' type of PPP was used. Under these projects, the government built selected stretches of NH roads and contracts with the private sector for service operation and maintenance and for the collection of tolls. Later, the Government adopted 'BOT annuity PPP model' for constructing, maintaining, and operating NH stretches through private developers. The private developers were paid an annuity, which is an effective tool in protecting the assured revenue, where this will insulate the private operator from insufficient traffic and other risks. In the third phase or maturity phase (late 2000s), a BOT Toll model of PPP was used, under which, huge roads were built. These roads were exclusively funded by private developers from domestic and international sources and obtained the best global private sector expertise. In the fourth phase (from early 2010s), a DBFOT model, Negative Viability Gap Funding (VGF) model, was adopted for creating National Highways from 2016 onwards; hybrid PPPs were planned. Hybrid PPPs are a blend of toll and annuity with VGF. During the Covid-19 period, the government adopted financing the public sector for developing NHs through hybrid Annuity BOT PPPs. Recently, the government has called for bids to develop NH roads through PPPs. With a view to attracting negative VGF or premium[2] to the government through developers for a few selected stretches.

NH PPPs Success Story

Now India has the largest road network in the world. PPPs have helped achieve the construction and managing of more than one hundred thousand (100,000) kilometres of NHs. There are many factors behind the success of India's National Highways during the last two decades. The present study is intended to explain these factors briefly.

Policy Initiatives

From 1996 onwards, Indian Government has introduced many policies towards creating a congenial environment for infra sector development using PPPs. These policies are listed in the following Box 1.

[2] In the high traffic NH stretches, private developers will promise to pay one-time capital grant to National Highway Authority of India (Government of India) for selecting them to build and operate the respective NH highway.

Box 1 briefly explains that India in a very short span of time has built world-class infrastructure in telecommunication, airports, ports, and NHs, attributed to its many reforms from the late 1980s onwards. This chapter focuses on national highways.

Box 1 Vital Policy for Infrastructure Development Through PPPs

1996 – Rakesh Mohan committee on infrastructure Financing

1997-2002 – 9th Five year plan - exclusively focussed on infrastructure-private sector participation through PPPs

Committee on Infrastructure (COI) - August 2004

Cabinet Committee on Infrastructure (CCI) – July 2009

To address the construction time and cost overruns – all NHAI's from phase III started development through BOT PPPs

2005 -Public Private Partnership Approval Committee (PPPAC)

2006- VGF- Viability Gap funding (VGF)

Empowered Institution (EI) / Empowered committee – To approve VGF

2006- India Infrastructure Finance Corporation Limited (IIFCL) - for innovative, cost effective methods of financing infrastructure projects.

Public Private Partnership (3Ps) Institute proposed in the 2014 union budget for promoting PPPs in the county by the Finance Ministry, GoI.

Vijay Kelkar committee to revisit and revitalise the infra PPPs (May 2015)

Source: GOI (2013) and Nagesha (2015)

Box 2 briefly discusses the measures adopted by Government of India (GOI) for the promotion of private sector investment in NHs.

Box 2 GOI Measures for Promotion of Private Sector Investment in National Highways

- Road sector declared as an industry to facilitate borrowings on easy terms and to permit issuance of bonds.
- Monopoly Restrictive Trade Practices (MRTP) provisions relaxed to enable the entry of large firms into the highway sector.
- National highway act amended to enable levy of a fee on national highways, bridges, and tunnels.
- Private sector participation including foreign investment sought in the development of stretches of national highways and the construction of expressways on BOT basis for a period of 30 years.
- For the smooth flow of traffic, sales tax and entry tax (octroi) barriers not to be established in the expressways and the normal checks by the authorities to be conducted at entry and exit points only.
- Land acquisition and removal of utilities to be done by the government.
- Foreign direct investment up to 100% (with a total foreign equity up to Rs. 1500 crores) allowed.
- Government/National Highway Authority of India (NHAI) authorised to provide capital grant up to 40% of the project cost to make the project economically viable.
- Five-year corporate tax holiday and deduction of 30% on profits for the purpose of tax in the next 5 years, to be availed of in 20 years of commissioning of the project.
- External commercial borrowing up to 35% of the project cost permitted.
- Import duties on identified modern high capacity road construction equipment removed.
- Specialised equipment allowed to be imported free of custom duty.
- Government to permit activities like development of housing as an integral part of BOT road projects within a maximum period of 3 years and to be treated as investment in infrastructure for tax benefits.
- Various Model concession agreements for NH PPP projects of National Highway Development Project (NHDP) have been developed to assist a hassle-free take off of the projects.

Source: GOI (2013) and Nagesha (2015)

Viability Gap Funding (VGF) and Premium (Negative VGF) Projects

The Government of India developed the VGF model in 2006 for financing the socially desirable but economically unviable infrastructure PPP projects across sectors in general. The VGF policy is aimed at providing capital of up to 40% of the total project cost (which includes 20% by the Ministry of Finance, GOI, and an additional 20% by the respective ministry or agency). National highway projects through the PPP mode have increased significantly due to this VGF policy. Infrastructure projects under the VGF scheme are eligible only if the projects are socially necessary. This means there will be huge benefits to the public due to the development of a respective Greenfield or Brownfield NH project, which are financially unviable. Financial or economical unviability refers to the projects where the expected lifetime revenue (toll and other services) of the respective project does not match the overall cost of the projects; the costs are much higher than the lifetime revenue of the projects. Many of the NH projects come under this category; therefore, it would not be possible to develop a financially viable PPP project on its own. These economically unviable projects can be converted into viable projects through a one-time construction capital grant of maximum 40% of its total cost. This is paid to the developers in five instalments during the construction phase.

Premium or Negative VGF Projects NHAI has effectively developed a policy to potentially harvest additional revenue from the high traffic zones of NH stretches. At such stretches, the expected revenue of projects is much higher with the developers willing to pay premium to NHAI instead of receiving capital grants to develop the projects. Many projects are already in various stages of development. Some are in the operative mode. Recently, NHAI has received bids for two projects with almost 5 billion rupees worth of premium quoted by the developers for developing the projects through the PPP BOT process. The respective premium amounts to almost 20% of the cost of the projects. NHAI is yet to finalise these projects.

The present chapter, based on previous studies (Nagesha and Gayathri (2015), suggests a strict adoption of the ex-ante competition principle in developing new roads. It is a universal truth that competition results in cost reduction and increased efficiency of service. In the development of PPP infra roads, the Government should adopt the principle of open global or national competitive bidding policy, transparent measures, including CAG auditing over the entire lifespan of the PPP projects.

Development of Model Concession Agreements Towards NH PPP Projects Government of India (GOI) agencies, namely Planning Commission, PPP nodal agency under the Ministry of Finance, and NHAI (National Highway Authority of India) have developed model PPP national highway documents for the smooth implementation of projects across India. These model PPP projects under NH projects have helped the development of the projects with a greater speed, execution of the respective projects, and rapid conversion of pipeline stage into operation stage.

Shifting of EPC to PPP Mode The Government of India in its eleventh Five-Year Plan (2007–2012) decided to move from Engineering Procurement Construction Contract mode to a bundled contract of PPP mode for the development of NH in India. The respective policy decision by NHAI resulted in the expansion of highways in India. Further, COVID pandemic and other local and global factors prevented private developers from investing in NH projects. Private developers were required for the development of brownfield and greenfield road projects. This led to the development of hybrid EPC and PPP blend projects in roadways since 2018.

Value for Money A research study by Nagesha and Gayathri (2015) proved that NH PPP projects created a positive value for money for all the three stakeholders, namely users, developers, and government. Indicators such as reduction in travel time, reduction in fuel consumption, increased road safety measures were some of the vital parameters used by the authors to assess the performance of VfM under the NH PPPs.

Performance of NHs Under PPPs and Non-PPP Projects

Time Efficiency Many studies including Nagesha and Gayathri (2015) have revealed that non-PPP projects are time-inefficient in converting the initial phase (construction) to the final phase (operating mode). Possible reasons for such time efficiency in PPP projects are the structure of project bundling model such as fixing the responsibility on the developer and linking revenue to the project, giving additional incentives, fixing the cost overrun burden to developers. Table 1 explains the average construction time overrun of NHs developed through PPP and non-PPP modes during 1998–2012. The respective table reveals that the average delay in various PPP NH projects is less than that in non-PPP projects.

Cost-Efficiency Nagesha and Gayathri (2015) in their paper show that PPP projects are cost-efficient as compared to non-PPP projects. An analysis of cost-efficiency per-lane-kilometre of construction and operation of NHs proves that non-PPP projects are costlier by 11.9 million (in Indian rupees) for one lane-kilometre based on a study of 520 NH projects. The details are revealed in Table 2.

Table 1 Average time overrun of national highway projects 1998–2012

Type of project contract	Average time overrun (in months)
PPP (BOT/SPV/Annuity) funded 133 projects completed	15.44
Non-PPP projects (World Bank, JBIC, NHAI, funded projects)	21.86

Source: Adopted from Nagesha and Gayathri (2015)

Table 2 Average cost of national highway projects

Type of the project	No. of projects/ DMUs/firms/ developers	Average cost of projects (values are in million Indian rupees * (2004–2005 prices))	Average cost of projects (values are in million US$)
PPP (annuity + toll)	239	22.0	29,409.60
PPP annuity	51	27.8	30,412.20
PPP BOT toll	188	20.5	28,741.20
EPC**	281	33.9	45,317.52
All projects	520	28.0	37,430.40

Source: Adopted from Nagesha and Gayathri (2015)
Note: In the fourth column, values are converted from Indian rupees to US$ at exchange rate of 74.5 rupees = 1 US$

Issues to Be Addressed for Further Growth of NH Projects in India

Encouragement to a Greater Number of Developers, Including International Developers Nagesha and Gayathri (2015) have shown that ex-ante competition results in a reduction of project cost and value for money for all the stakeholders. Hence, it recommends bringing more competition into the bidding phase.

Optimum Project Risk Synergy Each infrastructure project experiences risks during construction, operation, and maintenance phases. Government and private developers have their own capabilities in addressing various risks, which may arise during the phases of project development. Many research studies have shown that a greater synergy between government and private sectors results in positive results. An optimum sharing of project related risk is unique to each specific project.

Financial Mismatch Many developers, in the recent past, inflated their project costs, resulting in an increased borrowing capacity. Banks provided extra funding to developers with inflated costs as a base. The funds allotted to respective projects were diversified towards some other projects, resulting in a massive asset–liability mismatch. In India, till early 2010s, infra sector projects were largely funded by public sector commercial banks (Nagesha & Gayathri, 2016). The respective phenomena aggravated the commercial banks' lending to infra projects funding. As a result, all the Infra PPP projects, especially National Highway PPP projects, have faced funding issues from FY2014–2015 onwards to a large extent. Although Reserve Bank of India's debt restructuring policy has helped downsize the commercial banks' asset–liability mismatch, their funding has not increased massively as it did during the 2000s. Government of India's present initiative of development bank for exclusive infrastructure funding through creation of a unique bank, namely

'National Bank for Infrastructure Development and Restructure', is a very vital step in this direction with this policy initiative. One can expect hassle-free funding to infra projects.

Latest Developments in NH PPPs in India

1. National Infrastructure Funding Development Bank: Recently, GOI in its budget for the year FY2021–2022 has proposed a separate development financial institution for the funding of various infra projects in the county in the near future. This initiative is intended to allocate financial resources on a massive scale to the infrastructure development of the country (GOI, 2021).
2. Development of Green National Highways: GoI has recently planned to convert all the major national highways into green national highways, through many initiatives such as plantation of trees across the entire national highway stretches, respective assignment of plantation, handing over the development and maintenance of such plants to nearby villages, which, in turn, is expected to create sufficient employment opportunities to the local people. Further, recently, NHAI has decided to build a green national highway across the Mumbai–Delhi express corridor as one of India's longest green national highways.
3. Development of World-Class Wayside Amenity: Ministry of Road Transport and Highways intends to develop various amenities such as shopping complexes, showcasing of local goods and crafts, etc., across national highways, at least one for a stretch of every 50 km and around 600 spots have been identified by NHAI. This initiative is intended to provide employment opportunities to the villagers and also people along the NHs for selling and canvasing the local goods in the respective amenity bazars (Ministry of Roads Transport and Highways, N, 2021).

Summary

The present chapter on Indian NHs based on an empirical review has identified the factors such as value for money for all stakeholders, policies, and actions, which have enabled the construction of the highest number of road projects over the years. It also has explored the currently existing issues like optimum project risk synergy between government and private developers, enhancing of the ex-ante competition, fixing of financial mismatch, and many such factors that need to be addressed on a priority basis. It has concluded with the latest developments such as a separate development bank for infra funding, focus on development of green national highways, world-class amenities across NH stretches, etc.

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Public-Private Partnership: Lessons from Italy's Morandi Bridge Collapse

Francesca Leccis

Acronyms

ANAS	Azienda Nazionale Autonoma delle Strade [Autonomous National Road Company]
Ansfisa	Agenzia Nazionale per la Sicurezza delle Ferrovie e delle Infrastrutture Stradali e Autostradali [National Agency for Railway, Road and Toll-Road Safety]
ART	Autorità di Regolazione dei Trasporti [Transport Regulation Authority]
ASPI	Autostrade per l'Italia [Toll roads for Italy]
CDP	Cassa Depositi e Prestiti [Deposits and Loans Fund]
CSLP	Consiglio Superiore dei Lavori Pubblici [Italian Supreme Council for Public Works]
MIT	Ministero delle Infrastrutture e dei Trasporti [Ministry of Infrastructure and Transport]
PPP	Public–private partnership
SpA	Società per Azioni [Joint-Stock Company]
SCpA	Società Consortile per Azioni [Consortium Joint-Stock Company]
VfM	Value for money

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Introduction

The chronic lack of public funding motivates governments worldwide to establish different forms of collaboration with the private sector to deliver various kinds of services to the public. The numerous formulae of PPP demonstrated the ability to harness additional financial resources and operating efficiencies inherent to the private sector, thus solving many structural and operational problems that often cause budget and schedule overruns for large capital projects. Another advantage is the possibility for the contracting parties to both share and allocate the risk borne with the investment. This aspect assumes primary importance in transport infrastructure investments since they are inherently capital-intensive and typically have long payback periods. However, private contractor's interests might be different from the public's ones. For example, it might appear more compelling to strengthen the company's balance sheet rather than to invest in maintenance and repair activities. This might be especially true if the company's shares are listed on the stock exchange.

The accusation of neglecting the infrastructure to maximize private profits has been repeatedly brought against the company that operated Italy's Morandi bridge, *Autostrade per l'Italia (ASPI)*, since the bridge collapsed on August 14, 2018. While the Court is investigating to identify those responsible for the tragedy, the Government has initiated the procedure to revoke *ASPI*'s contract to operate the A10 highway of which the collapsed bridge was a key component. Consequently, PPP's VfM was thrust center stage in the Italian public debate, and two main opposite stances can be identified. On the one hand, a profound widespread distrust in the private sector leads to the request for the nationalization of the A10 highway. On the other hand, the awareness of public spending's scarcity encourages a new transparent PPP agreement to be negotiated through a public tender procedure, which entrusts the management either to a single contractor, which would operate the entire A10 highway, or to several contractors, which would operate individual sections of the route.

This chapter analyses both the advantages and the disadvantages of PPPs for transport infrastructure delivery with the aim of providing recommendations to enhance collaboration agreements between the public and private sectors. In order to achieve this, an extensive literature review of benefits and shortcomings of PPPs is conducted, the Italian case study of the Morandi bridge collapse is deeply analyzed, the new safety regulations introduced in Italy are carefully illustrated and conclusions and recommendations for good practice are finally drawn.

Benefits and Shortcomings of Public–Private Partnerships

PPPs are defined as agreements which align public objectives and private profit goals, according to which public authorities and private sectors collaborate to provide public infrastructure assets and services, by introducing private skills, expertise, and finance into public service delivery and by transferring substantial risk from the government to the private sector (European Commission (EU), 2004; European Investment Bank (EIB), 2004; International Monetary Fund (IMF), 2004; Standard and Poor's, 2005; Organization for Economic Co-operation and Development (OECD), 2008; International Monetary Fund (IMF), 2006; Leccis, 2015). The concept is to improve quality service delivery and to ensure higher efficiency with respect to traditional forms of public procurement by combining the strong qualities of both the public and private sectors (Shaoul, 2005) and by allocating the risks to the partners who are better equipped to handle them (Sørensen, 2016). Nonetheless, PPPs require strong government capability in both defining clear legal and policy frameworks and setting appropriate regulatory and oversight systems to manage the contracts (Organization for Economic Co-operation and Development (OECD), 2008). Indeed, the public sector needs to demonstrate different skills and experience during the preparation, procurement, and management of the contracts as well as throughout the project cycle (European PPP Expertise Centre (EPEC), 2015). In addition, competition is essential to reinforce the bargaining position of the government to achieve better VfM and to avoid monopolistic behavior, thus preventing the private partner from forcing the government to renegotiate the terms of the contract (Organization for Economic Co-operation and Development (OECD), 2008). However, infrastructure projects are naturally characterized by high barriers to entry, economies of scale (many projects are monopolies indeed), inelastic demand for their services, low correlation with the economy and the business cycle, high operating margins, long durations of the concessions, long-term and stable cash flows (often covered against inflation), and low default rates (Weber & Alfen, 2010; Weisdorf, 2007).

In particular, Iossa and Martimort (2014) identified the infrastructure sector remarkably suitable for PPPs, exactly due to its intrinsic characteristics, such as the relatively stable demand for the service and the significant impact of the quality of the infrastructure on reducing maintenance costs.

One of the arguments in favor of PPPs is the release of government resources, which, in this way, do not have to be tied up in the upfront investment, so that they can be allocated to other priority services (Davis & Salter, 2006; Khoury & Rabih, 2015; Taher & Hajjar, 2014). Nevertheless, Engel, Fisher, and Galetovic (2014, 2020) warn that this consideration is just an illusion, since it does not consider the whole fiscal impact of the project, as it ignores the phase after the construction, when the government renounce to collect toll revenues or it even finances the project through tax revenues.

Concerning the improvement of VfM, findings are controversial in the literature. On the one hand, there is the number of supporting study results, which highlight cost savings, on-time and on-budget deliveries, successful risk transfers, and considerable design innovation (Andersen and LSE Enterprise, 2000; Burger & Hawkesworth, 2011; Hart, 2003; MacDonald, 2002; National Audit Office, 2000, 2003; Pollitt, 2005). On the other hand, multiple studies do not show these major advantages, identify various drawbacks, and picture PPPs as wasteful, risky, and even misleading accounting trickery (Bloomfield et al., 1998; Walker & Walker, 2000). For example, Sørensen (2016) indicates the reduced flexibility for the public authority due to the long-term tie with a specific supplier, expensive transaction costs to negotiate contracts due to their complexity and higher cost of capital due to the impossibility for private companies to borrow at the risk-free interest rate, which is granted to governments. Moreover, Shaoul (2005) analyzed several appraisal processes and detected inadequate information for project evaluation and their inappropriate manipulation favored PPPs over conventional public procurement, besides refinancing scandals, and risk transfer agreements according to which the risk supposed to be transferred to the private sector, actually remained placed on public authorities. In addition, public authorities often lack the technical financial competence to properly negotiate and monitor concession contracts (Ashton, Doussard, & Weber, 2012; Kauppi & van Raaij, 2014; Sarmento, 2010; Soecipto & Verhoest, 2018), and institutions are often incapable of implementing their regulatory provisions (EIU, 2015). It is evident in the literature that more competence in the public sector is needed to negotiate and monitor complex financial contracts (Vecchi & Cusumano, 2019).

The Case Study: The A10 Bridge History from the Construction to the Reconstruction

The A10 bridge, also named after its design engineer Riccardo Morandi and officially known as the Polcevera Creek Viaduct, was built in the 4-year period between 1963 and 1967 by the *Società Italiana per Condotte d'Acqua* (Marsico, 2018; Rovellini, 2018). Open to the public on September 4, 1967 (Agenzia Nazionale Stampa Associata (ANSA), 2018a), it is a strategic road link, which connected Northern Italy with Southern France and Genoa city center with the container port in Voltri-Pra', the airport Cristoforo Colombo and the industrial areas in Genoa suburbs (Alessandrini, 2020). Figures 1 and 2 show Genoa location and bridge location, respectively.

"The viaduct is constituted by 11 spans with 43,000 m to 207,884 m lengths, linked together by a simply supported precast prestressed 36 m span, placed between the ends of each pair of cantilever peculiar systems" (Morandi, 1967, p. 872). It was one of the most iconic pioneering works made of pre-stressed reinforced concrete in Italy by the engineer Riccardo Morandi (Zonta, 2018), renowned all over Europe (Rovellini, 2018). Nevertheless, it immediately presented numerous problems, such as higher-than-estimated costs and inaccurate concrete viscosity evaluation, which required multiple corrective structural interventions and in-depth maintenance measures (Brenchic, 2016).

It was 11:36 local time of August 14, 2018, when the section of the bridge above the fluvial and industrial area of Sampierdarena fell to the ground (Agenzia Nazionale Stampa Associata (ANSA), 2019; Ingenio, 2020). Figure 3 shows the 250-m section collapsed.

The reconstruction begun on April 15, 2019 (PERGENOVA SCpA, 2019a), and the structural backbone of the new viaduct was completed on April 28, 2020, after

Fig. 1 Genoa location (Author's elaboration)

Fig. 2 Bridge location (Author's elaboration)

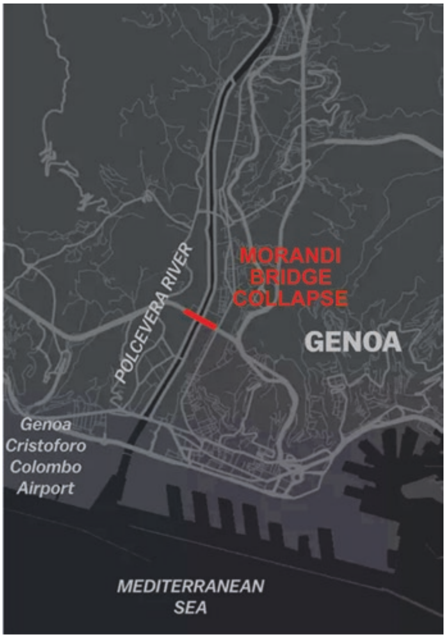

Fig. 3 Collapsed section (Author's elaboration. Source: Google Earth)

309 days of restlessly works (Ruggiero, 2020). Table 1 briefly illustrates the main steps of the reconstruction.

It does not yet have an official name, but a heated debate is involving authorities, politicians, and associations (Genova 24 (GE24), 2020). The design was donated by the Genoese architect Renzo Piano (Povoledo, 2020), who also supervised the project (Pianigiani, 2019). The new bridge is supported by 18 elliptical section, constant-shape reinforced concrete piers, where a continuous mixed steel-concrete deck, recalling the hull of a ship, measuring 1067 m totally, with 19 spans, lays (PERGENOVA SCpA, 2019b). Figure 4 shows the new Polcevera Creek Viaduct illuminated in the green, white, and red colors of the Italian tricolor along its entire length. The building company, *PERGENOVA*, bathed the new bridge along its entire length and lighted every one of its 18 piers in the national flag's colors, together with the laser beams that cross the bridge from above every evening from April 28, 2020, to May 1, 2020, as a tribute to the residents of the port city (Salini Impregilo, 2019).

Morandi Bridge Managing Contractor and Concession Contract

The Morandi bridge was built by the public company *Società Italiana per Condotte d'Acqua* for the public client *ANAS S.p.A.* [Autonomous National Road Company] (Autostrade per l'Italia (ASPI), 2020a). In 1999, the Italian motorway network has

Table 1 Reconstruction steps (author's elaboration. Source: Cottone, 2019; PERGENOVA SCpA, 2019a)

Date Margins	Step English system
08/14/18	Morandi bridge collapses
09/07/18	Architect Renzo Piano donates his project for a new viaduct
10/04/18	Marco Bucci is appointed commissioner for the reconstruction
12/18/18	The newborn society *PERGENOVA* wins the building contract
04/07/19	Approval of the executive design project (estimated cost: €202M)
04/15/19	Beginning of construction works for the new viaduct
06/28/19	Demolition of the remains of the Morandi Bridge
07/15/19	Works begin for the raising of the first pier
10/01/19	Launch at height of the first deck
10/09/19	Raising of the first span
11/07/19	Raising of the second and third spans
12/15/19	Raising of the fourth span
12/28/19	Raising of the fifth span
01/08/20	Raising of the sixth span
01/22/20	Raising of the seventh span and launch at height of the second deck
02/07/20	Raising of the eighth span
02/13/20	Raising of the first 310-m steel maxi-span
03/10/20	Raising of the second 100-m steel maxi-span
03/24/20	Raising of the third and last 94-m steel maxi-span
04/28/20	Last deck is installed at height

Fig. 4 The new Polcevera Creek Viaduct (Agenzia Nazionale Stampa Associata (ANSA), 2020a)

been partially privatized, meaning that network ownership remained with the State, while operation and maintenance were transferred to private companies in return for toll collection (Capozzi, 2018). In particular, management and maintenance were outsourced to *Società Autostrade*, constituted by *Società Schemaventotto Spa* (30%), headed by the Italian family *Benetton*, and by a group of shareholders who acquired their shares in the market (70%) (Autostrade per l'Italia (ASPI), 2020b). In this way, the State became the regulator of the network even though it had neither the technical and financial expertise nor the managerial competence (D'Arpizio & Valbonesi, 2018). In addition, there was no regulatory authority, which was established only 12 years later, in 2011, under the name of *Autorità di Regolazione dei Trasporti (ART)* [Transport Regulation Authority] (Gazzetta Ufficiale (GU), 2011).

In 2003, due to a new organizational structure, motorway concession was granted to the newborn *ASPI* (Autostrade per l'Italia (ASPI), 2020b), which is owned by *Atlantia* (88.06%), *Appia Investments Srl* (6.94%), and *Silk Road Fund* (5%) (Autostrade per l'Italia (ASPI), 2020c). *ASPI* is one of the biggest motorway concessionaires in Europe, since it manages a network of 3020 km and more than 200 motorway service areas across Italy (Ibid.).

What is most interesting, however, is the excessive profitability, which is typical to Italian concessions (Capozzi, 2018). Indeed, according to a report from the structural economic analysis directorate of the Bank of Italy, Italian concessions have one of the highest ratios of toll revenues to kms managed in Europe, concessions, and have been extended for more than 20 years between 1999 and 2003 with no public tender procedure. Thus, there has been no guarantee of contract fulfillment. The gap between planned and realized investments has been constantly growing between 2008 and 2013, and transparency is severely compromised by lack of information and regulatory complexity, so that assessing tariff development and their consistency with laws and regulation is anything but simple (Sestilo, 2015).

The Polemic and the Judicial Inquiry Against *Autostrade per l'Italia*

Immediately after the bridge collapse, the *Five Star Movement*, which was part of Italy's governing coalition together with the *League Party*, announced a procedure to revoke the concession held by *ASPI* to operate toll highways, blaming it for not carrying out the ordinary and extraordinary maintenance of the motorway (Custodero, 2019). Consequently, the debate soon involved the issue of private management of public infrastructure and the deputy head of government Luigi Di Maio highlighted that the technical report written by the court experts clearly states that last effective maintenance works had been performed 25 years before the collapse, when the management authority was still the State (Di Maio, 2019). Similarly, the Minister of Transport, Luigi Toninelli complained about management authority's high profits, which were the highest in Europe, cheap licenses, low taxes, and inadequate maintenance (Toninelli, 2018). The breach of duty of custody and maintenance can be used by the Ministry of Infrastructure and Transport (MIT) to pursue unilateral revocation of the concession, but renegotiation of the concession might be considered as an alternative to this breach of duty by the concessionaire (Ministry of Infrastructure and Transport (MIT), 2019a). Hence, in the article 35 of the law decree no. 162/2019, unofficially known as *Milleproroghe*, converted it into the law no. 8/2020, the Italian Government focused on the termination of public concessions in relation to roads and motorways, including toll roads (Gazzetta Ufficiale (GU), 2019, 2020). It states that, in case of revocation of public concessions concerning roads or motorways, including toll roads, the government-owned company *ANAS S.p.A*. can be entrusted with the management and maintenance of these roads or motorways (Ibid.). In addition, the same article provides that, in case of early termination of public concessions due to breaches of the concessionaires, the concessionaires are only entitled to an indemnity corresponding to the value of the works carried out plus ancillary charges, net of amortizations, or the costs actually incurred; while indemnities for profit loss compensations are excluded (Ibid.). Accordingly, revocation of the toll road concession of *ASPI* will be smoother and less expensive for the Italian State (Fatto Quotidiano (FQ), 2019). *ASPI* legally complained about the rearrangements provided by art. 35 (Agenzia Nazionale Stampa Associata (ANSA), 2020b), but the risk of a €23 billion termination payment and of the postponement of maintenance works and investments on the one hand and bankruptcy of *ASPI* on the other hand (Fioravanti, 2020; Fubini, 2020), motivated both the parties to renegotiate the concession agreement (Nicotra, 2020). Therefore, on July 15, 2020, after a nightlong Council of Ministers, the two parties reached an agreement at 5:16 a.m., which establishes €3.4 billion compensation for the Morandi Bridge collapse, €20.2 billion of investments and maintenance, surrender to any contentious proceedings, toll reduction according to new tariffs set by the ART, sensible reduction of the company shares held by the Benetton family, who should maintain the 10–12% of the shareholdings, and the entrance of *Cassa Depositi e Prestiti* (CDP) with 51%, which will effectively make *ASPI* a public company (Presidenza del Consiglio dei Ministri (PCM), 2020).

In the meantime, Italy's financial police seized all documentation on design, management and maintenance from the country's transportation ministry (Mancini, 2019), from the public works department of *Liguria*, *Piemonte*, and *Valle d'Aosta* regions, and from the company Spea Engineering S.p.a. (Agenzia Nazionale Stampa Associata (ANSA), 2018b) together with the ruins of the collapsed bridge and its two remaining sections (RTI, 2018). Among the seized documents were those related to the ordinary and extraordinary maintenance works carried out over the years, and a report written in the 1980s by Morandi himself, where he expressed his astonishment at the high level of degradation of the materials, faster than one could expect (Agenzia Nazionale Stampa Associata (ANSA), 2018b).

Thanks to the seized documents and telephone tapping, the Public Prosecutor of Genoa discovered that *Spea Engineering* and *ASPI* tampered with evidence by altering and falsifying monitoring reports to avoid traffic restrictions and the closure of the bridge for safety reasons, besides saving on maintenance costs (Filetto &

Lignana, 2019; Pasqualetto, 2019). Moreover, they spent approximately €70,000 to buy four mobile phone jammers to create strong interference in communication, thus preventing telephone tapping by police (Fregatti & Grassi, 2019). The two societies *Spea Engineering* and *ASPI* together with 74 people were placed under investigation (Caprino, 2019a). Therefore, there is a long way to go before the Public Prosecutor's office will be able to conclude the inquiry. At present, it has been established that the bridge collapsed due to corrosion of the cables of the stay of tower 9 and that the tragedy could have been prevented if proper maintenance were carried out (Il Secolo XIX, 2021), but no charge has still been brought against people under investigation (Bacci, 2021). The next step is the hearing where it will be decided which telephone and environmental interceptions provided by the police can be used during the trial (Il Secolo XIX, 2021). It was scheduled for March 3, 2021, but it has been postponed to March 10 (Bacci, 2021). Hopefully investigations will be completed in the course of Spring 2021 (Fatto Quotidiano (FQ), 2021).

The Joint Venture for the Construction of the New Viaduct

The construction contract of about €200M of the new Viaduct was won by the listed consortium company *PERGENOVA S.C.p.A.*, which is constituted jointly by the two Italian companies *Salini Impregilo* and *Fincantieri Infrastructure* (Fincantieri, 2018; PERGENOVA SCpA, 2019c; Smale, 2019).

Infrastructure Monitoring and New Safety Regulations

After the collapse of the Morandi bridge, *ASPI* promoted an extraordinary operation to monitor the 130 most important infrastructures of its network by leading external specialized companies (Caprino, 2019b). In addition, the extraordinary control plan was extended to the entire portfolio of infrastructures managed by *ASPI*, consisting of 1943 bridges and viaducts (Atlantia, 2018). According to the company, the results of these controls, in addition to those carried out systematically by Spea Engineering, confirmed that the infrastructures analyzed do not present any specific critical concern (Ibid.).

Simultaneously, through the law decree no. 109/2018, unofficially known as *Decreto Genova*, converted into the law no. 130/2018, the Government established the *Agenzia Nazionale per la Sicurezza delle Ferrovie e delle Infrastrutture Stradali e Autostradali - Ansfisa* [National Agency for Railway, Road and Toll-Road safety], with the tasks of guaranteeing the security of the national railway, road, and toll-road network (Agenzia Nazionale per la Sicurezza Ferroviaria (ANSF), 2018). In this way, the State is expected to occupy a crucial role in improving the safety of the infrastructure network by efficiently monitoring that proper maintenance is undertaken, also through inspections and audits on a sample basis and by encouraging the adoption of safety management systems certified by independent third parties recognized by the Agency (Ministry of Infrastructure and Transport (MIT), 2019b). The *Ansfisa* will also conduct studies and experiments on infrastructure safety and will elaborate the "National Plan for the Adjustment and Development of National Roads and Toll Roads," which will be updated every 2 years (Ibid.).

In the meantime, the *Consiglio Superiore dei Lavori Pubblici—CSLP* [Italian Supreme Council for Public Works], on May 7, 2020, published the *Linee Guida per la classificazione e gestione del rischio, la valutazione della sicurezza e il monitoraggio dei ponti esistenti* [Guidelines for Risk Classification and Management, Safety Assessment and Monitoring of the Existing Bridges] (Consiglio Superiore Lavori Pubblici (CSLP), 2020). They formulate a general, multi-level, multi-criteria approach for risk classification and identify a set of objective benchmarks to which all the concessionaires operating in the national territory have to refer to, thus overcoming evaluation discrepancy caused by the application of different risk assessment methodologies (Marra, 2020). Over the next few months, they will undergo a trial period coordinated by the CSLP, so as to provide useful lessons for possible general adoption (Dari, Samorì, & Alessandrini, 2020).

Summary and Conclusions

Intense and often heated debate over the VfM of PPPs occupies a central place in both academic and political stages with arguments which concern efficiency, service quality, and accountability. Studies show that improvement of project VfM through PPPs is, at least, debatable, since there is considerable evidence to both support and oppose it, and better evaluative design is needed to increase result reliability.

The Morandi Bridge case study raised numerous questions on safety issues and countless objections to excessive profitability of Italian concessions, thus supporting existing literature that harshly criticizes PPPs. For example, misleading project evaluation and lack of transparency, reported by several studies (i.e., Bloomfield et al., 1998; Walker & Walker, 2000; Shaoul, 2005), are also identified in the *ASPI* concession by the analysis conducted by the structural economic analysis directorate of the Bank of Italy. Added to the problems of Italian concessions is the alteration and falsification of monitoring reports and illicit savings on maintenance costs (Filetto & Lignana, 2019; Pasqualetto, 2019).

In addition, the case study depicted in this chapter confirms that public authorities suffer from reduced flexibility caused by long-term ties with a specific supplier, as Sørensen's warned. Indeed, regardless the deadly bridge collapse and the new law no. 8/2020, a concession is still difficult and expensive to be revoked by the Italian government. Renegotiation of terms and conditions of the concession contract appears more feasible and less costly, but it is a lengthy and delicate process, in which Italian authorities have limited control, due to their technical financial incompetence, as found by D'Arpizio and Valbonesi (2018).

The only positive aspect of this tragedy is the major attention it brought about to safety issues by both the concessionaire and the Italian Government. Indeed, the concessionaire conducted an extraordinary operation to monitor the entire Italian network they managed, while the Italian Government has established the *Ansfisa*. In the meantime, the Italian Supreme Council for Public Works published the "Guidelines for Risk Classification and Management, Safety Assessment and Monitoring of the Existing Bridges," even though they now need a suitable period of experimentation, so as to provide useful lessons for possible general adoption.

Nonetheless, this case study does not conclude that PPPs are wasteful, risky, and employ misleading accounting trickery, rather that they might be an efficient form of procurement if adequately negotiated and monitored by government. Indeed, the cause of major improvement neglect of the Morandi bridge was not the PPP in its very nature, but rather the irresponsible behavior of the contractor, who altered and falsified monitoring reports to save on maintenance costs and is now prosecuted under criminal law. As a matter of fact, the joint venture between *Fincantieri* and *Salini-Impregilo*, which reconstructed the A10 Bridge in a short time, according to a top-quality design, requiring highly skilled workforce and leading-edge technology, clearly demonstrates that private companies can provide the necessary skills and expertise to enable quality service delivery, otherwise not evident under public conduct.

Better designed contracts, providing appropriate requirements of the private partner, together with guidelines for risk classification and management, safety assessment and monitoring of the existing bridges should oblige the contractor to schedule maintenance based on asset status, rather than arbitrary calendars, thus avoiding future disasters. The problem is that public authorities often lack the competence required to properly negotiate and monitor concession contracts, as widely illustrated in the literature (Ashton et al., 2012; Kauppi & van Raaij, 2014; Sarmento, 2010; Soecipto & Verhoest, 2018). Therefore, it would be beneficial to provide education in finance and management to all the public authorities that might potentially want to take advantage from a PPP, so that they become experts in negotiating and monitoring concession contracts. Public authorities might also appoint specialist external advisers for financial, legal, and technical issues, but they must be able to manage these specialists effectively.

On July 15, 2020 *Aspi* has been transformed into a public company; further research is needed to investigate outcomes produced by the nationalization. Indeed, this chapter shows that, although the bridge was very profitable, the contractor did not invest sufficient resources in its maintenance. For this reason, the Italian government decided to provide firsthand infrastructure maintenance, but additional investigation is needed to assess its efficiency.

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Applying a Performance Measurement System in European PPP Road Projects

Felix Villalba-Romero and Champika Liyanage

Introduction

The term Public–Private Partnership (PPP) is commonly used as an alternative contractual arrangement to traditional public procurement. Following a World Bank (n.d.) report, it is referred to as "any long-term contractual arrangement between a public entity—or authority—and a private entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility." In the road sector, the main reason for using PPPs is that it could lead to efficiency gains in service delivery. There are many positives supporting this PPP model such as: feasible project screening, project financing requirements, user contributions, achieving performance indicators, enhanced risk allocation, sustainability (cost, time and quality), and incentives (Engel, Fischer, & Galetovic, 2014).

A specific type of roads within transport infrastructure projects, are the highways, motorways, or road projects. Toll roads or toll motorways are understood as projects in which the traditional method of contracting of public works by the State is not used, but which are based on private participation, in one or all phases of project development. A toll road project refers to a road project (with various quality and technical specifications), bridge or tunnel, in which a charge is applied in the form of price or toll for access and use of the infrastructure until a set deadline, through an entity established to develop and operate the transportation network (PPIAF, 2009). The elements of the value chain should also be considered when

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exploring road projects. It is indicated that in the road concession sector, there are two types of value chain elements: (1) the services offered by the use of the road in its different facets and (2) the assets that are associated with the range of said services. Therefore, type of the motorways varies depending on the ownership, which can be public or private; the use of toll, regardless of whether the access is free; who makes the payment for the service; etc.

Other important considerations include the type of infrastructure provision and the business model, if any, used to repay the investment. Apart from public procurement, there are a range of private participation models and selecting the right one should not be based on a whim, but a result of identifying the most appropriate one aiming to achieve higher efficiency and greater success. Within these models, special attention is paid to the main source of the funds, which will repay the investment; namely the party who pays for the public services provided on the road. Again, a combination of these sources of funds is the rule, but there is always a main source of finance: users or a public agency.

Measure of Success

The term "success" of a project may vary depending on different contextual factors as well as the objectives of a project; and its perceptions may change over time. It is needed in more of a subjective way depending on what someone wants to see in a project. For example, a project can be successful in terms of achieving cost objectives; however, it may not succeed in meeting the time goals. In the same ways, a project can be successful from private partner's point of view, but not from the user's perspective. Furthermore, the perception of project success may change as new information or performance data is revealed. Ashley, Lurie, and Jaselskis (1987) describes the success of a project as "the achievement of results much better than expected or normally observed in terms of cost, schedule, quality, safety and satisfaction of the participants"; while Shenhar, Levy, and Dvir (1996) points out that the success of a project should foster the prosperity of the organization and of society. Shaoul, Stafford, and Stapleton (2007) focusses on success in terms of technical achievements, though it should also take into account social and financial objectives. A project is traditionally considered successful when the "iron triangle" measures have been satisfactorily met; i.e. time—finished on time; the cost—within the budget; and quality—finished according to specifications (Atkinson, 1999; Khosravi & Afshari, 2011); or a good combination of these measures (Phua, 2004).

Nguyen, Ogunlana, and Lan (2004) have measured the success of a project using this traditional approach, but also included measuring the development of the project according to the satisfaction of stakeholders. In addition, for Savindo, Grobler, Parfitt, Guvenis, and Coyle (1992), the basis of success of a project is in the achievement of expectations of different interested parties, such as the owner, the planner, and the consultants, the constructor, or the operator. Authors such as Pinto and Slevin (1988) and Bryde and Brown (2005) also identify the main elements of project success, such as stakeholder satisfaction. However, Cox, Issa, and Aherns (2003) have evaluated the success of the project on the basis of contract specifications, not only the technical specifications, but also other quantitative measures. On the other hand, Freeman and Beale (1992) and Toor and Ogunlana (2008) have identified the performance of the process (i.e. efficiency and effectiveness of the different processes involved in a project) as the main criterion of success of the project. Similarly, there are other researchers who have identified different ways and means to measure the success of a project, either in general or specifically with respect to PPPs (Aziz, 2007; Chan, 2001; Farinde & Sillars, 2012; Li, Akintoye, Edwards, & Hardcastle, 2005; Takim & Adnan, 2008; Takim, Akintoye, & Kelly, 2004; Zhang, 2005) and other modes of procurement (Chan & Chan, 2004; Gudiyene, Ramelite, & Banaitis, 2013; Qiao, Wang, Tiong, & Chan, 2001; Saquib, Farooqui, & Lodi, 2008; Tabish & Jha, 2012).

Looking at the approach to measuring the success of PPP infrastructure projects, it should include various Critical Success Factors (CSF), various elements known as key performance indicators (KPI) (Hardcastle, Edwards, Akintoye, & Li, 2005), although there is no clear consensus on the method to measure the success of projects using KPIs, and diverse performance measures (PM). These are "markers or signs of things that you want to measure, but that cannot be direct, complete or easy measurements" (Adair et al., 2003). A PM is one of several measurable values that contribute to the understanding and quantification of an indicator. Measures and performance indicators are used interchangeably in the literature. Distinguishing these terms provides useful clarification. PMs are quantitative measures of capabilities, processes, or results relevant to the evaluation of a performance indicator (Liyanage, 2006). On the other hand, KPIs are not direct measures of quality, but are a means of alerting users to possible opportunities for improvement.

Taking into account the factors mentioned above, a set of KPIs and PMs, including objective and subjective indicators, have been developed to establish a "success" methodology for this chapter. The approach followed to develop the indicators is analysed below.

According to Hodge and Greve (2007), the thorough and independent evaluation of PPPs has been scarce, and the results from these appear insufficient to draw significant conclusions; hence, there is a great need for a rigorous evaluation of these PPPs. Therefore, the main objective of this section is to fill this gap with the presentation of a solid evaluation of the success of PPPs. This evaluation is presented as a system of measurement of results (Performance Measurement System, PMS) that is tested using 30 selected cases.

Methodology Adopted: A Case Study Approach

Considering the main research question of the study, i.e. "how to measure success in road projects?" there was a need to adopt an exploratory approach with the use of in-depth case study research. Therefore, an exploratory case study approach was adopted to analyse a number of road projects across Europe that have adopted a PPP model.

Taylor, Dossick, and Garvin (2009) argue that case study research seeks to achieve in-depth analysis by including multiple extreme cases and multiple analytically similar cases. According to Yin (2009), case studies are the preferred research strategy when a "how?" or "why?" precedes a question about a set of current events, about which the researcher has little or no control. The case study approach looks for verification of the theory, since it moves from deductive to inductive or the need to apply the logic of replication (Eisenhardt, 1989).

The following phases have been carried out for the case study approach: (a) review of practical cases in which to analyse the factors studied in this research; (b) data collection: this consisted of several actions focused on collecting different types of information from the case study; and (c) analysis of the data collected by transferring data to an excel spreadsheet.

The case study protocol was developed as part of a EUCOST Networking project on "Public Private Partnerships—Trends and Theory" (2010–2014) (Roumboutsos & Liyanage, 2013). This protocol has been used to select cases within the context of the aforementioned project. The case study protocols have been developed to answer the questions of "why?", "what?" and "what sense?" of PPPs in transportation. The protocols also highlight the need to continue observing cases as they evolve throughout the life cycle of the contract, influenced by external events such as the economic crisis and internal events such as changes in ownership. The next stage of the project, on which this work is based, was to collect data from selected case studies from PPP Toll roads. The case study protocol used for data collection have been completed with semi-structured interviews and secondary data. The secondary data used were extracted from project related information available on the web and from accessible project reports.

Collection of Data and Information

In total, 30 toll road projects in 16 European countries under the PPP model were chosen for this study. Of these, 24 case studies (see Table 1) were taken mainly from COST ACTION TU1001 P3T3 Public–Private Partnerships in Transportation: Theory and Trends (COST TU1001, 2013a, 2013b, 2014). Additional four cases were taken from the BENEFIT Project (n.d.) (*B*usiness models for *EN*hancing funding and *E*nabling *F*inancing for *I*nfrastructure in *T*ransport) project (www.benefit4transport.eu). Final two cases were taken from the Omega Centre at University College London (http://www.omegacentre.bartlett.ucl.ac.uk/author/ucftw3b/) mega infrastructure projects and PPP database.

Choosing a particular type/mode of project makes the comparative analysis and synthesis consistent, reliable, and valid. All the selected highway projects represent developments of the highest relevance in their respective countries. Although a criterion of statistical representation of the countries in which the projects have been

Table 1 Index of analysed cases of European PPP road projects

No	Project name	Short project ID	Type	Country	ISO code
1	A19 Dishforth to Tyne Tunnel	A19 Dishforth	Road	United Kingdom	GB
2	A2 Motorway Poland	A2	Road	Poland	PO
3	A22—Algarve	A22—Algarve	Road	Portugal	PT
4	A23—Beira Interior	A23—Beira	Road	Portugal	PT
5	Athens Ring Road	Athens R.R.	Road	Greece	GR
6	BNRR (M6 Toll Motorway)	BNRR (M6 Toll)	Road	United Kingdom	GB
7	BreBeMi	BreBeMi	Road	Italy	IT
8	C-16 Terrassa-Manresa Toll Motorway	C-16 Terr.-Manr.	Road	Spain	ES
9	Central Greece (E65) Motorway	Cent. Greece E65	Road	Greece	GR
10	Coen Tunnel	Coen Tunnel	Tunnel	Netherlands	NL
11	E18 Grimstad Kristiansand	E18 Grim.-Krist.	Road	Norway	NO
12	E18 Muurla-Lohja	E18 Muurla-Lohja	Road	Finland	FI
13	E39 Orkdalsvegen Public Road	E39 Orkd.	Road	Norway	NO
14	E4 Helsinki-Lahti	E4 Helsinki-Lahti	Road	Finland	FI
15	Eje Aeropuerto (M-12) Toll Motorway	Eje Aerop. M-12	Road	Spain	ES
16	Herrentunnel Lübeck	Herrentunnel	Tunnel	Germany	DE
17	Horgos—Pozega	Horgos-Pozega	Road	Serbia	RS
18	Ionia Odos Motorway	Ionia Odos	Road	Greece	GR
19	Istrian Y	Istrian Y	Road	Croatia	HR
20	Lusoponte—Vasco da Gama Bridge	Lusoponte	Bridge	Portugal	PT
21	M25 Motorway London Orbital	M25 Orbital	Road	United Kingdom	GB
22	M-45 Madrid Loop Road	M-45 Madrid	Road	Spain	ES
23	M80 Haggs	M80 Haggs	Road	United Kingdom	GB
24	Millau Viaduct	Millau Viaduct	Viaduct	France	FR
25	Moreas Motorway	Moreas	Road	Greece	GR
26	Olympia Odos	Olympia Odos	Road	Greece	GR
27	Radial 2 (R-2) Toll Motorway	Radial 2 (R-2)	Road	Spain	ES
28	Rion-Antirion Bridge	Rio-Antirion	Bridge	Greece	GR
29	The Oresund Link (1)	The Oresund Link	Combined	Swed/Denm	SE/DK
30	Via-Invest Zaventem	Via-Invest Zav.	Road	Belgium	BE

executed has not been followed, the selected projects largely represent the countries that can be considered as "most active" in the use of private participation and implementation of projects with the use of various PPP models. Thus, Greece contributes six projects; United Kingdom and Spain, four projects each; Portugal, three projects; Norway and Finland, two projects each; one project has been selected from each of the following countries: Italy, Holland, Poland, Belgium, Germany, France, Serbia, and Croatia; and finally, a shared project from Sweden and Denmark is included. Therefore, it could be said that the case base represents a reasonable sample of projects in Europe, which constitutes an added advantage towards maintaining consistency and diversification.

Table 1 shows a list of the projects analysed and the location country.

Evaluating Success

The evaluation of the success of the PPP projects is carried out in this work through a performance measurement system (PMS). The PMS is a step-by-step approach as explained below, which was presented in detail in Liyanage, Villalba-Romero, and Njuangang (2016):

- Step 1: Use of a case study approach
- Step 2: Case descriptions
- Step 3: Development of the KPIs and performance measures (PMs)
- Step 4: Three-stage Delphi approach to refine and prioritize the KPIs and PMs
- Step 5: Assigning mean zones (M)
- Step 6: Filling in the KPIs table
- Step 7: Calculation of the weighted score (WS)
- Step 8: Calculating the overall level of performance
- Step 9: Interpretation of the performance results

The main remaining steps are discussed and summarized below.

Development of Key Performance Indicators and Performance Measures (KPIs and PMs)

During this process, the different categories and codes were developed to make the case studies comparable. The categorization and coding were done using QSR NVivo, where NVivo is a computer program for the analysis of qualitative data produced by QSR International. The main categories developed for the case study were extracted from the different sections of the case template itself. Initially, 47 performance measures were identified, which eventually were summarized to 29 PMs. The categories and codes were then transferred to a tabular format. The codes were given on a Likert scale to easily quantify the results (Liyanage & Villalba-Romero, 2015). The categories developed were identified as key indicators of performance or results (KPI), and the codes developed within them were identified as measures of performance or results (PM) to define the criteria of success of a project.

Three-Stage Delphi Method to Refine and Prioritize KPIs and PMs

A Delphi study in three phases was carried out to refine the KPIs and PMs, after considering their priority according to their level of importance, based on a Likert scale. The indicators and measures developed were refined, reviewed, and weighted by means of a Delphi study. The initial set of KPIs and PMs was refined using a focus group, which was carried out at the University of Twente in the Netherlands. The group included members of the TU1001 COST project.[1] Eleven members were present during the focus group discussions. All members have in-depth knowledge and experience in the field of PPPs. This was considered as the first Delphi round. A refined set of indicators and measures were later sent to all members, during the Delphi second and third rounds. The indicators and measures were further prioritized/weighted using the level of consensus reached during the aforementioned Delphi rounds (Liyanage et al., 2016). During the second round of Delphi, the experts were asked about the level of importance of these indicators or measures (on a Likert scale of 4—in order to avoid "medium" or "sitting on the fence" answers, e.g. neither important nor unimportant) to assess PPP project success. During the third round of Delphi, the experts were asked to revise their preferences for level of importance of indicators and measures (if they so wish) that have not achieved the level of consensus. All eleven experts contributed to both the Delphi rounds.

Assignment of Mean Zones (M), Weights, and Weighting Scores (WS) of KPIs and PMs

Based on the mean scores obtained from the Delphi exercises, the performance measures (PM1–PM29) were classified in four different levels of importance or mean zones (M)—A, B, C and D–since some PMs contributed more than others to the success of PPP projects. Weighting factors or weights (W) were assigned 4, the highest, to 1, the lowest. Thus, the mean zone to which the mean score belongs and

[1] Founded in 1971, COST—European Cooperation in Science and Technology—is the first and widest European framework for the transnational coordination of nationally funded research activities. COST Action TU1001, which deals with Public–Private Partnerships in Transport: Trends and Theory, is composed of member teams from 24 European countries and additional six non-member teams from Australia, USA, Hong Kong and Albania.

a weight (W) applies is identified using the following scale/values: (4) 4.28–5; (3) 4.01–4.28; (2) 3.75–4.01 and (1) <3.75.

Having established different weights, a weighted score (WS) for each performance measure is calculated by multiplying the performance level (*L*) by the weighting (*W*). The weight assigned to a mean zone, i.e. WS_A, is the same for all performance measures that are classified in that zone.

Table 2 shows the scale, score and weight for the developed 9 KPIs and the 29 PMs.

Calculation of the General Level of Performance

After assigning the weighted score ($L \times W$) for all performance measures, the next step was to establish the overall level of performance for all PPP transport road projects. This was achieved by adding the weighted score of all performance measures (PM) that are categorized according to each of the PPP projects. The total weighted score of a project may be calculated by adding together the scores of the four mean zones. The overall result is then divided by the total number of PMs in the mean zones and multiplied by their respective maximum weighted scores. The maximum weighted score of all projects is calculated from WS_A (20 × 4) + WS_B (15 × 8) + WS_C (10 × 7) + WS_D (5 × 10) = 320. Once the overall level of performance was calculated, in order to provide a uniform measure for all transport projects, the final score for each case was multiplied by 100 (to represent the result as a percentage). The maximum weighted score is the same for all performance measures in a mean zone, i.e. 260 for WS_A, 195 for WS_B, 130 for WS_C and 65 for WS_D. To summarize, the overall performance for each project is calculated using the following formula:

$$\frac{\sum\left(\mathrm{WS_A}+\mathrm{WS_B}+\mathrm{WS_C}+\mathrm{WS_D}\right)\times 100}{\left[\mathrm{N}\left(\mathrm{P_A}\right)\times 20\right]+\left[\mathrm{N}\left(\mathrm{P_B}\right)\times 15\right]+\left[\mathrm{N}\left(\mathrm{P_C}\right)\times 10\right]+\left[\mathrm{N}\left(\mathrm{P_D}\right)\times 5\right]}$$

where $N(P)$ = number of outcome measures in a mean area.

A scale was developed to interpret the results thereafter. Projects that achieve a global performance score equal to or greater than 75% are considered “excellent”, while 25% or below are “very poor”.

Out of different alternative performance measurement methods (Villalba-Romero & Liyanage, 2016b), based on the weighted method described, the overall success results obtained from all the projects are shown comparatively in a ranking in Fig. 1.

The success level of the projects varies from 92% to 24% (see Table 4). A-23 Beira in Portugal has a higher success rate with a 92% score (after the successful restructuring of the project), followed by three other projects with success rates on 85% or above, i.e. Coen Tunnel in the Netherlands (87%), E-39 Orkd. in Norway (86%) and E-18 Muurla-Lohja in Finland (85%). In descending order, E-18

Table 2 Delphi score after study of KPIs and PMs

KPIs and performance measures (PMs)	Likert scale	Code	Mean score	Weight
Objectives		KPI-1		
Are the objectives specified in the contract SMART?	1 to 5	PM-1	3.1765	1
To what extent have the objectives being achieved?	1 to 5	PM-2	4.3514	4
Have/will user benefits been/be monitored?	1 to 5	PM-3	4.1765	3
Have user benefits been as large as expected?	−2 to 2	PM-4	3.6471	1
Risk		KPI-2		
How much risk has been transferred to the private sector?	1 to 5	PM-5	3.9730	2
Was risk allocation agreed quickly?	1 to 5	PM-6	3.3529	1
Specifications (contract project)		KPI-3		
Have the deliverables been specified clearly in the contract?	1 to 5	PM7	4.1892	3
Are the roles and responsibilities of different parties involved in the contract clearly defined?	1 to 5	PM-8	4.3243	4
Are minimum standards for condition of infrastructure and equipment specified in the contract?	1 to 5	PM-9	3.7778	2
Are there any performance targets?	1 to 5	PM-10	3.9091	2
Is the method of measuring performance targets clearly defined?	1 to 5	PM-11	3.2500	1
Are there penalties for non-compliance?	1 to 5	PM-12	4.5556	4
Does the contract have procedures for amendments, dispute resolution or termination?	Y/N	PM-13	3.8919	2
Has the contract proceeded without renegotiations?	Y/N	PM-14	3.0606	1
Are there any guarantees specified in the contract?	Y/N	PM-15	3.7588	2
Tendering process		KPI-4		
No. of bidders (negotiation vs. final)	1 to 3	PM-16	2.8788	1
Time from tender notice to financial close	Y/N	PM-17	2.3824	1
Legal challenges to outcome	Y/N	PM-18	3.0909	1
Construction phase		KPI-5		
Was the project completed on time?	Y/N	PM-19	4.0270	3
Was the project completed within budget?	Y/N	PM-20	4.1389	3
Was the project completed according to the specifications and design?	Y/N	PM-21	4.2432	3
Are there any penalties for non-compliance?	Y/N	PM-22	4.0541	3

(continued)

Table 2 (continued)

KPIs and performance measures (PMs)	Likert scale	Code	Mean score	Weight
Operations		KPI-6		
Were the services specified in the contract delivered?	1 to 5	PM-23	4.2973	4
Maintenance		KPI-7		
Are the deliverable standards for infrastructure and equipment being met?	1 to 5	PM-24	4.2162	3
Monitoring and evaluation		KPI-8		
Is there a formal monitoring procedure in place?	1 to 5	PM-25	3.8919	2
Finance		KPI-9		
Was finance available when needed?	1 to 5	PM-26	3.9189	2
Was the project cash flow sufficient to expected payments to all parties?	1 to 5	PM-27	4.1351	3
Did the project result in financial benefits to users (e.g. in terms of charges)?	−2 to 2	PM-28	3.5000	1
Has the financial outcome been equal or better than expected for the private partner?	−2 to 2	PM-29	3.5135	1

Grimstad-Krist., E4 Helsinki-Lathi, M-45 Madrid Loop, Millau Viaduct, M-80 Haggs and M-25 Orbital also have considerably higher success rates with a score greater or equal to 75% (but less than 85%). In contrast, the least successful projects appear to be Central Greece (E-65), Olympia and Ionia Odos (24%, 30% and 31%, respectively) in Greece, and Horgos-Pozega (26%) in Republic of Serbia, which had to be restructured and disaggregated in different sections and phases.

The results illustrate how PPP projects can be evaluated to draw conclusions about the level of success of a project from a global point of view, and a detailed analysis allows us to identify areas and elements which are not satisfactory.

Analysis of Key Factors in Road Project Success

Typology of the Analysed Projects

In the previous section, a level of success in the range from 0 to 100% has been assigned to each project within a performance measurement system (PMS). Now, we evaluate whether these respective levels of success may be associated with some basic key factors. This section analyses some key features of the projects that, from different perspectives, may influence the success of the projects, especially some related to the type of project and the adopted PPP model.

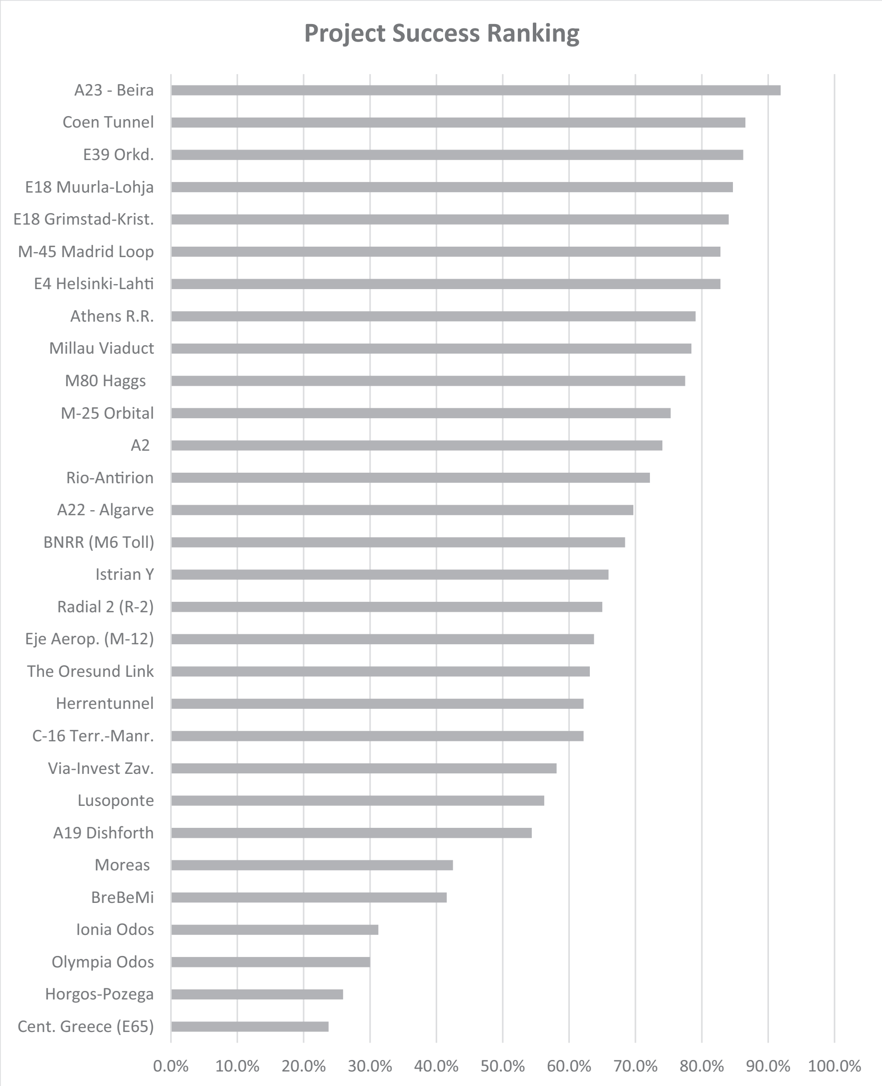

Fig. 1 Ranking of project success

The type of infrastructure of the projects selected is mainly a road between two points with several lanes in each direction. The road can include different structures, such as bridges, false tunnels, service roads, etc., typical of the quality of a toll road. In addition, projects that consist basically of singular structures, or in some cases a combination of other means of land transport, have been included. Specifically, it includes 24 generic road concession projects, two bridge concession projects, two tunnel concession projects and two combined projects: Via-Invest Zaventem (which

Table 4 Project summary ordered by success level

No.	Short project ID	Country ISO code	Transport mode	Type	Status	Cost size[a]	Years	Opening date	PPP model[b]	Private provisions[b]	Public provisions[b]	Main source	Success level (%)
4	A23—Beira	PT	Road	Both	Operation	M	30	2003	BOT	DBFOMT	Others	Agency	92
10	Coen Tunnel	NL	Tunnel	Both	Operation	M	30	2013	DBFO	n.a.	n.a.	Agency	87
13	E39 Orkd.	NO	Road	Both	Operation	S	25	2005	BOT	DBFOMT	Others	Users	86
12	E18 Muurla-Lohja	FI	Road	Greenfield	Operation	M	21	2009	DBFO	DBFOMT	Others	Agency	85
11	E18 Grimstad-Krist.	NO	Road	Both	Operation	M	25	2009	DBFO	DBFOM	Ow	Agency	84
22	M-45 Madrid Loop	ES	Road	Greenfield	Operation	M	25	2000	BOT	DBFOMT	D others	Agency	83
14	E4 Helsinki-Lahti	FI	Road	Both	Operation	S	15	2012	DBFO	DBFOMT	Others	Agency	83
5	Athens R.R.	GR	Road	Greenfield	Operation	L	25	2001	BOT	DBFOM	DF	Users	79
24	Millau Viaduct	FR	Viaduct	Greenfield	Operation	M	78	2004	BFOT	BFOMT	D	Users	78
23	M80 Haggs	GB	Road	Both	Operation	M	33	2011	DBFO	DBFOM	DB others	Agency	78
21	M25 Orbital	GB	Road	Brownfield	Operation	M	30	2015	DBFO	DBFOM	DF	Agency	75
2	A2	PO	Road	Greenfield	Operation	L	30	2011	BOT	DBFOMT	n.a.	Users	74
28	Rio-Antirion	GR	Bridge	Greenfield	Operation	M	42	2004	DBFO	DBFOM	FOw	Users	72
3	A22 – Algarve	PT	Road	Both	Operation	S	30	2003	BOT	DBFOMT	Ow others	Agency	70
6	BNRR (M6 Toll)	GB	Road	Greenfield	Operation	M	53	2003	BOT	DBFOM	Others	Users	68
19	Istrian Y	HR	Road	Both	Operation	M	32	2006	BOT	DBFOM	n.a.	Users	66

No.	Short project ID	Country ISO code	Transport mode	Type	Status	Cost size[a]	Years	Opening date	PPP model[b]	Private provisions[b]	Public provisions[b]	Main source	Success level (%)
27	Radial 2 (R-2)	ES	Road	Greenfield	Operation	M	25	2003	BOT	DBFOMT	D others	Users	65
15	Eje Aerop. (M-12)	ES	Road	Greenfield	Operation	M	25	2005	BOT	DBFOMT	D others	Users	64
29	The Oresund Link	SE/DK	Combined	Greenfield	Operation	L	29	2000	BOT	n.a.	n.a.	Users	63
16	Herrentunnel	DE	Tunnel	Brownfield	Operation	S	30	2005	DBFO	DBFOMT	F	Users	62
8	C-16 Terr.-Manr.	ES	Road	Greenfield	Operation	S	35	1991	BOT	BOM	D	Users	62
30	Via-Invest Zav.	BE	Road	Both	Operation	S	30	2012	DBFM	DBFOM	F	Agency	58
20	Lusoponte	PT	Bridge	Both	Operation	M	30	1998	BOT	DBFOM	n.a.	Users	56
1	A19 Dishforth	GB	Road	Brownfield	Operation	S	30	1998	DBFO	DBFOM	D others	Agency	54
25	Moreas	GR	Road	Both	Operation	L	32	2015	DBFO	DBFOM	FOw others	Users	43
7	BreBeMi	IT	Road	Greenfield	Operation	L	20	2014	BOT	DBFOM	Others	Users	42
18	Ionia Odos	GR	Road	Both	Operation	L	30	2017	DBFO	DBFOM	DFOw	Users	31
26	Olympia Odos	GR	Road	Both	Operation	L	30	2017	DBFO	DBFOMT	FOw	Users	30
17	Horgos-Pozega	RS	Road	Both	Restructured	M	25	Cancelled	BOT	n.a.	n.a.	Users	26
9	Cent. Greece (E65)	GR	Road	Both	Construction	L	30	Not in full	DBFO	DBFOM	DF	Users	24

[a] *S* small, *M* medium, *L* large
[b] See Table 5. Acronyms list for description detail

in addition to the highway includes the construction and remodelling of bridges for other uses) and, of particular interest, The Oresund (which, in addition to the structures of roads, bridges and tunnels through the Gulf of Oresund, includes the construction of a railway on the same route).

Of the projects, 12 can be considered purely greenfield projects, 3 projects are almost exclusively for the remodelling of existing brownfield infrastructures, and 15 projects are a mixture of both types in which the construction of new infrastructures or stretches is included. Most of the projects selected are fully in operation at present except the four cases below. Three projects in Greece, which in 2007/2008 and following years has faced a financial crisis, have been delayed: i.e. Ionia Odos and Olympia Odos where both projects have been made smaller and were completed in 2017/2018; and Central Greece (E-65), which is still under construction. Another project, Horgos-Pozega, which was selected for inclusion as a pioneering initiative in Serbia, eventually had to be restructured, and currently only some of the sections are being executed under a different business model. Other projects which suffered delays were Moreas, in Greece; Eje Aerop. (M-12) and Radial 2, both in Spain, and Brebemi in Italy. Most projects were built and inaugurated in the twenty-first century, except for the British A19 and the Portuguese Lusoponte, that were both inaugurated in 1998. In total, in the completion process, eight projects (not including the restructured Horgos-Pozega project) reported delays in PM-19, though not severe (−1 in a Likert scale of −2 to 2) and 10 projects informed of cost overrun in PM-20 (same delayed project group plus C-16 Terr.-Manr. project in Spain and The Orensund Link in Sweden/Denmark) (see Table 2).

The business models of the road concessions have been identified (see next paragraph for the capital letter acronym), highlighting the BOT models in 15 cases and DBFO in 13 cases. Additionally, two cases have been identified as DFOT and DBFM, which in general only involve slight variations of the predominant models indicated, respectively. Even though only one case is clearly identified as DFOT model by the case study contributors, many projects eventually will be transferred to the government agency, and therefore could be considered within this business model group. The difference may come from including or not, in an explicit or implicit way, the date in which the assets will be transferred, since often the contract period is open to new operating contracts or extensions. In any case, it is necessary to highlight how the differences in the concession models of the motorways are sometimes minimal and respond to the most common denomination in each country. Thus, the business model classification is not straightforward.

Perhaps a complementary way to define more clearly the particularities of each case is derived from the analysis of public and private provisions in the contracts of each of the cases, especially considering some provisions are often shared. The possible provisions considered are design (*D*), build (*B*), financing (*F*), operation (*O*), maintenance (*M*), transfer (*T*) to the public sector at the end, possession (Ow), the generic category, Others, which includes several elements such as the procedures for the occupation of the land, etc. Regarding the provisions to be made by the private sector, 14 cases have been identified that include DBFOM and 11 cases with the DBFOMT provisions, where the transfer of the infrastructure to the public sector is clearly highlighted. In addition, a case has been identified with the BFOMT private provisions and another with those related to BOM. As for the provisions to be made by the public sector, the most common function retained in the public sector relates to the design (D) of the infrastructure, which is identified in 11 cases; followed by financing (*F*) and the possession (Ow) in 6 cases each; and in 13 cases it is mainly the other category that has been identified, including miscellaneous functions. In three cases, accurate information on private and public provisions has not been identified (see summary in Table 3 and more details in Table 4).

Another important aspect with great influence on the viability of the projects is the context of exclusivity or monopolistic stance in which each project is developed. In principle, to the extent that if the project is an exclusive means of transport, there is a higher rate of traffic capture and less volatility in both traffic and revenues. In contrast, a project located in a totally competitive context may have more difficulty in reaching the required rate of traffic capture, and this will be much more sensitive to changes in the general conditions of the environment and especially the economic situation. Of the total of 30 projects analysed, two "exclusive" projects have been identified, 12 "quite exclusive" projects and another five "somewhat exclusive", which implies that almost two thirds of the projects have a rather favourable context. In contrast, six projects have a "competitive" context, three projects a "rather non-exclusive" environment and two "non-exclusive" projects.

Findings and Discussions

In this section, we discuss the extent of which key factors in the PPP model and the type of project are associated with different levels of performance. The projects have been ranked and classified by the level of success and some of the key factors are presented in Table 4. In this table, four levels of success are classified, which could be named respectively with the categories: "excellent" (range 100–75%, especially those on 85% and over), "good/successful" (<75 ≥ 60%), "neutral" (<60 ≥ 50%), "poor" (<50 ≥ 25%) and "very poor" (<25%). These groups may also be observed graphically in Fig. 1, which shows the ranking of the level of success of the projects.

Table 3 Breakdown of models, provisions and features in projects[a]

PPP model	Private provision	Public provision	Exclusivity
BOT 15	DBFOM 14	Oth 13	Full 2
DBFO 13	DBFOMT 11	D 11	Quite 12
BFOT 1	BFOMT 1	F 9	Somewhat 5
DBFM 1	BOM 1	Ow 6	No 2
	n.a. 3	n.a. 6	Rather no 3
		B 1	Competitive 6

[a]See Table 5. Acronyms list for description detail

Table 5 Acronyms list

Provisions and model/combinations		
Provisions		Model/combination
D	Design	BOT
B	Build	DBFOM
F	Financing	DBFO
O	Operation	DBFOMT
M	Maintenance	BFOT
T	Transfer	BFOMT
Ow	Possession	DBFM
Oth	Other	BOM
Other acronyms		
PPP	Public–private partnership	
PMS	Performance measurement system	
KPI	Key performance indicator	
PM	Performance measures	
CSF	Critical success factor	
(n.a.)	Not available	

It is worth noting that the level of success estimated through the PMS is a holistic approximation of the various performance measures analysed, although the specific behaviour of a certain performance measure may be contrary to the overall evaluation of the project. In this regard, some projects, which have excellent execution in the planning, tendering and/or construction phase and meet outstanding technical specification, may have failed in some KPI or PM, because of poor financial performance, as is the case of some projects in Spain (Eje Aerop. M-12 and Radial 2 (R-2)). Conversely, in other projects the overall assessments were worsen mostly by lack of financing caused by the 2008 economic crisis. This could be the case for projects Ionia Odos and Olympia Odos in Greece, which incurred long delays.

By geographical area, the results suggest that the projects that achieve lower levels of success are located in Mediterranean countries in southern Europe. Neutral success was evident in the A19 Dishforth in the UK and Via-Invest Zav. in Belgium. In a lesser extent, Herrentunnel in Germany or The Oresund in Sweden/Denmark are considered as Neutral success. These results may be due to the greater impact in these countries of the several years of the economic crisis. However, the projects that have had excellent results seem to be mostly located in Nordic countries or central Europe, again with some exceptions such as the most successful project A-23 in Portugal or M-45 in Spain.

The results of the project success analysis do not show complete correlation with the monopolistic stance relationship described in the previous section. However, the "quite exclusive" group, mainly Coen Tunnel, E18 Grimstad-Krist., E4 Helsinki-Lahti, Athens R.R., M80 Haggs, Rio-Antirion, has achieved good success levels (with the exception of some Greek projects, namely, Cent. Greece (E65), Olympia Odos, Ionia Odos and Moreas).

The results neither clearly indicate higher levels of success to be associated with the different modes of transport, although most of the projects refer to roads and only 6 out of 30 are other modes of transport. However, there seems to be greater success in those projects that were already partially built (i.e. combination of greenfield and brownfield), possibly with proven existing traffic.

In terms of its estimated cost size, even considering the difficulty of obtaining a homogeneous comparison due to different time and currency equivalent references, the table shows a classification for small (S) cost size projects (<€300 Million), medium (M) projects (≥€300 < €1000) and large (L) projects (≥€1000). The level of success is clearly lower in most large projects (see the bottom part of the table) and basically low in the small project. Therefore, the results associate higher level of success to those projects which are considered medium in terms of cost size, between €300 Million and €1000 Million. Regarding the duration of the projects, which varies in a wide range from 15 to 75 years, the most common being 25 or 30 years, no greater success associated with a specific duration is detected. Regarding the opening date of the projects analysed, which ranges from 1998 to 2017, there is no correlation of the level of success with the general economic cycle of the region. However, it is worth noting those projects that have achieved lower lever of success as a consequence of the higher impact of the financial crisis. These projects have been modified and delayed or have not been completed to date, such as the Ionia Odos, Olympia Odos and Central Greece (E-65) projects in Greece, or have been cancelled altogether, as in the case of Horgos-Pozega in the Republic of Serbia.

On the other hand, it is difficult to determine whether specific models of PPP can be associated with better levels of success due to lack of detailed contract information obtained and homogeneous criteria in the business model classification. Instead, it is more useful to focus on provisions that are transferred to the private sector, and especially on the source of income associated with the repayment mechanism adopted. Thus, the results seem to suggest that the DBFO models have reached higher levels of success.

It should be noted that the two projects A-22 and A-23 in Portugal with a high level of success were initially conceived as BOT, but were later restructured to models similar to DBFO. Also, public provisions in projects are sometimes shared (such as the project design (D), commercial activities), and often the public sector partially contributes to the financing of the projects. Thus, it is sometimes difficult to verify with clarity to what extent these public reserves can be associated with higher levels of success. But, the results suggest that the greater success of those projects is when the granting public agency payments are the main source of income. This may be due to the adopting of shadow toll payment mechanism, availability of payments, or payments by performance and use of indicators (active management). Therefore, the main conclusion is that the results clearly indicate how direct toll repayment mechanism are associated with lower level of success. More detailed information on the characteristics of the various repayment mechanisms can be reviewed in Villalba-Romero and Liyanage (2016a).

Summary and Conclusion

This chapter contains an empirical research applied to European road projects including analysis of the success factors of PPP road projects (RP) and their classification in a success ranking. The description of the RP database, in relation to the key factors of interest for this work, can be summarized as follows:

- Location: 30 projects from 16 European active countries in the use of PPPs in RPs have been analysed.
- Transport mode: The projects correspond to concessions of 24 roads, 2 bridges, 2 tunnels, 1 viaduct and 1 combined road and rail.
- Concession period: The average concession terms are 25–30 years.
- PPP models: The models are mainly BOT and DBFO, whose differences are sometimes limited depending on the idiosyncrasy of each country.

In the analysis of the success factors of the projects, possible key performance indicators (KPI) and performance measures (PM) have been considered, most of them with an economic and/or funding dimension. The selection, refinement and priority according to the level of importance of the KPIs and PMs have been achieved by applying a Delphi methodology, with groups of experts mainly based on the COST project. In total, 29 PMs are integrated into nine KPIs that have shaped the performance measurement system (PMS). Identified KPIs are related to project objectives, risk, contract specifications, tendering process, completions parameters, operation, maintenance, monitoring and finance. The PMS was applied to the projects to assess the level of success achieved in the projects. This has allowed us to obtain a success rate on a scale of 0 to 100% for each project and to position it in a ranking. The results obtained reflect a wide range of success levels in both the outcome measures and KPIs and in the projects (Table 5).

In terms of the success of projects, their scores range from 92% to 24%, and in general—with the exception mainly of the highest ranked project, i.e. the A23 Beira in Portugal, and with certain other exceptions—the results show a greater success in the projects developed in the countries of central and northern Europe compared to the projects in the Mediterranean countries. The main reason for this lies in the strong impact of the 2008 on economic crisis that has affected the demand for the service in some projects, which have reduced the score of some PMs related to the financial sustainability of short-term projects.

On the other side, the level of success has been contrasted to several main project variables to explore potential links and extract possible conclusion that may be relevant to policy makers. Though no clear success relationship has been found in basic variables like transport mode, type of project, contract period or opening date (except for the mentioned impact of economic crisis), there are some evidences that suggest links of other variable with the level of success of the projects.

In particular, large projects obtain lower level of success, what suggest a general conclusion to avoid very large-scale projects that are rather split into several smaller projects less risky and more adaptable to be successful. In addition, since the level of exclusivity of the transport mode is associated with the level of success when other factors do not substantially impact the project, it seems relevant to avoid promoting rather and non-exclusive high capacity road projects, especially if there are alternatives ways free of charge.

The current trends to adopt hybrid PPP models make difficult to extract conclusions about the preferred holistic business model. Instead, exploring the right selection of risk transfer and/or risk sharing scheme, as a combination of public and private provision for each particular case may be the best option. However, with regard to project funding, the results suggest that the achievement of success is less likely in some projects that have based their income exclusively on direct toll revenues, especially considering high demand elasticity and affordability constrains. Indeed, it is clear that projects that have adopted models whose main source of income is based on payments from the granting public agency achieve higher levels of success, and thus, these payment mechanisms should be prioritized in the infrastructure provision if the public agency can effort it.

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Highway Infrastructure Delivery Through Government Finance and PPPs

D. G. Williams

Acronyms

BBC	British Broadcasting Corporation
BOO	Build Own Operate
BOOT	Build Own Operate Transfer
CIHT	Chartered Institute of Highways and Transportation
CIL	Community Infrastructure Levy
DBFO	Design Build Finance Operate
DfT	Department for Transport
ESRC	Economic and Social Research Council (United Kingdom)
FAPESP	São Paulo Research Foundation (Brazil)
Fp1-9	Firepool lots 1-9
HM Treasury	Her Majesty's Treasury
LHA	Local Highway Authority
MHCLG	Ministry of Housing, Communities & Local Government
MRN	Major Road Network
NIDR	Northern Inner Distributor Road
NWO	Netherlands Organisation for Scientific Research (Netherlands)
PARCOUR	Public Accountability to Residents in Contractual Urban Redevelopment
PFI	Private Finance Initiative
PPPs	Public–Private Partnerships
QUANGO	Quasi-government organisation
RIS	First Roads Investment Strategy (2015–2020)
RIS2	Second Roads Investment Strategy (2020–2025)

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S38 Agreement	Section 38—The Highways Act 1980. Agreement between highway authority and developer
S73 Agreement	Section 73—The Town and Country Planning Act 1990. Agreement between highway authority and developer
S106 Agreement	Section 106—The Town and Country Planning Act 1990. Agreement between highway authority and developer
S278 Agreement	Section 278—The Highways Act 1980. Agreement between highway authority and developer
SRN	Strategic Road Network
SW	South West (region of England)
UK	United Kingdom

Introduction

There is no clear and consistent meaning of 'highway' in English law, and the meaning can change between statutes and even within provisions within statutes (Thomas, Nihat, & Wigy, 2018). The Department for Transport (DfT) has assigned two tiers of highway network in England[1]: the *Strategic Road Network* (SRN) and the non-strategic network. This definition influences how new highways are funded, constructed and maintained. The SRN covers 13% of the highway network (4300 miles) and is formed of motorways and major A Roads. The non-strategic road network accounts for the remaining 87% of roads in England (Department for Transport, 2019) and is managed by the Local Highway Authorities (LHA).

This chapter discusses how new highway infrastructure is constructed in England, evaluating the use of Public–Private Partnerships (PPP) in the delivery of the SRN. The chapter explores three case studies, where a PPP urban development schemes delivered new non-strategic highway infrastructure. The research is based on data collected through the PARCOUR research project[2] and provides an analysis of the processes involved in constructing highway infrastructure in the UK and the challenges and benefits of this process for both the public and private sectors.

The Use of PPPs on the Strategic Road Network (SRN)

In the 1990s, the UK government explored ways of utilising private sector expertise to deliver new infrastructure projects and improve maintenance of the existing SRN (Highways Agency, 2012). The Majority of UK's motorway network was

[1] The strategic highways in other parts of the UK by the devolved governments in the region.

[2] *Public Accountability to Residents in Contractual Urban Redevelopment (PARCOUR).* A 3-year São Paulo Research Foundation (FAPESP) Brazil, Netherlands Organisation for Scientific Research (NWO) Netherlands & Economic and Social Research Council (ESRC) United Kingdom funded PARCOUR Project (no. 485-14-010) exploring urban regeneration in the UK, Brazil and The Netherlands.

constructed in the 1960s and 1970s (Charlesworth, 1984), and some sections needed to be upgraded. Design, Build, Finance and Operate (DBFO) agreements were set up between the UK Government and private companies to deliver a new motorway (the M6 Toll road), to manage sections of the existing network and deliver new large-scale schemes.

In 1991, the UK government entered a DBFO PPP to deliver the M6 Toll road, a 27-mile, six-lane motorway to the north of Birmingham, in central England. The DBFO transferred the risk from the government to the private partners for the costs of delivery and operation. The DfT oversaw the contract and licence to operate the new highway. Midland Expressway Ltd, used $1.2 bn (£1 bn) of private funding to deliver and manage the M6 toll (M6 Toll, 2019). The M6 Toll road was opened in December 2003 and was expected to serve 74,000 vehicles per day. The route has delivered an average of 54,000 vehicles per day in 2015 (M6 Toll, 2015). Due to the poor performance of the M6 Toll, the owners, Midland Expressway Limited, sold the M6 Toll to private investment company, *IFM Investors,* in June 2017 (British Broadcasting Corporation [BBC], 2017), having made a significant loss through the DFBO contract.

In 1994, the UK government set up *The Highways Agency* to manage the SRN, separating the SRN's management from the DfT. The Highways Agency utilised the government's Private Finance Initiative (PFI) to procure road services on parts of the network where significant upgrades were required (Highways Agency, 2012). The Highways Agency had fixed 1-year budgets to which offered little opportunity to develop large-scale multi-year capital schemes. PFI schemes were used to deliver large-scale projects that transferred some of the risk to the private sector, promote innovation and create a private sector road-operating industry (Highways Agency, 2012). It was believed that the utilisation of DBFO agreements with private companies would reduce the financial burden of the public sector for delivering new infrastructure.

In 1996, The Highways Agency set up eight DBFO PPPs across their network. These are shown in Table 1 and Fig. 1. Users of the network were unaware that the road had been transferred to private ownership, as no tolls were charged to use the network. Instead, the Highways Agency paid the DBFO companies '*Shadow Tolls*'. The DBFO companies were paid in relation to traffic (number of vehicles) and performance (lane closures and road safety) (Highways Agency, 2012).

In 2003, two further DBFO agreements were introduced by The Highways Agency. These schemes, shown in Table 2 and in Fig. 1, enhanced the Shadow Tolls payment method by introducing *Active Management Payment Mechanisms*. The additional mechanisms focused on congestion management and safety. The final DBFO was agreed in 2009 and covered the M25 London Orbital Motorway (Highways Agency, 2009). This DBFO included additional clauses of lane availability, condition of the network, and management of the maintenance and incidents (Highways Agency, 2012).

The UK Government found that the delivery of highway infrastructure through the DBFO approach was not the most efficient way to deliver new infrastructure, with The Highways Agency paying more to the private sector partners in the first three years of each of the first eight DBFO contracts than it would have cost to

Table 1 1996 DBFO schemes on the SRN (Highways Agency, 2012)

A69 Newcastle to Carlisle DBFO (AREA) 25 • \$11.6 m (£9.4 m) highway upgrade • 52 miles long • 30-year contract (1996–2026) • DBFO Company: *Road Link Ltd* • Shareholders ASTM/SIAS 20% Henry Boot 61.2% Pell Frischmann concessionaires 18.8%	A168/A19 Dishforth to Tyne Tunnel DBFO (AREA) 26 • \$35.9 m (£29.4 m) highway upgrade • 73 miles long • 31-year contract (1996–2027) • DBFO Company: *Autolink Concessionaires* • Shareholders PFI Investors Ltd 100%
M1-A1 Link (Lofthouse to Bramham) DBFO (AREA) 27 • \$244 m (£200 m) highway upgrade • 18.6 miles long • 30-year contract (1996–2026) • DBFO Company: *Connect A1-M1 Limited* • Shareholders Balfour Beatty 50% Barclays infrastructure investors 50%	A50/A564 stoke to Derby DBFO (AREA) 28 • \$25 m (£20.6 m) highway upgrade • 35 miles long • 30-year contract (1996–2026) • DBFO Company: *Connect A50 Ltd* • Shareholders Balfour Beatty 85% Barclays 15%
A1(M) [J14-17] Alconbury to Peterborough DBFO (AREA) 29 • \$156 m (£128 m) highway upgrade • 13 miles long • 30-year contract (1996–2026) • DBFO Company: *Road Management Services (Peterborough) Limited* • Shareholders Barclays Integrated Infrastructure Fund 41.66% Kellogg Brown & Root 25% Abertis Motorways UK Ltd 33.33%	M40 [J1-15] Denham to Warwick DBFO (AREA) 30 • \$79.4 m (£65 m) highway upgrade • 76 miles long • 31-year contract (1996–2027) • DBFO Company: *UK Highways M40 Ltd* • Shareholders John Laing Investments Ltd 50% Semperian Holdings 50%
A419/A417 Swindon to Gloucester DBFO (AREA) 31 • \$92.5 m (£75.7 m) highway upgrade • 32 miles long • 30-year contract (1996–2026) • DBFO Company: *Road Management Services (Gloucester) Ltd* • Shareholders KBR 25% Abertis Motorways Ltd 33.33% Barclays Infrastructure Investors Ltd 41.66%	A30/A35 Exeter to Bere Regis DBFO (AREA) 32 • \$134 m (£110 m) highway upgrade • 63 miles long • 30-year contract (1996–2026) • DBFO Company: *Connect* • Shareholders Balfour Beatty Investment 85% Barclays Infrastructure Investors Ltd 15%

deliver the work themselves (Shaoul, Stafford, & Stapleton, 2007). In 2012, the UK government undertook a review of PFI schemes aimed at addressing criticisms of this funding model and in 2017, Her Majesty's (HM) Treasury confirmed that they would no longer use this investment model for any schemes (HM Treasury, 2018), although the existing DBFO schemes would remain in place until the end of their contracts. DBFO delivery models were viewed by the UK Government as a more expensive model of delivering highway infrastructure.

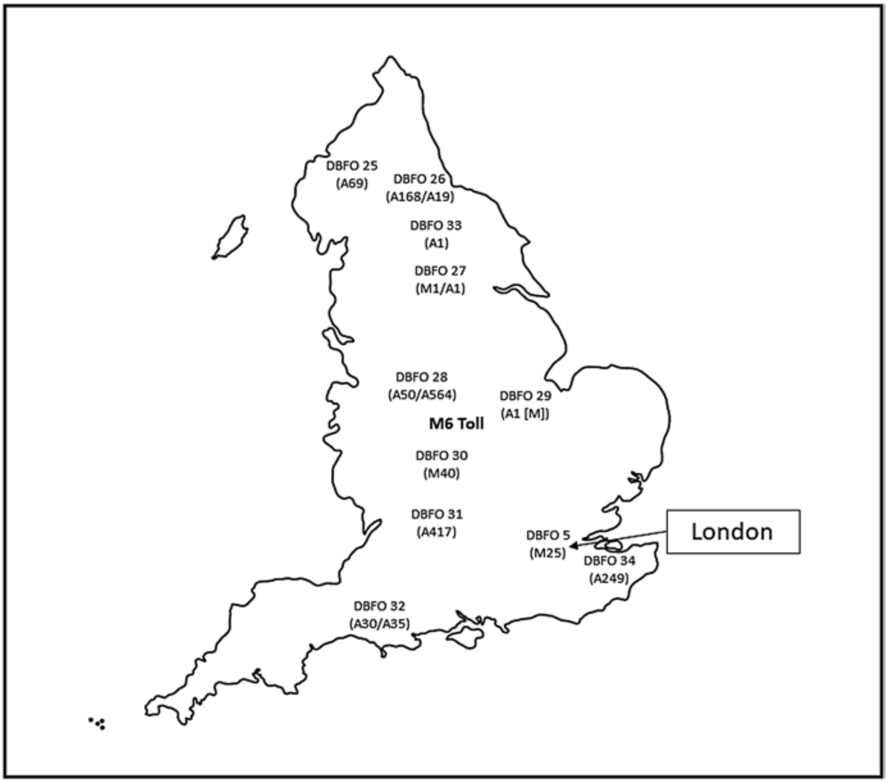

Fig. 1 DBFO and the M6 Toll locations in England

In 2015, the UK government changed the funding method for the SRN and developed the Roads Investment Strategy (RIS) consisting of $18.5 bn (£15 bn) to deliver improvements to the existing SRN and 400 miles of extra capacity, including new highways such as the A14 (Highways England, 2019). As part of the RIS process, the UK Government privatised the existing government organisation, The Highways Agency, and formed Highways England, a private company that is wholly owned by the UK government. Highways England was designed to operate as a private company to deliver the RIS efficiently and to keep highway development 'in-house', whilst driving forward efficiencies and cost savings in a similar way to a private business. In August 2021, Highways England was renamed National Highways.

The RIS process has allowed National Highways to design, deliver and manage large-scale projects that would not have been possible under the funding model prior to 2015, enabling the national government to move away from the DBFO funding model for large-scale schemes. Highways England has designed 5-year delivery programme of forward work under both stages of the RIS, with the first RIS period enabling a significant upgrade of the SRN to occur between 2015 and 2020.

Table 2 2003 and 2009 DBFO schemes on the SRN (Highways Agency, 2012)

A1 Darrington to Dishforth DBFO (AREA) 33 • $299 m (£245 m) highway upgrade • 33 miles long • 33-year contract (2003–2036) • DBFO Company: *Road Management Services (Darrington) Ltd* • Shareholders Barclays Infrastructure Investors Ltd 25% Semperian 50% Kellogg Brown & Root Ltd 25%	A249 Stockbury (M2) to Sheerness DBFO (AREA) 34 • $35.9 m (£29.4 m) highway upgrade • 11 miles long • 30-year contract (2004–2034) • DBFO Company: *Sheppey Route Limited* • Shareholders Carillion Private Finance 50% Barclays European Infrastructure Road Ltd 50%
M25 (including associated link roads, Dartford Tunnel and stubs and tails from M25 to GLA boundary), Berks, Bucks, Herts, Essex, Kent and Surrey DBFO (AREA) 5	• $7.8 bn (£6.2 bn) highway upgrade • 63.4 miles long • 30-year contract (2009–2039) • DBFO Company: *Connect Plus* • Shareholders Balfour Beatty 40% Skanska 40% WS Atkins 10% Egis projects 10%

It was announced that $33 bn (£27 bn) was made available for the second RIS period (RIS2), which will be delivered between 2020 and 2025 (HM Treasury, 2020). The success of the RIS process in terms of financial savings for government and delivery of significant highway infrastructure upgrades means it is unlikely that SRN will be delivered through a PPP in the future.

Non-strategic Road Network

In comparison to the SRN, the non-strategic road network is the ‘poor relative’ in terms of funding. Local governments have experienced a significant reduction in national government funding in the period 2010–2020, with a $26 bn (£21 bn) total budget reduction forecast between 2010 and 2020 (Gainsbury & Neville, 2015). These cuts have impacted all services provided locally, including highways, with a reduction of $728 m (£590 m) per year on maintenance of the non-strategic network between 2005 and 2016 (Eichler, 2018). Whilst asset management techniques can account for some of this reduction, the loss of funding has had a significant impact on LHAs' ability to manage, develop and adopt new highway infrastructure and maintain it to a high standard.

Major Road Network (MRN)

The UK government, aware of this disparity, announced that LHAs would be able to apply a share of $4.3 bn (£3.5 bn) between 2020 and 2025 to maintain non-strategic A roads to the same standard as the SRN (Department for Transport, 2018). The non-strategic A roads were redefined as the Major Road Network (MRN), a new level that sits below the SRN. The concept was based on the Rees Jeffreys Road Fund study *'A Major Road Network for England'* which called for the A Road network controlled by LHAs to receive funding at a similar level to the RIS programme (Browne, 2016). This money can however only be spent on maintaining and improving A Roads (Department for Transport, 2018). Other funding is required to maintain the remainder of the highway network.

Construction of Non-strategic Roads

Construction of new non-strategic highways or highway infrastructure in LHA areas rely on funding by the central government, other government agencies, developers, adoption of developer constructed roads, bank loans and the local highway authority's own cash reserves. In the 20 years up to 2019, there has been an increase of 4400 miles of minor roads, predominantly either funded or constructed by housing developers who build new housing estates and the associated transport infrastructure which is adopted by the LHA (Department for Transport, 2019). These are delivered under a Build-Own-Operate-Transfer (BOOT) approach and account for over 90% of new roads constructed in the UK. The transfer or adoption of new highways in England is regulated by three acts of parliament: The Highways Act 1980; The Town & Country Planning Act 1990; and The Planning Act 2008, a summary of each is included in Table 3.

Due to the temporal nature of new development schemes, the adoption of new highways constructed by the private sector is a slow process for all parties. Each government act is designed to provide the relevant parties with an understanding of their obligations in relation to the quality of highway construction and the process for adoption by the LHA. The next section of this chapter explores three case studies of urban regeneration schemes where new highway infrastructure was constructed and adopted by the LHA.

Case Studies

The three case studies describe a range of differing contributions to the highway network though the development of previously used land. The new highways discussed were funded in three ways: through S106 agreements with developers, directly by the National Government, or from a quasi-government organisation (quango) funding. The three case studies, located in the southwest of England, outline the process of highway adoption involved at regeneration sites in the cities of Bristol and Gloucester and the town of Taunton.

Data Collection

The case studies used in this research were constructed using an inductive grounded theory approach designed to generate new data from interviews with 30 people involved in the regeneration process. The research started with an initial desktop study to identify potential interviewees, with a snowballing approach used to identify people and key documentation.

The documentation analysed within the research includes S106 and S73 agreements, between the developers and the local authority, and other key documentation provided by interviewees. The interviews have been anonymised in line with data collection protocols.

Case Study 1: Bristol Harbourside Regeneration

The Bristol Harbourside development (Figs. 2 and 3) sits to the west of the city, on Bristol's Floating Harbour, which was constructed between 1804 and 1809 and operated for almost two centuries. The site had been derelict since the 1980s and had been difficult to develop due to the land being owned by multiple companies and government organisations shown in Table 4 and Fig. 2. Bristol City Council instigated an informal agreement with the other landowners in 1993 called the *Harbourside Accord*, a PPP to regenerate the site and share profits, in relation to each partner's land holding, once this process was complete (Atkinson, Tallon, & Williams, 2019).

The regeneration process was fraught, with planning permission being denied twice by Bristol City Council's own Planning Committee, due to the quality of the scheme proposed (Atkinson et al., 2019). The site was finally awarded the planning permission in 2001, at the third attempt, and the four remaining landowners: Bristol City Council, Transco PLC (Gas), Secondsite Property Holdings Limited (National Grid) and Lloyds TSB (Bank) signed a Joint Development Agreement with property Developer Crest Nicholson and their subsidiaries on 20 July 2001, with Crest

Table 3 Government acts influencing highway construction in England

The Highways Act 1980 • Developers enter Section 38 (S38) agreement with LHA • LHA will adopt highway if it meets appropriate standard (Practical Law, 2019) • Failure to enter this agreement or for the highway to meet the required standard mean the developer remains responsible for the highway (Evans, 2015) • The highway becomes a Build-Own-Operate (BOO) with little intervention from the LHA • Developers also need to enter a Section 278 (S278) agreement with the LHA to develop a new access/egress to their site (Birmingham City Council, 2019)
The Town & Country Planning Act 1990 • Section 106 (S106) agreements outline the planning obligations placed on the developer • This is known as 'planning gain', as it is designed to improve the local area to mitigate the impact of the new development • Both parties can change the S106 by entering a Section 73 (S73) agreement • This often occurs once the scheme is underway
The Planning Act 2008 • The Community Infrastructure Levy (CIL) introduced through this act meant that any 'planning gain' from the development could be spent anywhere within the LHA area rather than in the vicinity of the development • The CIL can be altered through a S73 agreement

Nicholson funding the development. This agreement was for Crest Nicholson, via their subsidiary Nicholson Estates PLC (later amended to *Crest Nicholson (South West)* on 28 November 2003), to redevelop the derelict area known as Bristol Harbourside.

The initial S106 agreement (2003) set out the planning obligations that had to be met by Crest, as the developer, to minimise impact and enhance the public areas. Other subsequent S106 agreements were created for each new phase of the development. The initial S106 agreement contained just over £2m of planning obligations for Crest Nicholson. This included a Surety Bond of £995,000, which would be repaid when Crest completed certain phases of the regeneration placing the financial risk of the development on the developer. The remaining £1.03m was requested to improve the highway including reconfiguring the nearby Jacob Wells Roundabout (£0.5m) (shown in Fig. 3) and making other highway improvements. Crest Nicholson would also construct the new highways on site (Fig. 3). This highway was designed to be adopted in line with the S38 agreement between Crest Nicholson and Bristol City Council.

In total, Crest Nicholson was liable to pay Bristol City Council £1.8m for transport infrastructure improvement across the duration of the Bristol Harbourside Regeneration between 2003 and completion in 2016. Once the Crest Nicholson (SW) had paid this money to Bristol City Council (the LHA), it was the responsibility of the Council to ensure the new highway infrastructure was delivered. The S106 agreement stipulated that if the money was not spent within 10 years of payment it would be paid back to the developer with interest. The alterations to the Jacobs Wells roundabout were made in 2005, with traffic signals added to the junction with the works carried out by Bristol City Council's highway contractors.

Adoption of New Highways

The temporal nature of the regeneration process means that hand over of highway infrastructure can create a long ‘tail’ for developers, requiring them to hold on to land until the Bristol City Council adopts the highway and adjacent land, shown in Fig. 2, as explained by interviewee BH8 in 2016:

> There are significant areas of this scheme which are to be adopted or have been or are to be adopted by Bristol City Council… to then take on and hold in perpetuity and manage the upkeep. That also protects those routes and aspects for the wider public and the residents of Bristol as a wider whole.

This can cause problems for developers looking to divest from the site, once their work is completed. The second main criticism related to the layout of the new highway, as explained by interviewee BH1:

> …once you’ve sold off the flats to individuals you are stuck with the layout. It will live as long as the medieval part of the city lives as terms of its shape. There may be no medieval buildings left, but the shape of the city is the same. So, what you lay down is really important.

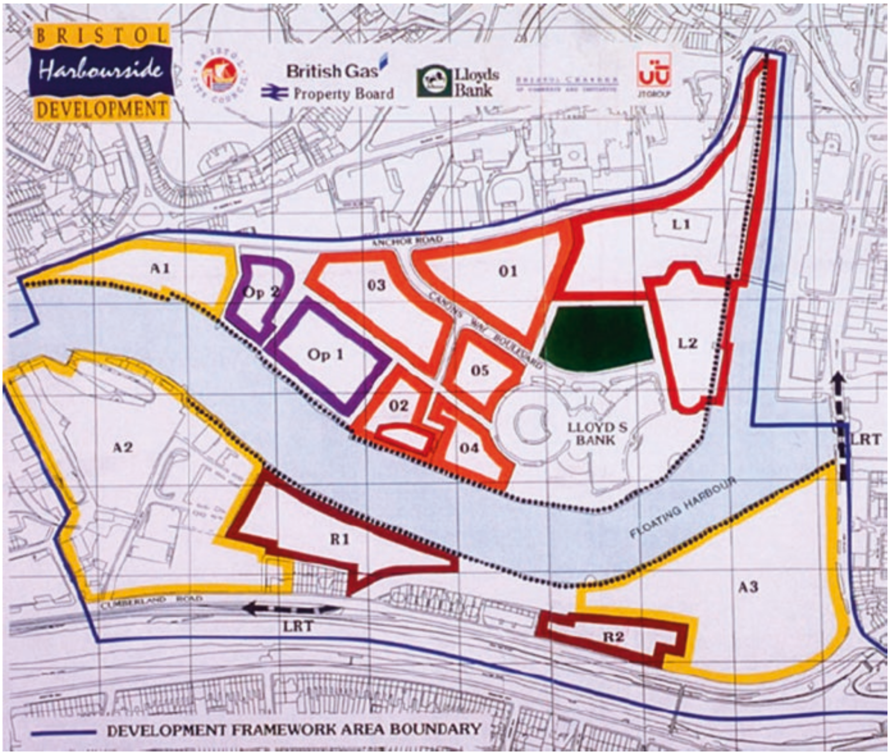

Fig. 2 Harbourside site 1993 (©Richard Holden, ©Bristol City Council)

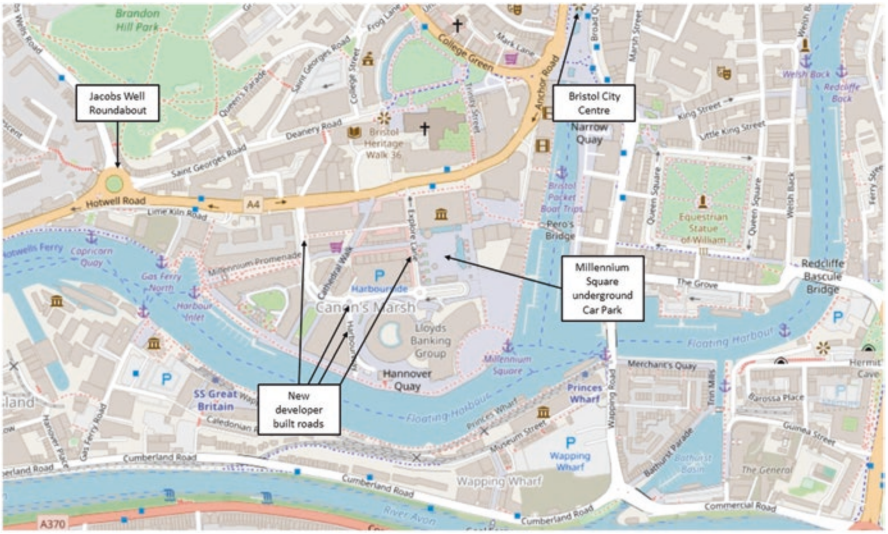

Fig. 3 Harbourside site location (© OpenStreetMap contributors)

Table 4 Landowners at Bristol Harbourside

Bristol Harbourside Landowners (Fig. 2) • British Rail Property Board—Lots A1, A2 and A3 • British Gas—Op1 and Op2 • Housing developers—R1 and R2 • JT Group—L1 and L2 • Bristol city council—01 to 05

This shows the importance of the design phase of the new development, as the highway network and all the associated sewage, utilities and fibre optic infrastructure will influence how the site develops for many years to come. All the roads on the development site have now been formally adopted by Bristol City Council.

Success of the Harbourside Redevelopment

Despite the initial challenges of undertaking the development of Bristol Harbourside, the site is now complete. The area provides a mix of housing, employment and social activities for the benefit of the city on a site that was once derelict. The development of a PPP through the Harbourside Accord provided an opportunity for the development to take place and enabled each landowner, both public and private, to receive a greater level of profit than if each site was developed separately. The new highway infrastructure works at Jacobs Wells Road, and other public transport infrastructure mean that the site, and the centre of Bristol to the east of the site, are easier to access by highway, bus or by walking and cycling.

Case Study 2: Gloucester Quays Transformation

The Gloucester Quays development, Fig. 4, is similar to Bristol Harbourside as it involved the regeneration of the city's derelict docks. Regeneration of the area started in the 1980s when Gloucester City Council purchased one of the former dockside warehouses for just $1.21 (£1). The Council's offices now sit to the north of the development site shown in Figs. 4 and 5 and are now worth considerably more. The closure of the Fielding and Platt factory, the development area to the east of the Gloucester and Sharpness Canal (bottom of Fig. 4), left a large derelict area as interviewee GQ1 explained:

> There were a lot of derelict buildings, a bit of a no-go area. Quite a lot of anti-social behaviour, thefts and so on. In fact, my own car stolen when down there!

One of the problems in redeveloping the site was the lack of access from the M5 motorway to the site, which required navigating the busy non-strategic road network within the city. Access from the west was difficult due to the lack of crossing points on the Gloucester and Sharpness Canal to the south of the site. In the 1990s, the initial infrastructure for a crossing point was build, but no bridge was constructed, and this was known locally as 'the bridge to nowhere'.

In the 1990s, the land was owned by two parties: British Waterways and Peel Holdings who owned a pre-existing shopping centre to the south of the site. Both parties entered into a BOOT public–private partnership (PPP) agreement to develop the sites together and share the costs and profits from the development. In 2002, they submitted a planning application for the development.

With planning approved in 2004 Peel and British Waterways signed a S106 agreement to provide the highway infrastructure for the development, which interviewee GQ3 described as: "a substantial one: the whole road junction around the Quays and the new bridge.". Interviewee GQ2 suggested that the S106 payment was: "….in the region of £2.5m of funding, which was designed to part-fund various transport schemes across the city", rather than solely focus on schemes adjacent to the development.

The first phase of the Gloucester Quays retail site opened in 2009. In 2017, interviewee GH10 explained that much of this infrastructure immediately adjacent to the site was still owned by Peel Holdings, despite the developer signing a S38 agreement with Gloucestershire County Council to adopt the highway. In addition to the access and egress points off St Ann Way, shown in Fig. 5, two other significant sections of highway infrastructure were also provided to enable access to the new shopping and leisure site: a link road to the M5 that bypassed the city centre to the north of the development site (shown in Fig. 5) and a new bridge providing a crossing

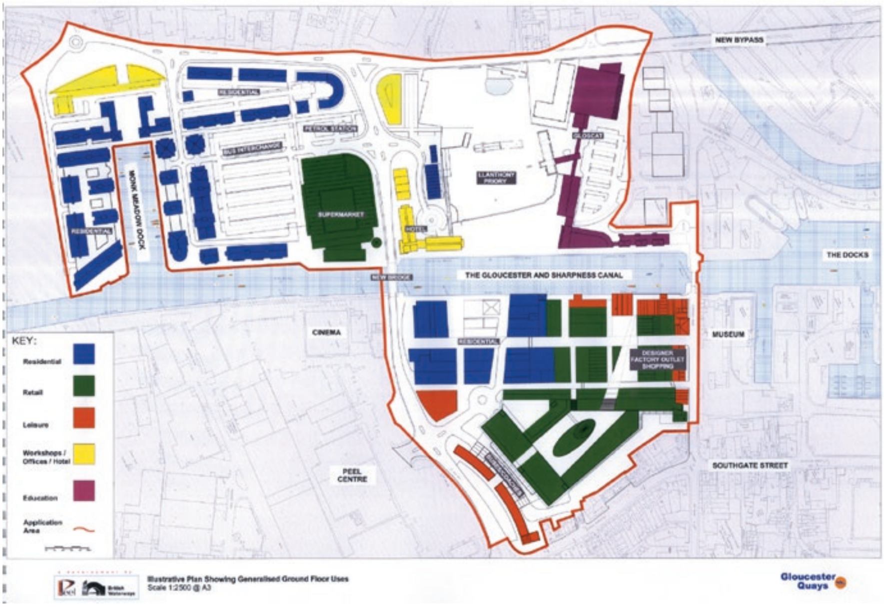

Fig. 4 Gloucester quays proposal 2002 (© Gloucestershire County Council)

over the canal, linking to Peel Holdings' newly improved road, St Ann Way, also shown in Fig. 5.

Link Road

In 2001 the MP Parmjit Dhanda spoke to the then Lord Commissioner of the Treasury regarding the need for a link road (Dhanda, 2015), shown in Fig. 5. The link road had long been an aspiration of the LHA, Gloucestershire County Council (GCC), but had never come to fruition. The DfT agreed to provide GCC with £12m to develop the new 1.8-mile highway, with the other costs being met locally through S106 agreements with developers. This scheme was developed between 2002 and 2005.

The late 1990s and early 2000s were a time of relative prosperity and high government spending, which enabled key elements of infrastructure to be delivered by local authorities though central government funding. This opportunity has diminished since the economic crisis of 2008, as discussed in the Taunton Case Study below, with very few schemes funded since 2010. The link road opened up the western side of the city and provided a new link to the Gloucester Quays development.

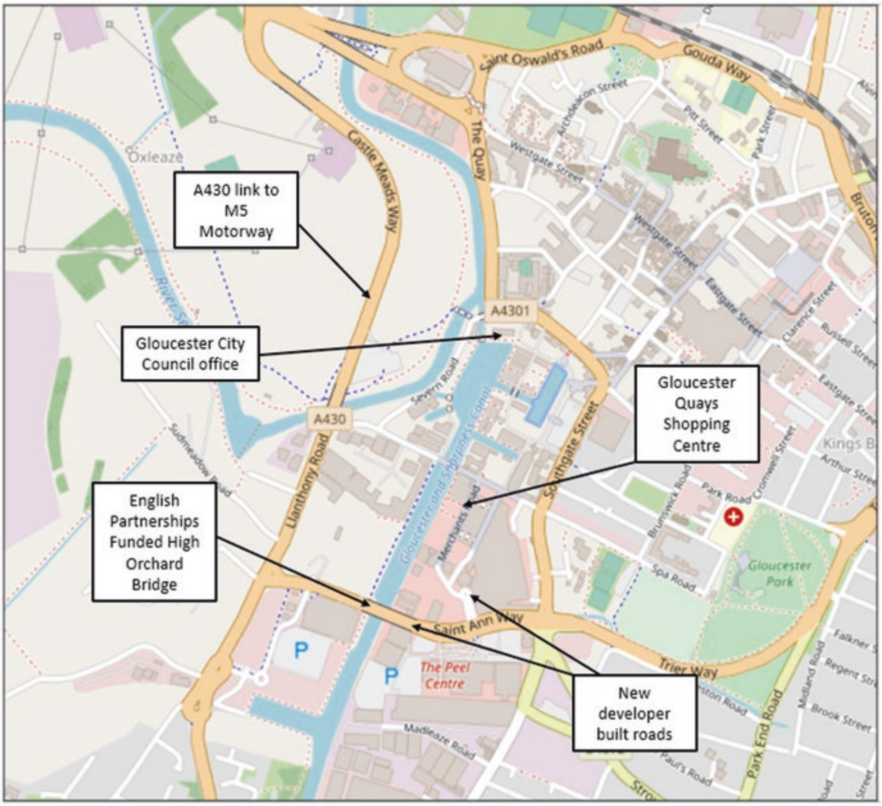

Fig. 5 Gloucester quays location (© OpenStreetMap contributors)

The High Orchard Bridge

The High Orchard Bridge provided the link between the ‘road to nowhere’ and St Ann Way where Peel Holdings’ existing shopping centre, The Peel Centre, and the proposed access to the Gloucester Quays site was located, shown in Fig. 5. The bridge was funded by \$11.8m (£9.7m) from *English Partnerships*, a government quango tasked with purchasing land and assembling sites for new development projects. GQ10 suggested that developer Peel Holdings provided \$6.7m (£5.5m) of this funding. English Partnerships (now Homes England) was interested in opening this link as it provided access to land to the south west of the city centre for new housing and retail opportunities. These housing developments are now in the process of being constructed to the west of the development site shown in Fig. 4.

The combination of these two new, predominantly government-funded highway improvements altered the city and enabled access to the new shopping and leisure site by car. The funding of infrastructure by Peel Holdings, who bought British Waterways out of the PPP in 2011, has provided leverage for the company as they look to further invest in the site and their adjacent shopping centre. This assisted with the opening of a new retail store for retailers *Next* close to the development in 2018.

Success of the Gloucester Quays Redevelopment

Despite initially opening in the economic down period of 2009, the Gloucester Quays development has been successful, with over 5 million people visiting the site in 2017. The construction of the new link road and the High Orchard bridge have enabled travel to the site by car and enabled the second phase of the development to open, including a multiplex cinema, several restaurants and new housing units to be constructed on the site. This would not have been possible without the cooperation and coordination between the two PPP partners, Peel Holdings and British Waterways, and the local government.

Case Study 3: Taunton Firepool Regeneration

The regeneration of Taunton Firepool was far more fragmented than both Bristol Harbourside and Gloucester Quays, as it is made up of multiple sites with different developers. Access to the site by car was a primary concern, with the construction of a new road bypassing the town centre included in the design. This was known locally as the Northern Inner Distributor Road (NIDR) and was designed to alleviate traffic through the town centre, as well as provide access to the Firepool development.

Public/Private Partnership Delivery of NIDR

The Firepool site comprises two large development sites: Firepool Lock (Fp3) and the former cattle market site (Fp1, Fp2), as shown in Fig. 6. Firepool Lock comprised the former east goods yard and was sold by Network Rail to developer Abbey Manor in 2007 who developed it as a BOOT scheme. Abbey Manor received planning permission for the site and subsequently sold it to Crest Nicholson who developed the site. Part of the S106 agreement between Abbey Manor and Taunton Deane Borough Council, the local planning authority, involved the construction of a section of the NIDR. This section was adopted by Somerset County Council as the LHA after meeting the standard design under S278, as interviewee TF8 explained:

> The developer submits their proposal and the LHA review that, make sure we were happy with the design and then when it's being built. We also have a supervisory role when these

> things are built, checking that it is being built to the standard and layout that we'd agreed. If there are things like it is built in the wrong place, we can pick it up and get it corrected.

As part of the PPP agreement, the initial section of the NIDR (Fig. 7) provided a link to the Firepool Lock site and was designed to a high standard by the developer so that it could be adopted by the LHA. The remainder of the NIDR was funded in a similar way to the Gloucester Link road, with central government funding providing the bulk of the payment. TF4 explains:

> The government were cutting back on major road schemes. This was one of only I think 10 or 11 road schemes in the whole country that agreed to fund.

Somerset County Council submitted a Major Scheme Business Case to the DfT in 2011 for funding to complete the scheme. In May 2013, the DfT awarded Somerset County Council $18.5 m (£15.2m), as part of the $25.6 m (£21 m) estimate to deliver the scheme, with the initial completion date in the autumn of 2014. The scheme was delayed as the costs of the scheme exceeded the initial estimates as interviewee TF4 explained:

> I haven't even dared asked the cost over runs on it, but I'm sure they'll be jaw-dropping. When the County let the contract, the contractor Carillion were saying they'd have it finished by November 2014.

The dispute between the County Council and the now defunct contractor Carillion, went to court with "quite a few million-pound claim and counter claim" (TF6), before the scheme was finally adopted by Somerset County Council and opened to the public in July 2017.

Mixed Benefits of Taunton Firepool Redevelopment

The Taunton Firepool redevelopment, unlike Bristol Harbourside and Gloucester Quays, is yet to be complete, so the success or otherwise of the redevelopment process is still uncertain. The redevelopment of lot Fp3, in Fig. 6, has been completed and has provided new housing for Taunton, close to the public transport hub of Taunton railway station, but the long-term benefits of the NIDR and the potential of induced demand in traffic filling the new capacity, and the uncertainty over the completion of developing Lots Fp1 and Fp2 (Fig. 6), it remains to be seen what the long-term benefits will be for the town. Taunton Deane Borough Council and their developers have been unlucky in terms of their planning for lots Fp1 and Fp2, as the plans for development have been stopped by wider economic factors. The original plans for an office led development were halted by the global economic crisis of 2008, whilst the retail led development of 2016 was halted by a change in shopping habits, with retail companies unwilling to commit to new developments. In March 2022, permission was granted to develop the final sections of the Firepool site.

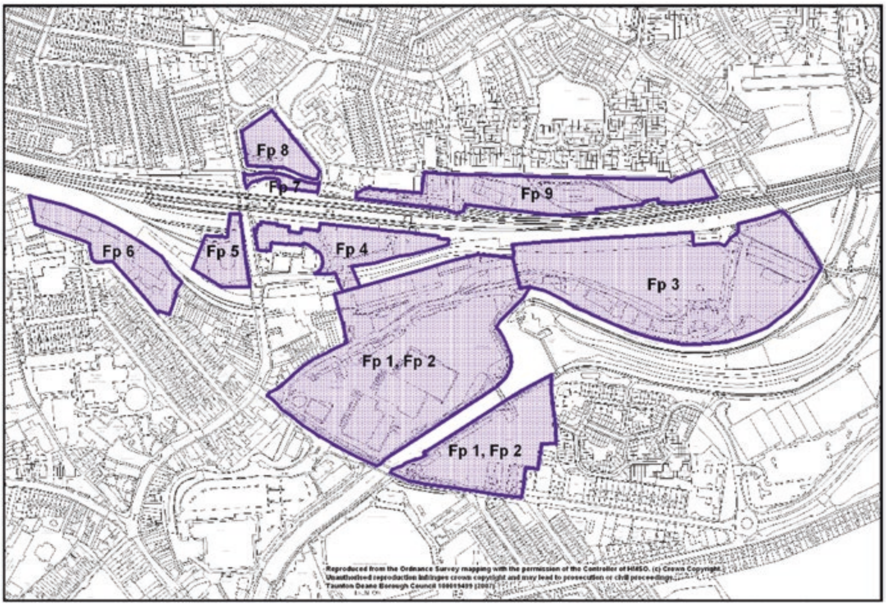

Fig. 6 Taunton Firepool 2016 (© Taunton Deane Borough Council)

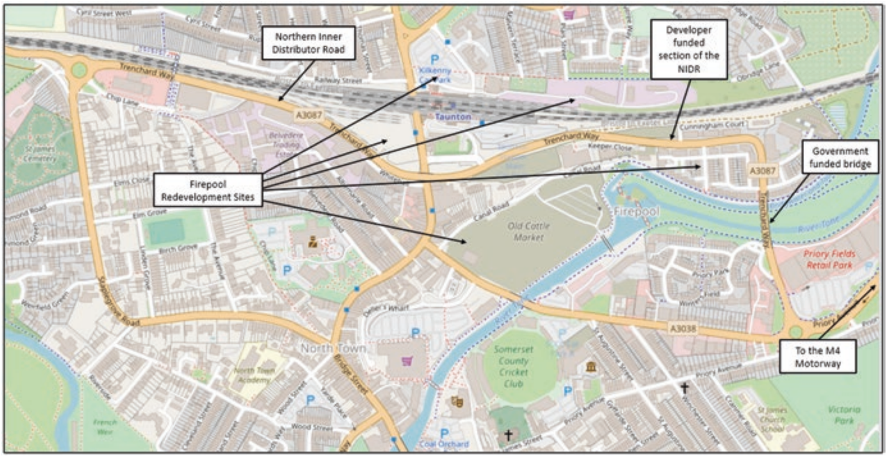

Fig. 7 Taunton Firepool location (© OpenStreetMap contributors)

Summary and Lessons Learned

Funding for highway schemes remains varied due to the number of parties involved in highway construction. With regard to the SRN, the UK government has moved away from the DBFO delivery approach using private finance, due to the long-term cost and inefficiency savings that have been demonstrated through the RIS process through bringing this process back 'in-house'. Within the RIS (2015–2020) period, Highways England (National Highways) was tasked with finding $1.2bn (£1bn) of efficiencies, compared to pre-2015 costs through a range of initiatives. These savings were met through the first RIS period, with the cost savings equivalent to the costs of delivering the new $1.26bn (£1bn) section of the A14, which opened in 2019. It is therefore unlikely that DBFO schemes will be delivered once the current contracts, shown in Tables 1 and 2, expire. The Department for Transport has learned that by retaining the controlling interest in the delivery mechanism, it is possible to control the overall costs of delivery.

For the non-strategic network, the delivery mechanism for new highway infrastructure is mixed, with funding coming from central government, through the $4.3 bn (£3.5 bn) MRN funding, and new roads constructed by developers under the existing BOOT and BOO models. The three case studies show that there can be a long lag time between highway construction and adoption through the S278 process for the highway and surrounding land. This is a lesson that has been learned in all three case studies as it can be problematic for developers involved in the Public–Private Partnership such as Crest Nicholson in Bristol who are looking to divest ownership of the site. The delay however has been beneficial to Peel Holdings as it has provided the opportunity to further develop their adjacent site in Gloucester.

The current highway adoption process in the UK based on the Highways Act 1980 appears to be working albeit slowly in some cases, as there is a clear set of processes in place as demonstrated in Taunton, where Abbey Manor's section of the NIDR was adopted by the LHA. Again, this system is unlikely to change in the foreseeable future, as more housing developments come on-line to meet the UK's housing demand. Developers therefore need to be prepared for the time required to divest their ownership of highway assets, at the tail of any development.

Moving forward into the future, the national government and local authorities need to embrace alternative uses for highways that provide access to all users rather than motorised transport if the UK is to meet its ambitious target of net zero carbon emissions by 2050 (Walker, Mason, & Carrington, 2019). In June 2019, the Welsh Government took the first step towards this by scrapping the development of the M4 motorway relief road, a $2 bn (£1.6 bn) 14-mile highway (British Broadcasting Corporation [BBC], 2019), as construction of new highways do not reduce congestion (Sloman, Hopkinson, & Taylor, 2017), and the scheme would have had a significant impact on the local environment (British Broadcasting Corporation [BBC], 2019).

The key lessons for the government have been providing central government funding for managing the SRN provides significant cost and efficiency savings. The important lesson for both LHAs and developers working through PPPs to deliver new highway infrastructure is to open dialogue early and ensure that any new highway infrastructure is designed and constructed to the appropriate standards so that it can be adopted by the LHA as soon as possible.

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EU Financial Backing to Hybrid Transport PPPs

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Acronyms

BOT	Build operate transfer
CEF	Connecting Europe facility
CF	Cohesion fund
DBFO	Design build finance operate
DG REGIO	Directorate General for Regional and Urban Policy
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECA	European Court of Auditors
EFSI	European Fund for Strategic Investments
EIB	European Investment Bank
ESIF	European Structural and Investment Funds
EPEC	European PPP Expertise Centre
ERDF	European Regional Development Fund
EU	European Union
FI	Financial instruments
GDP	Gross domestic product
GFCF	Gross fixed capital formation
IIW	Infrastructure and innovation window
INEA	Innovation and Networks Executive Agency
InvestEU	EU Investment Programme (2021–2027)
LGTT	Loan Guarantee Instrument for Trans-European Transport Network projects

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NPBI	National Promotional Banks and Institutions
PFI	Private finance initiative
PPP, PPPs	Public private partnership(s)
SIH	Slovak investment holding
SPV	Special purpose vehicle
TEN	Trans-European Networks
TEN-T	Trans-European Transport Network
TEN-T EA	TEN-T Executive Agency
WB	World Bank

Introduction

The chapter discusses how transport investments across European Union (EU) member states have been financed through "hybrid" PPP agreements and focuses on how EU budgetary support, often provided in close cooperation with the European Investment Bank (EIB),[1] has contributed to develop a specific EU approach to this segment of the PPP market.[2] This component has emerged and evolved over the past three decades and, although it represents a minor segment of the overall transport market,[3] it can provide a number of valuable indications to practitioners on the challenges and opportunities to implement PPPs combining private finance and public budgetary resources. Two recent cases of hybrid PPPs in the road transport sector provide insights on the post-2014 evolution of the EU approach.[4]

Some definitional issues help introduce the discussion:

- There is no agreed definition of PPP and this inevitably complicates the assessment of the size and evolution over time of the relevant market.[5] I mostly follow the definition of the EIB's European PPP Expertise Centre (EPEC)[6], where a PPP is defined as a long-term contract between a public contracting authority and a private sector entity that regulates the procurement of infrastructure construction and management services. Normally only investments in which the PPP contract integrates the construction and operational phase are considered in this definition.

[1] The Luxembourg-based EIB is often presented as the "in-house" bank of the EU. EU member states and the European Commission (EC), the executive arm of the EU, are its main shareholders.

[2] For a previous discussion of transportation PPPs in Europe, see Medda, Carbonaro, and Davis (2013).

[3] This depends in part on how you delimit the notion of a hybrid PPP arrangement, as we will explain shortly.

[4] This may also be relevant in the wider context of impact investment tools. See for instance the discussion in OECD (2018) and GIIN (2018).

[5] On this see the discussion in Carbonaro et al. (2017).

[6] https://www.eib.org/epec/, in particular EPEC (2019a, 2019b).

- As to the definition of a "hybrid" PPP, the expression is often used in the US and World Bank (WB) literature, while in the EU "blended" is used to denote cases where EU public financial support is provided to complement private funding of PPPs.[7] In this discussion the terms "hybrid" and "blended" are used interchangeably to refer to the same family of PPP operations supported by EU budgetary resources.
- A further point relates to the nature of EU financial backing combined with private and other public funds in hybrid PPPs. Support through non-refundable grants from the EU budget has been traditionally the typical approach for large-scale transportation projects. However, other ways to deliver budgetary support have emerged over time, including via financial instruments, i.e. EU budgetary resources granted in the expectation of financial remuneration. In addition, the EIB has provided substantial financial resources for European transport infrastructure since its founding in 1958. However, the EIB raises its resources on the capital markets and is not funded through the EU budget. In my discussion I shall restrict the notion of "hybrid" PPP only to cases where at least some of the PPP investment needs are supported through EU budgetary resources.

The EU Market for Hybrid PPPs: A Complex Landscape

The parallel evolution of the EU policy framework and the PPP market has affected the way transport PPPs are planned and implemented in Europe. In this respect, one of the key features of the EU operational habitat for hybrid PPPs is the diversity of the European transport investment market, with different nation-states and regions and a wide variation in wealth levels, administrative traditions, regulatory systems, and infrastructure needs. This habitat has evolved through a fragmented and disjointed process, reflecting the need to accommodate PPP contractual agreements emanating from a highly diversified context. Table 1 briefly summarizes the parallel development of the PPP market, the EU policy framework and EU budgetary support tools over time. Given the centrality of EU budgetary mechanisms in our discussion, the summary timeline is aligned with the so-called programming periods that characterize the budgetary cycle within the EU.

[7] See the WB Public-Private Infrastructure Advisory Facility (PPIAF) literature, including the 2006 PriceWaterhouseCoopers study (PWC-PPIAF, 2006) exploring PPP arrangements in Europe, as well as EPEC (2016a).

Table 1 Parallel evolution—PPPs, EU Policy, EU budgetary tools[a]

Timeline	PPP market	EU policy framework	EU budgetary tools
Before 2000	The project finance approach is increasingly used in build operate transfer (BOT) contracts (power plants, mining); adopted in large-scale transportation projects in the EU (e.g. Channel Tunnel 1994, Vasco da Gama bridge 1998); in 1992 launch of the Private Finance Initiative (PFI) and Design Build Finance Operate (DBFO) model for roads in the UK	Establishment of the European Regional Development Fund (ERDF) (1975) and Cohesion Fund (CF) (1993) supporting infrastructure investment through the EU budget; the multi-year programming approach for the EU budget is introduced in 1994–1999; the notion of Trans-European Transport Network (TEN-T) is introduced in 1990	Grants are the main EU budgetary support instrument
2000–2006	PPP models applied in more EU countries and over a wider range of sectors beyond transport	PPP explicitly mentioned for the first time in Council Regulation No. 1260/1999 for the Structural Funds European Commission (EC)-DG REGIO[b] PPP guidelines published in 2003; the 2004 resource book on PPP case studies; Trans-European Transport Network Executive Agency (TEN-T EA) is established	Grants are the main support instrument
2007–2013	PPP market severely affected by the financial crisis and recession	The programming approach in cohesion policy is further consolidated PPPs become part of EU policy, explicitly mentioned in the general and specific regulations governing the funds	Introduction of "innovative financial engineering instruments" Financial regulation (2013)
2014–2020	Continued recession is affecting infrastructure investment within the EU. Signs of recovery of the PPP market	Programming approach focused on sectoral thematic objectives A unified regulatory framework is established for the European Structural and Investment Funds (ESIF) delivering Cohesion Policy. The thematic scope of financial instruments is widened Specific provisions are introduced to facilitate PPPs in combination with EU funding. The Innovation and Networks Executive Agency (INEA) is established in 2014	The European Fund for Strategic Investment (EFSI) is established, investment platforms introduced Revised Financial Regulation (see European Commission 2018) InvestEU initiative planned for 2021–2027

[a] Adapted from Carbonaro et al. (2017)
[b] The European Commission, based in Brussels, is the EU executive body. Within the EC, the Directorate General for Regional and Urban Policy (DG REGIO) is in charge of policies to assist the development of the less developed regions within the EU

Before 2000: Back to the Future?

Already in the early 1990s there was a re-birth of privately funded transport infrastructure in Europe,[8] facilitated by the fact that in several EU countries tolling was extensively applied and accepted by users in road transport.[9] The privately financed Eurotunnel link between France and the UK, which opened in 1994, was a key illustration of this trend.[10] The main route for hybrid PPPs was through large-scale flagship projects co-financed by EU grants. This took place through Cohesion Policy budgetary resources managed by the Directorate General in charge of regional affairs, aimed at supporting the less developed regions. Examples were the second Tagus crossing in Lisbon and the Rio-Antirrio bridge in Greece. Also the need to develop a “trans-European” network was introduced in the early 1990s, and a set of 14 transportation projects was launched in 1994 by the Christophersen group.[11] One of the key concepts in promoting the Trans-European Networks (TEN), including their transportation component, denoted by the acronym TEN-T, was that private resources should also support their development. It is useful to note that in this period the PPP model, although increasingly applied particularly in the UK under the Private Finance Initiative, was not systematically addressed within the EU regulatory framework.

2000–2006: PPPs Enter the EU Institutional Picture

In this period PPPs came explicitly into the picture as a policy concern for EU, combined with the perceived relevance of TEN-T as a way to pursue EU integration and the critical role of transport infrastructure in bolstering convergence across EU regions. In this period, specific procedures were developed to fund “major projects”—including in the transport sector—under the Cohesion Policy budgetary resources. These procedures, codified into the regulatory framework, include standardized procedures for cost-benefit analysis and determining the level of EU grant support. Regulations include the notion of “funding gap” in revenue-generating major projects, which is typically the case for toll-funded transportation projects. Projects in need of EU budgetary support are seen as one of the core market segments for EU grant funding and, potentially, implementation through PPPs. A

[8] This followed a wider worldwide trend towards transport privatization. On this, see Gomez-Ibanez, John, and Meyer (1993).

[9] The Turin-Milan motorway opened in 1932 was an early example of privately managed toll motorway.

[10] Note that the tunnel was not financed via the EU budget, so it cannot be classified as a hybrid PPP, although the EIB contributed significantly to its funding.

[11] Henning Christophersen was at the time the Commissioner for Economic and Financial Affairs and Vice-president of the European Commission. For details on the birth and development of TEN, see Turro (1997).

notable initiative during these years was the Loan Guarantee Instrument for TEN-T Projects (LGTT), launched in the years 2004–2007 to mitigate via EU-funded guarantees ramp-up traffic and revenue risks in TEN-T projects. The initiative was implemented by the EIB following an agreement with the European Commission, which provided budgetary support to the guarantee facility.[12]

2007–2013: Consolidation and Financial Diversification

During this budgetary period, the rationale for PPPs was introduced explicitly into the EU policy mainstream and the regulatory framework for Cohesion Policy. EU budget support can be delivered also through revolving multi-project instruments which seek remuneration, as opposed to non-reimbursable grants for individual projects. These so-called financial instruments (FIs)—supporting investment projects through financial products such as loans, equity and guarantees—were introduced into the Cohesion Policy regulatory framework to also cover infrastructure funding. FIs aimed at the infrastructure sector were in principle destined to support investment with private sector participation. However, transportation infrastructure was not a priority sector for the use of FIs, which in this phase were limited to integrated urban development and energy efficiency schemes. A fundamental episode was the global financial crisis which hit the EU early in the programming period, inducing EU institutions to articulate a strategic response to leverage limited budgetary resources to assist the recovery. A component of the response was the so-called "Europe 2020" strategy, launched by the EC in 2010 with a view to stimulating the recovery and transformation of the European economy. In this context, the Project Bond initiative was launched in 2010 to support infrastructure investment, including transport, making project finance more attractive to capital markets and institutional investors by credit enhancement. Like the Loan Guarantee Instrument for TEN-T Projects (LGTT), the initiative relied on a cooperation agreement between the EU and the EIB, which was in charge of administering the instrument.[13] Last but not least, during this period the first Marguerite Fund, the "2020 European Fund for Energy, Climate Change and Infrastructure", was established, backed by European public financial institutions, the EIB and budgetary resources provided by the European Commission. In this case, the EU budget contributed part of the share capital of the fund, so that the EU took an equity stake in the portfolio of projects eventually funded through the facility.[14] Thus, instruments developed during this

[12] The rationale, development and ex-post performance of the LGTT pilot phase are presented in European Investment Bank (2014) and European Commission (2014c).

[13] On the Project Bond initiative, see Ernst and Young (2015) and Vassallo, Rangel, Baeza, and Bueno (2018).

[14] For further details, see European Commission (2014b).

period involved more complex relationships in combining EU budgetary resources and those of other financial players.[15]

2014–2020: The Response to the Great Recession Continues

As a component of the wider institutional response to the continuing negative aftermath of the economic crisis, the 2014–2020 EU budgetary framework and Cohesion Policy regulations included provisions specifically aimed at facilitating the incorporation of EU budgetary support into PPP contracts.[16] For instance, payments supported via European Structural and Investment Funds (ESIF) could cover a timeframe extending into the operating period even where this goes beyond the timeframe of the programming period. This is an extension of eligibility rules specifically aimed at facilitating the provision of EU budgetary support where the remuneration of the private party relies on availability payments after project completion.[17]

In parallel to the new budgetary and Cohesion Policy regulations, the so-called Investment Plan for Europe (or Juncker plan) was launched in late 2014 to support and accelerate the post-recession recovery of EU investment, employment and growth. The European Fund for Strategic Investments (EFSI), a central pillar of the Juncker plan, is a joint EC-EIB initiative launched in July 2015 to mobilize investment. EFSI includes the Infrastructure and Innovation Window (IIW), managed by the EIB.[18] Transport investment and the promotion of PPPs are central components of the IIW, which also foresees the possibility of combining support in different forms and from different budgetary sources, i.e. various form of blending. The enhanced role of National Promotional Banks and Institutions (NPBI) and the possibility of developing so-called investment platforms are other innovative EFSI components likely to affect the ecosystem of hybrid PPP funding within the EU. The role of NPBI is potentially critical, as they could be co-financiers and facilitators acting as a bridge between EFSI budgetary instruments and opportunities in the national and local economies. Investment platforms could be successors of the financial instruments launched under Cohesion Policy in 2007–2013. In this case as well, the concept is to create financially self-sustaining multi-project vehicles supported by the EU budget with a specific geographical and/or sectoral focus, capable to reach investment opportunities of different size and forms, including through PPPs.

[15] These arrangements are generally implemented through dedicated agreements with the EIB and other financial institutions.

[16] For instructive presentations of the effects of the financial crisis on road PPP contracts in Spain, see EDHEC Infrastructure Institute (2018) and Baeza & Vassallo (2014).

[17] For a more detailed illustration of the changes aimed at facilitating blending in PPPs in the 2014–2020 period, see Carbonaro et al. (2017).

[18] The EFSI also includes the Small and Medium Enterprise (SME) Window, implemented by the European Investment Fund (EIF), which is the arm of the EIB Group dedicated to SMEs.

The TEN policy framework also evolved in 2014–2020 through the establishment of the Connecting Europe Facility (CEF) in December 2013. The aim was to adapt and extend the TEN strategy, including in transportation. As part of the CEF transport pillar, blending is specifically presented to combine CEF resources to attract private sector financing in dedicated calls for proposals. Although the involvement of the private sector can take place by providing support to private transport operators and Special Purpose Vehicles (SPVs), projects delivered through PPP procurement are also eligible for funding.

PPPs in the EU Market for Transportation Investment

Reliable data sources on hybrid PPPs are scarce. A specific 2012 EIB study[19] on blended PPPs funded by Cohesion Policy resources between 1996 and 2011 found that, of the 49 PPP projects reported as blended operations through a dedicated survey, 11 were in the transport sector and absorbed about EUR 3.7 billion in grants. The study highlighted how difficult it was—and as a matter of fact still is—to find a reliable source of information on PPP operations based on regularly collected systematic databases. According to a more recent study of the European Court of Auditors (EURODAD, 2018) EU funding for PPP transport investment in 2000–2014 supported 24 projects with a total cost of EUR 25.5 billion, of which about 4.5 billion contributed by the EU budget. Resources came primarily from Cohesion Policy tools and to a lesser extent via other sources, such as the CEF and more recently the EFSI instrument. Thus, these sources confirm that the hybrid PPP segment appears to account for a minor share of the overall EU transportation infrastructure investment requirements.[20]

The position and role of hybrid PPPs should be seen against the wider backdrop of the market for transportation investment in the EU. Historically overall investment in transportation infrastructure within the 28 member states of the EU has fluctuated annually in the EUR 80–140 billion range, achieving a peak in 2008 and decreasing thereafter;[21] according to recent EIB estimates the GDP share of investment in transportation has fluctuated in the range 0.6–0.8%, remaining in the lower range in recent years,[22] to confirm that an annual EUR 100–120 Bn range is a plausible estimate of transportation investment in recent years.[23]

The contribution to transportation investment from the EU budget, mostly channelled through the Cohesion Policy budget and mainly via the European Fund for

[19] See EPEC (2012b).

[20] According to European Commission (2014a) the requirement is of the order of EUR 1.5 trillion for the 2010–2030 time horizon, of which the TEN-T network would require EUR 550 billion.

[21] Reported in Deloitte (2017) on the basis of 2001–2014 OECD data.

[22] See European Investment Bank (2019a, 2019b).

[23] This is compatible with a GDP at current prices of the order of EUR 15–16 trillion, which in line with Eurostat statistics.

Regional Development (ERDF) and the Cohesion Fund (CF)[24] could be of the order of 11 billion EUR per year in 2014–2020, to which possibly EUR 2.0 billion per year could be added through the resources of the Connecting Europe Facility budget;[25] the support provided by the EIB to the transportation sector in 2014–2018 has been of the order of EUR 10.8 billion per year, and is not included in the above figures;[26] thus the EU budgetary contributions plus the EIB lending appear to cover a significant share, perhaps up to 20–25%, of overall transport investment within the EU.

According to the EPEC database, the PPP market in the EU transportation sector in the years 2014–2018 can be estimated at EUR 4.6 billion per year, compared to a peak of over EUR 14 billion in 2007.[27] Thus transport investment co-funded by resources from the EU budget (primarily grants) under a PPP arrangement represents a minor component not only of the overall transportation market, but also of the PPP transport market. In this respect, it is worth noting that EU budgetary resources support transportation investment delivered via conventional public procurement, typically large-scale schemes implemented by public authorities, including states, regions, or possibly public transport utilities. In addition, a substantial part of the EU transport PPP market is funded without EU budgetary involvement.[28]

A recent report[29] confirms that it is very difficult to have a precise estimate of the level of investment in the EU transport by member state and compare it to investment needs. The view that the order of magnitude of the level of this investment does not exceed 1% of GDP in most member states is confirmed in the report, as well as the fact that this investment level is highly unlikely to meet the investment needs associated to the expansion, adaptation and replacement of the transportation system. Thus, the EU policy intention to use budgetary resources to support investment seems well founded, despite the shortage of precise assessments. EU action to tackle the perceived investment gap is performed primarily through the Cohesion Policy budgetary tools[30] addressed to regional assistance, principally the ERDF and Cohesion Fund, and those centrally administered by the EC, primarily those of the Connecting Europe Facility and those recently consolidated into and activated

[24] The cohesion fund is a cohesion policy budgetary tool aimed primarily at supporting larger projects in environment and transportation located in less developed regions.

[25] The CEF 2014–2020 programme budget foresees EUR 23.7 billion for transport, of which EUR 10.0 billion are earmarked from the cohesion fund. Thus, the order of magnitude of additional CEF budgetary resources is approximately EUR 2.0 billion per year.

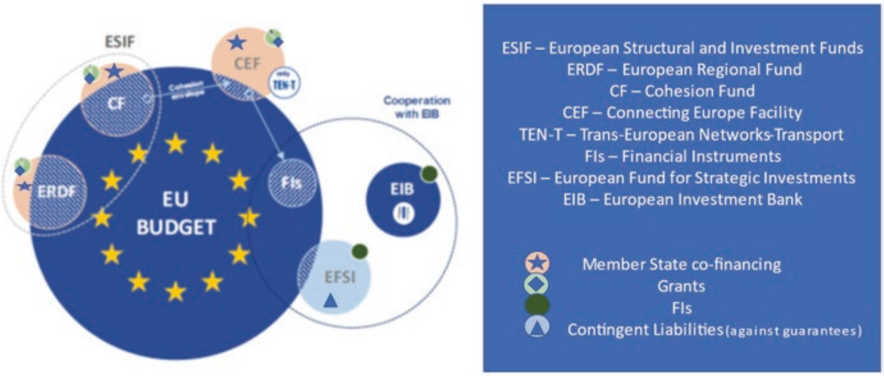
[26] This represents approximately 17% of EU lending, see European Investment Bank (2019a, 2019b).

[27] Source: EPEC PPP market database, and EPEC PPP EU market updates (various years).

[28] In addition, some of the most active PPP markets are mature markets where procedural complications and the limited availability of EU budgetary support in transport infrastructure, which focuses more on the less developed regions, are likely to discourage the use of hybrid solutions.

[29] European Commission (2019), section 4.2, based on 2016 OECD data.

[30] An important difference between these budgetary tools is that those addressed to regional assistance are co-managed with national and regional authorities (so-called shared management) while the others are managed directly by the EC Directorates General, for instance DG for Mobility and Transport.



Adapted from Vassallo and Garrido (2019), page 27

Fig. 1 EU budget support channels

through the European Fund for Strategic Investments (EFSI). Having said that, the indications of a recent report specifically dedicated to PPPs in Cohesion Policy[31] are that on a long-term 2000–2014 perspective the macroeconomic relevance of PPP investment in all sectors remains moderate in the EU, with a contribution of the order of 0.7% of total gross fixed capital formation (GFCF), becoming more relevant as a component of public investment and notably in certain countries such as Portugal and the UK with respectively 4% and 2.5% of GFCF.

Thus, the critical policy challenge is to find the best way to leverage scarce public resources to achieve maximum policy impact "per Euro" of EU budgetary resources employed. Figure 1 gives a bird's eye[32] of the ways EU budgetary support can leverage transport investment, including PPPs via multiple channels and instruments. Some of the features of EU budgetary support to the transport sector are highlighted in Fig. 1, such as the opportunity to use grants and financial instruments under Cohesion Policy and CEF and the role of contingent liabilities—whereas only a portion of budget resources are set aside to meet guarantee obligations—in leveraging budgetary funds under the EFSI. Figure 1 also shows how support from the EU budget should be seen as separate from EIB lending operations. The EIB, however, remains an essential partner for the delivery of budgetary impacts, particularly where these are delivered through financial instruments co-financed or guaranteed via EU budgetary resources.

[31] Carbonaro et al. (2017).

[32] Vassallo and Garrido (2019) provide an excellent synthesis of the role played by the EU budget in supporting the transport sector.

The Performance of Hybrid PPPs

In the context of the combination of EU budgetary resources and PPP contracting, two countervailing tendencies are likely to be at work in determining hybrid PPP performance.

On the one hand it is difficult to align PPP contracting and EU budgetary processes to achieve a coordination across decisions taken by diverse stakeholders, often taking place at different times and governmental levels. The design, negotiation, financial closure and management of PPP contracts are normally more complicated compared to conventional public works procurement. This complex multi-agent process needs to be coordinated with other intricate procedures associated with using budgetary resources from the EU. In the case of Cohesion Policy, for instance, these procedures are codified into detailed regulations which specify obligations ranging from the eligibility of expenditures (type and timing of expenditures) to the provision of evidence of expenditures, so that these can be officially certified as eligible and cashed in by the beneficiary, to various obligations related to traceability and auditing of EU contributions. This obviously complicates blending and may ultimately make hybrid PPPs less effective, possibly for both the public sponsor and the private parties involved, compared to alternative implementation routes.

On the other hand, blending procedures may lead to improvements in investment quality, given certain requirements related to the use of EU budgetary resources. These include for instance the particular attention paid to cost-benefit analysis, strict compliance with environmental regulations and transparent and competitive procurement. This may lead to improved offers by the private sector which may generate better value for money for the public contracting authority. Thus, the higher level of EU governmental supervision likely to be associated with hybrid PPPs may ultimately have positive impacts on project quality, although it is not necessarily obvious which of the stakeholders benefits most from such involvement.

Challenges in closing PPP agreements, with or without EU budgetary involvement, have been exacerbated in the aftermath of the financial crisis and the long recession, in the context of expanding public sector debt and a period of infrastructure underinvestment, as discussed in EPEC (2012a). In addition, several recent studies—some specifically focusing on PPPs combining EU budgetary resources and private sector funding—indicate that the use of PPP remains controversial and the practical impacts of PPP operations in the transport sector often unsatisfactory.

The literature dealing with PPP failures, including in transport, is extensive[33] and numerous references and case studies are provided for instance in Perez (2004), Shaoul et al. (2006), Hall (2013), Fabre et al. (2019). Two recent contributions[34] have specifically focused on hybrid PPP operations within the EU, including in the

[33] For sites providing ample critical documentation on PPPs, although not focused on the transport sector, see for instance https://eurodad.org/ or https://www.psiru.org/.

[34] The studies are Carbonaro et al. (2017) and EURODAD (2018).

transport sector, and have concluded that evidence on their effectiveness is mixed, and in some cases distinctly negative. However, it is important to stress that the evidence so far does not allow robust conclusions as to whether blending made a difference in the overall investment performance compared to other "no-blending" options.

The study[35] specifically dedicated to hybrid PPPs funded through the Cohesion Policy budget concludes that the overall evidence from the case studies, some in the transport sector, is mixed. Indications are that while some of the objectives of PPP contracting—namely savings in public budgets, bringing forward infrastructure delivery and attracting private sector resources—have been achieved, this is counterbalanced in some cases by poor outcomes with respect to other objectives. In particular, the convenience of the PPP route to circumvent public debt constraints in the short run may expose the public sector to long-term fiscal risks and inappropriate risk allocation. The study's literature review and case studies, 8 cases, with 3 in the transportation sector,[36] indicate that "PPP projects perform better in the construction phase, concluded on time and on budget, but also point to many open issues concerning the real long-term costs of PPPs for the public sector, and ultimately for taxpayers".

The study from the EU Court of Auditors (ECA) is even more critical, indicating that the evidence points to "widespread shortcomings and limited benefits". The ECA study covers in some detail six road transport PPPs in Greece, Spain and Ireland. Unsatisfactory outcomes in the audited PPPs range from construction delays and cost overruns to inadequate competition in the procurement phase.[37] More specifically, the roots of failures were found in inadequate project planning and preparation, notably with respect to demand analysis and value for money considerations, as well as inadequacy of the legal and institutional framework. However, the ECA study does not compare the performance of these case studies to similar PPP operations not supported by EU budgetary resources, so that it is difficult to determine whether and how EU budgetary involvement may have affected PPP performance.

A third study carried out by Garrido et al. (2017) provides a rare example of a quantitative analysis focused on assessing the impact of EU support on road PPPs. The study is based on 57 road concessions implemented in Spain between 1995 and 2009, 30 with EU "financial backing". The study indicates that there is a statistically positive relationship, at 10% confidence interval, between EU financial backing and project performance, measured by the gross profit on assets in the fifth year of operation. However, the analysis does not distinguish between the impact of EU budgetary support and the effect of loan funding from the EIB. In fact, 27 of the 30 concessions were financed by the EIB alone and only 3 involved some form of EU

[35] Carbonaro et al. (2017), study carried out for the European Parliament.

[36] The transportation cases are the Vasco da Gama bridge in Lisbon, the Eleftherios Venizelos International Airport in Athens and the D4-R7 bypass in Bratislava.

[37] This applied to the Greek cases—the PPP route however had the (initial) merit of enabling large-scale road investment through a low number of procurement procedures.

budget contribution. In addition, the selected performance indicator relates to the profitability for the concessionaire and not the wider socio-economic impact of the projects.

Thus, although the massive academic and professional literature on transport PPPs can capitalize on an increasing pool of practical experience within the EU and elsewhere, the systematic analysis of the specific impacts of combining EU budget resources with other sources of funds on the performance of PPPs—ideally comparing "standalone"[38] vs "hybrid" PPP operations—remains sparse and inconclusive.

A New EU Habitat for Hybrid Funding

During the decade 2000–2010, the interaction between the EU policy framework and the evolution of the PPP market has facilitated the emergence of an increasingly articulated, potentially "hybridization friendly" habitat in the transport sector. This ecosystem is populated by a variety of public sector agencies, project sponsors, infrastructure operators and financiers, active throughout the PPP project life cycle—planning and preparation, construction and post-construction phases, including operation and decommissioning/end of concession.[39] Some reflections are appropriate on this emerging habitat:

- The investment for new PPP transport infrastructure, traditionally the core market for EU hybrid funding, should be seen against the wider backdrop of the secondary market for existing assets, as asset rotation is likely to affect the long-term financial and economic performance of hybrid PPPs.
- The evolution of the transport infrastructure construction and operation industry, shaped by merger, consolidation and internationalization strategies, determines the investing capabilities of private companies and the way they interact amongst themselves and with long-term investors in the market for hybrid transport PPPs. According to Deloitte University EMEA, in 2016 European companies operating in the global PPP transport market were ranked in the top positions worldwide with respect to the number and value of concessions.[40]
- The hybrid PPP arena is populated by a variety of organizations at various governmental levels, including at the supranational level the European Commission and its directorates and at the national level member states, but also local and regional authorities. In the EU's institutional framework, the latter play a pivotal role in the delivery of EU budgetary resources for Cohesion Policy. These are jointly managed by the EU and by national (central and regional) authorities,

[38] Standalone here meaning without EU budgetary involvement.

[39] On the relationship between ecosystem players and PPP operation life cycle see Deloitte (2017).

[40] On this aspect see Deloitte (2017), pp. 24–27.

Table 2 Hybrid PPPs in legacy and emerging habitat

	Legacy habitat Pre-2014	Emerging habitat Post-2014
Investment type	Project-specific/standalone, generally large scale	(Also) portfolio/multi-level funding (funds of funds, investment platforms), reaching smaller schemes
Project life cycle focus	Primarily construction	Extension to investment preparation and post-construction
Financial support tools	(Mostly) non-reimbursable grant	Mixed: grants continue, but increasingly also other (reimbursable) instruments
Revenue drivers	User charges, real/shadow tolls	More weight to availability payments
EU Budget sources	Mostly cohesion policy (ERDF, cohesion fund)	(Also) other instruments, CEF, EFSI, InvestEU
Quality enhancement incentives	Ad-hoc (transaction specific)	More systematic combination with value for Money analysis/advisory support
Key risk-sharing dimensions	Construction/demand risks, primarily in the early phase of the project life cycle	(Also) long-term growth, technical change volatility, resilience of financial structure

making considerable differences on the way hybrid solutions are structured and implemented on the ground.[41]

In view of the previous considerations, it is useful to distinguish a "legacy" pre-2014 habitat and the "emerging" post-2014 habitat. This distinction does not imply that the legacy models are destined to disappear, as they remain the most widely experimented form of hybrid support but is indicative of how the EU budgetary support is likely to continue its diversification with respect to the various dimensions illustrated in Table 2.

A brief examination of two PPP road projects can provide a better understanding of how the emerging habitat differs from the legacy habitat for hybrid PPPs.

The Bratislava D4-R7 Bypass

Enabling Context The Bratislava bypass has been considered by the Slovak authorities a high-priority project with critical relevance for the national economy. The project was included in the planning process already in 2007–2008 and is intended to improve the traffic conditions and wider connectivity of the main metropolitan area in Slovakia. The project includes a section of the D4 motorway which should link Bratislava to the country's express road network and is part of the

[41] As an example, consider the establishment of dedicated PPP units in several EU member states, which in the case of Greece has led to a notable increase in hybrid PPPs, including in the transport sector.

TEN-T network. The D4-R7 PPP involves designing, financing, building, and operating 27 km of the D4 motorway and 32 km of the R7 radial expressway. The latter forms a bypass ring road around Bratislava, aimed at facilitating traffic flows and reducing transit traffic of heavy good vehicles through more central parts of the urban area. The project, currently under construction, has been controversial because of its allegedly high cost and negative environmental implications.[42]

EU Budgetary Support The overall cost of the project was estimated at approximately EUR 1066 m. The funding structure of the operation includes EUR 426 m provided by the EIB (40% of project cost), enjoying an EFSI guarantee supported by the EU budget, as well as a EUR 28 m subordinated loan (3% of project cost) sourced from ESIF (i.e. Cohesion Policy) budgetary resources and provided to the concessionaire by the Slovak Investment Holding (SIH), a newly established public investment fund.[43] In addition, EUR 148 m of senior debt was provided by the European Bank for Reconstruction and Development (EBRD)[44] and EUR 377 m by commercial banks.

Some EUR 87 was provided as equity by the concessionaire Zero Bypass.

The subordinated loan was an innovative way to mobilize support from Cohesion Policy resources, channelling them through SIH. The SIH was funded by the EU budget through the ERDF[45] resources to which Slovakia is entitled as a less developed region of the EU. In due course the concessionaire is expected to repay the loan and SIH can reinvest the proceeds in other public interest projects in transport or other investment areas.

Revenue Generation/Payment Mechanism The operation is based on a Design Finance Build and Operate (DBFO) contract remunerated by availability payments, with a concession period of 30 years following the construction. The annual amount of the availability payment due to the concessionaire was the main value-for-money criterion for the award of the contract and apparently achieved—at an annual payment of EUR 56.7 m[46]—significant savings compared to the conventional public sector procurement route. The calculation was based on a comparison—carried out by the Slovak granting authorities—between the costs of the two alternatives.[47]

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[42] On these issues, see CEE Bankwatch - Counter Balance (2016) and European Investment Bank (2017).

[43] SIH is a joint stock company 100% owned by the Slovak Guarantee and Development Bank, a public promotional bank established by the Slovak Ministry of Finance.

[44] The London-based EBRD is an international financial institution established in 1991 to assist the countries of the former Eastern Bloc in their transition to a market economy.

[45] The ERDF (European Regional Development Fund) is one of the European Structural and Investment Funds (ESIF) used to pursue Cohesion Policy objectives.

[46] The full payment is conditional on the achievement by the concessionaire of minimum quality targets during operation.

[47] The evidence on the comparison was based on interviews with Slovak authorities carried out as part of the Carbonaro et al. (2017) study.

Performance/Role of Hybrid Funding The D4-R7 PPP was the first in Slovakia to be supported through EU financial instruments receiving a remuneration as opposed to a more traditional non-refundable grant. In addition, a central innovative feature was the combination of EU budgetary resources from two different sources, Cohesion Policy (ESIF) on the one hand and the European Fund for Strategic Investment (EFSI) on the other. EU budgetary support supported some 43% of the overall project cost. In addition, the operation's signalling and demonstration impacts were also regarded as significant, in view of their ability to show how tools alternative to the traditional non-reimbursable grant can work in practice. The ESIF-supported subordinate loan "played a vital role in achieving financial close, because senior lenders require equity contributions from the <private> promoter in this type of transactions, and the subordinated loan could be treated by them as equity replacement,"[48] reducing financial risks to senior lenders. Over time the loan proceeds are expected to give the Slovak Investment Holding (SIH) the opportunity of re-using the remuneration to finance other projects. SIH operates as a holding fund (fund of funds), in charge of deploying the Cohesion Policy resources of ESIF through financial instruments within the Slovak Republic in multiple sectors. While the SIH contribution represented a small share of the cost of the project, learning and demonstration effects could be significant beyond this direct contribution. The combination with EFSI guarantee to the EIB loan also constituted an early example of how support from Cohesion Policy and the Juncker Plan could be successfully combined in a specific PPP operation, which was at the time the first example of such combination in the EU. In addition, the D4-R7 project benefited informally from EIB technical and advisory assistance, which may have been incentivized by EU budgetary involvement through financial instruments.

Ecosystem Structure As illustrated in Fig. 2, the public promoter is the Ministry of Transport of the Slovak Republic and the private concessionaire Zero Bypass Ltd. The shareholders of Zero bypass are Cintra Infraestructuras Internacional, a major Spain-based private developer of transport infrastructure, PORR AG, an Austrian construction company, and Macquarie Corporate Holdings, part of the Australia-based Macquarie Group, a global provider of banking, financial, advisory, investment and fund management services. Zero Bypass Ltd's shareholders committed approximately EUR 87 m of equity to the project. Although the PPP experience in Slovakia was limited when the operation was designed, this relatively articulated ecosystem reflects already the richer post-2014 hybrid PPP habitat and the innovative funding model.

[48] From Carbonaro et al. (2017). The study contains a relatively detailed description of the D4–R7 operation.

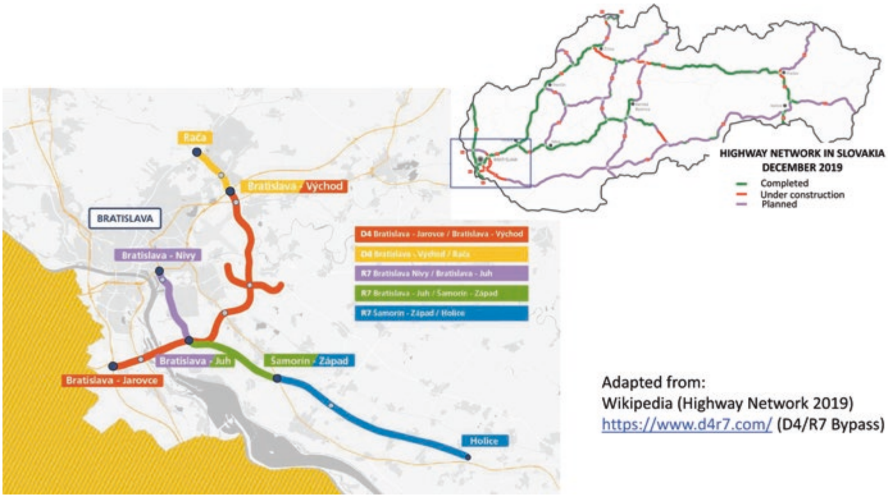

Fig. 2 Bratislava bypass map

A8 Motorway Germany

Enabling Context Germany has a highly articulated system to deploy road PPPs, consisting of three main models developed since 1994. These are the F-Model, where the remuneration of the private party is based on charges paid by users, the A-Model, where the private party is paid by the public sector based on heavy traffic using the infrastructure, and the V-Model based on availability fees. The A8 operation concerns a project to widen and subsequently operate and maintain for 30 years a 58-km stretch of the existing A-8 federal motorway between Ulm and Augsburg, including the widening of a 41 km section from two to three lanes per direction, under the A-model.[49]

EU Budgetary Support The overall project cost was approximately EUR 500 m. The project was supported by EU budgetary resources in two successive phases. At the construction phase, the PPP, which was part-financed by the EIB, was supported through a LGTT guarantee. The LGTT is a guarantee instrument where EU budgetary support is set aside against a guarantee to cover ramp-up traffic and revenue risks to the private parties in the early operation phase of a PPP. This budgetary support was considered critical at the time, since the transaction was structured and closed in 2009–2011 in highly challenging market conditions very close to the financial crisis. The 2016 successive EU-supported hybrid component was a guaranteed credit enhancement supporting a further EIB subordinated loan of EUR

[49] See https://www.eib.org/en/infocentre/press/releases/all/2016/2016-162-successful-long-term-financing-of-a-german-a-modell-project-a8-motorway.htm. Retrieved April 2019.

70 m. Following the credit enhancement, the EIB retained its position as senior lender for its previous EUR 138 m loan provided in 2011.

Revenue Generation/Payment Mechanism The project is a PPP where payments to the concessionaire Pansuevia are based on fees paid by heavy goods vehicles and related to traffic intensity, according to the German A-model of road concessions, similar to a shadow tolling system.

Performance/Role of Blending In this operation the form of EU support was adapted over time to the development of the PPP project, focusing on mitigating revenue shortfalls during early operation in the construction phase and on strengthening the financial structure to attract new investors in the post-construction phase. The example shows that the policy impact of EU budgetary support can take place also in later stages in the life cycle of a hybrid PPP project.[50] In the post-2014 hybrid funding habitat EU budgetary resources can be used in order to mitigate risks in the mature operation phase and facilitate the transition to a funding structure attractive to a different investor pool, including institutional investors with lower risk tolerance compared to the initial investors.

Ecosystem Structure The re-financing widened the range of private financial supporters, allowing the involvement of additional financial institutions and new institutional investors. The pool of debt providers in Fig. 3, which depicts the situation in late 2019,[51] includes several long-term investors such as pension and infrastructure funds, significantly broader than those involved in 2011, which included only the EIB and three other banks (Figs. 4 and 5).[52]

Summary and Conclusions

The traditional grant-driven model of EU budgetary support remains one of the key tools to assist transport investments of European interest within the EU, including those delivered through PPPs. The argument made in this discussion is that the grant-centred habitat of hybrid PPPs has evolved into a more diversified system, populated by a wider variety of sponsors/operators, investors and financial products. A brief reflection on the two road projects presented in the previous section leads to the following considerations:

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[50] The rationale for the use of financial instruments such as the Debt Facility in the implementation of CEF policy was studied in a dedicated ex-ante analysis, see European Commission (2014a, 2014b, 2014c). For an assessment of the use of financial instruments, including the CEF Debt Facility see European Commission (2017).

[51] Information based on Lacher (2019).

[52] These were UniCredit, BBVA and the Baden-Württemberg LandesBank.

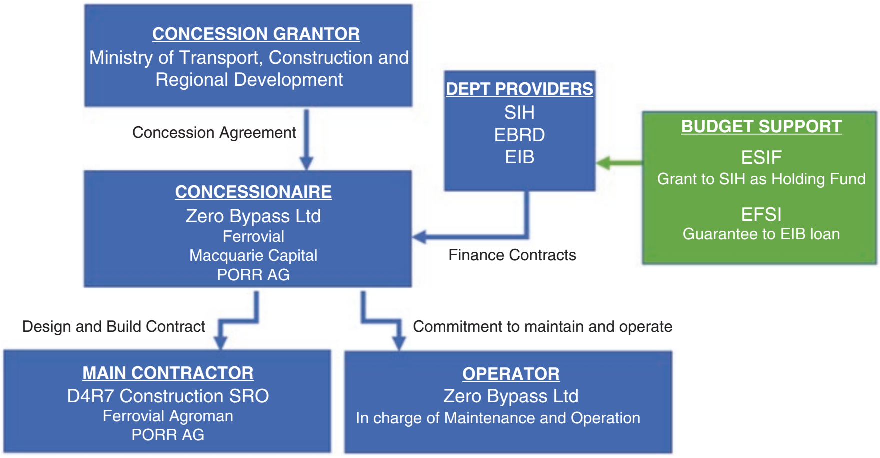

Fig. 3 Bratislava bypass contract structure. Source: Adapted from Carbonaro et al. (2017)

Fig. 4 A8 motorway Ulm-Augsburg map. Source: Adapted from VIFG (2013)

- Both operations are large-scale road projects which in the legacy habitat would have been supported only through grant funding; in the post-2014 habitat EU budgetary support was delivered via financial instruments, i.e. loans and guarantees, and with a more pronounced direct involvement of financial intermediaries, both public and private.
- The Bratislava bypass illustrates how multiple funding channels from different EU budgetary tools can be used for the same hybrid operation.
- The 2016 Ulm-Augsburg motorway re-financing illustrates how in the post-2014 habitat different EU budget support tools can be used in successive phases of the

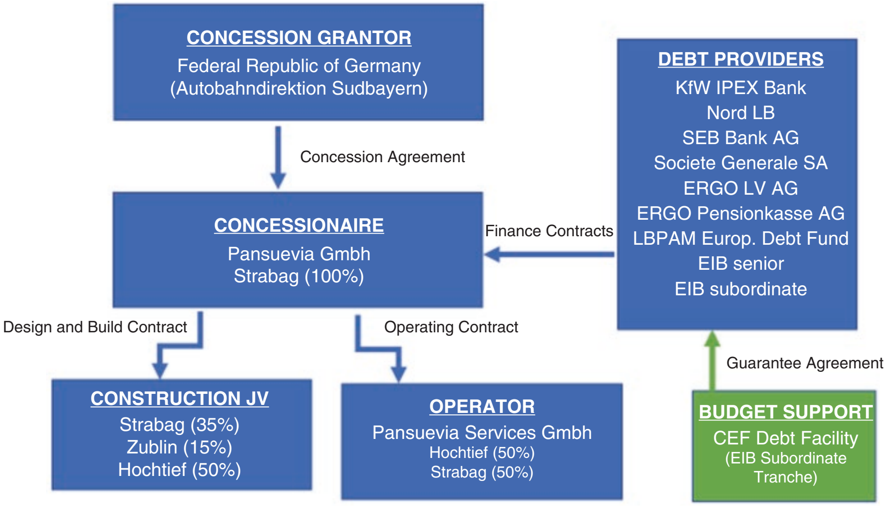

Fig. 5 A8 motorway Ulm-Augsburg contract structure. Source: Adapted from Lacher (2019)

project life cycle. This can address changes in the risk profile of a hybrid PPP operation and better align its financial structure to the interests of private fund providers.

To sum up, the evolution of hybrid transport PPPs in the EU has been affected by developments in three interlinked areas:

- Those in the PPP transport market, with various trends in transaction configuration, such as the types of project supported via PPPs, contractual forms, and payment mechanisms.[53]
- Those related to the wider EU transport policy framework, which has become more complex and incorporated decarbonization, digitization, environmental sustainability and innovation as critical policy concerns.
- Those related to the EU financial budgetary support tools, on which I have focused in my discussion, have evolved from the traditional grant-based system to a far more diversified range of financial products and multi-level, multi-agent arrangements. The forthcoming programming period 2021–2027 may widen opportunities for the hybrid PPP delivery of transport investment. From this perspective, the InvestEU initiative represents an ambitious attempt at simplifying and consolidating various forms of centrally managed EU budgetary support, drawing on the positive experience from EFSI.

Against this backdrop, the development of better-focused PPP ex-post evaluation methods could help improve the contribution of EU budgetary resources to the

[53] For instance the movement away from user charges towards availability payments, or a mix of the two, in road PPPs.

performance of PPP assets over the project life cycle. A 2018 EPEC study (EPEC, 2018) specifically deals with issues related to the ex-post assessment of PPPs and the challenges in defining a performance evaluation framework allowing robust evidence-based judgements. The EPEC study does not focus on the transportation sector and no mention is made of blending issues. However, it emphasizes the need to define ex-ante key performance indicators more likely to enable an effective monitoring and evaluation. Thus, it is important to be clear as possible on the objectives and performance criteria related to the adoption of a PPP procurement route vs other delivery modes, as well as those related to the hybrid route vis-à-vis options without EU budgetary involvement.

Looking at the future, the European Commission as the EU executive body has been working hard to streamline some of the labyrinthine requirements linked to the use of budgetary resources in hybrid/blended PPPs, including in the transport sector. This seems to be one of the indications from the proposed ESIF regulatory structure applicable in the 2021–2027 financial perspective. Be as it may, there may be a trade-off between on the one hand facilitating a more decentralized decision process in the planning and structuring of hybrid transport PPPs, leaving ample discretion to member states and other PPP stakeholders, and on the other robust and transparent criteria to achieve policy impact in the use of scarce EU budgetary resources. This difficult trade-off should be seen against the backdrop of the current scarcity of reliable analysis on how to measure and maximize in practice the policy impact of EU budgetary support in hybrid PPPs, in the transport sector as well as in other investment areas. Such difficulties notwithstanding, options and pathways to design and implement hybrid PPPs in the transport sector are now more discernible and a wider pool of stakeholders increasingly aware of these opportunities.

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Highway Public-Private Partnership Projects in the United States

Patrick DeCorla-Souza and Mark Sullivan

Acronyms

CPI	Consumer price index
DOT	Department of Transportation
FDOT	Florida Department of Transportation
HOT	High-occupancy toll
I	Interstate
P3	Public-private partnership
PAB	Private activity bonds
PR	Puerto Rico
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SANDAG	San Diego Association of Governments
SH	State highway
TEA-21	Transportation Equity Act for the 21st century
TIFIA	Transportation Infrastructure Finance and Innovation Act

Introduction

Public-Private Partnerships (P3s) have been used as a project delivery method mainly for complex highway projects in the USA. The nation's first three P3 projects—the Teodoro Moscoso Bridge in San Juan, Puerto Rico, the Dulles Greenway in Northern Virginia, and the 91 Express Lanes in Orange County, California—all

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reached financial close in the 1992–1993 timeframe. This initial period of P3 activity was followed by a ten-year hiatus without a new P3 project. Activity picked up momentum in 2003 with the financial close of the South Bay Expressway in San Diego, California. To date a total of 32 projects have been implemented via P3s (several are under construction). They are summarized later in this chapter, and web references providing detailed information on each project are listed at the end.

Interest in using P3 approaches to develop and finance transportation improvements is due to the convergence of key issues: growing travel demand, rising capital costs, constrained funding, aging infrastructure, and increased pressure on budgets. Alternative project financing and delivery strategies are attractive to public agencies, particularly when resistance to new or increased taxes persists. P3s offer many potential benefits, including access to new sources of financing, reduced capital and life cycle costs, and the potential to accelerate the completion of needed projects. In addition, one of the key motivators for public agencies to procure projects on a P3 basis is the ability to transfer to their private sector partners more project risk, including construction cost overruns, construction completion schedules, toll revenue levels, and long-term maintenance cost overruns.

To build new facilities, two distinct P3 compensation structures have been used, each of which transfers a different set of risks to the private partner. The earliest P3 transactions involved financings that leveraged toll revenues. Known as "toll concessions," these deals involved the significant risk that actual project revenues will fall short of forecasted levels, leaving the private partner unable to repay its debt or achieve a return on its investment. In 2009, the US highway industry introduced its first P3 project with compensation based on the direct performance of the private partner. Financed by leveraging a combination of milestone payments, made by the public partner after meeting construction deadlines, and periodic availability payments paid throughout the term of the concession contingent on the private partner operating the project at a defined level of condition and performance, these "availability payment" concessions carry considerably less risk for the private partner, making them an attractive P3 alternative for some types of investors.

In addition to the construction of new highway facilities, toll concessions have been used on long-term lease transactions for *existing* toll facilities. With these arrangements, private investor/operators assume the role of an existing, typically public sector, manager. The new manager obtains the right to operate and collect tolls for a specified period in exchange for lease payments that often involve an upfront payment to the public owner. The private partner may also be responsible for undertaking capital repairs or for expanding the facility. The fact that these projects have proven revenue streams mitigates traffic risk to a certain extent.

These three different types of P3s—toll concessions, availability payment concessions, and long-term leases—are discussed in the rest of this chapter.

Toll Concessions

Table 1 lists the P3 toll concessions that reached financial close in the USA since 1992. As discussed below, two have been purchased by public sector transportation authorities, and a third filed for bankruptcy. Toll concession projects fall into three distinct groups:

- “Greenfield” toll roads
- Water crossings
- Priced managed lanes

We discuss each category below.

Greenfield Toll Roads

Greenfield toll roads are new toll roads in previously undeveloped highway corridors. These projects have significant revenue risk because there is no documented travel demand in the corridors. In many cases, revenue risk is exacerbated if traffic and revenue projections are predicated on growth in population and employment along the corridor. Only three P3 greenfield toll concession projects have been built in the USA:

- Dulles Greenway in Northern Virginia
- South Bay Expressway in San Diego, California
- State Highway (SH) 130 Segments 5-6 near Austin, Texas

The experience with the first greenfield toll roads in the USA has been mixed. The agencies sponsoring these projects and the public at large have benefited from them, the projects have been built on budget without public sector funding, and they provide new travel options to the public. However, for the private sector developers that financed, built, and operated these three greenfield toll roads, their business results have not conformed to their expectations, in large part due to larger economic conditions that influenced traffic and revenue levels.

The initial developers of the Dulles Greenway were able to stave off bankruptcy by having their concession period extended by twenty years and restructuring their underlying debt. The growth in population levels and economic activity that the project’s traffic and revenue forecasts were predicated upon were slow in coming but did eventually occur. Nearly 10 years after opening, the initial investors were able to sell the concession, recover their costs and derive a profit. The new operators had the benefit of being able to price their offer based on 10 years of traffic and revenue data and, with the help of healthy toll increases, continue to operate the concession profitably.

The South Bay Expressway opened in late 2007 on the cusp of the impending financial crisis. The revenue forecasts prepared for the project assumed that it would be a catalyst for new development on the southern edge of San Diego. This growth

Table 1 Toll concessions

Project	Location	Facility type	Length	Cost ($M)	Concession length	Financial close	Open date	Revenue source
Teodoro Moscoso Bridge[a]	San Juan, Puerto Rico	Water crossing	1.4 miles	$127	35 years	1992	Open Feb 1994	Tolls
Dulles Greenway[b]	Loudoun Co., Virginia	Greenfield toll road	14 miles	$355	41 years	1993	Open Sept 1995	Tolls
91 Express Lanes[c]	Orange Co, California	Managed lanes	10 miles	$119	35 years	1993	Open Dec 1995	Tolls
Elizabeth River Crossings[d]	Norfolk, Virginia	Water crossing	<1 mile	$2088	58 years	April 2012	Open Nov 2016	Tolls
South Bay Expressway[e]	San Diego, California	Greenfield toll road	9.8 miles	$658	35 years	May 2003	Nov 2007	Tolls
I-495 Capital Beltway HOT Lanes[f]	Fairfax Co., Virginia	Managed lanes	14 miles	$2065	85 years	Dec 2007	Nov 2012	Tolls
SH 130 Segments 5-6[g]	Austin metro area, Texas	Greenfield toll road	40 miles	$1336	50 years	Mar 2008	Oct 2012	Tolls
North Tarrant Express (I-820 & SH 121/183)[h]	Ft. Worth, Texas	Managed lanes	13 miles	$2122	52 years	Dec 2009	Oct 2014	Tolls
LBJ Express	Dallas metro area	Managed lanes	13 miles	$2645	52 years	June 2010	Sept 2015	Tolls
I-95 HOT Lanes[i]/I-395 HOT Lanes[j]/I-95 HOT Lanes Ext.[k]	Northern Virginia	Managed lanes	29.4 mi (I-95)/8 mi (I-395)/10 mi (I-95 Ext.)	$923 (I-95)/$554 (I-395)/$809 (Ext.)	76 years (I-95)/70 years (I-395)/68 years (Ext.)	Nov 2012/ Jun 2017/2019	Dec 2014 (I-95)/ Nov. 2019 (I-395)/2022 scheduled (Ext.)	Tolls
North Tarrant Express (I-35W)[l]	Ft. Worth, Texas	Managed lanes	10.2 miles	$1641	52 years	Sept 2013	Dec. 2016	Tolls

Project	Location	Facility type	Length	Cost ($M)	Concession length	Financial close	Open date	Revenue source
US 36 Express Lanes (Phase 2)[m]	Denver, CO metro area	Managed lanes	15 miles	$209	50 years	Feb 2014	Jan 2016	Tolls
I-77 Express Lanes[n]	Charlotte, North Carolina metro area	Managed lanes	26 miles	$636	50 years	June 2014	May 2019 (first segment)	Tolls
SH 188 Toll Lanes[o]	Houston, TX	Managed lanes	10.6 miles	$1064	52 years	May 2016	Nov 2020	Tolls
Transform 66[p]	Fairfax & Prince William Co., Virginia	Managed lanes	22.5 miles	$3724	50 years	Nov 2017	Dec 2022 (scheduled)	Tolls
Belle Chasse Bridge[q]	Plaquemines Parish, Louisiana	Water crossing	1.4 miles	$148	35 years	Dec 2019	Apr 2024 (scheduled)	Tolls

[a]Federal Highway Administration. (2021). Project profile: Teodoro Moscoso Bridge. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/pr_teodoro_moscoso_bridge.aspx

[b]Federal Highway Administration. (2021). Project profile: Dulles greenway. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/va_dulles_greenway.aspx

[c]Federal Highway Administration. (2021). Project profile: 91 express lanes. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/ca_91expresslanes.aspx

[d]Federal Highway Administration. (2021). Project profile: Elizabeth River tunnels (downtown/midtown tunnel). Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/va_elizabeth_river_tunnel.aspx

[e]Federal Highway Administration. (2021). Project profile: South Bay Expressway (formerly SR 125 South Toll Road). Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/ca_southbay.aspx

[f]Federal Highway Administration. (2021). Project profile: Capital Beltway high occupancy toll (HOT) lanes (I-495). Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/va_capital_beltway.aspx

[g]Federal Highway Administration. (2021). Project profile: SH 130 (segments 5-6). Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/tx_sh130.aspx

[h]Federal Highway Administration. (2021). Project profile: North Tarrant express I-820 and SH 121/183 (Segments 1 and 2W). Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/tx_north_tarrant.aspx

[i]Federal Highway Administration. (2021). Project profile: I-95 HOV/HOT lanes. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/va_i95.aspx

[j]Federal Highway Administration. (2021). Project profile: 395 express lanes. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/va_395_express_lanes.aspx

[k]Federal Highway Administration. (2021). Project profile: I-95 express lanes Fredericksburg extension. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/va_i95_express_fredericksburg_extension.aspx

[l]Federal Highway Administration. (2021). Project profile: North Tarrant express 35W (segments 3A, 3B and 3C). Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/tx_north_tarrant_3a3b.aspx

[m]Federal Highway Administration. (2021). Project profile: US 36 express lanes (phase 2). Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/co_us36_express_lanes_phase2.aspx

[n]Federal Highway Administration. (2021). Project profile: I-77 express lanes. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/nc_i77_express_lanes.aspx

[o]Federal Highway Administration. (2021). Project profile: SH 288 toll lanes project. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/tx_sh288.aspx

[p]Federal Highway Administration. (2021). Project profile: Transform 66 - Outside the Beltway. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/va_transform_66.aspx

[q]Federal Highway Administration. (2021). Project profile: Belle Chasse Bridge and tunnel replacement. Center for Innovatiive Finance Support. Retrieved July 5, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/la_belle_chasse_bridge_tunneL_replacement.aspx

was slow in developing, and weak revenues and lingering legal action forced the private concessionaire into bankruptcy. When the concession was sold to the San Diego Association of Governments (SANDAG), the proceeds from the sale were used to repay the project's commercial debt and the private partner lost $130 million of its own money that it had invested as at-risk equity in the project. SANDAG benefited from the sale, buying for only $341.5 million a project that had been built at a cost of $658 million. This, in turn, enabled SANDAG to lower toll rates on the facility, benefiting the driving public in greater San Diego.

SH 130 suffered from toll revenues that upon opening were 60% below forecasts. In spite of increases to the speed limit on SH 130 and signs on Interstate 35 (I-35) encouraging motorists to use SH 130, many drivers prefer to use the more congested I-35 corridor because there are no tolls, demonstrating the difficulty in developing financially viable P3 projects when a free competing facility is available to the driving public. While the concession company has transferred the roadway to its creditors and lost the $210 million it invested in the project, this has had no impact on the public sponsor, the Texas Department of Transportation (Texas DOT) or the customers that use SH 130 Segments 5-6.

Water Crossings

There have been three toll concessions involving water crossings in the USA:

- Teodoro Moscoso Bridge in San Juan, Puerto Rico
- Elizabeth River Tunnels (Downtown Tunnel/Midtown Tunnel/Martin Luther King (MLK) Expressway Extension) in Portsmouth and Norfolk, Virginia
- Belle Chasse Bridge, Louisiana, currently under construction

The Teodoro Moscoso Bridge was the first P3 project to open in the USA and is financially stable. The bridge was completed in a timely fashion, and, with its relatively low construction costs, it earns a good return for the private partner and provides opportunities for profit sharing with the public sponsor. Even so, the concession period was extended by 17 years in 2010 to help the concession company recoup losses experienced earlier in the term. The Teodoro Moscoso Bridge project is unique in that the Puerto Rico Highways & Transportation Authority (PRHTA) used its own bonding capacity to raise the necessary funding for the project and then passed the repayment obligation on to the private partner.

The Elizabeth River Tunnels project opened in stages in 2016, with the rehabilitation of the existing Midtown Tunnel completed in 2018. The project illustrates the risks associated with public acceptance of tolling—especially the introduction of tolls on existing non-tolled facilities. In this case, the opposition included a lawsuit and anti-P3 legislation introduced by state legislators. The Commonwealth Transportation Board helped to mitigate the project's significant public acceptance risk by providing an additional $100 million in public funding in order to delay the implementation of tolling on the existing Elizabeth River tunnel crossing until construction of the new crossing was completed.

Traffic risk in the case of the Elizabeth River Tunnels is mitigated to some extent by the fact that historic traffic levels are well documented in each of the crossing corridors. Although the project involves the construction of a new tunnel, it adds needed capacity in a heavily traveled existing corridor.

Priced Managed Lanes

Most toll concessions that have reached financial close since 2009 have involved priced managed lane projects, which are typically toll lanes added to an existing non-tolled corridor. Motorists have the choice to opt into the new capacity, at a price, or remain in the general-purpose lanes as before. The following priced managed lane projects are currently in operation in the USA:

- 91 Express Lanes in Orange County, California
- I-495 Capital Beltway High-Occupancy Toll (HOT) Lanes in Northern Virginia
- North Tarrant Express (I-820 and SH 121/183) in Fort Worth, Texas
- Lyndon Baines Johnson Express (LBJ Express) in Dallas, Texas
- I-95 High-Occupancy Toll (HOT) Lanes in Northern Virginia (95 Express Lanes)
- North Tarrant Express 35W Project in Fort Worth, Texas
- US 36 Express Lanes in Denver, Colorado
- I-77 Express Lanes in Charlotte, North Carolina
- SH 288 Toll Lanes in Houston, Texas

The first priced managed lane concession in the USA was the 91 Express Lanes, which opened to service in late 1995. Running in a geographically constrained valley in an extremely congested highway corridor, the project has been highly profitable for its entire history. It was built without any public funds but was purchased by the Orange County Transportation Authority in 2003 in order to annul a non-compete clause in the P3 concession agreement that prevented Caltrans (the California State DOT) from making improvements to the parallel general-purpose lanes. Built at a cost of $119 million, the private developer sold the concession for $207.5 million and derived a significant profit. The original cost of construction was low because no new right-of-way was needed since the lanes were constructed within the existing median of the facility.

Most of the more recent managed lane projects have involved much larger and more expensive improvements in heavily traveled commuter corridors with well-documented traffic levels. Nonetheless, in most cases, the sponsoring public agencies have made significant financial contributions toward construction in order to make the private financing viable. In addition to new capacity, these projects have involved the reconstruction and enhancement of existing urban-suburban highway corridors and have featured concession terms in excess of 50 years.

The $2.068 billion, 85-year Capital Beltway High-Occupancy Toll (HOT) lane concession opened to service in late 2012 to lower than expected revenue levels. This led to a refinancing less than two years later, with the private partner investing an additional $280 million of its own equity to reduce its debt servicing costs. The concessionaire's additional equity investment indicates that it has confidence in the project's long-term financial performance. Despite the recent drop in revenues due to the pandemic, traffic is expected to return to pre-pandemic levels and plans are underway to extend the HOT lanes north to the Maryland state line.

The $2.047 billion North Tarrant Express (I-820 and SH 121/183) opened to traffic in October 2014 to revenues that were higher than industry expectations. The project has maintained its credit rating due to its positive performance and expectations for continued economic and population growth in the Dallas-Fort Worth metropolitan area.

The $923 million 95 Express Lanes project opened in Northern Virginia in December 2014. This project did not receive a public subsidy due to its lower cost and healthy revenue generation potential. The project has been extended north to Washington, DC on I-395 and is currently being extended south to Fredericksburg. Despite traffic losses during the pandemic, credit ratings remain stable for most US managed lanes due to the anticipated rebound in traffic and revenues post-pandemic.[1]

The $2.615 billion LBJ Express opened to service in September 2015 with revenues higher than expected due to higher-than-anticipated toll rates. There is a "soft" toll rate cap of 90 cents a mile (LBJ TEXpress 2021)[2] which is adjusted each year by a percentage equal to the previous year's Consumer Price Index (CPI). However, with congestion-management pricing, tolls can be raised above the soft cap if needed to keep traffic moving in accordance with a pre-defined mechanism approved by the Regional Transportation Council (RTC) and the Texas Department of Transportation (Texas DOT).

The $209 million US 36 Express Lanes (Phase 2) opened in January 2016. The private partner is also operating and collecting toll proceeds from the US 36 (Phase I) Express Lanes and the I-25 Express Lanes, both of which were built by the state of Colorado. At opening, gross revenues were slightly above expectations. Targeted equity rates of return for toll concessions range from 12% to 17% for priced managed lanes depending on the level of risk perceived.[3]

The $3.69 billion I-66 high-occupancy toll (HOT) lanes project is under construction at the time of writing. The project did not need a subsidy from the public sponsor—in fact, the winning bidder provided a concession fee of almost $600 million.

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[1] Fitch Ratings. (2021). Most U.S. Managed lanes stable amid pandemic fallout. Fitch Ratings. Retrieved 5 July, 2021, from https://www.fitchratings.com/research/infrastructure-project-finance/most-us-managed-lanes-stable-amid-pandemic-fallout-24-02-2021.

[2] LBJ TEXpress. (2021). LBJ Express FAQs: Tolls, pricing and financing. LBJ TEXpress. Retrieved 5 July, 2021, from https://www.lbjtexpress.com/faq-page#t77n210.

[3] Federal Highway Administration. (2016). Guidebook on financing of highway public-private partnership projects. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/pdfs/p3/p3-toolkit_p3_project_financing_guidebook_122816.pdf.

Financing Toll Concessions

The three toll concession projects built in the 1990s predate the establishment of federal credit assistance available today. As a result, P3 developers had limited financing options. For example, the Dulles Greenway and 91 Express Lanes were both originally financed using a combination of commercial loans made by banks and at-risk equity provided by their private partners. The Teodoro Moscoso project involved a one-of-a-kind financing where the government of Puerto Rico used its full faith and credit to raise special facility revenue bonds, which were then repaid by the private partner.

The Transportation Infrastructure Finance and Innovation Act (TIFIA) Credit Program was established by the Transportation Equity Act for the twenty-first century (TEA-21) in 1998 to provide revenue-generating transportation projects with access to low-cost and flexible financing compared to the terms generally offered by commercial lenders. The goal of the program is to attract private and other non-federal co-investment in transportation projects. The program was created in recognition of the fact that state and local governments that sought to finance transportation projects with tolls often had difficulty obtaining financing at reasonable rates due to the uncertainties associated with tolling.

TIFIA loans have been used on most toll concessions that reached financial close in the United States since the program was established. Beginning with the South Bay Expressway in 2003, the TIFIA program has provided approximately one-third of the funding needed to support these projects. The TIFIA credit program was especially helpful to those projects that reached financial close in the wake of the 2008 financial crisis.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) of 2005 amended Section 142 of the Internal Revenue Code to allow tax-exempt private activity bonds (PABs) to be used to finance highway and freight transfer facilities. This change allowed private developers to reduce their borrowing costs by tapping the municipal credit market and gaining access to tax-exempt financing. PABs are issued by public authorities but the responsibility for repayment of the bonds lies with the private partner and the credit worthiness of PABs depends on the private partner's credit worthiness and the project's characteristics. The I-495 Capital Beltway High-Occupancy Toll (HOT) lanes project was the first project to use PAB financing when it reached financial close in 2007. PABs have been used on most toll concessions that reached financial close since. The combination of PABs and TIFIA financing has provided the necessary foundation to leverage other sources of financing, including at-risk equity contributions from private sector P3 investors.

Beyond TIFIA and the US municipal bond market, the third major source for debt financing of P3 toll concession projects is the commercial banking industry. However, banks tend to lend money at a higher cost compared to federal credit programs, as commercial lenders set interest rates to reflect the level of risk involved with each transaction. The risk level is generally documented by ratings assigned to these transactions by the three major bond rating houses: Fitch Ratings, Moody's, and Standard and Poor's. Commercial debt has only been used on two toll concession projects since the establishment of the TIFIA Credit Program: SH 130 Segments 5 and 6 and US 36 Express Lanes (Phase 2). Commercial debt was a viable financing tool for the US 36 project because it leveraged the toll proceeds from two existing managed lane projects, both of which had established and well documented revenue streams. This fact reduced the project revenue risk, allowing the banks to lend money at a more attractive interest rate. The project's risk profile was further reduced because nearly half of its cost was covered by a combination of a public subsidy and private equity.

Public sector payments have also been an important funding source for several toll concession projects. In some procurements, bidders have been asked to specify the amount of public subsidy that they would need to be able to complete a deal, and in others they are asked to identify the physical extent of a construction program they would be able to deliver with a fixed subsidy. Public subsidies are often used for larger and more expensive projects, such as managed lane improvements that reconstruct entire highway corridors or complex undertakings such as the Elizabeth River Tunnels. Other sources of funding for toll concession projects can include tolls from other existing facilities that the private partner has been asked to operate as part of a concession.

As might be expected, toll concession revenues were heavily impacted by the current pandemic, especially revenues on priced managed lanes. Yet all concessions have been able to withstand the revenue losses without major impacts on the ratings on their debt.

Availability Payment Concessions

Table 2 shows the availability payment P3 concessions that have reached financial close in the USA. The availability payment approach was pioneered in the state of Florida in the mid-2000s with two contemporaneous projects: the I-595 Corridor Improvements in Fort Lauderdale and the Port of Miami Tunnel. In developing its tolling plan for I-595, the Florida Department of Transportation (FDOT) chose to retain control of the rate setting and revenues to maximize traffic throughput in the corridor. For the Port of Miami Tunnel, FDOT was keen on procuring a P3 partner due to its own limited experience in tunnel construction and operation. Because it would not be politically feasible to toll the crossing, FDOT made the decision to use its own funding to make annual payments to a private partner that would design, build, finance, operate, and maintain the project, and have the private partner raise the necessary financing by leveraging the state's availability payments.

In addition to toll projects where the public sponsors wish to retain control of toll rates, availability payments are used on toll projects that are not projected to generate adequate amounts of revenue to cover their costs. Project sponsors use traditional federal and state sources to fund availability payments. These can be supplemented with toll proceeds or other state and local transportation funding sources.

Table 2 Availability payment concessions

Project	Location	Facility Type	Length	Cost ($M)	Concession length	Financial close	Open	Revenue source
I-595 Corridor Roadway Improvements[a]	Broward County, Florida	Express lanes	10.5 miles	$1834	35 years	Mar 2009	Mar 2014	Tolls & taxes
Port of Miami Tunnel[b]	Miami, Florida	Tunnel (non-tolled)	1 mile	$1113	35 years	Oct 2009	Aug 2014	Taxes
Presidio Parkway[c]	San Francisco, California	Highway (non-tolled)	1.6 miles	$365	30 years	June 2012	July 2015	Taxes
Goethals Bridge Replacement[d]	Staten Island, New York	Toll bridge	1.3 miles	$1526	40 years	Nov 2013	May 2018 (westbound span)	Tolls
I-69 Section 5[e]	Bloomington, Indiana	Toll road	21 miles	$466	35 years	July 2014	State took over project in July 2017	Taxes
I-4 Ultimate[f]	Orlando, Florida	Express lanes	21 miles	$2878	40 years	Sept 2014	2021	Tolls
Pennsylvania Rapid Bridge Replacement[g]	Pennsylvania statewide	Bridges (non-tolled)	Not applicable	$1117	25 years	Mar 2015	Jan 2019	Taxes
Southern Ohio Veterans Memorial Highway[h]	Portsmouth, Ohio	Highway (non-tolled)	16 miles	$647	35 years	Mar 2015	Dec 2018	Taxes
Ohio River Bridges—East End Crossing[i]	Southern Indiana and Louisville, Kentucky	Toll bridge	3.8 miles	$1319	35 years	Apr 2015	Dec 2016	Tolls
I-75 Modernization Segment 3[j]	Detroit metro area, Michigan	Freeway (non-tolled)	5.5 miles	$725	30 years	Nov 2018	2022 (scheduled)	Taxes
Metro Region Freeway Lighting[k]	Detroit metro area, Michigan	15,000 lights (approx..)	5 corridors regionwide	$49 (design and const.)	15 years	Aug 2015	Aug 2017	Taxes

[a]Federal Highway Administration. (2021). Project profile: I-595 corridor roadway improvements. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/fl_i595.aspx

[b]Federal Highway Administration. (2021). Project profile: Port of Miami Tunnel. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/fl_port_miami_tunnel.aspx

[c]Federal Highway Administration. (2021). Project profile: Presidio parkway (phase II). Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/ca_presidio.aspx

[d]Federal Highway Administration. (2021). Project profile: Goethals Bridge replacement. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/ny_goethals.aspx

[e]Federal Highway Administration. (2021). Project profile: I-69 Section 5. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/in_i69_section5.aspx

[f]Federal Highway Administration. (2021). Project profile: I-4 Ultimate. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/fl_i4ultimate.aspx

[g]Federal Highway Administration. (2021). Project profile: Pennsylvania Rapid Bridge replacement project. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/pa_rapid_bridge.aspx

[h]Federal Highway Administration. (2021). Project profile: Southern Ohio Veterans Memorial Highway (Portsmouth Bypass). Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/oh_veterans_highway.aspx

[i]Federal Highway Administration. (2021). Project profile: Ohio River Bridges East End Crossing. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/ky_eastend_crossing.aspx

[j]Federal Highway Administration. (2021). Project profile: I-75 modernization project segment 3. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/mi_i75_modernization_segment_3.aspx

[k]Federal Highway Administration. (2021). Project profile: Metro region freeway lighting P3 (Michigan). Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/mi_metro_region_freeway_lighting.aspx

Concession periods for availability payment projects range between 25 and 40 years. This provides an indication of the timeframe public sponsors are willing to extend payment obligations.

Transportation agencies have used availability payment procurements to develop a wide array of highway projects. They include non-tolled projects—a tunnel providing truck and vehicular access to the Port of Miami, as discussed above; the approach road to the Golden Gate Bridge; an Interstate highway segment in Indiana; a highway bypass in Ohio; 558 one- and two-span bridges in largely rural regions in the state of Pennsylvania; and a freeway modernization and a freeway lighting project in Michigan. Tolled projects include two priced managed lane projects in Florida and two toll bridges, one connecting New York and New Jersey and the other Kentucky and Indiana.

Availability payment P3s have proven an effective strategy to accelerate the completion of large and expensive projects that would otherwise be built in smaller pieces extended over multiple budget cycles. As with toll concessions, they also transfer lifecycle risk to the private partner and incentivize long-term maintenance efficiencies and cost savings. They can also be an effective vehicle for providing sponsoring agencies access to international firms with expertise not available domestically—such as experience with subaqueous, wide-diameter, bored tunnel construction in the case of the Port of Miami Tunnel. Thus, one of the strongest motivations for project sponsors to use the availability payment approach is to achieve the benefits of P3s on high-priority projects that do not generate revenue.

A potential downside to availability payment concessions is that all three major rating agencies consider them equivalent to debt obligations. As such, the use of availability payment concessions puts downward pressure on state credit ratings. This pressure can be mitigated to a certain extent if availability payment concessions are used on projects that generate toll revenues covering all or a portion of the state's obligations. However, this is not the case with availability payment procurements for non-revenue-generating projects. Therefore, there is a limit on the volume of availability payment activity if states wish to avoid a threat to their credit rating. Because of this dynamic, the use of availability payment procurements is generally limited to those states with stronger credit ratings. Florida has set caps on the overall amount of availability payment activity that can occur in the state, enabling it to maintain the robust confidence of the credit agencies and derive the benefits from the procurement strategy on a small number of complex, high-priority projects.

The growth in the use of availability payment concessions in the USA coincided with the aftermath of the 2008 financial crisis. With the tightening commercial credit market and the loss of the bond insurance market, availability payment concessions provided public agencies with a new way to structure P3 transactions to mitigate revenue risks associated with toll concessions. With the lower risk profile, the public sector may receive more competitive bids due to lower costs for financing.

The availability payment P3 approach has proven attractive to some private developers as it involves considerably less financial risk compared to toll concessions. Availability payment financings essentially leverage the full faith and credit of state governments. However, there is always appropriations risk, i.e., the possibility of a state legislature not obligating funds to their DOTs in future budget cycles and thus affecting funding of the availability payments from state budgets. State DOTs often mitigate this risk by prioritizing availability payments in their capital or work programs ahead of other agency obligations. Even with such policies, the annual state legislative appropriation process may still present risk to the private partner. In the case of the Presidio Parkway in California, the state legislature chose to commit to a "continuous appropriation" that provides protection against budget delays, because, as a lump-sum appropriation, the funds may be paid regardless of passage of the annual budget. While availability payment procurements may afford many benefits to project sponsors, prioritizing future payments reduces the sponsor's flexibility to allocate revenues where they may be most needed.

Availability payment procurements are attractive to private sector developers because they mitigate the troublesome revenue risks associated with toll concessions. However, their upside profit potential is capped by the availability payments, which are fixed for the duration of the concession. Toll concessions provide the potential for greater profit, but with much higher risks for the private sector.

Financing Availability Payment P3 Projects

TIFIA financing for P3s is nearly as common among availability payment concessions as with toll concessions. Some availability payment P3 projects have included commercial debt in their financings, likely related to the reduced financial risk profiles associated with availability payment concessions.

As with toll concessions, all availability payment financings have included private equity. However, compared with toll concessions, the average level of equity is significantly lower. The higher debt to equity ratio is possible because availability payment projects are less risky. As a result, lenders do not require private partners to contribute as much equity when they make loans supporting availability payment projects.

With most availability payment projects, their public sponsors have made upfront payments to their private partners, either in the form of an upfront public contribution, milestone construction payments, or a combination of the two. Given that these projects are funded entirely with public money, this is a deliberate choice on the part of their public sponsors. By doing so, they reduce the amount of the annual availability payments.

Long-Term Lease Concessions

With these arrangements, private investor/operators are given the right to operate and collect tolls on an existing toll facility for a specified period in exchange for making an upfront lease payment. Toll rates and growth of toll rates over the concession term are set in the concession agreement. Long-term lease concessions can take several forms. These include:

- Debt transfer lease transactions where a fee paid by the private concessionaire is used to pay off the toll facility's underlying publicly held debt, with no additional funds available to the public sponsor. Such transactions require the private concessionaire to maintain the road to specified standards throughout the concession period and may also require the private investors to make additional capital repairs to address safety and condition issues.
- Hybrid debt transfer and new construction lease transactions where the private investor pays a fee that is used to pay off the underlying publicly held debt on the facility and agrees to complete new construction extending the existing toll facility. In some cases, new construction may only be required at a future point in time if certain predetermined performance levels are achieved.
- Value extraction lease transactions where a fee paid by the private investor is used to pay off any underlying public debt associated with the toll road *and* provide the public sponsor with a sizeable infusion of additional funds that it can use for other needs. These transactions require the private investors to maintain the road to specified standards throughout the concession period and may also require the private investors to make additional capital repairs to address safety and condition issues.

Table 3 summarizes the five long-term lease concessions in the USA to date. While other project owners have considered leasing toll facilities, no other lease concessions have occurred. Concession periods tend to be longer than with "new build" toll concessions and availability payment concessions. Adherence to established performance standards is not as easily enforced as in availability payment concessions, since there are no performance-based payments.

Two lease transactions have included provisions for facility expansion: the Pocahontas Parkway, where the concessionaire constructed a connecting road segment to Richmond International Airport; and the Northwest Parkway, which includes options for two extensions of that facility. Other commitments bundled with long-term leases have included upgrading toll collection systems, capital maintenance, and other safety and system improvements.

Most long-term lease concessions are no longer held by their original investors. The Chicago Skyway's investors sold their interest in the facility for a profit in 2015, 10 years into the lease. Both the Indiana Toll Road and Pocahontas Parkway struggled to achieve traffic and revenue levels sufficient to cover their debt repayments. The Indiana Toll Road's concessionaire filed for bankruptcy in 2014, and the lease was subsequently auctioned off to a new private consortium at a price substantially above what the first concessionaire paid the state of Indiana. Pocahontas Parkway's concessionaire ultimately transferred ownership of the roadway to the banks holding its senior debt in 2014. Subsequently, the Virginia Department of Transportation (VDOT) awarded a concession to a new private consortium in October 2016.

Table 3 Long-term Lease Concessions

Project	Location	Facility type	Length (miles)	Cost	Concession length (years)	Financial close	Status	Revenue source
Chicago Skyway[a]	Chicago, Illinois	Toll road	7.8	$1830	99	Jan 2005	Open	Tolls
Indiana Toll Road[b]	Northern Indiana	Toll road	157	$3948	75	June 2006	Open	Tolls
Pocahontas Parkway/ Richmond Airport Connector[c]	Richmond, Virginia	Toll road	8.8	$766	99	May 2016	Open	Tolls
Northwest Parkway[d]	Denver, CO metro area	Toll road	8	$726	99	Dec 2007	Open	Tolls
PR 22 & PR 5 Lease[e]	Puerto Rico	Toll roads	52/2.5	$1,146	40	Sept 2011	Open	Tolls

[a]Federal Highway Administration. (2021). Project profile: Chicago Skyway. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/il_chicago_skyway.aspx

[b]Federal Highway Administration. (2021). Project profile: Indiana Toll Road. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/in_indiana_toll.aspx

[c]Federal Highway Administration. (2021). Project profile: Pocahontas parkway/Richmond Airport Connector. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/va_pocahontas.aspx

[d]Federal Highway Administration. (2021). Project profile: Northwest Parkway. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/co_northwest_parkway.aspx

[e]Federal Highway Administration. (2021). Project profile: Puerto Rico PR-22 and PR-5 Lease. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/project_profiles/pr_pr22_and_pr5_lease.aspx

The Northwest Parkway's concessionaire reported favorable performance in 2014 and 2015 due to strong economic activity in the Denver metropolitan area. Nonetheless, prior years of underperformance and an inability to restructure private debt maturing in 2017 led the concessionaire to sell the toll road to new investors in late 2016.

The Puerto Rico 22 (PR-22) and PR-5 concessionaire refinanced its shorter-term debt in December 2015 extending the payback period and stabilizing the facility's finances. The concession agreement also was extended by 10 years in April 2016 in exchange for an additional payment from the concessionaire to the project sponsors of $115 million. In conjunction, the concessionaire's revenue share was increased from 50% of future toll revenues to 75%.

While several initial private investors have been challenged to realize expected returns from their investments in the near-term, public sponsors have generally benefited from their long-term lease transactions. First, changes in lease ownership have not had an impact on facility users or public sponsors since the provisions of the original concession agreements still stand, including commitments to operate and maintain the roadways, to follow established methods for toll rate increases, and to share excess profits. Second, the large, upfront payments secured upon lease execution have provided demonstrable benefits. At a minimum, they helped retire debt on burdensome or troubled assets for all five projects, and in three instances, permitted the project sponsors to make investments elsewhere in their respective region or state. Both the Chicago Skyway and Indiana Toll Road exemplify this outcome, as the City of Chicago and State of Indiana were able to make substantial investments in infrastructure, and in the City of Chicago's case, to parlay the proceeds into social benefits as well.

The P3 agreements often allow the concessionaire to impose substantial increases in toll rates. With mature facilities such as those in Chicago, Indiana and Puerto Rico, the income forfeited by the public sponsors (for up to 99 years) is substantial. However, in exchange the sponsors did receive significant payments that provided capital funding for other project needs. In the case of Indiana, the $2.6 billion, 10-year Major Moves transportation investment program was funded, advancing the benefits of the projects included in the program.

Financing Long-term Lease Concessions

Original financings for long-term lease concessions in the USA have all comprised significant private equity investment coupled with taxable long-term debt from commercial banks. The fact that these facilities all have well-established traffic and revenue histories mitigates traffic risk, thereby making commercial debt a viable option for their private operators. Given that federal credit programs must be used on projects involving the expansion of existing facilities or the construction of entirely new projects, they have not been available for use on long-term lease projects. However, the Pocahontas Parkway lease transaction did include a TIFIA loan to help finance the construction of the Richmond Airport Connector.

The percentage of equity as a share of overall concession cost at initial financial close depends on the perceived project risk, defined by the lenders, and ranges between 18% (for Pocahontas Parkway) and 48% (for Chicago Skyway, although the concessionaire was able to refinance only seven months after financial close, reducing its equity share to 25%).

Summary and Conclusions

In general, public agencies and the public throughout the USA have benefited from delivery of major highway projects through P3s. Benefits have included expedited project delivery, allocation of risk to private partners, improved budget and schedule certainty for the public agency, performance levels meeting standards in the P3 agreements, and conservation of public sector debt capacity which allowed other non-P3 projects to move forward.

The private sector has also benefited. Investors seeking higher returns have benefited from the opportunity offered by "new build" projects to increase their returns through efficiencies, innovation, and managing risks. Institutional investors such as pension funds have benefited from predictable long-term returns, especially in the case of availability payment P3s.

For toll concessions, revenue risk has been successfully transferred from the public owner to the private partner. In the instances when revenue failed to meet expectations, the credit rating of the public agency was not affected. However, due to the tenuous outcomes for the private partners who developed the first three revenue-risk greenfield highway toll concessions, private developers appear to have little to no appetite for participating in other greenfield highway toll concessions. Interest in priced managed lanes remains, however, and most recent toll concession P3s have been of this type.

While there were several availability payment P3 concessions implemented during the 10-year period after the great recession, the pipeline of such projects appears to have dried up. This may reflect the fact that they need long-term public budgetary capacity to make availability payments during the term of the concession. In most states, DOT budgets are constrained and raising new transportation revenues though taxes is difficult. The Federal government has not raised the fuel tax, its main source of highway revenue, for almost 30 years.

P3 projects have been less prevalent in the USA than in many other countries, in part due to longstanding public policies that have led to large Federal investments via grants-in-aid for highways. In general, federal laws discourage tolling of the Interstate highway system, subsidize the borrowing costs of municipal agencies, and constrain the mingling of public and private capital. Similarly, state-based policies restricting tolling and private financing also constrain public agency use of P3s.

Public sponsors face challenges relating to several prerequisites for P3 delivery:

- *Technical and institutional capacity* to develop and oversee P3s, including planning, project feasibility evaluation, contract negotiations, and performance monitoring.
- *Statutes* granting agencies permission to enter into a variety of types of P3 agreements.
- *Reliable revenue streams*, either from tolls or taxes.
- *Outreach and education* of stakeholders to increase understanding of the value of P3s.
- *Clear understanding of uncertainties*, e.g., traffic and revenue projections, and pricing and allocation of risk, to ensure an objective feasibility analysis and a proper structuring of P3 agreements.

In the past, there have been many misperceptions about P3 due to inadequate public information and transparency in the process. A common misperception is that the public sector loses control or ownership of the asset in a P3. In reality, the public partner does not relinquish ownership of the facility and remains involved to the extent that the contract terms clearly define the responsibilities of public and private parties, and other provisions in the P3 agreement protect the public interest, e.g., toll setting and service standards.

Against the backdrop of general policy, specific federal programs facilitate use of P3s. Higher financing costs can be mitigated through the use of Federal tax provisions (e.g., accelerated depreciation), TIFIA loans that provide low interest costs and flexible financing terms, and tax-exempt private activity bonds (PABs). The United States DOT's (USDOT's) Build America Bureau and the Federal Highway Administration (FHWA) assist state and local governments and private developers seeking to use the available Federal finance tools and initiatives. The Build America Bureau and FHWA help project sponsors sort through a host of complex issues in developing P3 projects. FHWA has developed a suite of educational materials—a "P3 Toolkit"—to support better informed decision-making in P3 project planning, development, procurement, and implementation. Further, FHWA's National Highway Institute provides introductory and advanced P3 training courses available free of charge for public sector staff.

Acknowledgement This chapter updates and builds upon information in the FHWA publication *Report on Highway Public-Private Partnership Concessions in the United States*.[4] The views expressed in this chapter are those of the authors and not necessarily the views of the U.S. Department of Transportation (USDOT) or the Federal Highway Administration (FHWA).

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[4] Federal Highway Administration. (2021). Report on highway public-private partnership concessions in the United States. Center for Innovatiive Finance Support. Retrieved 5 July, 2021, from https://www.fhwa.dot.gov/ipd/pdfs/p3/p3-toolkit_report_on_highway_p3s_122916.pdf.

TIFIA's support for public–private partnerships (P3s), including ground-breaking managed lanes transactions in Virginia and Texas that reached financial close during the stressful economic era of 2007–2010. He has also worked for public port agencies in Seattle and New York City. He is an awesomely loyal graduate of the University of Washington, where he graduated Phi Beta Kappa with degrees in journalism and history. He holds a Master of Public Policy degree from the Harvard Kennedy School of Government.

Case Studies of Financially Distressed Highway Public-Private Partnerships in the United States

Michael J. Garvin

Acronyms

AB 680	Assembly Bill 680 in California
CDA	Comprehensive development agreement
CTV	California Transportation Ventures (an SPC in SBX case)
HOT	High-occupancy toll
HOV	High-occupancy vehicle
IFA	Indiana Finance Authority
IRR	Internal rate of return
ITR	Indiana Toll Road
ITRCC	Indiana Toll Road Concession Company (an SPC in ITR case)
LBJ Express	Lyndon Baines Johnson Express Lanes in Texas
NAFTA	North American Free Trade Agreement
ORC	Otay river constructors (design and construction consortium in SBX case)
P3	Public-private partnerships
PAB	Private activity bond
PPTA	Public-private transportation act in Virginia
SANDAG	San Diego Association of Governments
SBX LLC	South Bay Expressway Limited Liability Company (an SPC in SBX case)
SBX	South Bay Expressway
SBXLP	South Bay Expressway Limited Partnership (an SPC in SBX case)
SPC	Special purpose company
TIFIA	Transportation Infrastructure Finance & Innovation Act

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Introduction

Over the last several decades, the United States has experienced increased private involvement in infrastructure investment, development, and management—particularly in the transportation sector. This contemporary activity has rekindled interest in public-private arrangements for infrastructure that were common in the nineteenth and early twentieth centuries but fell dormant until the 1990s.

Today, these arrangements are typically called public-private partnerships (P3s or PPPs for short). Most P3s:

- Involve a contract, or concession agreement, between a governmental agency and a single private entity to design, build, finance, operate and/or maintain a facility, where the private entity is often a special purpose company (SPC) established exclusively for the intended functions and a number of private firms provide funds or services to the company.
- Typically have contract durations of 30 years or more.
- Include a financing package that the SPC puts together comprised of equity from the company's sponsors and debt provided by bonds or commercial loans and these equity and debt are secured solely by the revenue stream that the SPC receives from the facility/project.

In such arrangements, the SPC receives payments in the form of user fees (tolls) or budgetary disbursements over time (or sometimes a combination of the two) from the government *in return for* providing the services and the financing associated with the facility/project; moreover, these payments are the primary or exclusive means for repaying up-front equity and debt investments. Consequently, the structure of these payments to the SPC dictates associated risks, and governments have various ways of structuring them. Three structures have become most prevalent in the United States and elsewhere. Table 1 depicts the basic characteristics of these three common structures.

1. In Structure 1, tolls are imposed on a transportation facility and collected by the SPC, and an up-front budgetary payment may (or may not) be made to help fund design and construction; this is referred to as the *revenue risk* or *toll concession* P3 model.
2. In Structure 2, tolls are also imposed on a facility but they are collected by a public agency, and periodic "availability" payments are made to the SPC from public budgetary sources; this is referred to as the *availability payment plus public sector toll collection* P3 model (or *availability payment plus toll* model for short).
3. In Structure 3, tolls are not imposed on a facility, and periodic "availability" payments are made to the SPC; this is referred to as the *availability payment* P3 model (or it may be referred to as a "pure" availability payment model).

The *revenue risk* structure transfers toll collection rights to the SPC; this gives the company the ability to set toll rates in accordance with the conditions set in the

Table 1 Alternative payment structures in P3s

Structure	Tolls imposed?	Tolls collected by	Budgetary payments made?	Typical form of budgetary payment[a]	P3 payment model
1	Yes	Private entity (SPC)	Maybe	Up-front contribution to fund design and construction	Revenue risk or toll concession
2	Yes	Public agency	Yes	Periodic availability payments over the duration of the agreement	Availability payment plus public sector toll collection
3	No	Not applicable	Yes	Periodic availability payments over the duration of the agreement	Availability payment

[a]Typical forms of government budgetary payments are shown; a government may make various modifications such as extending an up-front payment over time, making additional payments for the completion of project milestones or offering other forms of support such as subordinated loans or credit enhancements

P3 agreement over its duration. Generally, this structure relieves the government of the project's demand and revenue risk and provides incentives to the SPC to seek facility investment opportunities that may enhance access and connectivity as well as lifecycle cost reduction strategies. Conversely, affordable toll rates in this structure may be more difficult to achieve without public monetary contributions, and agreement on a strategy for handling competing routes is usually necessary.

The *availability payment with toll* structure keeps control of toll rates in the hands of the government but obligates it to pay an SPC over an agreement's duration as long as the company meets specified requirements for performance or progress. Consequently, the government can defer short-term budgetary requirements while project development takes place and gains significant certainty over the timing and amount of its long-term payments to the SPC. Further, the SPC company is incentivized to reduce project lifecycle costs. On the other hand, the government's promised payments to the SPC has created a financial liability, which can prove problematic in many jurisdictions. Plus, the government is holding the demand and revenue risk associated with the project.

The *availability payment* structure eliminates tolls from a project, which takes these challenges out of the equation altogether. However, a government must now come up with the budgetary funds needed to make all promised payments to an SPC. In summary, the payment structure ultimately chosen for a project will depend on the government's goals, the legal and commercial conditions in a jurisdiction, the prevailing market situation, and the characteristics of each project.

When the contemporary movement toward utilizing P3s for transportation projects began in the 1990s in the USA, the *revenue risk payment* structure (Structure 1) was used almost exclusively. Over the past several years, however, the use of the *availability payment plus toll* (Structure 2) and the *availability payment* (Structure

3) structures has increased. A touted benefit of the *revenue risk* structure is the transfer of the market/demand risk to the SPC. If financial issues arise, such as actual demand is less than expected, then financial distress occurs and the SPC bears this burden; if the distress is prolonged, the SPC can go bankrupt and administration proceedings may follow. In such cases, the public sector is likely insulated from the financial failure. Yet, a financial failure of this sort is hardly a “win-win” outcome since investors, debt providers, and even governmental agencies may lose money or experience financial restructuring. This circumstance, among others, partly explains the increased use of other payment structures.

However, the *revenue risk* structure should remain an option for P3s since its track record includes successful projects such as the LBJ Express Toll Lanes in Texas (Reinhardt, 2016a). Accordingly, this chapter examines financial distress and bankruptcy in highway P3s by presenting four case studies of US highway P3 projects employing the revenue risk model: (1) South Bay Expressway; (2) Indiana Toll Road; (3) SH 130 Segments 5 & 6; and (4) Capital Beltway Express. Each project experienced financial distress, and three of the four ultimately declared bankruptcy. The cases provide the basis for explaining the causes of financial distress and examining the outcomes as well as implications for the US market.

South Bay Expressway

Project Overview

The South Bay Expressway (SBX) project (originally called the SR 125 Toll Road) was developed pursuant to California Assembly Bill 680 (AB 680), which was passed in 1989. AB 680 authorized Caltrans to solicit proposals from private entities and then enter into contracts to finance, build, lease, operate, and maintain four transportation projects in California (Miller, 2000). The other three projects that were selected under AB 680 were SR 91, SR 57, and the Mid-State Tollway (Eno Center for Transportation, 2014). Caltrans pre-qualified 10 consortiums based on their skills, experience, and background, and invited “Conceptual Proposals” from the consortiums for any transportation project in the state that met qualifying criteria set by Caltrans.

In response to Caltrans’ solicitation, California Transportation Ventures or CTV, an equal partnership among Parsons Brinckerhoff Inc., Transroute International S.A., Fluor Daniel Corporation and Prudential Bache Capital, proposed to develop the long-planned southern extension of SR 125 as a toll road. Caltrans selected CTV’s proposal as one of the four projects recommended for development. In January 1991, Caltrans and CTV signed a franchise agreement sanctioning CTV to finance and build the roadway, transferring title to Caltrans on completion. In exchange, CTV would get operational rights for a 35-year concession period, during which the concessionaire could set toll rates, subject to a cap on its rate of return. Caltrans also agreed to a non-compete clause, which essentially prohibited Caltrans from building any other competing routes that would divert traffic away from SBX during the concession period (USDOT 2014).

Under the agreement, CTV was to develop and submit final environmental documentation for the project by December 1997. CTV faced many challenges ranging from public opposition to environmental permitting delays. The SBX project faced strong opposition from local residents, especially from Bonita along the highly developed northern end. Near the Otay Mesa River at the southern end of the proposed road, it also faced numerous endangered species problems and wildlife issues (AECOM, 2007; Samuel, 2007). To reduce impacts on established local communities at the northern end, the road alignment was changed several times and CTV had to implement major efforts to conceal the highway and contain traffic noise by sinking the roadway below natural grade and bounding it with berms and sound walls. Extensive landscaping and high quality architectural finishes were also incorporated, in response to local concerns (Guiliano, Schweitzer, Holliday, Minch, & Kuhn, 2012). These issues and legal challenges, among other factors, delayed the final environmental approval from the US Environmental Protection Agency (USEPA) and US Fish and Wildlife Services, to mid-2000 and expected capital costs escalated from \$400 million to \$635 million (Samuel, 2005).

Due to these delays and increased costs, CTV began exploring a variety of ownership models, including formation of a non-profit corporation but the franchise agreement with Caltrans was not conducive to non-profit ownership since the government wanted to demonstrate that privately developed projects were profitable ventures. In September 2002, Macquarie Infrastructure Group and Macquarie Infrastructure Partners based out of Australia acquired a majority 81.6% stake in CTV for an undisclosed amount. Shortly thereafter, Otay River Constructors (ORC), a joint venture of Fluor and URS, was awarded the project's design-build contract. In May 2003, Macquarie acquired the remaining 18.4% stake from various minority interests (Guiliano et al., 2012). A new company, South Bay Expressway Limited Partnership (SBXLP) was formed to implement the project. Construction for the project began in May 2003 and was completed in November 2007, a delay of roughly 13 months from the contractual completion date (Samuel, 2010). The road was opened to the public on November 19, 2007 and tolling began about 2 months later.

The project was financed by a syndicate of 10 international banks with BBVA as administrative agent and Depfa Bank as co-lead for the term loan that was arranged in 2003 and set to mature by 2021. The other lenders included Allied Irish, Bank of Ireland, BNP Paribas, Commonwealth Bank, DVB Bank, DZ Bank, and HSH Nordbank. Wells Fargo acted as collateral agent on behalf of various lenders, including Banco Bilbao Vizcaya Argentaria, S.A. and Depfa Bank at a later stage of the project (Fretz 2010). The project also received a federal loan under the Transportation Infrastructure Finance and Innovation Act (TIFIA) program. South Bay Expressway was one of the first five projects selected for credit assistance through TIFIA. The total funds required for development was projected at \$658 million. Table 2 summarizes the overall financial structure.

Table 2 Financial structure of South Bay Expressway Project

Bank debt	$340 million
TIFIA loan	$140 million
Donated right-of-way	$48 million
Investor equity	$130 million
Total	$658 million

Financial Challenges

As mentioned, construction of the project was delayed by over 13 months, and the roadway opened for public use in November 2007, with 2 months of non-tolled usage to promote patronage. From the onset, actual traffic fell short of projections. The Traffic and Revenue studies completed by Wilbur Smith and Associates (WSA) in 2003 for the concessionaire indicated average daily traffic of roughly 60,000 vehicles/day by 2009. Actual traffic was 22,600 vehicles/day. In addition, average daily revenue collections were $58,341—well short of the daily expectation of $102,000 (Reston Citizens Association, 2012).

On March 22, 2010, SBXLP filed for a reorganization under Chapter 11 US bankruptcy writing off the private equity. The equity holder Macquarie Infrastructure Group had already written down the project's value shortly after opening in 2007 and had valued it at zero ($0.00) in its financial report from June 2009 onwards (Samuel, 2010).

The primary cause for the project to file for bankruptcy as stated in the bankruptcy proceedings (Case No. 10-04516-A11) was ongoing litigation with the project's contractors, ORC. ORC filed multiple claims for cost overruns and delays, but SBXLP had rejected these claims. Consequently, ORC took SBXLP to court, and the private concessionaire incurred $40 million in legal defense fees (Allen, 2010) against these claims, which at one point totaled $740 million (Allen, 2010; Eno Center for Transportation, 2014). SBXLP requested that US bankruptcy courts address both: (1) the reorganization and write-off of debts and (2) the ORC claims. ORC also filed a first priority "mechanics lien" over other creditors when settling debts under the bankruptcy case (US Bankruptcy Court, 2010). The court ruled against ORC denying them any settlement for their claims.

Another major cause for the bankruptcy was lower traffic than projected. Only about 38% of the traffic forecasted by SBXLP materialized (Samuel, 2010). Toll revenues in 2008 were $22 million, or 70% of the projected $31 million and in 2009 toll revenues dropped to $21 million, about 50% of the $42 million projected (Reston Citizens Association, 2012). The project simply did not have enough revenue to fulfill its debt obligations. A deeper look, however, suggests underlying factors that contributed to the aggressive projections. When Macquarie Infrastructure Group decided to acquire a majority stake of CTV in 2002, the population in Chula Vista and neighboring areas in San Diego County was increasing, and Otay Mesa was a growing industrial zoned area and the only commercial port of entry in United

States in San Diego County (San Diego Census 2010). Further, enactment of the North American Free Trade Agreement (NAFTA) in 1994 heightened the potential strategic importance of this new route given its proximity to US/Mexico border and the Otay Mesa Port of Entry. This Act was expected to increase trade between the two countries, and a higher truck traffic on this route. However, political wrangling between the United States and Mexico has mitigated cross-border freight movement; the US has blocked truck freight from entering the United States and Mexico has imposed trade tariffs (Guiliano et al., 2012).

Additionally, the project opened to public just before the burst of housing bubble in 2008 and an economic recession, the worst since the Great Depression. Prior to the recession, regional demand for housing and economic development was strong. San Diego's population was expected to grow from 2.5 million in 1990 (actual) to 3.6 million in 2015, a 44% increase. Actually, the population of San Diego in 2015 was 3.1 million, only a 25% increase (Guiliano et al., 2012). As trouble in US housing market began and a series of high profile banks were impacted, consumer spending dropped and unemployment increased. The fall in housing prices resulted in homeownership decreases in areas around SBX. The economic crisis impacted traveler behavior; many preferred driving less or only on non-tolled routes. Especially during and after the recession, travelers preferred to use I-805 and I-5, which ran north-south parallel to SBX (Guiliano et al., 2012). Cross border traffic, specifically trucks, dropped significantly. Such drastic changes in the economy from project conception to actual operations, certainly exacerbated the difference between forecast and actual demand by the private concessionaire.

Resolution and Aftermath

The US Bankruptcy Court confirmed the bankruptcy in April 2011 and established a new concession company, SBX LLC, under the ownership of the project's secured lenders. Thus, TIFIA and the project's commercial lenders were given control of the road allowing them to collect tolls to recover their share of investment. Under the reorganization plan as illustrated in Table 3, about half of the debts were written off for secured lenders while unsecured debtors (Otay River Constructors) and equity providers lost their entire investment.

TIFIA had initially issued $140 million in 2003 with payments scheduled from 2010 to 2040. When the project applied for bankruptcy in 2010, the outstanding balance for TIFIA with accrued interest was $172 million. After reorganization, TIFIA's debt came on par with that of the commercial lenders. The "springing lien" of TIFIA's loan agreement allowed TIFIA to be in a junior or subordinated debt position to senior lenders during investment, but in case of insolvency or bankruptcy, the TIFIA lien would create parity with senior creditors (Federal Highway Administration (FHWA), 2001).

The project's commercial lenders (a consortium of 10 banks) had loaned $340 million for a term period of 18 years (until 2021). The outstanding balance for

Table 3 Pre-bankruptcy and post-bankruptcy loans (adapted from Oakley & Farrell, 2017)

Party	Type	Pre-bankruptcy	Post-bankruptcy	Loss (%)
US DOT (TIFIA)	Springing lien	$172 million	$6.9 million (equity) + $92.5 million (secured loans)	42
Private bank (consortium of 10 banks)	Senior lien	$363.3 million	$14.6 million (equity) + $195.5 million (secured loans)	58
Otay River Constructors	Unsecured; mechanics lien	$95 million	$0	100
Macquarie Infrastructure Group	Private equity	$200 million	$0	100

commercial lenders before bankruptcy was $363 million; after restructuring, the bankruptcy courts heavily wrote off the lenders debt to $195 million (Guiliano et al., 2012). In addition, residual equity was apportioned between the banks and TIFIA. With the control of the new company, SBX LLC, in the hands of TIFIA and the commercial lenders, all the future toll revenues were shared pro-rata between TIFIA (32%) and the commercial lenders (68%). The reorganized company emerged from bankruptcy on April 28, 2011 (Samuel, 2011a).

Shortly after the bankruptcy proceedings, the San Diego Association of Governments (SANDAG) board had a closed meeting where it decided to pursue purchase of the toll road franchise. It appointed Barclays to establish a purchase price for buying the facility; Barclays viewed SANDAG as a "strategic investor" that would likely place a higher value on the asset (Guiliano et al., 2012). On July 22, 2011 SANDAG approached TIFIA and the commercial lenders about purchasing the toll road for $344.5 million. On December 21, 2011 SANDAG closed the deal and purchased SBX for the proposed price. The lenders received 100% of their portion of the sales price in cash, allowing them a full exit from the project; TIFIA received a cash distribution of $15.4 million, but reinstated $94.1 million of its debt (Oakley & Farrell, 2017). SANDAG funded the purchase using TIFIA's reinstated debt, $247.5 million from its TransNet program,[1] and around $4 million by issuing toll revenue bonds. SANDAG would repay TIFIA and its revenue bond holders from SBX's toll revenues.

In June 2012, SANDAG lowered tolls to maximize traffic throughput and relieve congestion on I-805. Toll rates were reduced by up to 40% depending on the length of travel. Between 2013 and 2017, annual revenue grew from $26 million to $37 million (Oakley & Farrell, 2017). Consequently, SANDAG issued $194 million in A/A-rated revenue bonds in November 2017 and used the proceeds to refinance its acquisition debt, and TIFIA received a prepayment total of $168.1 million; this amount combined with the $15.4 million cash distribution and 6 years of principal and interest payments from SANDAG gave USDOT nearly a full recovery of its

[1] TransNet is a regional half-cent sales tax fund for transportation administered by SANDAG.

initial investment in the project (Oakley & Farrell, 2017). Currently, SBX is operational, and SANDAG staff, augmented by private contractors, operate and maintain the facility. Control of SBX is scheduled to revert back to Caltrans in 2042 under the terms of the original franchise agreement.

Indiana Toll Road

Project Overview

In 1951, the Indiana General Assembly passed legislation creating the Indiana Toll Road Commission. Construction of the Indiana Toll Road (ITR) began in September 1954. The project was valued at $280 million; it opened in sections beginning in August 1956 with the final section opening in November 1956 (Wensits, 2006). The road has been operational since. Several additional interchanges were built between 1980 and 1985, financed by bonds sold in October 1980.

ITR's vehicular volume followed an overall increasing trend, with minor fluctuations attributable to construction activities. Even after a toll increase in October 1985, transactions rose by 5.1% with a 15.7% annual increase in revenue. The tolls remained stagnant after 1985, though, and were eventually among the lowest per-mile rates in the country. Contributing about 60% of the traffic on the toll road, commercial trucks are a substantial portion of the traffic volume and toll revenue (Table 4). Given the road's nature as a cross-state thoroughfare, the majority of tolls are collected from non-Indiana drivers (Samuel, 2006).

After his election in 2004, Governor Mitch Daniels began exploring avenues for funding transportation investments within the state; he recognized leasing the toll road could enable a substantial contribution toward a ten-year, $10.6 billion "Major Moves" investment in statewide transportation infrastructure (Samuel, 2006). To enhance ITR's attractiveness to prospective concessionaires, he announced a toll increase in 2005, which was designed to double toll revenues to $170 million annually, raising rates 72% for passenger vehicles (from $0.03/mile to $0.05/mile) and 122% for trucks—still lower than the per-mile rates in Pennsylvania and Illinois (Samuel, 2006). Consequently, he directed the Indiana Finance Authority (IFA), which was formed in 2005 to consolidate all debt issuance by state building agencies, to manage leasing ITR through a competitive procurement.

Table 4 ITR's toll revenues in 2004

	Western section (barrier system, 24 miles)	Eastern section (ticket system, 133 miles)	Total
Passenger	$10.7m	$24.7m	$35.3m
Commercial	$4.4m	$45.2m	$49.6m

After deciding to seek bids from interested private companies to lease the toll road, the state developed a fast-track procurement process in which binding offers were submitted only 117 days from solicitation. The goal was to have bids in hand by the end of the General Assembly session in March 2006 for a vote on HEA 1008 (the "Major Moves" legislation), which would authorize the lease. Ultimately, the bill passed by a single vote.

The procurement was done in phases. Nine qualified bidders were invited to participate in the final process of evaluation by early January 2006, and four groups submitted offers. Statewide Mobility Partners, a team formed by Macquarie and Cintra, the equity concessionaire partners in the Chicago Skyway lease, won the bid for $3.8 billion obtaining the right to operate the toll road for a 75-year lease period. Other bidders, in the order of decreasing bids, were: a group led by Babcock & Brown at $2.84 billion, an all-Spanish group at $2.52 billion, and Kwame Parker at $1.9 billion. Financial close was achieved in June 2006. The winning consortium planned an initial 80/20 debt-equity financing to fund the deal. ITR's equity risk premium was 8% to 9%, resulting in an equity internal rate of return between 12.5% and 13.5% (Samuel, 2006). The concession agreement permitted annual toll increases starting in 2011 at the highest of three factors: (1) 2.00%; (2) increase in the Consumer Price Index (CPI); or (3) increase in nominal Gross Domestic Product (GDP) per capita.

Governor Daniels issued Executive Order 06-10 on June 7, 2006, authorizing a seven-member citizen's board to oversee lease operations and compliance (ITR Concession Company LLC, 2015). Upon receipt of $3.8 billion, IFA transferred the operation and management of ITR to the Indiana Toll Road Concession Company (ITRCC) on June 29, 2006. The proceeds were subsequently used to defease $225 million in state debt on the toll road while $2.6 billion of funding was provided to the Major Moves program. Indiana not only benefited from the concessionaire's up-front payment, but the state's credit rating also increased from AA to AA+ (Nickerson, 2006).

To obtain the $3.8 billion bid, ITRCC arranged contributions from its equity partners, Cintra and Macquarie, of $374 million each and borrowed over $3 billion from a syndicate of international banks. The debt was arranged in three tranches; series A was a $3.25 billion term loan, series B was a $150 million liquidity facility to fund certain early period interest payments, and series C was a $665 million liquidity facility to fund capital improvements through 2014; all tranches were due in 2015 (Healey, 2014). As part of the debt arrangements, ITRCC utilized accreting interest rate swaps. ITRCC agreed to make fixed interest payments to its counterparty, whereas the counterparty's interest payments to ITRCC were floating; according to ITRCC Chief Executive Officer Fernando Redondo, the swaps at inception were "at the money"—in other words, the total value of the expected fixed interest payments were essentially equal to the expected floating interest payments (Healey, 2014).

Financial Challenges

ITRCC assumed operation of the toll road in June 2006. The concession agreement committed ITRCC to a long-term capital program of roughly $4 billion over the 75-year lease period. By 2009, the company invested $191 million in upgrades, adding fully electronic tolling and widening congested stretches, with another $157 million in projects scheduled by the end of 2010 (Schnitzler, 2009).

The onset of the economic recession in 2008 hurt US toll roads. A June 2009 report from Moody's gave the toll road industry a negative outlook for the coming year to 18 months, indicating that traffic growth had flattened due to weak economic conditions. ITR was no exception. While ITRCC had boosted revenues from pre-lease amounts, traffic and revenue projections were not meeting expectations. These circumstances fueled speculation about what ITRCC might do—from selling the asset to failing to meet its contractual obligations (Schnitzler, 2009). In 2010, average traffic transactions were 74,600/day, which was 35% lower than expected and revenues were about 17% lower than forecasts (Samuel, 2011b). Toll revenues were $164.2 million and non-toll revenues were $9 million while toll collection expenses were $9.6 million, routine maintenance and repair expenses were $8.7 million and other operating costs were $16.3 million. With $79.7 million in depreciation and amortization deductions, profit before interest was $59.1 million (Samuel, 2011b). Yet, interest was $268 million while losses from the interest rate swaps were $51.9 million; consequently, the total loss was $260.8 million (Samuel, 2011b).

In 2012, ITRCC retained Morgan Stanley and Moelis & Co. to address its outstanding debt of roughly $3.7 billion that was set to mature in 2015; Morgan Stanley was charged with exploring capital raising options while Moelis & Co. was to explore liability management scenarios, including restructuring (Berke et al. 2012). The interest facility funded at $150 million was down to $40 million; further, the series A term loan's interest rate was set to jump from Libor + 110 bps to Libor + 125 bps in 2014, and the swap fixed interest rate would increase from 3.65% to 4.15% in June 2013 until June 2015. Concurrently, ITRCC's creditors interviewed financial advisors for a potential mandate (Berke et al. 2012). As interest rates continued to fall, ITRCC's interest rate swaps had become a $2.15 billion liability by 2014; this liability came due and payable after early termination of the swaps when ITRCC could not make a $102 million payment in June 2014 (Healey, 2014).

Resolution and Aftermath

On September 22, 2014, ITRCC filed for Chapter 11 bankruptcy in Illinois Bankruptcy court, eight years after it first started operations. The company had about $6.3 billion in obligations to secured lenders (Bathon, 2014). The project company presented a pre-packaged proposal, which was the result of over two years of work with creditors. The proposal sought an early exit from Chapter 11 requesting that the court allow a post-bankruptcy approval of an asset sale by August 2015 with proceeds distributed among its creditors OR if the asset sale was unsuccessful its creditors could buy a 95.75% stake in the restructured company, using proceeds from a $2.75 billion additional borrowing to restructure its debt (Randazzo and Fitzgerald 2014). The plan had support from more than 87% of senior secured debtholders and 100% support from equity owners (Indianapolis Business Journal (IBJ), 2014). Given this, ITRCC asked the courts to approve the plan within a month. The sale or restructuring process was expected to take until the summer of 2015. Shortly after filing, the courts approved the plan.

ITRCC CEO Redondo stated to the bankruptcy court that "the global economic recession stifled interstate commerce, which depressed the interstate trucking activity that accounts for a significant part of the toll road's revenues." He commented further that "even though earnings increased every year between 2008 and 2013, they were lower than projected, forcing the company to devote an ever-greater share of operating income to debt service" (Bathon, 2014). For instance, in 2013, ITRCC had $193 million in debt service while revenue was only $158 million (Randazzo & Fitzgerald, 2014). Further, actual traffic was 11% lower in 2013 than it was 2007 (Mallett, 2014).

As soon as news regarding ITR's auction spread, some of the world's leading pension funds and infrastructure investors formed consortia to bid. Teams reported to have an interest were (Roumeliotis & Stone, 2014):

1. A consortium of Canada Pension Plan Investment Board (CPPIB) with Ferrovial SA's toll road operator Cintra and Canadian investment manager Brookfield Asset Management.
2. Australia's Hastings Funds Management who partnered with the California Public Employees' Retirement System (Calpers) and Italian toll road operator Autostrade Meridionali SpA.
3. Spanish infrastructure operator Abertis Infraestructuras SA with Borealis, which is the infrastructure investment arm of the Ontario Municipal Employees Retirement System.
4. Alberta Investment Management Corporation (AIMCo) and Abu Dhabi Investment Authority (ADIA).
5. Australian infrastructure fund manager IFM Investors, which is owned by 30 Australian pension funds.

In May 2015, Australia's IFM Investors reached a $5.73 billion agreement to purchase ITRCC's lease of ITR for 66 years until 2081; subsequently, the road would revert back to IFA/INDOT. IFM must follow the guidelines and performance standards set in the initial lease agreement. IFM contributed $3.2 billion in equity, expecting yields ranging from 8% to 9%; the balance of the funds came from $2.5 billion in senior debt financing from nine banks and three institutional investors (Reinhardt, 2015a). IFM also secured a $328.5 million capital expense facility and plans to spend $260 million in the next five years (Reinhardt, 2015a). Michael Kulper, former president of Transurban USA and new board member of ITRCC, indicated that current traffic levels will generate revenues sufficient to repay the new senior debt, so IFM's large equity contribution was critical (Reinhardt, 2015a). ITR is IFM's first toll road in the United States; it holds other infrastructure assets mainly in Europe. With the closing of the IFM deal, ITRCC's creditors recovered 95 cents on the dollar (Fitzgerald, 2015). By July 2015, IFM had refinanced a portion of the bank debt through the issue of over $1 billion of senior secured revenue bonds by ITRCC; the notes were rated BBB and applied to a $551 million bridge loan and a portion of a $1.27 billion term loan (Reinhardt, 2015b).

In February 2016, ITRCC awarded a $200 million contract to Reith-Riley Construction to repave and rehabilitate a 70-mile segment of the 157-mile ITR, which was completed in late 2017; this was the largest capital investment in the roadway since its original construction (Reinhardt, 2016b). In September 2018, Indiana Governor Eric Holcomb announced a deal between the state and ITRCC where the state would receive $1 billion over three years from ITRCC in exchange for a one-time 35% toll increase on commercial trucks; the Indiana Finance Authority (IFA) subsequently approved the arrangement (Carden, 2018). On October 5, the rate increase on commercial trucks took effect, and the state received $400 million; subsequent payments of $300 million each are due in October 2019 and 2020 and are secured by a letter of credit (Carden, 2018). Holcomb plans to use the proceeds to fund his "Next Level Connections" program, which will accelerate completion of I-69 while funding broadband access to underserved regions, a grant program for local/regional trails and other transportation infrastructure improvements (Kelly, 2018a). The deal, however, caught legislators by surprise, and several voiced concerns about the transparency of the arrangement and their lack of involvement (Kelly, 2018b). Not surprisingly, the trucking industry took issue with the deal, but the governor's office countered that the rate per mile after the increase remains lower than many other similar roads across the country; for Class 5 vehicles, rates in Indiana will be higher than Ohio and New York but lower than Illinois and Pennsylvania (Kelly, 2018a).

SH 130 Sections 5 & 6

Project Overview

SH 130 was built in six different segments from 2003 to 2012. Segments 1–4 were delivered by design-build (DB), and this roadway forms the Central Texas Turnpike System. Segments 5 & 6 were developed through a public-private partnership arrangement by the SH 130 Concession Company.

In the early 2000s, TxDOT was exploring the feasibility of developing a new long-distance route parallel to I-35 called the Trans-Texas Corridor 35 (TTC-35), which was part of a proposed network of super-corridors across the state. In September 2003, TxDOT received three competing proposals from Fluor, Trans Texas Express LLC (a Skanska led consortium) and the consortium of Cintra and

Zachry American Infrastructure (Cintra-Zachry) to prepare a master plan for TTC-35 (AECOM, 2007). On December 16, 2004 the Texas Transportation Commission unanimously voted for the Cintra-Zachry proposal, and a Comprehensive Development Agreement (CDA) was established in March 2005 (AECOM, 2007). The master plan CDA also sought to identify specific projects in the corridor that were ready to advance and gave the Cintra-Zachry team the right to negotiate separate CDAs for these projects (Build America Bureau, 2015).

Consequently, the Cintra-Zachry team proposed to develop segments 5 & 6 of SH 130 as a part of TTC-35, and formed SH 130 Concession Company (65% Cintra and 35% Zachry) for the project (Build America Bureau, 2015). Following negotiations, TxDOT and the Concession Company executed a CDA in March 2007 to develop segments 5 & 6 of SH 130 as Texas' first DBFOM P3 project; the term of the agreement was 50 years from opening. Under the CDA, the Concession Company would collect tolls from users of the road but would also share revenues with TxDOT based on a predetermined schedule. Moreover, the concessionaire would also make a minimum up-front payment of $25 million to TxDOT when the roadway opened. To increase the attractiveness of the facility compared to parallel free routes, the concessionaire could offer $100 million in the form of a concession fee, if TxDOT authorized a maximum speed limit of 85 mph, the highest legal speed limit in the USA.

A year after signing the agreement, SH 130 Concession Company was able to reach financial close in March 2008 with project funding of $1327.9 million. A syndicate of European banks loaned $685.6 million in the form of long-term senior debt and the TIFIA program loaned another $430 million as subordinate debt. The equity partners contributed $209.8 million and made additional commitments for a $35 million "liquidity facility" that could support debt service obligations for the first five years of operations. Construction began in April 2009 and opened to traffic in October 2012; toll collection began in November 2012. The Concession Company opted to pay the full concession fee of $125 million to have the right to raise the speed limit to 85 mph.

Financial Challenges

Once opened in 2012, traffic fluctuated and grew slowly, but never met expectations with reports that demand was 60% below forecasts. A year after the road operations began, Moody's downgraded the credit rating due to lower than expected traffic projections; 8 months later it released another report that warned of SH 130 Concession Company's near default situation and downgraded the ratings on the outstanding debt from B1 to Caa3 with the outlook as negative (Moody's Investor Service, 2013). The rationale for downgrading the rating was the increased chances of the SH 130 Concession Company to default on its loan repayment because of its substantially weaker and falling revenue performance compared to its forecast. It had also used up its "liquidity facility" for debt service, and Moody's expected that the SH 130 Concession Company would not have enough cash to meet its debt service payment of June 2014 (Moody's Investor Service, 2013). The Concession Company renegotiated with the banks to postpone its June 2014 debt service payment to January 2016 to avoid default (Build America Bureau, 2015).

Resolution and Aftermath

Unable to ramp up the traffic on its road, SH 130 Concession Company filed for Chapter 11 Bankruptcy on March 2, 2016 in the US bankruptcy courts in Austin, Texas. When it filed for bankruptcy, the Company had late payments on about $1.7 billion of debt, including the principal and accrued interest on the project's TIFIA loan; consequently, USDOT was the project's largest creditor (Reinhardt, 2017). On August 12, 2016 the Company submitted its reorganization plan to the courts and agreed to continue to operate the road for at least 18 months.

In June 2017, the Concession Company emerged from bankruptcy protection with new ownership, new senior management and $260 million in new financing in the form of a three-year debt facility for working capital and other needs (Reinhardt, 2017). The reorganization removed $1.4 billion in debt from the Company's balance sheet; Strategic Value Investors (SVI) took ownership of over half of the reorganized company while the lending banks and TIFIA owned the balance. SVI contracted Louis Berger to operate and maintain the roadway. Estimates indicated that TIFIA's ownership share was roughly 34%, and it was expected to sell its stake as soon as possible (Reinhardt, 2017). Prospects for the project had improved as annual toll transactions increased by 11% in 2016 (Morton, 2017). However, pavement flaws that first appeared along the roadway's shoulders before the roadway's construction was completed had spread to about 5% of its travel lanes; these flaws became the subject of a lawsuit filed by the new owners of SH 130 Concession Company against Cintra and 13 others (Reinhardt, 2018). This action has slowed TIFIA's ability to put its ownership stake up for sale.

Capital Beltway Express

Project Overview

The Capital Beltway (I-495) was initially constructed in 1956 and completed in 1964. It serves as a perimeter highway circling Washington, D.C. In 1977, four additional lanes were added to the existing four lanes; this was its last major improvement. Originally designed to serve through traffic bypassing Washington, D.C., the primary use has shifted towards local traffic with more than 75% of the current travelers along the Virginia section of the Beltway beginning or ending their trips in Fairfax County. The Beltway totals 3% of the lane miles in Northern Virginia while carrying nearly 11% of all daily regional trips. Without improvements, future growth would lengthen periods of severe congestion.

Realizing that the congestion issue along the Beltway required action, the Virginia Department of Transportation (VDOT) completed a Major Investment Study in 1994, concluding that highway improvements on the Beltway should promote High-Occupancy Vehicle (HOV) and bus travel in the region to address the area's congestion problems. In 1998, VDOT and the Federal Highway Administration (FHWA) began an Environmental Impact Study (EIS) to examine various improvement alternatives.

During this period, the state of Virginia passed the Public-Private Transportation Act (PPTA) in 1995 that enabled state and local authorities to enter into agreements with the private sector to provide needed transportation infrastructure that could not be funded out of the state budget. PPTA is the legislative framework enabling VDOT to enter into agreements with private entities to construct, improve, maintain, and operate transportation facilities. The act allowed for both solicited and unsolicited proposals. Amendments have also granted VDOT the right to solicit competing proposals when an unsolicited proposal is received in order to promote competition and improve the value for money of the proposed project.

In 2002, FHWA approved the EIS that included several HOV lane alternatives for the Beltway. In the same year, VDOT received an unsolicited PPTA conceptual proposal from Fluor Daniel to develop, finance, design, and construct High-Occupancy Toll (HOT) Lanes on the Capital Beltway. Although VDOT advertised for competing proposals, none were received. In the spring of 2003, VDOT submitted a grant application to FHWA to study HOT lanes and other "value pricing" applications in Northern Virginia; it also held several public input meetings to solicit input regarding HOV versus HOT lane alternatives. A strong majority of the public feedback supported the HOT lanes concept. Early in 2005, the state's Commonwealth Transportation Board selected the HOT lanes plan as the preferred alternative. By 2006, FHWA gave its final approval of the HOT lanes plan. In September 2007, Capital Beltway Express LLC, a joint venture between Fluor and Transurban, and VDOT reached an agreement in principle for the design, construction, operations, and maintenance of the Capital Beltway HOT Lanes. This comprehensive agreement was finalized on December 20, 2007. Under this agreement, VDOT owns and oversees the HOT lanes and the Concessionaire will construct and operate them. The total length of the concession is 80 years—5 years of construction and 75 years of operation.

The project adds 14 miles of new HOT lanes (two in each direction) on I-495 between the Springfield Interchange and north of the Dulles Toll Road in Northern Virginia in the United States. Tolls for the HOT lanes will change according to traffic conditions, which will regulate demand for the lanes and keep them congestion free. The project is electronically tolled using transponder technology. This project also makes a contribution to the Beltway's 45-year-old infrastructure, replacing more than 50 aging bridges and overpasses, upgrading 10 interchanges and enhancing bike and pedestrian access.

Construction began in the summer of 2008, and the HOT Lanes opened for service in November 2012, ahead of schedule. A key aspect of the project was the effort to gain public support. The promise of the HOT Lanes is the trip reliability it will allow to both public transit and commuters along this highly congested corridor; both have access to traveling lanes that are expected to provide an average travel speed (55 mph) with the latter paying a toll for use if a vehicle has less than 3 travelers. Capital Beltway Express and VDOT made a concerted effort to assure the public of these anticipated benefits.

The total $1.93 billion in costs were financed through:

- $587 million senior debt in private-activity bonds (PABs)
- $587 million in Transportation Infrastructure Finance and Innovation Act (TIFIA) loans
- $350 million in equity (Transurban 90% and Fluor 10%)
- $409 million of VDOT funds

The internal rate of return (IRR) was projected at 13% once operations commenced, and the concession includes a revenue-sharing agreement with VDOT where the Department will receive a portion of the gross revenue once certain levels of return are met. VDOT's entitlement starts at 5% when IRR is over 12.98%, rising to 15% when IRR is over 14.5%, and 40% when the IRR exceeds 16%. Transurban also receives 1% of the net asset value of the concession as a base management fee.

Financial Challenges

Development of the HOT Lanes took place amidst the economic recession that hit in 2008. Consequently, Capital Beltway Express had revised down its traffic and revenue forecasts from 2007. After opening in late 2012, initial traffic numbers were still disappointing—average daily traffic during the first quarter of 2013 was running at only 21,000 vehicles; experts, however, pointed out that traffic on SR 91 Express in California took up to 3 years to stabilize while project company personnel indicated that savings during the project's design-build phase were used to bolster reserve accounts (Reinhardt, 2013).

By early 2014, traffic was still below expectations, so revenues were insufficient to meet all of the project company's liabilities. Transurban decided in February 2014 to pay down $430 million in variable rate PABs by liquidating $150 million in reserves and contributing $280 million in corporate equity; the strength of its asset portfolio, particularly the performance of its toll roads in Sydney, Australia, provided Transurban the capacity to restructure the project (Reinhardt, 2014a). Transurban CEO Scott Charlton commented, "We put it on a long-term sustainable footing" (Reinhardt, 2014a). In the process, Transurban also bought out Fluor's stake in the project, so it now had 94% ownership of the asset. Second quarter 2014 traffic figures showed some promise as volume increased by 20% (Reinhardt, 2014b). By the end of 2014, revenues were sufficient to cover all of the company's operating expenses.

Resolution and Aftermath

At the end of the first quarter of 2016, average daily traffic in the HOT Lanes was approximately 36,000 vehicles—a 71% increase from first quarter of 2013 (Reinhardt, 2016c). Further, the maximum toll for an end to end trip had climbed to $19.50 from $6.35 over the same timeframe. The addition of nearly thirty miles of HOT Lanes along I-95, which opened in late 2014, as well as planned future expansions of HOT Lanes throughout northern Virginia will create a network of managed lanes in the region. In 2018, VDOT began planning an extension of the I-495 HOT Lanes from its current northern terminus to the state line with Maryland; an environmental study of the 495 Express Lanes Northern Extension (495 NEXT) began in April and is expected to be completed in Spring 2019. Hence, the Capital Beltway Express appears that it has weathered its financial troubles.

Discussion

Table 5 summarizes pertinent information from the four case studies.

Indeed, the four cases provide several insights about revenue risk P3s that experience financial distress.

Traffic Forecasts and Aggressive Financing

Chief among the lessons in the cases is the challenge of forecasting traffic demand; the literature has documented this phenomenon and generally characterized it as "optimism bias" where traffic forecasters overestimate traveler demand and willingness to pay (Bain, 2009). In particular, two of the cases, SBX and SH 130 Segments 5 & 6, were arterial type Greenfield routes that relied on expected sources of traffic that did not materialize. Further, both were affected by non-tolled parallel routes. The ITR case, in particular, demonstrated the susceptibility of such routes to economic cycles especially when roadway users are non-local; in these circumstances, freight movement and transient travelers tend to decrease. However, while the economic recession of 2008 certainly hit ITR's traffic hard, ITRCC put together an aggressive financing plan through senior commercial loan arrangements with tenors of less than 10 years. Moreover, the company employed an accreting interest rate swap where it fixed its interest rates, and its counterparty took a floating interest rate. In 2006, ITRCC's CEO indicated that the expected value of each party's position offset each other. With the onset of the recession, prevailing interest rates reached historic lows. Consequently, ITRCC found itself on the wrong side of the swap, so its liability ballooned to over $2 billion. When it could not make its payment to its counterparty in June 2014, bankruptcy was triggered.

Legal and Market Remedies

As financial distress mounted, the SPCs in SBX, ITR, and SH 130 made the logical decision to file for Chap. 11 bankruptcy. The courts oversaw the reorganization of the companies and the write-down of debts while equity providers lost their investment. In SBX, the commercial lenders and TIFIA emerged as the owners of the project; subsequently, SANDAG initiated negotiations to purchase the SBX

Table 5 Summary of case studies

Project	Overview	Financial Issues	Current Status
South Bay Expressway (SBX)	One of four projects authorized by AB 680 in California 35-year franchise awarded to concession company in 1991 to develop southern extension of SR 125 in the San Diego region as a toll road alternative to I-805 and I-5 Construction did not commence until 2003 and was completed in 2007	Construction costs escalated from $400 million to $635 million Traffic fell short of expectations, so revenues were roughly half of forecasts Concession company, SBXLP, filed for bankruptcy in 2010 Emerged from bankruptcy in April 2011 under new concession company, SBX LLC, under ownership of project's secured lenders	SANDAG purchased franchise from SBX LLC for $344.5 million in December 2011; however, TIFIA reinstated $94.1 million SANDAG lowered tolls in 2012 and annual revenue grew; SANDAG issued $194 million in revenue bonds in 2017 to refinance its acquisition debt and pay off TIFIA SANDAG operates and maintains toll road until franchise ends in 2042
Indiana Toll Road (ITR)	Lease of ITR was part of governor's major moves program to fund transportation infrastructure throughout Indiana HEA 1008 authorized the 75-year lease and following a competitive procurement the state received $3.8 billion payment from a concession company, ITRCC, in 2006	2008 economic recession hurt toll road traffic so by 2010 average traffic was 35% lower than expectations ITRCC's use of interest rate swaps in its financing was also detrimental to its situation ITRCC filed for bankruptcy in 2014 with a pre-packaged proposal to sell or restructure the project company IFM purchased ITRCC in 2015 for $5.73 billion with a mix of equity and debt	ITRCC refinanced a portion of its bank debt soon after IFM's purchase In 2016, ITRCC awarded a repaving contract for a 70-mile segment of ITR In fall 2018, Governor Holcomb reached a deal with ITRCC for state to receive $1 billion in installments in exchange for a one-time 35% toll rate increase on commercial trucks; Holcomb plans to use proceeds to fund other infrastructure investments

(continued)

Table 5 (continued)

Project	Overview	Financial Issues	Current Status
SH 130 Segments 5 & 6	Cintra-Zachry team selected to support TxDOT's TTC-35 proposed developing Segments 5 & 6 of SH 130 south of Austin, TX as DBFOM project In 2007, TxDOT and SH 130 Concession Company executed a 50-year CDA to develop segments that parallel I-35 as a toll road Construction of $1.3 billion roadway commenced in 2009 and was completed in 2012	Once opened, traffic was far short of expectations, roughly 60% below forecasts Concession Company renegotiated with banks to postpone June 2014 debt payments to January 2016 Concession Company filed for bankruptcy in 2016 Emerged from bankruptcy in 2017 under ownership of SVI as well as TIFIA and lending banks	Louis Berger is contracted to operate and maintain the roadway Pavement flaws that appeared during the roadway's construction are subject of a lawsuit filed by new owners against Cintra and others Lawsuit has hampered TIFIA's prospects for selling its stake in Concession Company
Capital Beltway Express	In 2002, Fluor submitted unsolicited proposal authorized by state's PPTA legislation to VDOT to develop 14 miles of HOT lanes in median of Capital Beltway in region northwest of DC In 2007, joint venture of Fluor and Transurban reached agreement with VDOT to develop project with 5-year construction and 75-year operating period Construction of the $1.9 billion project was completed in 2012	Once opened, traffic numbers were short of expectations; by 2014, traffic was still lower than anticipated Transurban chose to pay down debt by liquidating reserve funds and contributing $280 million in additional equity; in the process, it also bought out Fluor's stake	By 2016, traffic had increased by 71% from 2013 and maximum price for an end to end trip on lanes had risen substantially By 2014, similar lanes were opened on I-95 at the southern end of the project. In 2018, planning began to extend the lanes to the state border with Maryland

franchise, which it successfully completed in 2011. It will operate the facility until it reverts to Caltrans in 2042. In ITR, IFM Investors purchased ITRCC's lease of ITR for 66 years until 2081 when the toll road will revert back to IFA/INDOT. In SH 130, SVI, the commercial lenders and TIFIA became owners of the concession. In each case, neither the state nor its executive agency had to step in to facilitate these remedies; the legal system, not surprisingly, handled the proceedings as they would any other filing, but reorganizations and purchase arrangements demonstrate the emerging market for infrastructure assets, albeit distressed. In Capital Beltway Express, Transurban elected to reinvest in the project to mitigate its financial troubles; to date, this corporate remedy appears to have solved this project's challenges.

Commercial Lending

Interestingly, each of the bankruptcy cases acquired debt through commercial loans; this circumstance afforded the SPC's some flexibility to renegotiate their debt when financial distress occurred as illustrated in the SH 130 case. Comparable flexibility is not likely with bond issues (Yescombe, 2007); PABs were issued in the Capital Beltway Express, so Transurban's options to mitigate its financial troubles were likely constrained by the project's financial structure—which may have partially influenced their decision to recapitalize the project. While the cases provide no hard evidence of a connection between P3 bankruptcies and commercial lending, this is potentially an area for further inquiry and research. In each of these cases, however, the commercial lenders suffered losses, so how this impacts their appetite for similar arrangements in the future remains to be seen.

TIFIA's Springing Lien and Patience

TIFIA funds were provided in three of the four cases (SBX, SH 130 Segments 5 & 6, and Capital Beltway Express), and these loans were certainly important to their financial structure. The TIFIA program is known as a "patient" lender since it takes a subordinate position, and it often will provide flexible repayment terms. When SBX and SH 130 went bankrupt, however, the "springing lien" of TIFIA functioned generally as intended. TIFIA was brought on par with other senior debt providers during bankruptcy proceedings. Like other providers, TIFIA was given an ownership stake in the reorganized companies. In SBX, it committed funds to the project in 2003 and received the vast majority of it back in 2017. In SH 130, it is currently the project's largest creditor. While it is expected to sell its ownership, legal issues arising from pavement flaws have delayed such a transaction; here, its "patience" is certainly being tested.

Other Issues

An issue that warrants further investigation and future observation is the provision of toll road services by a P3 concession company during financial distress or bankruptcy proceedings. The P3 concession company remains under contract to operate and maintain its project regardless of the financial situation, so financial distress and bankruptcy cases could impact the quality of these services. While the cases did not delve into this issue, it is certainly worth additional consideration.

In addition, P3 equity investors certainly lost significant sums of money in each case; however, some were not complete losses—at least from a parent organization perspective. For instance, in the SH 130 Concession, the Central Texas Highway

Constructors joint venture was formed to design and construct the roadway; Ferrovial Agroman (a sister company of Cintra in Ferrovial) and Zachry (the parent of Zachry American Infrastructure and among the companies in the Zachry Group) were lead organizations in the joint venture engaged by the SH 130 Concession Company for such services. Hence, they received payments to complete design & construction services. So, equity dollars can indeed be lost but often sister organizations receive compensation for services rendered. This is not necessarily inappropriate, but it tempers financial losses by the private sector.

Finally, Indiana has continued to find ways to tap into ITR's revenue potential to fund other infrastructure requirements, albeit toll rate increases on commercial trucks were necessary to exchange longer-term revenues for short-term payments from ITRCC. The Governor's 2018 deal with the new owners is resourceful, but it did break precedent with the legislative oversight present in the original deal. Whether this causes any sociopolitical backlash bears monitoring.

Conclusion

Four P3 highway projects that have experienced financial distress or bankruptcy were examined to explore the causes and outcomes. The evidence from case studies illustrated that the legal system and the market can handle bankrupt P3s, so the public sector is not significantly affected when these conditions occur. Moreover, the transfer of the revenue risk to the private sector is generally sustained. However, commercial lenders did experience sizeable losses, and the TIFIA program had to bear the transaction costs of the bankruptcy proceedings and aftermath. Further, it is still awaiting the opportunity to sell its stake in one of the cases. How these experiences will impact equity investors, commercial lenders and TIFIA in future P3 transactions is not entirely clear. At the very least, these players will likely exercise greater due diligence when considering such opportunities.

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State Public-Private Partnership Laws: Why Are They Needed?

Frank Vram Zerunyan

Acronyms

ASCE	American Society of Civil Engineers
BOE	California Board of Equalization
CTC	California Transportation Commission
DBFOM	Design build finance operate and maintain
DOT	California Department of Transportation
FHWA	Federal Highway Administration
IFA	Infrastructure Finance Act
LAO	Legislative Analyst's Office
MPO	Metropolitan Planning Organization
NAO	National Audit Office
NCPPP	National Council for Public-Private Partnerships
PCC	Public Contracting Code
PECG	Professional Engineers in California Government
PFI	Performance Finance Initiative
PIAC	Public Infrastructure Advisory Commission
PPP or P3	Public-Private Partnerships
SANDAG	San Diego Metropolitan Planning Organization
SB	Senate bill
SR	State route
TIFIA	Transportation Infrastructure Finance and Innovation Act

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Introduction

The purpose of this chapter is to examine the role of enabling P3 laws with a particular interest in transportation infrastructure. Typically, enabling laws allow state agencies to engage the private sector for greater participation in building infrastructure, which is often reserved for the public sector. Each state considers its policy focus, its unique economic circumstances, and its infrastructure conditions to legislate and meet its objectives. While we use California laws as the focal point of our discussion in this chapter, most states use either "broad" or "limited" enabling statutes to authorize P3 methodology, especially for transportation infrastructure.[1]

According to the American Society of Civil Engineers (ASCE), years of neglect and systemic infrastructure deficits present significant challenges for both the public and private sectors.[2] The ASCE report estimates that an additional $3.6 trillion is needed by 2020, beyond existing budgeted expenditures. While all levels of government in the USA have spent less on water and transportation infrastructure, the most significant reduction occurred at the federal level. Federal spending has fallen 19% since 2003, while states and municipalities have seen reductions of about 5% (Fig. 1). The USA has been underfunding its highway system for years resulting in substantial backlogs. According to the ASCE report, the current additional surface transportation funding investment is approximately $2 trillion. To close this gap, ASCE proposes the increase of investment from government and private sectors from 2.5% to 3.5% of US Gross Domestic Product (GDP) by 2025.[3]

According to the ASCE, while California's infrastructure fares somewhat better than the rest of the nation, "California's infrastructure investment has not kept up with the state's population demands and is continuing to delay much-needed renewal and maintenance."[4] To counteract this trend of road maintenance deficits, California implemented Senate Bill 1 (SB1) in 2017. California also successfully defended SB1 in 2018 with the failure of Proposition 6, which sought to invalidate SB1's additional 12 cents per gallon gas tax, 20 cents per gallon diesel fuel tax, and levies of vehicle registration fees ranging from $25 to $175.[5] Unfortunately, even with these types of efforts, the supply of public funds for many of these infrastructure projects is low given the strains placed on public funds due to various policy priorities of one of the most populous states in the nation. On the other hand, the supply of private funds remains abundant worldwide and is expected to top $2.5 trillion by

[1] https://www.fhwa.dot.gov/ipd/p3/legislation/.

[2] The 2017 Report Card found the national grade for infrastructure remains at a "D+"—the same grade the United States received in 2013—suggesting only incremental progress was made over the last 4 years toward restoring America's infrastructure. http://www.asce.org/infrastructure/.

[3] https://www.infrastructurereportcard.org/solutions/investment/.

[4] American Society of Civil Engineers, California Infrastructure Report Card 2017. www.ascecareportcard.org.

[5] https://lao.ca.gov/BallotAnalysis/Proposition?number=6&year=2018.

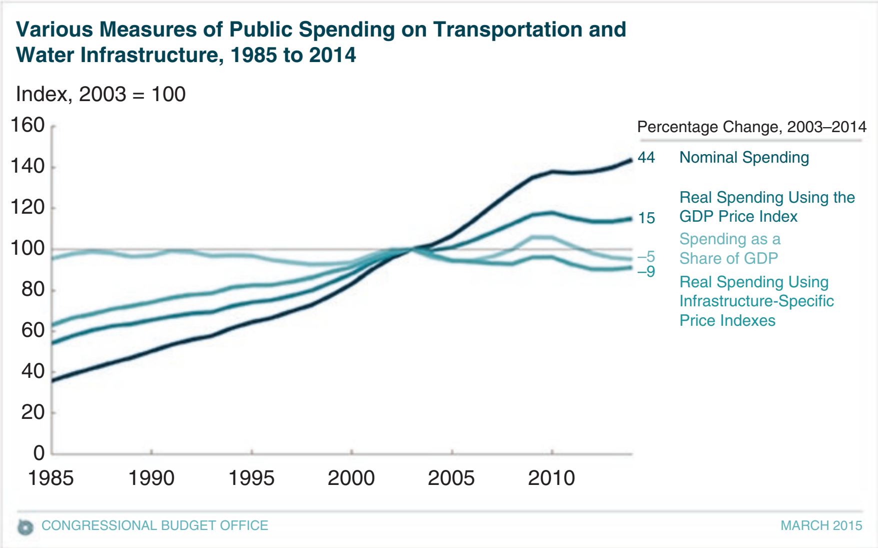

Fig. 1 Congressional budget office. Public spending on transportation and water infrastructure (https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/49910-infrastructure.pdf)

2030.[6] Hence, there is a real need to exploit the P3 methodology by enabling California, other states, and federal laws.

Public-Private Partnership as a Contractual Delivery Method

At its core, P3 is an alternative procurement method in which public agency partners with private sector entities leverage private resources and expertise. While assigning risk to the sector most capable of managing it, P3s are arrangements that allow private companies to undertake traditionally public functions in infrastructure projects while allowing the public sector to remain accountable to the public. P3 is not a "magic bullet" and is therefore not necessarily appropriate for all public projects.

A variety of benefits may make P3 a good fit. These benefits include the availability of revenue streams like tolls or user fees, risk transfer scalability, a full statutory authority, the cost of private funds instead of public funds, and the long-term maintenance (life cycle costs) strategy of the public owner. Concerns associated with P3s are typically articulated in terms of loss of public control and flexibility,

[6] Jones. (2013). Rebuilding failing infrastructure through public-private partnerships. CDC News. (Citing Sphere Consulting 2011 study); Dobbs et al. (2013). Infrastructure productivity: How to save $1 Trillion a year. McKinsey Global Institute, McKinsey Infrastructure Practice.

private profits at public expense, loss of future revenues, risk of bankruptcy by the private partner, accountability and transparency, and labor concerns. Most if not all P3 concerns can and should be addressed during contract negotiations.[7] Many P3 enabling laws, statutes, and regulations also address these concerns, providing a sound and level playing field for both participating sectors.

In exchange for a fee, the private sector in a P3 delivers built infrastructures, facilities, and services. Leveraging the private sector to economically or socially benefit the public sector is a relatively new phenomenon in governance. P3s have been used for a range of "economic" infrastructures in transportation, solid waste disposal, water and sewer services, and, more recently, parking. These "economic" infrastructures are generally fee-generating in nature (e.g., they provide a revenue stream) based, for example, on the actual use of a toll road, water service, parking, etc. According to the National Council for Public-Private Partnerships (NCPPP), 36 states enable P3 by statute; most of these are in-fee generating economic infrastructures and, more specifically, transportation.[8]

P3 Typology

There is no universal legal definition of P3. The Office of Innovative Program Delivery (OIPD), a division of the Federal Highway Administration (FHWA), defines P3 as "contractual agreements formed between a public agency and a private sector entity that allow for greater private sector participation in the delivery and financing of transportation projects."[9] While this definition is specific to transportation projects, the general meaning and the concept of "greater private sector participation" accommodate other types of P3 in public infrastructures.[10]

NCPPP defines P3 as "a contractual agreement between a public agency (federal, state or local) and a private sector entity." Through this agreement, the public and private sectors' skills and assets are shared in delivering a service or facility for use by the general public. In addition to the sharing of resources, each party shares in the risks and rewards.[11]

These definitions broadly describe P3. Each P3 "concession" agreement, which is between the concessionaire (private sector) and the public sector, is unique. The concession agreement is highly dependent on general contract law, which is well-settled in all states. The provisions of that concession agreement, however, are unique to the project. Given these concession agreements control all facets of a

[7] Duzert and Zerunyan. (2019). Newgotiation for public administration professionals. Vandeplas Publishing.

[8] http://www.ncppp.org/resources/research-information/state-legislation/.

[9] https://www.fhwa.dot.gov/ipd/p3/defined/.

[10] Other types of P3 in public infrastructures are outside the purview of this chapter.

[11] http://www.ncppp.org/ppp-basics/7-keys/.

long-term, sometimes a 40-plus-year relationship, they must be methodically and specifically negotiated to cover all possible angles of friction between the parties for the duration of the concession. The development of a successful contractual relationship begins with the correct contractual framework. While parties to the concession agreement have inherently different objectives, a successful outcome is achieved when parties approach the project in a spirit of partnership. This collaboration requires understanding each other's business, the allocation of risk, clearly defined quality of product and service, value for money, and arrangements in the written contract to deal with change. The Urban Land Institute (ULI) describes these objectives as essential skills in designing and negotiating successful P3s.[12]

A common form of the P3 concession agreement is where the private partner or the concessionaire designs, builds, finances, operates, and maintains (DBFOM) the infrastructure. Under a DBFOM model, the concessionaire is fully incentivized to design and construct a better-performing and longer-lasting project that will cost less to operate and maintain over the facility's entire life cycle. The incentive is purely economic. Both risk and continued maintenance of the infrastructure play a direct role in the profitability of the enterprise. Compensation depends on the use of the facility based on some contractually established measurement. Given the contractual nature of the transaction, it is also possible to build incentives and penalties to promote performance during the P3 contractual period as well as at the time when the P3 infrastructure is returned to the government partner at the end of the designated contractual concession period, which can be decades. Concession agreements also include performance bonds, letters of credit, or other forms of financial guarantees by the private sector to assure performance. Governments are not structured with these financial motivators. When the physical conditions of an infrastructure fail, there is no direct loss of revenue to governments to signal unacceptability. There is, however, in the case of the private sector.

Most, if not all, concession agreements make it abundantly clear what characteristics of performance are required of the concessionaire to get paid. The United Kingdom (UK) tracks the performance of P3 projects (also called the Performance Finance Initiative or PFI) through the National Audit Office (NAO). Data collected from 114 PFI projects compared to "non-PFI" in 2008 showed that 63% of non-PFI projects were delivered on-time and 54% on-budget. Of those delivered late, two-thirds also incurred price increases.[13] On the other hand, 70% of PFI projects were delivered on-time, 5% before-time, 10% between 1 and 6 months late, and a little more than 15% delivered more than 6 months late. Most delayed projects were hospitals. Consistent with the characteristics of the methodology, the public sector partner had no obligation to pay during the delay. As to price, 94% of PFI projects were delivered on or within 5% of the budgeted cost.[14] Therefore, the private sector's

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[12] Corrigan et al. (2005). Ten principles for successful public/private partnerships. ULI.

[13] https://www.nao.org.uk/wp-content/uploads/2009/10/2009_performance_pfi_construction.pdf.

[14] Id.

economic motivation may not be underestimated in these heavily negotiated contracts or concession agreements.

P3 encourages the private sector's early involvement to bring creativity, efficiency, and capital to address infrastructure problems. For example, detailed construction design, engineering, operation, or maintenance methodologies are typically not specified in the concession agreement. Instead, performance criteria and specific standards are described so that the concessionaire using its presumed expertise, devises the means and methods for an overall design and construction plan, including operations and maintenance best practices, to meet the required performance criteria and standards set forth by the public partner. These agreements are complex, negotiated over time, and are thousands of pages long, including appendices, exhibits, and amendments. Most, if not all, are public records readily available for review by the public.[15]

In short, traditionally extensive contracts negotiated between sophisticated public and private organizations are not novel. They are developed throughout three individual and distinct public phases: design, bid, and build. These phases are subject to the authority of governing public contracting codes in each state. State statutes almost exclusively govern this entire development process. Generally speaking, public agencies must publicly bid on certain contracts, especially construction contracts. In California, specific provisions applicable to local jurisdictions outlined in the Public Contracting Code (PCC).[16] The PCC contains an express declaration of legislative intent, stating that the purpose of the PCC is to:

(a) Clarify the law concerning competitive bidding requirements.
(b) Ensure full compliance with competitive bidding statutes as a means of protecting the public from the misuse of public funds.
(c) Provide all qualified bidders with a fair opportunity to enter the bidding process, thereby stimulating competition in a manner conducive to sound fiscal practices.
(d) Eliminate favoritism, fraud, and corruption in the awarding of public contracts.

This legislative intent stems from California's Constitution and more than 140 years of legal precedent precluding all payments on contracts violating competitive bidding. The California Supreme Court, on many occasions, has said, "the purpose of requiring governmental entities to open the contracts process to public bidding is to eliminate favoritism, fraud, and corruption; avoid misuse of public funds; and stimulate advantageous market place competition…The importance of maintaining integrity in government and the ease with which policy goals underlying the requirement for open competitive bidding may be surreptitiously undercut, mandate strict compliance with bidding requirements."[17] This crucial aspect of strict compliance

[15] See an example of a Concession Agreement http://www.dot.ca.gov/hq/esc/oe/project_ads_addenda/04/04-1637U4/P3Agt_Executed/P3_Agt_Executed_010311.pdf.

[16] California Public Contracting Code §20160-§20175.2.

[17] Miller v. McKinnon, 20 Cal. 2d 83,88 (1942).

with bidding requirements of the traditional procurement model makes P3 methodologies not workable without legislative intervention.

The State Legislative Role in Transportation P3

The primary role of any state legislature is first to determine the value of P3 as a procurement policy. For example, in 2015, Virginia enacted legislation to require the finding of "public interest" throughout the P3 process. If a given state legislature intends to deviate from the traditional contracting procurement model, the next important step is to adopt sound policies through legislation to guide its government and government organizations in the state. The creation of enabling statutes is a legal necessity for a state and a prerequisite by the private sector. The National Conference of State Legislatures tracks transportation funding and financing bills across the nation. Since 2009, 325 P3 transportation bills were considered and passed. The majority of these bills were considered after 2013, signifying more than ever the need for states, the District of Columbia, and Puerto Rico to come up with innovative solutions for transportation infrastructure funding policy.[18]

The first P3 enabling legislation for transportation was passed by California in 1989, followed by Florida and Missouri.[19] As of August 2018, there are 36 states in the United States, the District of Columbia, and Puerto Rico with a statutory framework to enable transportation P3s.[20] The map below (Fig. 2) distinguishes between states with "broad" versus "limited" authority prescribed by their applicable legislation. States with "broad" authority do not limit P3 procurement to projects or agencies. "Limited" authority means the enabling legislation is intended for a specific project type as well as agency.

For example, the state of Alaska only authorized the Knik Arm Bridge and Toll Authority (KABTA) "to enter into P3 in any form to finance, design, construct, maintain, improve or operate the Knick Arm Bridge." [21] The law was very limited in terms of the issuance of bonds or other forms of indebtedness for financing the Knick Arm Bridge and to collect tolls to pay or exceed operating costs.[22] KABTA was not required to obtain additional legislative authority but was required to issue a report to the legislature and the governor detailing its past operation and future prospects.[23] The project was never built. The ill-conceived financial aspects and limited structure of the law prevented meaningful engagement by the private sector.

[18] http://www.ncsl.org/research/transportation/public-private-partnerships-for-transportation--categorization-and-analysis-of-state-statutes-january-2016.aspx.

[19] http://www.ncsl.org/Portals/1/Documents/transportation/P3_State_Statutes.pdf.

[20] https://www.fhwa.dot.gov/ipd/p3/legislation/.

[21] Alaska Statutes Title 19. Highway and Ferries §§19.75.111 to 990.

[22] Id.

[23] Alaska Stat. Title 19. Highway and Ferries §§19.75.111(b)(1).

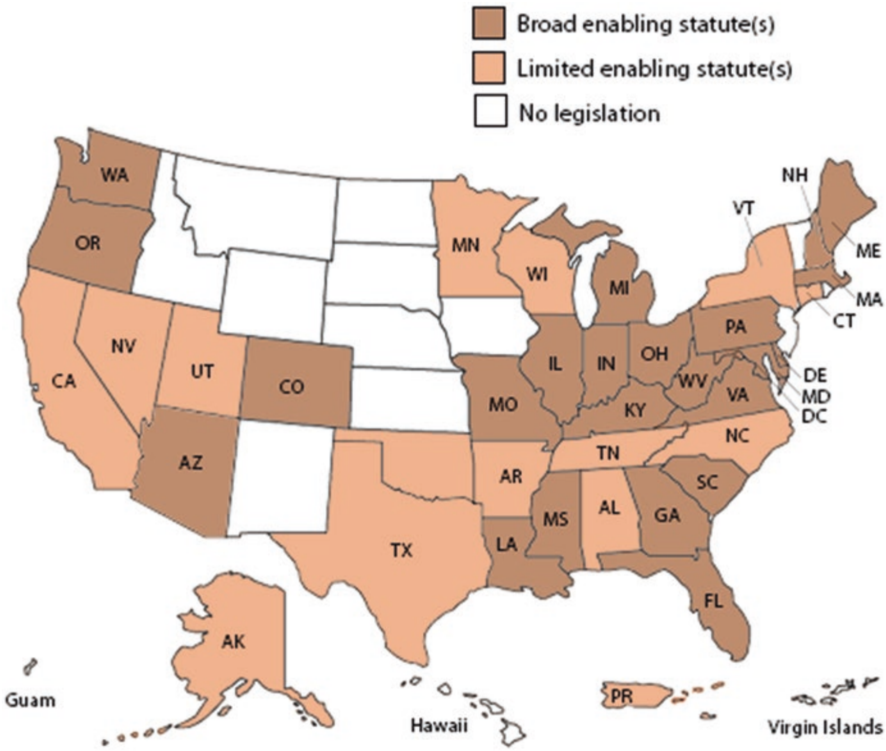

Fig. 2 States and territories with *Enabling Statutes for P3* as of August 2018

The bridge and its law were politicized. The Alaska legislature repealed the law, and even a government-financed version of the project was killed by the governor in 2016 for lack of necessary project revenue to pay off federal and state obligations.[24] The limitation of the law and the lack of sound financial underwriting are clear signs of potential failure in P3, and in this instance, even in conventional methodologies. It is worth repeating that P3 is not a "magic bullet." All projects have to be financeable.

On the other hand, Arizona has one of the broadest and most comprehensive statutes authorizing P3 for transportation projects. The Arizona Department of Transportation (DOT) may enter into "agreements with private entities to design, build, finance, maintain, operate, manage and/or lease transportation facilities, or for any other project delivery method that the DOT determines will serve the public interest."[25] No legislative approval or reporting is required in Arizona.

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[24] https://www.adn.com/politics/2016/06/30/governor-shuts-down-work-on-knik-arm-crossing-susitna-dam/.

[25] Ariz. Rev. Stat. Ann. §§28-7701 to 7710.

Virginia's Public-Private Transportation Act of 1995, later modified, is also one of the most comprehensive in the nation. This P3-enabling statute is intended to *encourage* (emphasis added) private investment in transportation facilities. While the complete P3 agreement is subject to approval from the Virginia Department of Transportation, Office of Public-Private Partnerships, the law "contains detailed implementation guidelines" as well as "specific requirements for comprehensive agreements." To further provide structure to P3 deals, the law "stipulates the powers and duties of a private entity."[26]

The added structure and the broad application in Arizona and Virginia, for example, provide the private sector with the necessary predictability to design sound P3 agreements. As such, there is increasing interest in seeking broad P3 legislation to engage the government sector. Virginia touts its P3 laws as a "world-class P3 program" and a model for other US states to use for "innovative financing, competitive procurement, and risk management to successfully deliver major infrastructure improvements."[27]

California's First Attempt at Transportation P3

California's first attempt at P3-enabling laws came in 1989 when the legislature authorized the California DOT (CalTrans) to use the P3 methodology for up to four projects in the state. On July 10, 1989, then-Governor Wilson signed into law AB 680 (Baker) to authorize CalTrans to implement P3 projects, including at least one in northern California and one in Southern California.[28] CalTrans subsequently entered into two P3 agreements in Southern California, one to build toll lanes on State Route (SR) 91 in Orange County, and the second to build SR 125 in San Diego County. Unfortunately, neither were successful in their implementation or toll operations for different reasons. While both were constructed with private concessions, they are now owned and operated by public organizations.

California SR 91 (Fig. 3)

In California SR 91, an interesting policy issue arose after its completion about the need to address growth. To assure private investors the necessary traffic counts for revenue and a return on investment, the private consortium and CalTrans negotiated a "non-compete" clause, promising not to build "competing" roads to SR 91. The population growth of Orange and the adjoining counties of Los Angeles and Riverside

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[26] Va. Code §§ 56-556 to 575.

[27] http://www.p3virginia.org/on-the-horizon/.

[28] http://www.dot.ca.gov/hq/innovfinance/public-private-partnerships/PPP_main.html.

forced the state and local jurisdictions to consider additional routes to relieve the traffic congestion on SR 91. The proper private sector motivation of a return on investment was now on a direct collision course with the public sector's push to address transportation policy. As a result, the Orange County Transit Authority (OCTA) was forced to step up and buy out the private toll operator's interest.

Interestingly, this experience in California allowed many states to write into their P3-enabling legislations the inability to agree to "non-compete" provisions in transportation P3 agreements. Even Arizona's generous and "broad" P3 enabling law prohibits "non-compete" clauses by requiring a provision in the contract to bar the private partner from seeking relief to hinder the DOT from developing or constructing competing facilities based on policy needs. However, to balance the equities for investment, Arizona allows an "agreement to compensate the private partner for adverse effects on revenues resulting from the development and construction of a then-unplanned facility."[29] This common-sense trend in Arizona, along with the tendency to find "public interest" in Virginia, will most likely continue for P3-enabling legislation and transportation projects.

California SR 125

California SR 125 is a freeway that runs from Otay Mesa near the USA-Mexico border to Santee, California (Fig. 4). The first parts of SR 125 were developed in 1933, connecting local communities to Interstate 8 (I-8). The southern portion of SR 125, South Bay Expressway (SBX), is a toll road initially developed under a P3 concession agreement, under AB 680, between CalTrans and California Transportation Ventures. During and after the completion of the project, SBX was the subject of several lawsuits based on environmental claims and toll revenue

Fig. 3 The interstate 4 (I-4) project in orange and seminole counties. Source www.91expresslanes.com

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[29] http://www.ncsl.org/documents/transportation/PPPTOOLKIT-AppendB.pdf.

collections, which were short of original projections. In March of 2010, SBX LP, the concessionaire, filed for chapter 11 bankruptcy protection. The bankruptcy filing was prompted by SBX LP's inability to pay its contracted obligations due to toll revenue shortfalls, based on unmet traffic projections. The bankruptcy filing was also to consolidate and resolve litigation, a tool typically used by financially strapped organizations to stay proceedings in state courts. In December of 2011, the San Diego Association of Governments (SANDAG), the metropolitan planning organization (MPO) for San Diego County, purchased SBX through the bankruptcy estate, which resolved the pending litigation.

Soon after its purchase, SANDAG lowered toll rates to attract more commuters and relieve congestion on another interstate parallel to SR 125. The SBX will revert to CalTrans in 2042 based on the 35-year concession agreement signed in 2007.[30] The lessons of this P3 case study are unique to the geographic location, but the economic modeling and its failure are all too common for toll roads across the

Fig. 4 The interstate 4 (I-4) project in orange and seminole counties. Source www.thetoll-roads.com

[30] https://www.transportation.gov/policy-initiatives/build-america/south-bay-expressway-sr-125-san-diego-ca.

board. Given toll, revenue is the driving force to repay the private sector bonds or obligations that finance the construction, and the maintenance and operations of the infrastructure. The financial projections and alternative plans for economic viability must be negotiated into the P3 agreement.

California Senate Bill 4 and Amended Section 143

California's next attempt to legislate P3 for transportation projects came in 2009 during the Schwarzenegger administration. Senate Bill 4[31] allowed the California DOT (CalTrans) and regional transportation agencies, if authorized by the California Transportation Commission, to enter into "comprehensive development lease agreements" with public and private entities for transportation projects, including those that charge tolls or fees. The statute, which amended Section 143 of the California Street and Highways Code, designated the Public Infrastructure Advisory Commission (PIAC) as the clearinghouse for P3s. It also empowered the California Transportation Commission (CTC) to supervise any P3 deals subject to PIAC approval.

Section 143 did not restrict P3 to leases, easements, and permits; specifically, it required that the infrastructure be owned by the public sector and revert to the public agency, at no cost, at the end of the contractual term.[32] Finally, the amended statute expanded the purpose of transportation P3s to include projects "primarily designed to achieve improved mobility, improved operations or safety, and quantifiable air quality standards."[33] Under this enabling legislation, CalTrans' authority to enter into new leases expired on January 1, 2017.

California's Section 143 created the framework within which CalTrans accomplished the governmental role of protecting the well-established public interest while leveraging the expertise and resources of the private sector. While the authority of this section for new leases has expired, the lessons learned continue to help develop the future of California's transportation policy.

Phase II of the Presidio Parkway Project in San Francisco, California (Presidio Project) is the first project reaching the actual award stage and successful completion under Section 143 of the California Streets and Highways Code. The Presidio Project replaced the old approach to the iconic Golden Gate Bridge from the south, connecting Marin and San Francisco counties. Doyle Drive, part of a state highway on State Route 101, was more than 75 years old. Doyle Drive did not meet current highway and seismic standards. The Presidio Project transformed this outdated roadway into a twenty-first century parkway accommodating trails and bikeways under a master plan. Phase I (design-bid-build) of the project was completed in

[31] California Sen. Bill No. 4X (2009−2010 2d Ex. Sess.) § 5 (SB2X 4).

[32] Cal. Street and Highways Code §§ 143 (b)(c) and (d).

[33] Cal. Street and Highways Code §§ 143 (c)(3).

2012, using traditional state financing mechanisms. Phase II (P3-enabled), including removing the temporary bypass, reconstructing Halleck Street, covering the tunnels, and adding landscaping, were delivered by 2017.[34] According to CalTrans, the P3 procurement assured reduced construction costs and freed up state funding for other projects. More importantly, perhaps, it secured a "high-level of maintenance over the life of the 30-year [lease] contract"[35] for this road connection between two counties in California. The total cost for both phases is $851 million, with Phase II at $365 million. Phase II was financed by a private bank loan of $166 million, U.S. Department of Transportation, Transportation Infrastructure Finance and Innovation Act (TIFIA) loans in the total sum of $151 million, private equity of $43 million, and about $5 million of contributions in terms of capitalized interest by entities related to the borrower and TIFIA.[36] By all accounts, the project was delivered on time and budget.

Under the California P3-enabling law (the new Section 143), the San Francisco County Transportation Authority, in agreement with CalTrans, awarded the 30-year lease/concession to Golden Link Partners G.P., to design, build, finance, operate, and maintain the Presidio Project. The parties agreed for CalTrans to be the implementing agency for the Presidio Project responsible for developing, supervising, and implementing technical specifications and procurement procedures. In May of 2010, the CTC approved the Presidio Project as a P3 according to Section 143.[37]

The Presidio Parkway Project (Fig. 5) is notable for its accomplishments as a series of firsts for P3-enabled projects. Still, its legacy is more important for the future of P3 in California and the nation. When the CTC considered this project under Section 143, both the Legislative Analyst's Office (LAO) and the California Attorney General's Office (AG) opined that the project was not authorized under Section 143. CalTrans and outside special counsel for the design of the P3 disagreed. The Professional Engineers in California Government (PECG), a professional union, sued almost a month after CalTrans released the P3 agreement on its website.

PECG challenged Presidio as a P3 project and CalTrans on its authority to approve it. The lower court ruled in favor of CalTrans. PECG appealed based on three grounds. First, PECG argued that CalTrans was not the "responsible agency" within the meaning of the statute. In that, such responsibility mandates CalTrans to use internal personnel to perform engineering services. The Appellate Court rejected this argument by simply stating that "to be a responsible agency connotes supervisory control—not necessarily actual performance of the supervised work."[38] The court concluded that the powers granted to CalTrans under Section 143 are broad

[34] http://www.presidioparkway.org/about/.

[35] https://ncppp.org/the-long-and-winding-road-to-complete-the-presidio-parkway/.

[36] https://www.fhwa.dot.gov/ipd/project_profiles/ca_presidio.aspx.

[37] Cal. Street and Highways Code §§ 143 (c)(2).

[38] Professional Engineers in California Government v. Department of Transportation (2011) 198 Cal. App. 4th 17. https://caselaw.findlaw.com/ca-court-of-appeal/1576956.html.

Fig. 5 The interstate 4 (I-4) project in orange and seminole counties. Source www.presidioparkway.org

and that it "may exercise any power possessed by it with respect to transportation projects," including, of course, P3. The court concluded, "section 143…does not require CalTrans to perform the actual engineering work on a P3 project, but only to be the responsible agency."[39]

The second argument made by PECG was more semantic and revolved around the interpretation of the word "supplemental" to an existing facility. PECG claimed that Phase II of the Presidio Project was a rehabilitation or reconstruction of an existing facility. The court disagreed and held that "under any standard definition…the [Presidio] Project is supplemental to existing facilities to add capacity."[40] Finally, PECG argued that the Presidio Project does not qualify as a P3 project because tolls do not fund it, but a facility payment agreed to by the parties to the P3 agreement. The court, again citing the broad language of the statute, held that while toll and user fees may be ways to fund the Presidio Project, it cannot be concluded from the language of the statute that they are the only ways to promote this new delivery methodology to address state policy. When the California Supreme Court denied review, this appellate decision became law for California and a guiding precedent for the state in the future.

California's P3-enabling law, now expired for new deals, very much respects legal precedent on competitive bidding or competitive negotiation while accommodating the need of the P3 methodology in empowering the private sector and consolidating the procurement process. According to CalTrans and the California courts, the law is broad enough to assist CalTrans and regional transportation agencies in addressing transportation policy while being creative enough in collaborative

[39] Id.

[40] Id.

processes such as P3 to improve productivity, efficiency, and long-term maintenance. The law contains extensive direction on qualifications required by any private partner. The law also contains language that exempts the private partner from being forced to pay possessory taxes on leased property subject to private development. In California, even leasehold interests are subject to possessory interest taxes (similar to real property taxes assessed by the tax assessor) when the private sector holds the interest. There is, however, a case-by-case review process for an organizational clearance certificate under the "welfare exemption." These certificates are for properties developed by the not-for-profit sector for the benefit of the public.[41] The California Board of Equalization (BOE) reviews these applications and is responsible for issuing clearance certificates.

In short, California has paved the way for P3 one lease at a time, which will require specific enabling legislation in the future. California may also be in a position with its new governor to renew Section 143 by aligning California's climate or electrification policy with transportation P3 policy.

Given the complexities of these financial transactions, the P3 law, capital requirements during the bidding process and beyond (e.g., no performance, no payment), and the consideration of life cycle costs, there are only a few organizations in the world capable of delivering large undertakings like the Presidio Project. The shortlist, which is active in North America, includes, Meridiam, Hochtief, and Skanska to name a few. The Presidio Project is a Hochtief and Meridiam partnership, while one of the largest P3 transportation projects in North America is being built by Skanska in Florida. The Interstate 4 (I-4) project in Orange and Seminole counties includes the reconstruction of 21 miles of the interstate highway with 15 interchanges, 145 bridges, and four "variable-priced" toll Express Lanes (Fig. 6). The expected completion date of the I-4 project is 2021. The concession for the P3 contract will expire in 2054. The deal was signed between the Florida Department of Transportation and Skanska in 2014.[42]

California Infrastructure Financing Act, Government Code Section 5956

The California Infrastructure Financing Act (IFA) dates back to 1996. Only 7 years after enacting the state P3-enabling laws in 1989, the California Legislature authorized Section 5956 to help California public agencies enter into P3s.[43] Significantly, this authority is not available to the California state government or its agencies because the state had its version previously discussed in this chapter vis-à-vis transportation. By its terms, the IFA applies to "fee-producing infrastructure." The code

[41] California Revenue and Taxation Code § 254.6.

[42] https://www.usa.skanska.com/what-we-deliver/projects/113147/I4-Ultimate/.

[43] California Government Code § 5956.

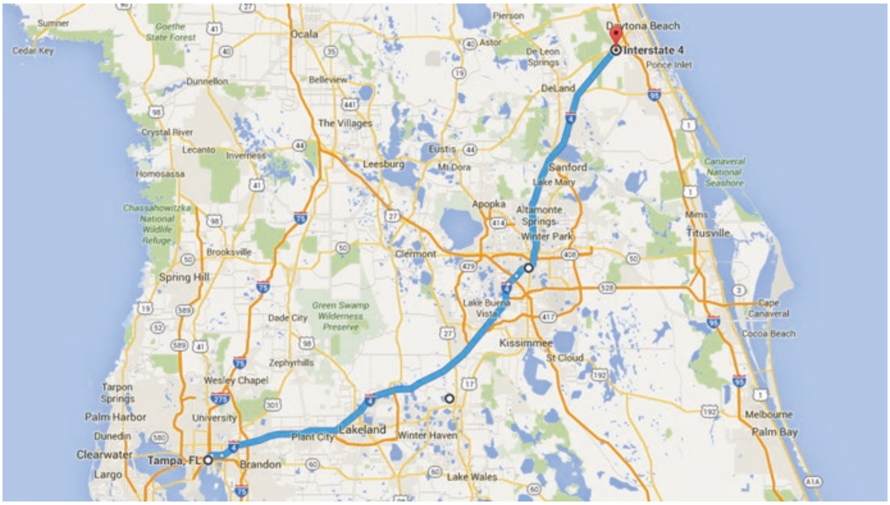

Fig. 6 The Interstate 4 (I-4) project in Orange and Seminole counties. Source www.media.bizj.us

defines fee producing as "the project or facility…paid for by the persons or entities benefited by or utilizing the project or facility."[44]

The permissible transportation-related projects under the IFA include highways or bridges, tunnels, commuter and light rail, airports and runways, harbors and inland waterways.[45] Public agencies included in Section 5956 are cities, counties, school and community college districts, joint power authorities, or any other public or municipal corporation. While the code does not require competitive bidding or the general application of the Public Contracting Code, it does compel a competitive process in the selection of the private sector partner to plan, design, build, finance, operate, and maintain any fee-producing project or facility. The competitive process must primarily utilize as selection criteria the competence and qualifications of the private sector partner, as well as its ability to ensure that "the facility be operated at fair and reasonable prices."[46]

Although the IFA explicitly authorizes P3 for local and regional levels of governments in California, the statute contains restrictive provisions, which may explain the seldom use of the law in practice. For example, the statute limits any lease term to 35 years. There is no exemption written into the statute about possessory interest, although in some instances, the "welfare exemption" may apply as discussed above.[47] Public hearings are required before user fees may be imposed or raised, potentially bringing uncertainty to the private sector partner's financial modeling or proforma. For transportation projects specifically authorized by this law, the

[44] California Government Code § 5956.3.

[45] California Government Code § 5956.4.

[46] California Government Code § 5956.5.

[47] Id 34.

government partner is required to "at least ten days prior to the meeting…publish for four consecutive times, a notice in the newspaper of general circulation in the affected area stating in no smaller than 10-point type a notice specifying the subject of the hearing, the date, time, and place of the meeting, and, in at least 8-point type, a general explanation of the matter to be considered."[48] The code also has stringent bonding requirements, which may not be suitable for large non-construction-related projects.[49]

The usefulness of the IFA will remain limited without twenty-first century amendments to the law. Assembly Member Caballero in AB 1261 made a good effort in 2007 to update the law by, among other things, extending the permissible lease term to 50 years, relaxing some of the selection criteria, and removing some of the uncertainty about the public process.[50] Unfortunately, the bill failed to become law after receiving substantial opposition from public sector labor groups, leaving the need to update this P3-enabling law at the local and regional level still active.

Conclusion

Part of California and 35 other state governments' motivation to consider and pass P3-enabling laws is the demonstrated success of such projects across the United States and around the globe. While the range of such projects is quite wide internationally, including social infrastructures such as hospitals, prisons, government buildings, and others, the overwhelming use of P3 in the United States involves transportation projects—namely toll roads. States such as Texas, Virginia, and Florida have led the way. California's experience in toll roads has been mixed for reasons discussed in this chapter. On the other hand, California has had a good experience in building schools under a statutorily well-designed P3 methodology known as a lease/leaseback outside the purview of this chapter.[51]

Opportunities for P3 across the board are still possible if we enable the public and private sectors to collaborate to achieve a win/win result without gaining an advantage over the other:

1. This collaboration requires a collaborative culture in both sectors where each understands the other.
2. It is necessary to forge a relationship between qualified sector participants that engenders trust.

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[48] California Government Code § 5956.6 (b)(5)(c)(iii).

[49] California Government Code § 5956.6 (b)(2).

[50] ftp://www.leginfo.ca.gov/pub/07-08/bill/asm/ab_1251-1300/ab_1261_cfa_20080806_122145_sen_floor.html.

[51] California Education Code § 17406.

3. Competent consultants and lawyers need to be available to negotiate all the equities fairly and balance all rights and concerns for the duration of the long-term contract.
4. A substantial education process must exist, which explains that P3 done right does not hurt public unions and only enhances the ability of their members to participate in projects that might otherwise not be built or financed.

Change is difficult, but not adapting to change may mean ultimate extinction. Who remembers Kodak or Polaroid?[52] And, last but not least, P3 opportunities are possible with the thoughtful legislation of enabling laws taking into account the experience of previous projects to address shortcomings and truly promote P3.

Final Thoughts

Our final thoughts to design enabling laws and negotiate sustainable P3s through our practice in the field and our review of the case studies in California and elsewhere include the following[53]:

1. Is the project *appropriate for P3* treatment? Not every project is.
2. Is the *sophistication level* of the public and the private partners compatible? A disadvantaged partner is of no use to the other in the long run.
3. Is the proposed contractual *framework collaborative*? Competition is generally good for innovation, but nothing is worthwhile about the private sector competing with the public sector or the reverse in a P3 contract. Such competition will only lead to failure over time.
4. Is there a *policy focus*? For example, California's Section 143 was signed into law to promote mobility, operational safety, and air quality.
5. Is there a *viable revenue stream* to repay bonds, a financial rate of return, as well as maintenance and operation costs? A predictable revenue stream is attractive to the private sector.
6. Is the *risk properly assigned*? A key characteristic of P3 is the ability of the public sector to transfer risk to the private sector, which may be better able to handle that type of risk. Common risks better handled by the private sector include construction risk, financial risk, operational risk, and maintenance risk. Conversely, risks better retained by the public sector are policy risk, user risk, and appropriation risk. Properly assigned risk enhances the public interest.

[52] https://betanews.com/2013/12/12/how-kodak-and-polaroid-fell-victim-to-the-dark-side-of-innovation/.

[53] The author of this chapter has had specific P3 infrastructure experience in the design and bidding phases of P3 projects like the Long Beach Court House and Oxnard Fire Station, among others in California. While the chapter focuses on transportation infrastructure, P3 as a delivery methodology generally remains the same across all types of projects.

7. *Cost of funds*. Is it equal to the government rate to finance the project? The cost of money in the private sector has been quite competitive over the past several years.
8. Is a long-term *maintenance strategy* a policy concern? Tying the project's maintenance to an economic incentive for the private sector will lead to a well-maintained facility over its life cycle. For example, a "class A" (designation of quality) building in downtown Los Angeles will be maintained as long as possible to attract Class A renters. A dilapidated government courthouse building has no such incentive.
9. *Accountability and Transparency*. These qualities or ways of conducting business are not for every private sector organization. Sophisticated organizations prepared to do business with the public sector must know to conduct business as the public sector is expected to conduct its business. This sophistication will make the P3 much more welcomed by the public.
10. *Labor*. All public projects are "prevailing wage" projects. Labor must be convinced that the government is not in a position to build every project. P3 is a viable solution to sound government policy and projects that may not otherwise exist. We observe here the lack of trust between labor unions and the private sector. Governments must mediate and become an honest broker of "good faith" between these organizations. It is possible to align interests.
11. Are *unpredictable matters* predicted or mitigated? Public hearings, changing budgets, and new election cycles can create uncertainty for the future for the public sector partner. For the private sector partner, bankruptcy may be a viable option under federal law to avoid public obligations under the P3 contract, and therefore a concern for the public partner. All can be predicted or mitigated upfront by experienced negotiators to protect the P3 over its life cycle. For example, binding resolutions or validation actions in court and requiring performance bonds and letters of credit may deal with all of these issues.
12. Is the *public interest* protected? This predicament is where an enabling law like what exists in Virginia may help find public interest before authorizing a P3. A typical objection to P3 includes private profits at the public's expense. This objection will be less of a concern if there is an identifiable and well-articulated public interest. The court in the Presidio Project was well aware of California's policy intent in drafting Section 143.
13. *Specific requirements* in the P3 contract. The more detailed the P3 enabling law is in implementation, the better. Often, both public and private sector partners look for predictable guidelines to achieve the desired outcomes.
14. *Scalability*. We often argue that P3 are complex legal systems and agreements. Most contracts are thousands of pages, including appendices and exhibits. This complexity precludes many municipal governments or small projects from ever using the methodology. States may use P3-enabling laws to bundle similarly situated municipalities or projects to enter into P3 arrangements. Examples exist in Pennsylvania to replace and maintain more than 500 small-to-medium-sized bridges. In Maryland, the EPA successfully worked with the state to pursue community-based P3s.

15. *Common Sense*! A commodity we all need, from driving a car to legislating or negotiating a P3.

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An Alternative Approach to Funding Parking Structures

Michael Martindill and Jason Perry

Acronyms

P3	Public-private partnerships
LOS	Level of service
RFQ	Request for qualifications
RFP	Request for proposals

The Challenge

Many public entities throughout the country today are facing issues with limited funding, growing populations, and more. These institutions, specifically both higher education, and transportation agencies in particular, often struggle to improve or add to their infrastructure. As a result, many have sought to finance significant projects, particularly the development of parking and mixed-use facilities, by utilizing public-private partnership (P3) financing.

Entities pursuing P3 projects often have a number of goals in mind to achieve project success. Public/private projects provide the financing, design, and construction all under one umbrella. This process allows experienced private developers to finance and construct projects based on economic considerations working a public entity to ensure that the outlined goals and objectives are met. When the expertise and values of both the public and private sector combine on a P3 project, it often results in a quality, cost-effective, and timely success.

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Throughout this chapter, we will outline the benefits, strategies, and best practices for implementing P3 approaches to develop projects for two significant sectors: higher education and public transit. These two sectors have led the way in P3 project development, resulting in numerous successful infrastructure projects throughout the country.

Challenges Facing Higher Education

Enrollment continues to grow at our nation's universities around the country, at both public and private institutions. Today, more than ever, it appears that every student class, including freshmen, either own or have access to a vehicle. The combination of increasing enrollment, and more automobile ownership, has placed a great strain on the parking resources at universities and colleges. Furthermore, many states are no longer funding, or using the traditional bond debt for financing parking structures. Understandably, the state prefers to use state funding for new buildings that support the mission of the universities and colleges, educating and growing students into tomorrow's leaders. Therefore, universities must look to alternative options for funding parking structures, as parking is still a very real and critical need and has a major impact on the overall student, faculty, and staff experience.

Although mobility trends are changing throughout the country due to ridesharing options, alternative modes of transportation, advancements in technology, and partnerships with transit agencies, some schools do not have the same mobility options as schools located in larger urban centers. Schools that are not adjacent to or part of a strong transit district will typically see a larger population of their student body driving a car. Since introducing a transit or transportation system(s) does not happen overnight, we anticipate that the need to have a car will be a trend for many for years to come.

Another ongoing challenge for universities is to provide prospective students with amenities such as on-campus student housing, more elaborate recreation centers, and certainly great learning and community spaces. Since the university business is so competitive, providing these new and improved spaces is a must if schools want to attract students and continue to grow. Some of these buildings will generate new on-campus parking demand (student housing), where students will want to park as close as possible to their residence. Other building improvements are typically built on top of existing surface lots, surface lots that provide parking for both staff and students. So, the combination of increased demand, plus the elimination of surface, or even on-street parking, really exacerbates the parking challenge.

An article in *Building Design & Construction* magazine entitled "*Universities Embrace Creative Finance Strategies,*" speaks to the growing popularity of public-private partnerships for student housing, mixed-use buildings, and *parking facilities*. The tightened standards by credit rating agencies, the financing climate, using financing for mission-related projects (like academic buildings), all contribute to the idea of working more with the private sector to deliver projects.

Seeking Solutions for Transit Agencies and Transit-Oriented Developments

For many transit agencies, it is increasingly difficult to fund or finance meaningful infrastructure and improvement projects that enhance their systems, improve commuter access, or repair and/or maintain critical infrastructure. In addition, transit agency property, often surface parking lots located near transit stations, is not the highest and best use of valuable property. Instead, many agencies seek to incorporate more advantageous uses such as retail or restaurant space, offices, or even residential properties. These transit-oriented developments are more aesthetically pleasing than surface parking lots, and create more activity at the transit station. As a result, these developments help to increase ridership, as well as generate revenue for station access improvements such as commuter parking.

A challenge for many transit agencies is the need to replace the parking supply often dislocated for other development, as well as accommodating the additional parking demand that these additional uses generate. Due to the desired density of mixed-use projects at mass transit and the limited availability of land, structured parking is often the solution to meet commuter parking needs, as well as the parking needs of the complementary uses. However, such as the case at higher education institutions, structured parking is expensive and not generally first on the list to finance.

Many transit agencies have sought public-private financing solutions to meet these growing needs and develop the critical infrastructure needed for future success. These valuable partnerships have resulted in the funding of numerous parking and mixed-use developments for transit agencies across the country. They bringing together the transit agency and developer, and the combination of their expertise, capabilities, and resources. Also, as discussed in relation to college and university efforts, parking does provide the essential revenue opportunities to make these projects possible.

An Alternative Solution

Public-private partnerships have offered a valuable alternative solution/strategy to many institutions to fund parking and mixed-use projects. A P3 is a contractual agreement between a public agency and a private entity in which the private entity provides the financing for the design and construction of a project on land owned by a public entity such as a university. As mentioned previously, privatized student housing and parking facilities are excellent examples of how universities are using the P3 approach to deliver new facilities to their campuses. Further, many transit agencies have utilized these methods to fund infrastructure projects that wouldn't otherwise have sufficient funds allocated to them. Working with private developers, these institutions have been able to deliver affordable, well-designed assets, while enhancing the user experience.

It is imperative that the institution work with a private firm that has a successful track record of working in similar spaces, and has an exceptional understanding of the design, construction, and financing of the project to be developed. When a private firm assembles a team that knows the area, understands design, and has experience in the building type is mission critical.

It all starts with design; design that meets the program the institution has envisioned. When the parking need is apparent, most universities or transit agencies will implement a parking study, or master plan, that confirms and/or verifies the need and where the parking improvement should be sited so that it serves the needs in that area and compliments the long-range growth plans of the university. One of the fundamental elements of the program is the space count, or how many net new spaces are necessary to build. Another important aspect of any program is the opportunity to activate the ground floor with some land use. The land use could be academic related, retail space, community space, or something similar. Not all parking decks include mixed-use or activated space. However, since garages are normally very large structures, the opportunity to introduce another land use often makes a great deal of sense from a planning perspective.

With the program established, successful P3 projects include a team of design professionals that understand the art of parking design (the inside), while creating a look or using materials to create an attractive façade, one that complements the surrounding buildings and space. University parking structures tend to be very attractive as they normally emphasize the use of campus brick, stone, and other materials that can soften the look of a parking garage, while creating a great sense of place. By engaging experienced parking designers, the garage can be designed to maximize efficiency, while providing an exceptional level of service for the intended user (staff, student, and visitors). By finding the right mix of efficiency with level of service, results in an economical, yet attractive solution—one that can stand the test of time, while providing much needed parking. Some of the parking solutions we are studying today include the option to convert the space to another need in the future as mobility trends change.

The contractor on the team plays a very critical role. Including a contractor with a successful track record in building parking decks is essential, no matter what the structural system. Contractors, by and large, favor building parking decks as they are not overly complicated buildings. That said, contractors that have little experience in building garages can overlook some of the most important elements of exceptional parking structure construction such as the proper installation of expansion joints, sealants, traffic membranes, concrete mix, air entrainment, rebar protection, and so on—all of these have an impact on long-term durability, which, to the university, is extremely important because someday (probably 25–30 years out) the asset will revert to the school as the debt will be paid. Thus, the university, through exceptional design and construction, wants to take ownership of a parking garage that will last another 30–50 years.

The group that leads the P3 team, the Developer, or Real Estate Entity, must have a track record in using both tax-exempt and taxable debt for financing. The firm's ability to work with a variety of banks or lending sources is essential to obtaining the most competitive cost of money. Most of these P3 deals can be financed using tax-exempt debt, so including bond attorneys and financial consultants that specialize in this arena is a must. The private firms that excel in the P3 space understand how to manage their key team players (architects, engineers, contractors) so that they are working together towards a common goal. Previous projects they have successfully delivered can be a testimony to their ability to lead their team.

The Opportunities

Case Study: Ohio State University

At Ohio State University, the school monetized their parking system and received a substantial sum of money under a long-term, third-party concession deal. A large school like Ohio State generated a significant revenue stream, one that was very attractive to the private market. However, schools do not need to be the size of Ohio State to generate a strong revenue stream from parking. Most schools around the country generate significant and reliable revenue stream from parking through student fees, parking permits, citations, and special-event parking. Consequently, many schools have a fairly well-funded parking department that typically reports to Auxiliary Services, where other revenue-generating services, such as bookstore and student housing, report.

Privatized student housing is a good example of how universities, when faced with the challenge of needing more housing, have turned to the private sector for help. When states cut back their funding for student housing, they have encouraged universities to work with the private sector for help. And, the private sector came through. The private sector, working with some of the best-known architects in the country, have created new, exciting living spaces for students—spaces that students have embraced as more "current" than the old housing built on campus decades ago with the community bathrooms, small rooms, lack of gathering spaces, etc. Most importantly, privatized student housing and working with third party, private firms, suggested that universities could do the same with parking, in some form, or fashion.

Case Study: New Jersey Transit Hamilton Station

New Jersey Transit was faced with the need to meet growing commuter parking demand and free surface parking for future transit-oriented development at its station in Hamilton, NJ. With limited capital, the agency chose to undertake an innovative public/private partnership initiative.

Through a competitive process, NJ Transit selected a local developer to lease a portion of the Hamilton Station surface lot to design, finance, build, operate, and maintain a 2066-space commuter parking facility.

The financing model included a ground lease with a 37-year term, with a base rent of $1.00 per year, and additional rent to NJ Transit defined as share net revenue after debt service and operational expenses are satisfied. NJ Transit receives 65% of the net revenue from deck operations in years one through 25 and 75% in years 26–37. At the end of the lease term, the parking facility will revert back to NJ Transit.

NJ Transit retains significant control over the facility through the terms and conditions of the ground lease, including facility design approval, development and construction milestones, a guaranteed maximum price, parking rate control, and operational standards. The developer can utilize tax-exempt financing for the facility due to its public/mass transit purpose but chose to use taxable financing and take advantage of the depreciation of the asset. NJ TRANSIT's net revenue share calculation is based on the tax-exempt interest rate.

The Hamilton Station parking structure was built in 12 months with NJ Transit overseeing the facility's construction. The developer also serves as the operator of the parking facility. With the approval of NJ Transit, the developer employed numerous revenue enhancing strategies, including variable rates for overnight parkers, preferred parking rates, and reserved parking rates.

This P3 structure for the Hamilton Station facility matched the goals of both NJ Transit and the developer design and construct a quality, economical parking structure to meet the growing parking needs at the station.

It All Starts with Great Design

Great design creates a "People Place," one that balances the functional needs of the users, with the architectural and program requirements of the Owner—great design can accomplish this within budget. Successfully integrating the structural frame and column grid with parking geometrics that are tailored to the users, is the key to creating a great design on the inside. Since parking is the first and last impression one has when traveling to a destination, the better the parking experience, the better one feels about using the facility (and returning to the facility).

Great design focuses on developing comfortable parking geometrics, an open column grid, abundant uniform lighting, comfortable turning movements, higher floor-to-floor heights, comfortable ramp slopes, and, in general, a design that is simple to use. Additionally, the garage must be designed to last for decades, implementing an ongoing, long-term maintenance program. Therefore, the details for promoting long-term durability such as specifying the right concrete mix, sealants, expansion joints, positive drainage, and waterproofing is essential to great design.

To round out great design, the architect working very closely with the university will integrate materials such as brick, stone, and metal to create a building that complements the surroundings and looks like it "belongs" on the property where the parking structure has been sited.

To help designers create great design, we recommend using a design approach commonly referred to as the Level of Service (LOS) approach. Developed in the mid-1980s, this innovative approach to parking design helps designers customize parking structure design to the specific functional requirements of the user, while doing so with a proven analytical approach. Embraced by traffic engineers, architects, and owners around the country, the LOS approach brings into the design process a language that effectively communicates the level of comfort offered by specific design features. In short, our LOS approach has become the standard for the industry. In reality, the parking geometric tables and parking dimensions we have developed through extensive research have become a part of the commonly used Architectural Standards manual.

The LOS design criteria are categorized, or graded, by letter. LOS "A" design criteria are more generous, more comfortable and result in fewer delays and congestion. LOS "D" design criteria are those that are minimally acceptable to the user. For example, a parking deck designed to accommodate visitors and short-term parkers requires a high LOS (A to B). This allows the users to logically and comfortably use the parking structure, even though it may be the first time they have visited the facility. Conversely, a parking structure dedicated for commuter students, resident students, faculty or staff, or similar long-term users, works extremely well with a lower LOS, say B to C. Using the LOS approach ensures that the right parking design criteria are used in the design, thus creating the kind of first and last impression an Owner is seeking and appropriate for the users.

The LOS design approach focuses on freedom to maneuver, minimizing delays, improving safety, improving driving comfort and convenience. The approach is applied to design considerations such as exit/entry, ramping systems, circulation systems, parking orientation, wayfinding, lighting levels, stall width, drive aisle width, flow capacity, travel distance and spaces passed, turning radii, floor slopes, signage, and similar design elements.

The "art" of properly designing a parking structure is what separates a great design from a good or acceptable design. Therefore, one of the keys to a successful P3 parking structure project is the makeup of the design team and their extensive experience in parking design and using the LOS approach.

P3 Model/Structure

With respect to how P3 agreements are typically implemented, two models are generally used: a concession agreement or a lease/leaseback structure. In a concession agreement, the private entity finances, designs, builds and even operates the project under a long-term license from the university. Although the title remains with the public agency through construction, the private entity takes possession after completion and continues to operate the facility for the period of the lease. Ohio State University leased their parking system under a concession agreement.

However, a more common method utilized by these institutions, and the one highlighted in this chapter, is through a traditional lease/leaseback structure. This delivers the same transaction proceeds as would a traditional sale and leaseback, but it avoids any legal or political issues the university could run into when transferring a title to a university or state-owned asset.

The reason that most institutions utilize the lease/leaseback structure is due to the ever-changing needs of their users. Since the entity maintains most of the control over the development, operation, and maintenance of the parking facility, this form of agreement proves extremely successful. Although the private partners may suggest changes or ideas which benefit their public partner, the university still serves as the primary decision-maker for the project.

It is important that the university or transit agency retain the right to take back the facility if needed for a higher and better use. For example, a parking facility may need to be expanded or even demolished at some point to provide for the long-term development needs and plans of the institution. For this reason, a lease/leaseback structure is often the most logical agreement between an institution and a private entity.

The most popular P3 structure that has been used for parking structures is one where a 501(c)(3) entity uses tax-exempt bond funds to design, build, and finance the parking structure. Under a lease-leaseback arrangement, the university pays an annual payment to the 501(c)(3) that covers, at a minimum, debt service. The university's parking revenues are one source of collateral for backing the debt service. As mentioned previously, many universities and transit agencies have a strong revenue stream from parking, one that can back the annual debt service payment. Most of these deals are structured for a term of 25–30 years. Many of deals are structured under a long-term ground lease, where the ground lease is five to ten years longer than the debt obligation. Once the debt obligation is met, the parking structure becomes the university's asset and sole responsibility. To make all of this work, it's essential that financial consultants, bond attorneys, the CFO, etc., are all involved. These financial structures are complicated, but with the right team and leadership of the third party, they can work.

Figure 1 illustrates the tax-exempt model and how the agreements flow between the various private and public entities.

The main elements of the tax-exempt model include the following:

- Involvement of a local bonding authority to assist in the issuance of tax-exempt bonds.
- The development of a 501(c)(3) entity to serve as the "owner" of the project and to serve as a conduit for managing the flow of the funds.
- Using non-recourse project funding; funding that is secured by collateral, usually the property provides this collateral.
- A long-term ground lease, issued through the state or institution; the ground lease term is normally 5–10 years longer than the debt service term, but automatically terminates upon the retirement of the financing.

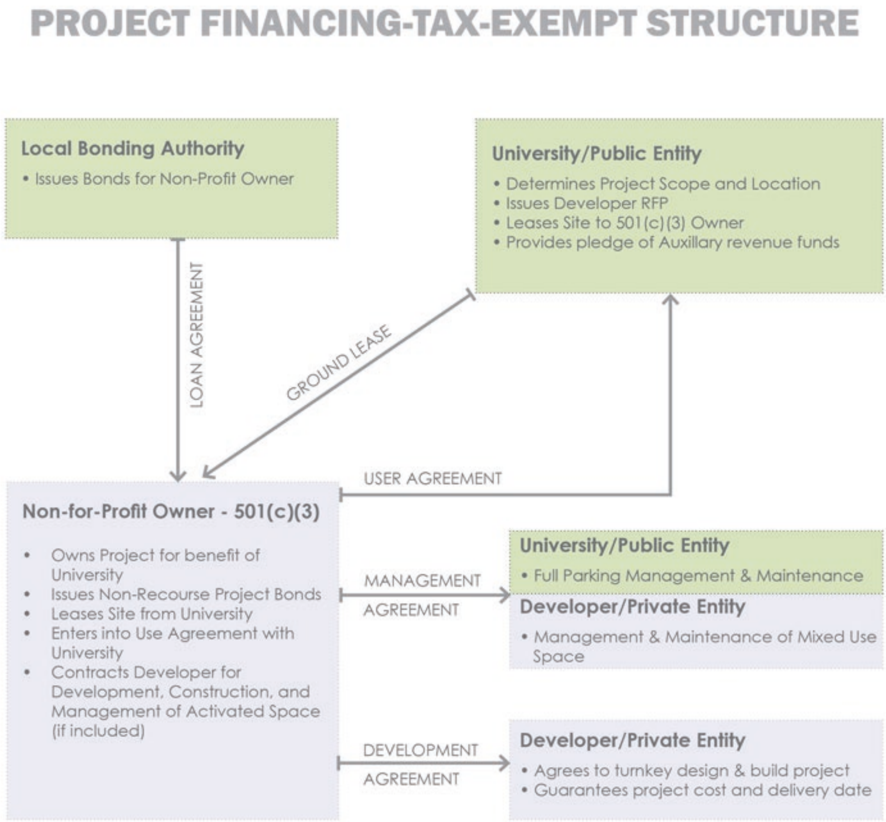

Fig. 1 Project Financing-Tax-Exempt-Structure

- The revenue pledge from the public institution (normally generated by the parking and transportation revenues of the parking auxiliary or parking department).
- The public entity (university) manages the parking operations and essentially bundles the operations of the new garage with their overall, campus-wide parking operations.
- A developer who has assembled a team that has an excellent understanding of parking structure delivery, including master planning, design, and construction.

Why It Works

This process works because the institution stays *actively* involved in the process from start to finish. Starting with programming, the university or transit agency stays very involved in the programming of the parking garage to ensure that they are getting a building that provides them with the net new spaces they are seeking and including, if desired, some form of activated or mixed-use space. By getting involved early in the programming/design process, the public entity can really help drive the design and ensure that they are getting what they are seeking in a new parking improvement. The institution also works very closely with the real estate professional and general contractor on schedule, pre-construction, and post-construction so that the delivery of the parking structure has minimal disruption to current operations and that the parking structure's construction emphasizes the safest work environment possible.

Another reason a P3 approach works for parking structures is that the parking asset itself is normally designed to have a useful life of 60–75 years, more than double the term of the lease. When the asset is properly designed from the outset, and properly maintained over the term of the lease, the university will ultimately assume full ownership of the parking structure that has another 40+ years of useful life. The longevity and durability of an open air, free-standing parking is another reason why using P3 makes so much sense—these types of buildings last for many decades when properly designed and maintained.

Delivery Process

The most successful P3 parking projects are delivered under a two-step process. The first step is for the institution to issue an RFQ (Request for Qualifications) to solicit qualifications packages from interested firms. The teams that submit need to show previous P3 projects, experience of the team, financing overview, and, in general, provide materials that demonstrate a successful expertise in this area.

The institution, with or without a consultant, reviews all of the RFQ packages and shortlists a group of firms, normally three to five, to advance in the process and submit a proposal, built around a more detailed RFP (request for proposal). To protect the interests of the university, it is highly recommended that a well-defined program is provided. For example, a good program includes: proposed site, proposed boundaries, number of spaces, number of levels, connectivity to any surrounding buildings, desired appearance, inclusion of any activated space with the parking structure, schedule, level of service, project budget, geotechnical information, boundary survey, and similar information. In other words, the more that can be defined up front, the better the responses by the shortlisted firms.

Once the shortlisted firms submit and their proposals are reviewed by an internal committee, two to three firms might be invited to present their solution and team to the university. This is a critical piece as it is very important that the institution feel comfortable with the team with whom they will ultimately be working, as a partner, for the next 12–18 months, depending on the size of the project. While the two basic structure models mentioned earlier will serve as the basis for project financing, selecting a firm with creative ideas for enhanced revenue generation should also be considered.

Paying the Lease

For most institutions, especially public and private entities, parking fees, visitor fees, special-event parking fees, transportation fees, permit fees, fines, and similar revenues provide sufficient funding to cover the debt service for a new parking structure. It is virtually impossible to finance a parking deck based on the daily or monthly parking fees due to the revenue required to cover the debt service and operating expenses which equates to a minimum of $125 to $150 per space per month, for most free-standing, above-grade parking structures. Very few institutions can realize this kind of monthly revenue for a standalone parking structure. However, when combining the previously mentioned multiple revenue sources, on a campus-wide basis, it becomes much more feasible and possible to develop the needed revenue stream for covering the debt and operating expenses. The parking "system or auxiliary" can then generate enough revenue to pay for a third party to design, build, and finance a parking structure on state-owned land.

In most cases, the institution will manage the parking operations of the new parking structure, though not always, as in the case of the New Jersey Transit Hamilton Station project. Since the institution is normally managing all of the on- and off-street parking at campus, it is much more financially feasible for them to absorb the operating costs into their operational budget, versus a standalone, privately operated parking structure. In addition, when the institution manages the asset, the institution provides a more consistent level of service to the users, campus wide.

Project Costs

Depending on where the parking garage is located, the construction costs for an above-grade, open air parking structure can range from a low of $14,000 per space to a high of $30,000 per space, when using precast. The premium for cast-in-place, post-tensioned beam and slab concrete construction is normally on the order of 10%, again, depending on where the parking structure is being constructed, the strength of the general contractors in that market, the location of the precast manufacturing plants, etc.

To arrive at total project costs, we often see an additional 15–20% added to the construction costs to compensate for AE fees, surveying, materials testing, development management, and so on. Typically, project financing costs are an additional 7–10% which covers legal and structuring costs, issuance fees, and interest reserves.

So, in the market where a free-standing, above-grade, open air parking structure costs $15,000 per space to build, we would anticipate the total project costs to be a minimum of $18,300 per space. This would be the all-in costs that are carried to complete the project.

Project Financing

One of the advantages of using P3 for a public parking project, like one at a university, is the use of tax-exempt bond financing. Section 103 of the Internal Revenue Code of 1986 allows the use of tax-exempt bond financing for a wide range of projects, including parking structures.

State-chartered bond authorities exist in every state. They include healthcare facility authorities, housing finance agencies, *higher education facility authorities*, and industrial development finance authorities. For those authorities, eligible projects include parking structures. The eligible borrowers for tax-exempt bonds are defined in the federal tax code as:

The benefits of tax-exempt bonds generally include (1) lower interest rates and (2) longer tenors than most taxable bonds, making them a well-suited and attractive means of financing projects such as parking structure for eligible borrowers.

"Tax-exempt" means that the interest component of bond debt service payments is exempt from federal and sometimes state and local income taxes for the bond holder. Therefore, with regard to credit quality and term of the bonds, the interest rate will be lower than for a taxable bond. Fixed interest rate bonds with 15- to 25-year terms are common, though longer terms are available. Tax-exempt bonds also have a deep market of interested bond purchasers. The ability to sell bonds, as always, is subject to the credit quality of the borrower, but credit enhancements can improve the credit quality of the bond.

For these reasons—lower rate, longer term, and deep buyer market—state and local governments can investigate tax-exempt bonds as a financing alternative for parking structures. State and local governments are advised to hold discussions with their bond authorities to see how they can participate in local or state financing programs.

In general, bond authorities are conduits to financing, not sources of financing. That is, they issue bonds, but the bond purchasers must still be arranged, and the credit of the borrower approved. Bonds can be sold on a private placement basis directly to a bond purchaser without a credit rating, or as a public sale in the capital markets with a credit rating for the bond from a bond rating agency like Fitch or Standard and Poor's. The minimum size for a private placement can be anywhere from $500,000 to $1 million. Some authorities have developed streamlined procedures for smaller bond issues.

The minimum size for a public bond sale is typically in the range of $10 million to $20 million, if not much larger. Credit enhancements or letters of credit can often help to secure a rating from the rating agencies. Some bond authorities can finance projects with their own resources, aggregate them, and then refinance with a bond issue. Or, the bond authorities can work with a partner financing institution that can originate the clean energy loans, which then can be pooled together for refinancing with a bond sale.

For P3 parking structures, where they meet all of the rules and regulations for tax-exempt bond financing, it's the best approach, primarily because it's a lower cost of money and thus, more affordable than private financing.

P3 Considerations

When undertaking a P3 project, the institution should evaluate and anticipate any potential issues to ensure that the project offers the best possible opportunity and economic return. This review should also ensure that the opportunity provides a marketable and financially viable project for the developer, as well as a desirable and beneficial project for the host community. With proper planning, coordination, realistic financial expectations, and cooperation by both the institution and its development partner these projects can be successfully implemented with long-term positive results. However, some issues to consider include:

Property Review and Approval for Development

After identification of a property for a potential public/private partnership, it is critical to undertake a comprehensive internal review of the property to ensure that there are no conflicts of interest related to the present and future use of the property.

Preliminary Due Diligence

Another important step is to undertake preliminary due diligence to ensure that the property can be successfully conveyed and developed to its highest and best use. Primary due diligence would include a title search to ensure that the institution holds clear title to the property, preliminary environmental investigations to ensure that the property can be conveyed without the need for extensive remediation that would negatively impact that economic viability of the potential project, and limited soil borings to understand geology of the site and its bearing capacity. The institution may want to also perform a preliminary market study of the site and area to identify the land uses and required zoning that provides the highest return opportunity for the property.

Replacement Parking

A major consideration especially related to parking development projects is the amount of parking to be replaced, or that will increase as a result of future development. Many of these developments are often already limited in the amount of available parking supply, and the addition of activity centers such as retail, office space, or residential units will enhance this issue. Structured parking is expensive when compared to surface parking, and the proposed parking facility should be right-sized to meet current and future parking needs, yet not result in an overbuild.

Zoning Issues

Another important consideration is the need to work with the local municipality to review current zoning ordinances and identify if there will be any need to modify existing zoning regulations to accommodate higher density, mixed-use development. Another such review may be required once a developer is selected, but it is also a best practice to help reduce any problems in the future, and identify the uses that will not be an option for the development. If this is done early on in the process, there will be adequate time to obtain any zoning variances that may be required to move the project forward.

Risk Sharing

Another major consideration is risk sharing between the public institution and the private entity. For the private entity, they will normally assume the risk of delivering the project on time and within the stated budget, which reduces the risk of the university. For any private entity to assume this risk, they will want to work at a university with a strong financial balance sheet, strong leadership, and firm commitment from the President and CFO on the merits of using P3 and one that may have history of using P3 for delivering other projects at campus, such as privatized student housing.

For the public entity, their risk is reduced when they chose to collaborate with a private entity that has a successful track record of using P3 for project delivery at other universities, a very strong design and construction team, strong bond attorneys and/or advisors, and the backing of a major lending institution or bank that has a relationship with the university.

Case Studies

University of Kentucky

An excellent example of a P3 approach for a parking structure is one that is being delivered at the University of Kentucky.

The University needed more parking in a particular zone of campus, especially after the delivery of new on-campus, student housing. The student housing was delivered under a P3 model. Rather than using the traditional approach of working with the state, UK decided to explore using the P3 approach to deliver the parking structure. Since their P3 student housing project was such a success, UK felt that using the same approach for a new parking deck might be a good alternative.

The process started with the assembly of a Parking Committee to develop the program for the project and to serve as the internal team that will ultimately select a private partner. From the outset, it was imperative that UK be committed to the P3 process to maximize the interest on behalf of the developed community. Therefore, a well-written RFQ to solicit interest was the first step. UK released a RFQ that was descriptive, while containing enough information to help solicit interest from the development community. UK sought qualifications from firms that specialize in using a P3 approach for designing, building, and financing a parking structure—ideally, seeking a private entity that has a track record in delivering P3 projects in the university market. The RFQ identified the site, the number of spaces, the ground-floor activated space and, most importantly, what UK was seeking in a partner.

UK received qualification statements from several firms. In the end, UK shortlisted two firms to continue with the process—both firms were highly qualified and had a track record in delivering projects using a P3 approach. The two firms received a more detailed RFP that addressed more information about the program (900–1000 spaces), the inclusion of ground-floor activated space, financing, etc. This was more than enough information for the two firms to work with respective teams to create a design, develop the financing alternatives, and submit a detailed proposal for the university to receive and review.

After receiving the proposals, UK called in both firms to hear more about their respective proposals and to meet all of the team members. Since this is a long-term commitment, it is imperative that the public entity really feel comfortable with the private partner they are about to engage. The Parking Committee that was formed at UK interviewed the respective teams. They asked questions about financing, design, terms, construction, schedule, the team's experience, etc. Again, getting to know your partner is essential to a successful process. Shortlisting highly qualified teams for consideration is an extremely important step in the process.

Ultimately, UK selected a team that utilized a P3 model that was built around a 30-year term, using tax-exempt bond financing and providing ground-floor space that included both retail and community uses. The successful solution included an architectural theme that was consistent with the buildings surrounding the new parking structure. The functional design was exactly what the university was seeking with respect to parking orientation, traffic flow, connectivity to an existing parking structure, and an overall level of service consistent with other parking garages on campus. Furthermore, the developer helped create revenue sharing opportunities for the UK through the ground floor uses. The contractor had a long history and extensive experience in building cast-in-place concrete parking structures. The developer had extensive experience in using a P3 approach for delivering similar projects at other universities around the country, including parking structure delivery. The developer's use of tax-exempt bond financing and the flexibility to work with multiple banking institutions for construction loan financing, were very attractive to the university. In total, the team provided the university with what they were seeking in a private partner.

For this particular project, the total design and construction timeline, including the arranging of financing, took approximately 18 months. The parking deck itself will take about 10 months to construct with the balance of the time being dedicated to design and closing on the financing. Since this and similar P3 projects are normally delivered using the design/build approach, the project can be fast tracked so that design packages can be used to facilitate a faster start and earlier groundbreaking, than the traditional approach. So, some aspects of design can still be underway, after the foundation package has been prepared and submitted for permitting.

To date, this is one of the "success stories" for using P3 to creatively deliver a parking structure. The project is slated for completion in the summer of 2020.

Arborpoint at Woodland Station

At Woodland Station in Newton, MA, the Massachusetts Bay Transit Authority partnered with a developer to create a high-quality mixed-income rental housing project, taking advantage of the close proximity of the site to public transportation. Arborpoint is primarily a residential project with 180 multifamily units.

The 6.9-acre site was made available by the MBTA under a 70-year lease to the developer. As part of the lease agreement, the developer was required to build a 548-space parking garage to replace lost surface parking along with the parking for the development project. The multifamily units will sit atop a two-story parking garage and an additional 22 units will be in town home-style structures.

Summary

The use of P3 for delivering parking structures is a very viable option for a public institution. The University of Kentucky may be one of the best examples on how a major public institution partnered with a private firm to deliver a parking structure in almost half the time it would normally take and for, most likely, a lower cost. Now, more than ever, the use of P3 makes sense. Many universities across the country are dealing with the financial impact of the pandemic. States' budgets are stressed and so obtaining funds for any project at a university is difficult, and probably difficult for a few years. Using private industry to deliver a parking structure may be the best way for universities to build infrastructure they need for growth and to serve their needs.

As universities continue to see an increase in enrollment, especially at non-urban schools where students typically bring a car to campus, the need for adding parking will be a real need. Public/private partnerships help unlock existing equity in the university's (parking) assets to pay for new development. Continued development through public-private partnerships will not only help a university tap into funding that would not normally be accessible, but it will also provide the infrastructure needed to grow and battle for students in this very competitive environment in which we live.

Michael Martindill joined Timothy Haahs & Associates (TimHaahs) in 2006 and started the Atlanta office, where he serves as Vice President and Managing Principal. TimHaahs is a nationally known AE firm specifically focused on the planning and the design of parking structures and mixed-use projects. The firm provides planning and design services around the world. Mike, a Principal and Owner, is responsible for managing all of the business and marketing affairs for the southern region. He moved to Atlanta in 1996 from Indianapolis, Indiana. He has been involved in the parking planning and parking design industry for over 30 years. During his career, he has authored several articles on parking planning, parking financing, and restoration engineering. He is a frequent speaker on parking planning and design at local, regional, and national conferences. He is one of the firm's experts on using P3 (public–private partnerships) as a form of project delivery for parking structures. Mike's clients include colleges and universities, architects, owners, private developers, hospitals, transit authorities, the federal government, cities and municipalities, and many others. In total, he has been involved in the planning and design of parking structures and mixed-use projects containing structured parking on over 600 projects during his career, representing over 450,000 spaces. He graduated from Purdue University with a BS in Building Construction Management in 1980.

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P3s in the Transportation Sector: Policy Implications

Simon Hakim, Robert M. Clark, and Erwin A. Blackstone

Acronyms

CPI Consumer price index
EU European Union
P3s Public–private partnerships
US United States

Background

Throughout the world it is common for government to fund, build, operate, and maintain the road systems based on the premise that roads are public goods. Therefore, everyone uses or benefits from this investment in road network. Road networks generally consist of major highways, regional, and local roads. The focus of this chapter is primarily on major highways and potentially regional roads.

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The United States (US) Interstate Interstate Highway system illustrates a major highway network. When US President Eisenhower began the interstate highway system in 1956, which is among the largest public works project in history, its total costs were over $500 billion through 1966 when it was essentially completed. The Consumer Price Index (CPI) has increased 8.2 times since 1966, so that the value in 2021 dollars would be $4.1 trillion. The project passed the House of Representatives with overwhelming support by members of both parties (388 in favor to 19 against), while the US Senate after a conference with the House passed the bill by 89 to 1. The US Interstate Highway system is considered a major success and has been transformative to the US economy

In April 2021, President Biden proposed a $2.0 Trillion expenditure on infrastructure which was subsequently reduced to $1.2 Trillion by July 22, 2021, with a larger proposal still including social infrastructure spending. The Republicans counteroffer for traditional infrastructure was much smaller than Biden's proposal. Clearly, there are numerous factors that have changed in the intervening 65 years from the Eisenhower era to the Biden era. However, one distinct change in attitude appears to be significant. In 1956 it seemed obvious that the federal and state governments should fund and construct roads. In 2021, the Republican House of Representatives plan was based at least in part on the use of $400 billion as P3s for the transportation projects (Wilkie, 2021). This proposal seems to replace the 1956 government fully controlled and non-tolled roads by partial market based private participation. Indeed, the perception and economic theory (Musgrave, 1959; Samuelson, 1955) of what is a pure public good and whether government should produce such goods has changed and is clearly reflected in the 2021 Republican counteroffer to Biden's infrastructural government funded proposal. Indeed, P3s and privatization have been adopted by governors and mayors of both parties, like Mayors Daley of Chicago, Goldsmith of Indianapolis, Rendell of Philadelphia, Giuliani of New York City, Governor Bush of Florida, Governor Schaefer of Maryland, and Governor Daniels of Indiana.

One claimed purpose of Eisenhower's interstate highway system was for defense, to provide easier evacuation of cities in case of an atomic attack by the Soviet Union. President Eisenhower however, believed that the major purposes of the roads were economic growth, to improve highway safety, to reduce lawsuits, and to relieve congestion and less so for defense purposes (Interstate Highway System, 2021). A major funding source for the operation of the highways was a semi-user' fee, namely, the gasoline tax. In the 1950s, a direct charge on the civilian users of the highways would have involved high government transaction costs of collecting, securing, and delivering the toll revenues. It is interesting to note that President Eisenhower preferred tolls on the interstate highways, but was persuaded by the argument that except for the two Coastal regions, drivers would not be able or willing to pay the tolls. In any case, in the 1950s high transaction costs made the collection of direct user fees impractical and justified "free" use of the highways. However, from both efficiency and equity viewpoints, funding the construction, maintenance, and operation of the road should be by the users of the system.

On the production side, substituting government monopoly construction and provision by competitive private and public entities improves efficiency. From an equity viewpoint, non-users of the highways should not subsidize the users of the highways. Further, indirect users of the highways like buyers of products delivered by using the trucks, pay through the fees that are incorporated in the price of the delivered products. The gas tax was supposed to serve as a semi-user fee and pay for public roads construction and maintenance when the transaction costs were high. Indeed, the gas tax was increased from 2 cents to 3 cents per gallon at the time when the interstate highways were created. The rationale for such a tax is that the more a driver uses a road, the greater is his/her gas tax contribution for it. However, the gas tax takes the entire road system as one project. Rather, each road should be considered as an independent venture, and the construction and operation of each road should be economically sustainable.

Financing Roads

Use of gas taxes to fund roads, especially highways, has some issues. Drivers who do not use the highways do not directly benefit from them so why should they pay for them. For example, a driver may purchase gasoline in New Jersey but drive almost exclusively on highways in Pennsylvania. Drivers of older, less fuel-efficient vehicles are unjustifiably taxed more heavily for any given distance. As shown below, a significant amount of the gas tax proceeds is diverted to non-highway uses like urban mass transit systems. In addition, the gas tax is likely regressive, being borne in percentage terms more by lower income individuals. We use the US example as a general illustration on the desired model of funding highways while showing the weaknesses of the more common funding sources for highways.

The gas tax revenues are used to fund other government ventures like mass transit, law enforcement, and education. For example, between 2000 and 2019 New York and New Jersey allocated more than 33 percent of their fuel tax proceeds to mass transit (Feigenbaum & Hillman, 2020). Transfer of funds to other activities creates the possibility of "white elephants" and encourages inefficient production of such activities. Further, such transfers cause drivers to unjustifiably subsidize users of mass transit, a redistribution of income. In general, user fees are appropriate wherever the direct beneficiaries can be identified. If government choose to subsidize one group of population, it should do so directly and not through penalizing another group for that amount. Cross subsidization by drivers of users of mass transit or other services does not correct for inequity and produces unjustifiably transfer of income among residents. Again, efficient road usage requires that the marginal costs of the investment, operating, maintenance, and associated negative externalities are equal to the marginal benefits of the trip. When for a given road, user fees are set above the marginal costs and the extra revenues are diverted to other services like mass transit, the road is underused, and drivers subsidize unjustified users of mass transit. If user fees are below marginal costs, subsidization inappropriately occurs in the other direction. The diversion is nontrivial. In the US, New York State diverts 37.5% of gas tax revenues to other state services; this is a long time practice in the US and is likely in the European Union (EU) countries (Feigenbaum & Hillman, 2020; Watson, 2019, respectively.) The gas tax in the Netherland is $3.36 per gallon, which suggests that it uses only a fraction of its gas tax revenues for roads, causing underuse of cars and roads and overuse of other services to which funds were probably diverted.

When Public–Private Partnerships (P3s) operate individual roads, competition among the private entities at least to obtain the concession is expected to yield the desired social optimum where prices are closer to cost. In providing public goods, government is expected to charge for the negative environmental externalities added to the direct average total cost. In the future when electric cars become the norm, such environmental costs will significantly diminish. Such governmental charges are appropriate only if those receipts are used either to compensate those that suffer from the pollution or are used to ameliorate pollution. Using these environmental receipts to subsidize other services yields inefficiency and unjustified equity outcomes. Again, making each road a profit unit and encouraging competition in the investment and operation of the road yields an increase in social welfare and avoids unjustified cross subsidization. The principle is that road fees are used for roads and their levels reflect direct and indirect costs, while cross subsidization of road fees and other services is avoided. This principle generally means moving as much as possible to competitive user fees for "traditional" government services that are essentially private. In today's reality of electronic technology, user fees are both easier to implement and often entail low transaction costs. Thus, gasoline taxes could become obsolete. Further, when electric cars become more ubiquitous, the gasoline tax will yield low revenue, and eventually become insignificant.

Pure public good services like national defense, air pollution control, police patrol, or disaster services are enjoyed by all residents, and each person enjoys the full magnitude of them. Thus, pure public goods are appropriately funded by the relevant government. The reason for such general ledger funding is that everyone in that society enjoys similar level of service. Still, even when pure public goods are under the responsibility of government, the construction, operation, and other related services can be contracted out to public and private entities, and produced under competitive bidding. In the case of highways, where users are identified, the direct beneficiaries should pay the average total costs.

In the second decade of the twenty-first century, as distinct from the 1950s, existing technology enables low transaction costs in collecting the tolls, while even avoiding congestion at toll booths. So, it would become efficient and equitable to set market prices where those that use the roads and enjoy their benefits pay for their use. Such prices could be adjusted to prevent congestion but at what might be considered competitive levels. User fees allow rational decisions about expanding or contracting capacity. When user fees are employed, drivers use the road until the last dollar they spend equals the benefits they gain from using the road. When the price is zero, as is still common on the US interstate highway system, the road is often over-used, often causing congestion, especially at peak times.

Conventional wisdom suggests that pricing of highways is only appropriate if a close substitute free road is available. However, if monopolistic prices could be prevented, user fees are appropriate and there is no efficiency or equity reason for general government funding to subsidize a highway. The question is how to prevent monopolistic pricing when no close substitute road is available. There are two possible solutions to this problem. One is to subject the operator of the road to the appropriate regulatory commission or agency to approve its pricing. The other is for the regulatory commission to set a price cap where prices could only be raised over time by the difference between some appropriate price index and the expected change in productivity in the highway industry. The latter method of controlling monopoly is considered preferrable since it encourages cost cutting and productivity gains and avoids the necessity for many periodic public hearings. Price caps are designed to encourage cost cutting innovations by allowing the private operator to retain the profits from improved efficiency or lower costs. By keeping prices near competitive levels, such caps and traditional rate regulation discourage entry of competing roads. Society gains greater output in the form of increased road usage compared to the usage under the higher prices without regulation. In any event, high capital costs and the advantages of incumbency make competitive entry unlikely, adding to the desirability of government regulation.

Shadow prices are suggested to reduce risks of the private participants when the latter finance the total costs of the project. Under shadow prices, the road is often offered free of charge to the users while the public partner might pay the average total costs per trip to the private partner. The objective is to maintain a free road to the drivers while minimizing risk, or possible losses, to the private partner. Shadow pricing could be criticized on both efficiency and redistribution grounds. At a price of zero, more drivers use the road than if tolls were set at average total cost. The direct and indirect users on the road are subsidized by taxpayers, and possibly even leading to “white elephants” or socially undesired roads.

A common argument in the case of high initial capital costs, like a bridge, where marginal cost is low relative to average total cost, government should build the bridge and price it at marginal cost, which is close to zero, until congestion occurs. This policy reflects the notion that taxpayers pay for the infrastructure, which is considered a sunk cost. This argument is questionable on several levels. Such an argument that encourages government to fund the bridge, or in the case of Spanish roads to shield the private partner from losses, leads to “white elephants” (Albalate and Bel-Piñana, this volume). Thus, roads where demand is low even when the roads are completed can be too easily justified by such a policy. From a redistribution and efficiency viewpoint, such a project is subsidized by taxpayers that mostly gain no benefits from the bridge rather than being paid for by direct users of the bridge who are its beneficiaries. Also, it is obvious that although consumer surplus is increased at lower prices, it is not clear that such losing roads should be built. Further, a road priced at average total cost is likely to accumulate sufficient funds to maintain the road rather than relying on the general government budget. In such a manner, under a P3 model, funds become available for repairs when needed. Obviously, as Leccis (this volume) stated about the collapse of the

Italian Morandi bridge, strict government regulation is needed for all bridges to prevent a catastrophy.

Advantages and Disadvantages of Public-Private Partnerships (P3s)

Governments often have difficulties raising funds for capital projects because of debt limitations. P3s enable private funds to be used. The role of government normally is not to conduct business activities. Partnership with private partners enables creative activities, faster adoption of technology, cheaper and opportunistic purchasing of inputs, easier use of part time employees, competitive market wages to employees, fewer restrictions from using unionized labor, and avoiding strict and costly government protocols. Experience has often shown that public monopolies act less efficiently than firms operating under competitive conditions. Government can partner with companies that specialize in particular activities and have unique knowledge that could improve the outputs and save on resources. Private partners are focused on meeting goals, increasing income and reducing costs more than government. In P3s, government shares with its private partner bad consequences rather than bearing them on its own. Also, in P3s the private partner's unique expertise could be instrumental in solving unexpected problems. When a private partner controls overall aspects of building, operating, and maintaining the road, it is likely to avoid many problems that exist when several independent contractors are involved. Significantly, P3s are more likely than government to avoid "white elephants." When government builds a road or a bridge, it is more likely to overestimate its usage, or is pressured to build it by political, interest or lobbying groups. A private partner is less likely to share in an unprofitable road.

Experiences addressed in this volume show some distinct disadvantages of P3s in roads. When a P3 concession is near the time of transfer to government, the private partner may neglect appropriate maintenance and incorporation of improved technology on the road. Government often lacks the expertise of highly paid lawyers, accountants, and engineers unlike their private counterpart. Thus, it is sometimes difficult for government to negotiate a good or appropriate contract reflecting the public interest. In particular, the private partner's experts often obtain incomplete contract that enables renegotiations to occur where the private partner benefits at the expense of the public. In addition, government incurs transaction costs to monitor P3s' contract compliances that is missing in public projects. Even though P3 contracts specify the share of each partner in case of a failure or disaster, government often ends up bearing the full responsibilities. The private partner often creates a separate corporation for this P3 or relies on high debt to bear low risk.

Small project P3s are generally preferred over one large P3. In the case of a large P3, it is advisable to break it up to a smaller number of independent P3s to reduce risk even though the costs seem higher than in the conduct of the entire project. By so doing, more private companies are able to enter the biddings for the smaller project, increasing competition among them, and yielding close to normal returns. When a large P3 project is offered for bidding, only a few companies may respond reflecting limited competition, the likely risk is higher, and therefore government would be in an inferior position. Smaller independent projects reduce the likelihood of risk and uncertainty for the government. Notably, companies have to be large enough to incorporate sufficient activities to obtain relevant synergies (Albalate and Bel-Piñana, this volume). Another disadvantage is the higher borrowing costs of P3s relative to government. P3s sometimes require special legislation, which incurs transaction costs and increases approval time. Government needs to regulate P3s that enjoy monopoly power to prevent output restriction. A significant problem related to P3s is the possibility of renegotiation, which encourages low bids and creation of "white elephants."

Public-Private Partnerships (P3s) Versus Privatization of Roads

The question is why not have complete privatization rather than p3s. The use of Build-Operate-Transfer (BOT) or Build-Transfer-Operate or Build-Own-Operate-Transfer for highways is common where the private partner over time (usually 20–40 years) recovers its investment, enjoys normal or somewhat above normal returns, and then transfers the road to government. The greater the initial private investment, the longer is the concession period. Government often intends to allow free or reduced prices once the road is under its control. One might question the rationale for the transfer to the government. In particular, the private partner might avoid introduction of new technology and all but repairs required in the contract as the road approaches the transfer to government. The operating company might be motivated to raise or request higher prices if it operates the road for a given time while it might avoid increasing prices if it operates the road indefinitely. Also, one might argue that government should avoid operating businesses, but should promote the public interest through appropriate regulation to control monopolistic pricing or encourage competition through auctioning, among other methods.

In any event, the introduction of user fees enables the shift from full government control to more market-oriented pricing of P3s. Electronic monitoring technology achieves lower transaction costs and thereby allows user fees and makes P3s more feasible. Fully or even partial private involvement through P3s enables more efficient production, greater adoption of technology, less bureaucracy, and greater flexibility in management, purchasing, and employment, and more rigorous analysis of the economic desirability of roads. One could view the creation of P3 as a stage towards reducing government operations and moving towards privatization. For a more complete treatment of this issue, see chapter 17 of volume 1.

The introduction of P3s to finance, construct, operate, and maintain highways is designed for government to share the risks with businesses, and inject productivity, flexibility, and usage of lower cost inputs. However, experiences show that regardless of the initial contract between government and the business entity, renegotiations often occur, and the risk sharing of government dominates. Of 148 worldwide infrastructure projects analyzed, which had financial closure between 2005 and 2015 and for which data were available, 33% were renegotiated (World Bank, 2021). In Latin America and the Caribbean, 58% were renegotiated, in Northern America 40%, in the EU 28%, and in Southeast Asia 13%. The most common infrastructure segment was transportation where 40% were renegotiated. On the average, renegotiation occurred 3.6 years after financial closure. In the case of construction, renegotiation on average occurred 2.5 years into the project. The major reasons for renegotiation were increased costs of construction (21%), changing government policy (19%), and tariff issues (16%) (World Bank, 2021). The main factors that probably contribute to renegotiation are risk and uncertain events, the relative low equity of the private partner's often separate company created for the p3, the greater desire by the government versus the private partner for the project's completion, and poor contract management by the public partner. Leccis, in this volume, argued that the public partner is reluctant to revoke concessions because of the costs involved, leading to greater bargaining power for the private partner. The realistic expectations for renegotiations could motivate private contractors to submit low bids when competing for the contract. Monteiro (2015) claims that better assessment of risk and mitigation strategies in the initial contract could significantly reduce the occurrence of renegotiations. Possible obstacles that have occurred in similar such projects can be used to assess risk and enumerate the appropriate remedies should they occur. Clearly, events and conditions that are unable to be predicted could still lead to renegotiations.

An important rationale for P3s is the fact that government needs a new road or major work on an existing road but lacks the funds to do so. The private partner is aware of the situation and uses opportunities to renegotiate and improve its own position. Also, the private partner's objective is to maximize profits while the public partner's objective is to complete the road and establish or maintain moderate prices to appease voters. Private road operators usually use demand sensitive pricing to maximize profits while public road operators often maintain fixed prices during the day.

Private toll roads could be considered an alternative to both P3s and public roads. Such roads were common historically in the US and are now common in Europe. Some have been successful, and some have failed as is the case in any other business. The Dulles Greenway Road has become successful after having initially overestimated ridership. The return on equity was expected to be 11–12% in 2020 and retained earnings grew from about $ 3 billion to about $7.5 billion in the seven-year period ending on December 31, 2019 (Commonwealth of Virginia, State Corporation Commission, 2021). SR 91 in Orange County, California has also been successful. It provided four traffic lanes, two in each direction with easy access to/from it as it is in the middle of the freeway. The road has been equipped with the latest technological devices guaranteeing travel at 65 miles an hour or tolls are returned to the consumer, and the road provides for immediate removal of disabled cars. Tolls are differentiated by the time of the day and by existing demand (Wikipedia, 2021a, 2021b).

On the other hand, some P3s have been unsuccessful. For example, the Morandi bridge, which is part of the A10 highway in Italy, collapsed in 2018 with 43 fatalities, raising questions about the desirability of P3s (Leccis, this volume.) Another failure was evident with the Southern Indiana's I-69 Project where the private concessionaire was four months late in beginning the construction and fell behind in paying subcontractors, contributing to the ultimate financial problems. The project's ultimate costs grew from $369 million to $556.2 million, a 51% higher cost, and it was completed 2 years behind schedule when the State took control over the entire project (DeGood, 2018). One could easily claim that even in business partnerships in general, it is common that some fail. The issue is clearly whether such failures are more common in P3s than in other similar businesses and whether appropriate contractual agreements could prevent their occurrences. Such a detailed study could be in order.

Private roads have some disadvantages. When a government agency operates and maintains a road it enjoys sovereign immunity in case an accident with injuries, death, and property damage (Fishman, 2009). At the same time, private roads, or even private partners in P3s are fully liable and need to carry expensive insurance. Also, state and federal road operators are not required to pay federal taxes on profits while private toll roads owners are fully taxed. Finally, government can borrow at a lower interest rate than private road operators. Thus, there seems to be a clear disadvantage for private operators of roads vis-a-vis public road, leading to disincentives to build competing P3 or private roads. However, such disadvantages are institutional, set by government procedures and are not related to the actual operation of the P3s.

Some remedies exist to overcome the disadvantaged private operators. The state legislator could grant sovereign immunity to the private operators of roads. Also, government could help the private operators to float tax exempt bonds like the Private Activity Bonds. However, nothing can or should be done with respect to the private operators' taxes, which exist for all business. Such tax discrimination discourages construction of private toll roads, which compete with existing toll free or tolled public highways. The existence of these obstacles creates uncertainty for potential private operators, leading to reduced incentives for their entry. Government's role is to prevent monopolistic power and control its pricing power. However, ceteris paribus, over time with increased population, income, and car ownership, the demand for travel on major roads increases. The supply of public roads has not kept pace, creating congestion and diminished speeds. This situation creates opportunities for P3s and even for fully private roads. In the case of roads we have determined that the public good aspect is limited, letting prices fluctuate makes better use of existing capacity. It seems that private firms more often employ demand sensitive pricing where prices change to reflect changing intensity of use and price elasticities of demand. Demand sensitive pricing on highways could eliminate congestion, enable flow of traffic at a desired spreed, and increase the revenues generated from the travelers. This is a similar policy to varying prices over the day by restaurants, movie theaters, and even some highways (e.g., SR 91 in Orange County, California.) Allowing prices to rise during rush hours prevents congestion on the toll roads while increasing revenues. Such pricing policy may also encourage other firms to offer substitute services to the existing state or federal roads, like buses, moving belts, or special lanes on existing roads.

The Road Beyond

The basic question this book addresses is whether P3s in highways, bridges, and parking increase social welfare and their productivity in comparison to government controlled construction, management, and operation of these infrastructures. In general, P3s in highways have been successful in the world. For example, Decola-Souza and Sullivan (this volume) have evaluated P3s of US highways and concluded that such ventures generally proved successful, as did the ring roads in India, and the developers' roads in England. The chapters in this volume indicate that problems with P3s have arisen when the private partner had low equity in the P3 ventures, the stake of the public partner was higher in risk taking, when the partnership agreements were incomplete, all reasons leading to renegotiation. A clear success of P3s was in parking facilities. Matindill and Perry, in this volume, have shown that P3s for parking facilities in universities and transit stations were successful compared with public parking facilities managed by public authorities. Construction, management, and operation of such facilities are provided by companies that possess specific knowledge and experience, specific IT programs, and well-trained employees while allowing universities and transit authorities to concentrate more on their core mission. These P3s also relieve the public partners from debt issues associated with the construction.

Other factors for success revealed in this book include the size of the project. The larger in scope and costs and the longer it takes to complete the project, the greater is the extent of risk and uncertainty, and more likely is renegotiation and even bankruptcy to occur. Thus, it has been suggested that large projects might be designed as independent smaller projects even at seemingly higher costs. High initial capital cost roads that compete with free roads are risky (Villalba-Romero and Liyanage, this volume). Since the initial costs for a road or bridge are often high, annual returns that are low in the immediate years of operation could lead to low profitability or even bankruptcy when much of the funding is based on debt. It is difficult to expect an economically feasible road if it has to rely on future revenues based on the development engendered by the road (De Buen and Ortiz, this volume). Roads whose revenues are based solely on tolls and not on increased value of adjacent land and properties that the road operators own, are less likely to be financially viable (Villalba-Romero and Liyanage, this volume). Clearly, the owners of new roads that own adjacent land may enjoy capital gains attributed to their operating road that could support the investment in the road. The unknown revenue stream is especially acute in the case for "greenfield" roads which are riskier due to the unknown actual ridership (Decola-Souza and Sullivan, this volume). A basic question is what should be the share of government in a P3 road investment. Roads provide direct and indirect benefits to the users as well as pure public good benefits to the community (e.g., encouraging development, reducing pollution) and therefore the financing should be shared proportionately by the partners (Carbonaro, this volume).

De Buen and Ortiz, in this volume, have made some important suggestions on the bidding process and its participants. The potential public partner should provide relevant information to the competing companies on the proposed project, including the expected demand and the environmental consequences. Preparation of the bid is expensive for the private companies but is expected to lead to more participants and quality bids. The costly negotiation process of P3s that is absent in public projects may contribute to better learning and overall cost reduction. Finally, long-term relationship between the public and private personnel contribute to better managed projects.

There are three alternatives in developing and rebuilding existing state and national or federal highways: public, P3s, and private ventures where the P3s may incorporate several models. We recognize the difficulties of the public option, the problems associated with P3s, and some issues with private roads and now we should evaluate and choose the preferred alternative of these three. We suggested that existing technology makes user fees possible with low transaction costs. A main thrust of P3s is the transfer of the road to complete government ownership and operation after 20–30 years and sometime even after 99 years. However, the discounted present value of net revenues of such distant years after the private option expires is very low, while any such infrastructure probably requires major rebuild after the lengthy private operation. These significant outlays also include the installation of new materials and technology that were not available when the project was initially built. Thus, there does not seem to be a clear advantage for having the road transferred to the government. Nevertheless, implementation of P3s seems to enjoy some advantages over public roads. Having private toll roads prevents both the renegotiation problems, and the lack of incentives for improvements in the last years of the concession period. Privatization of highways is likely be the preferred alternative of the three. The process of obtaining state laws to provide sovereign immunity for private roads and the cheaper financing for state governments could be incorporated in the privatization option. Clearly, investment in private roads should be treated no differently from other investments. Greater reliance on private roads seems desirable, but their use requires a change in the mindset of legislators and the public. P3s may be simply an intermediate but an important step to private highways.

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